RDNO

REGIONAL DISTRICT NORTH OKANAGAN

SOLID WASTE MANAGEMENT PLAN

2018 UPDATE

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TETRA TECH

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EXECUTIVE SUMMARY

In British Columbia, regional districts develop solid waste management plans (SWMPs) under the provincial *Environmental Management Act.* This plan, an update of the one prepared in 2011, provides a long-term vision of how the Regional District of North Okanagan (RDNO) would like to manage its solid wastes and will serve to guide the solid waste management related activities and policy development in the RDNO for the next 10 years.

For this plan, the issues addressed were:

1. Almost 30% of the current waste stream is comprised of compostable organics.
2. Not all households receive curbside garbage collection resulting in less diversion potential compared to a three-stream system (recycling, organics, and garbage).
3. Over 60% of the current waste stream is collected through commercial haulers.
4. There are currently insufficient programming and behaviour change resources to support the first levels of the pollution prevention hierarchy including rethink, reduce and reuse initiatives.
5. No staff resources are currently focused on supporting and implementing residential and ICI waste reduction programs, including collection and diversion efforts.
6. Armstrong Spallumcheen Recycling and Disposal Facility (ASRDF) is reaching capacity, there are emerging and ongoing environmental issues at the ASRDF and Lumby Recycling and Disposal Facility (LRDF), and additional land has been purchased beside the Greater Vernon Recycling and Disposal Facility (GVRDF) to allow for mitigation of environmental issues and lateral expansion of the site, reconfiguration of the disposal system may be necessary to mitigate issues and increase efficiency in the system.
7. The RDNO has no disaster debris management plan.

This plan provides strategies, actions and a budget to address these issues.

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ACRONYMS & ABBREVIATIONS

Acronyms/Abbreviations	Definition
ASRDF	Armstrong Spallumcheen Recycling and Disposal Facility
CBSM	Community-based Social Marketing
C&D	Construction and Demolition
EPR	Extended Producer Responsibility
GHG	Greenhouse Gas
ICI	Industrial Commercial Institutional
GVRDF	Greater Vernon Recycling and Disposal Facility
HHW	Household Hazardous Waste
LRDF	Lumby Recycling and Disposal Facility
MF RES	Multi-family Residential
MSW	Municipal Solid Waste
RDNO	Regional District of North Okanagan
RD	Regional District
RDF	Recycling and Disposal Facility
RSWAWG	Region Solid Waste Advisory Working Group
RYWCF	Regional Yard Waste Composting Facility
SF RES	Single Family Residential
SWMP	Solid Waste Management Plan

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1.0 INTRODUCTION

In British Columbia, regional districts develop solid waste management plans under the provincial *Environmental Management Act*. Regional districts are modeled as a federation composed of municipalities and electoral areas, each of which has representation on the regional board. Solid waste management plans are long term visions of how each regional district would like to manage its solid waste in accordance with the pollution prevention hierarchy. This plan will be renewed on a 10-year cycle to ensure that it reflects the current needs of Regional District of North Okanagan (RDNO) as well as current market conditions, technologies and regulations.

This draft document represents an update of the RDNO's 2011 solid waste management plan (SWMP) and once approved by the Province (along with any approval conditions), becomes a regulatory document for solid waste management and serves to guide the solid waste management related activities and policy development in the RDNO. In conjunction with regulations and operational certificates that may apply, this plan regulates the operation of sites and facilities that make up the region's waste management system.

1.1 Guiding Principles

A solid waste management plan provides regional districts (RD) – and their residents and businesses – clear direction on how they will achieve their solid waste goals. The province has provided the following guiding principles to follow in the development of their solid waste management plans:

- Promote zero waste approaches and support a circular economy
- Promote the first 3 Rs (Reduce, Reuse and Recycle)
- Maximize beneficial use of waste materials and manage residuals appropriately
- Support polluter and user-pay approaches and manage incentives to maximize behaviour outcomes
- Prevent organics and recyclables from going into the garbage wherever practical
- Collaborate with other regional districts wherever practical
- Develop collaborative partnerships with interested parties to achieve regional targets set in plans
- Level the playing field within regions for private and public solid waste management facilities.

During this planning process, the Regional Solid Waste Advisory Working Group's (RSWAWG) reviewed these guiding principles, as well as the principles used in all prior RDNO solid waste management plans, and integrated these principles along with locally relevant components to guide the development of this plan update.

The RDNO should reduce the disposal of residual solid waste because it can:

1. Negatively impact the environment
2. Requires resources to manage such as financial and landfill capacity, and
3. Because a reduction is being recommended by the Province of British Columbia.

The RDNO will:

Encourage residents and workers in all business sectors in the region to act in accordance with:

1. The hierarchy of “reduce, reuse and recycle”
2. The ideal of zero waste within closed loops
3. Ecological and social sustainability of waste disposal practices
4. The prevention of littering, air and water pollution and greenhouse gas emission

through approved programs, bylaws and polices that include:

1. Education and promotion
2. Best practices
3. Consistent criteria
4. Effective services
5. Incentives, and
6. Restrictions;

and, will prioritize and favour, in its practices

1. Prevention of air and water pollution
2. Prevention of greenhouse gas emissions
3. Use of renewable energy
4. Public health and safety
5. Development of collaborative partnerships to support initiatives, and
6. Resources shared with other jurisdictions, such as facilities and services.

1.2 Pollution Prevention Hierarchy and Targets

This plan adopts the 5 R pollution prevention hierarchy as illustrated in Figure 1-1.

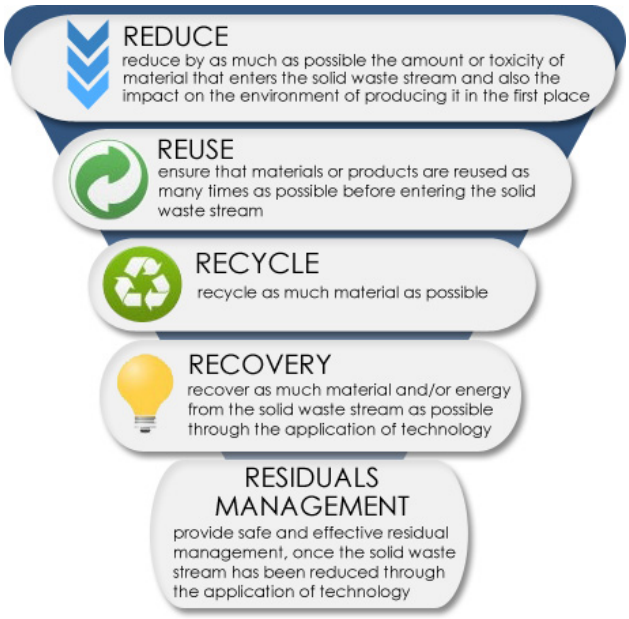

Figure 1-1: The Pollution Prevention Hierarchy
Source: (BC Ministry of Environment and Climate Change Strategy, n.d. [1])

The Plan's proposed strategies and actions are laid out in Sections 3.0, 4.0, and 5.0 and are presented in the order of the hierarchy: reduce, reuse, recycle, residual waste management.

The implementation of the proposed strategies and actions over a 10-year timeframe is expected to reduce the annual per person disposal rate from 550 kg per capita to 350 kg per capita over the next 10 years, by 2028, through a phased approach. Phasing implementation will optimize existing and implement new waste reduction and diversion programs with the capacity to reduce disposal per capita. The quantity of refuse to divert by 2028 through various programs is estimated to be 10,500 tonnes based on today's disposal rate. The disposal rate target aligns with the British Columbia Ministry of Environment and Climate Change Strategy's (Ministry) provincial target disposal rate of 350 kg per capita per year.

Additionally, the Ministry set a target to have 75% of the population in British Columbia covered by an organic waste disposal restriction by 2020 and through a separate Recycling Regulation, the Ministry oversees an Extended Producer Responsibility (EPR) program that sets 75% recovery targets for products covered through the program (e.g., beverage containers, packaging and printed paper, electronics, and other items).

As a signatory to the Climate Action Charter, RDNO is working towards reducing greenhouse gas (GHG) emissions derived from corporate operations which includes the transportation and diversion of solid waste. In working towards fulfilling the commitments of the Climate Action Charter, RDNO will conduct annual inventories of GHG emissions and seek opportunities for reducing emissions. With respect to solid waste management, RDNO will amend collection and or hauling contracts to include fuel management reporting requirements to populate the corporate GHG emissions inventory and encourage the use of fuel efficient vehicles. Energy efficiency opportunities will also be investigated in facilities used in the diversion of solid waste. The RDNO Regional Growth Strategy proposes to establish regional GHG reduction targets of 15% by 2020 and 25% by 2030 from the 2007 baseline. Solid waste management makes up 4.6% of regional community GHG emissions, therefore, initiatives that result in waste reduction, waste diversion or transportation reductions within the SWMP will contribute to achieving these GHG reduction targets.

[1] http://www2.gov.bc.ca/gov/content/environment/waste-management/zero-waste

1.3 The Plan Update Process

The process to review and update the SWMP was conducted in four steps. The first step included two components: the establishment of RSWAWG to assist in the plan review and update, an assessment of the current system and a report on the implementation status of the 2011 SWMP to develop a long and short list of options for consideration in the 2017 SWMP Update. The second step was a detailed analysis and evaluation of priority options, and developing and writing the 2017 SWMP Update. The third step was completion of a community and stakeholder consultation process to engage the public, key stakeholders, and First Nations to provide input on the selected options. The fourth step was to finalize the 2017 SWMP Update for submission to the Ministry for approval.

Several reports, as listed below, were prepared by the consultants to assist the RWSAWG with their deliberations. These documents are available on the solid waste management page of the RDNO's website (http://www.rdno.ca/index.php/services/community/solid-waste). These reports, as seen in Appendix B, include:

- Current Solid Waste System Report
- Technical Memorandum 1: Disposal Options
- Technical Memorandum 2: Reduce, Reuse and Recycle
- Technical Memorandum 3: System Recap, Bylaws, Policies, Plan Options

2.0 BACKGROUND

2.1 Plan History

The objectives of the 2011 SWMP review were to evaluate the status of current waste reduction initiatives and the quantity of waste currently being disposed. Seventy-one potential waste reduction initiatives were identified; ten strategies were selected and another six were derived through additional consultation, shown in Table 2-1. The primary objective of the SWMP Update was to create a feasible plan and identify initiatives which would allow RDNO to reduce the per capita disposal rate from 0.63 tonnes to 0.55 tonnes. The RDNO's first SWMP was completed in 1995, and updated SWMPs have been completed in 2002 and 2011. The updated plan in 2011 did not receive final approval by the Ministry due to a shortage of staffing resources at the provincial level.

Table 2-1: 2011 Solid Waste Management Plan Update Strategies

No.	Strategy	Description	Status
1.	**Organic Waste Management Strategy**	Determine the best management strategy for organic waste including wood and yard waste from the DLC, residential, commercial, industrial, and agricultural sectors; and kitchen scraps from the residential, commercial, industrial and agricultural sectors.	Ongoing
2.	**Expanded Curbside Collection**	Determine the economic viability of an Expanded Curbside Collection Program for all residential generated materials, including garbage, compostables, and recyclables.	Ongoing
3.	**Implement One Bag/Can Limit**	Consider a weekly one bag/can limit for households with a municipal curbside collection service. Since 1996 the limit has been set at two cans per week; given new diversion opportunities, there is increased viability for shifting to a new norm of one can per week	Ongoing
4.	**Blue Box Recycling Program for Businesses**	Determine the best method for including businesses in the Blue Box Recycling Program.	Ongoing
5.	**Upgrade Communications Tools**	Upgrade the RDNO website and other communication tools to help residents, businesses and others determine what materials can be recycled	Ongoing
6.	**Enhance Service at GVRDF for Commercial Haulers**	Evaluate the economic and operational implications of providing enhanced service for commercial haulers at the Greater Vernon Recycling and Disposal Facility (GVRDF). Enhancements could include early openings and a dedicated commercial scale. Being addressed through ongoing operations and major capital works, including the addition of a third lane in 2018 to assist commercial haulers	Ongoing
7.	**Audits of Large Waste Generators**	Consider offering a comprehensive waste audit to the 15 largest waste generators in the Region. Currently to be addressed through behavior change programs that provide audit support	Not currently being pursued
8.	**DLC Waste Management Strategy**	Examine mechanisms for further diversion of DLC waste, including but not limited to, private and public resource recovery parks and partnerships with industry.	Partially pursued via permitting mechanisms for City of Vernon, working to implement with other municipalities
9.	**Non-Typical Municipal Solid Waste Management**	Examine efficiencies and environmental protection needs with respect to including management of non-typical municipal solid wastes such as agricultural (e.g., plastics and slaughter waste) and industrial wastes (e.g., ash and wood), and water and wastewater treatment plant wastes in the SWMP.	Partially pursued by using Tolko Mill outputs to supplement daily cover, accepting Duteau Creek Water Treatment Plant sludge for composting, and accepting animal fatalities from agricultural operations

No.	Strategy	Description	Status
10.	**Blue Bag Recycling Program Improvements**	Evaluate the curbside Blue Bag Program and the Drop Centre Program to determine if the program should be expanded to include materials such as textiles, fluorescents, agriculture plastics, and other plastic products.	Partially pursued via Drop Centres (Recycle BC oversees Blue Bag Program)
11.	**Development Cost Charges**	Determine how local governments can include solid waste management infrastructure in their Development Cost Charge (DCC) bylaws by 2016.	Pursued but not currently viable
12.	**Inter-Regional Solid Waste Management Committee**	If interest exists, facilitate cooperation of southern interior solid waste management staff, municipal councils, and regional district Boards of Directors through an interregional Solid Waste Management Committee.	Pursued but not currently viable
13.	**Monitor Waste to Energy Technology**	Monitor waste to energy technology as it becomes accessible to small communities in Canada	Pursued but not currently viable
14.	**Eco-Depots**	Evaluate eco-depot concepts and locations especially with respect to customer convenience and land use in the region.	Completed
15.	**Blue Bag Processing Facility**	Continue to operate the current Blue Bag processing system and facility with minor capital improvement until more details about the provincial EPR program for packaging and printed paper are known.	No longer required
16.	**More Frequent Free Styrofoam Collection Events**	Consider increasing the number of free Styrofoam collection events until Styrofoam packaging becomes part of an industry stewardship program	No longer required

The draft 2017 SWMP is an update of the RDNO's 2011 SWMP and once approved by the Province (along with any approval conditions), becomes a regulatory document for solid waste management and guides solid waste management related activities in the RDNO for the next ten years.

2.2 Plan Area

The SWMP applies to the entire RDNO region. The land area of the RDNO is 7,503 square kilometres and the population density is 11.2 people per square kilometre. Regional districts are modeled after federations composed of municipalities and electoral areas, each of which have representation on the regional board. RDNO municipalities and electoral areas include Armstrong, Coldstream, Enderby, Lumby, Spallumcheen, Vernon, B – BX/Swan Lake, C – BX/Silver Star, D – Rural Lumby, E – Cherryville, and F – Rural Enderby. A map of the RDNO is included as Figure 2-1.

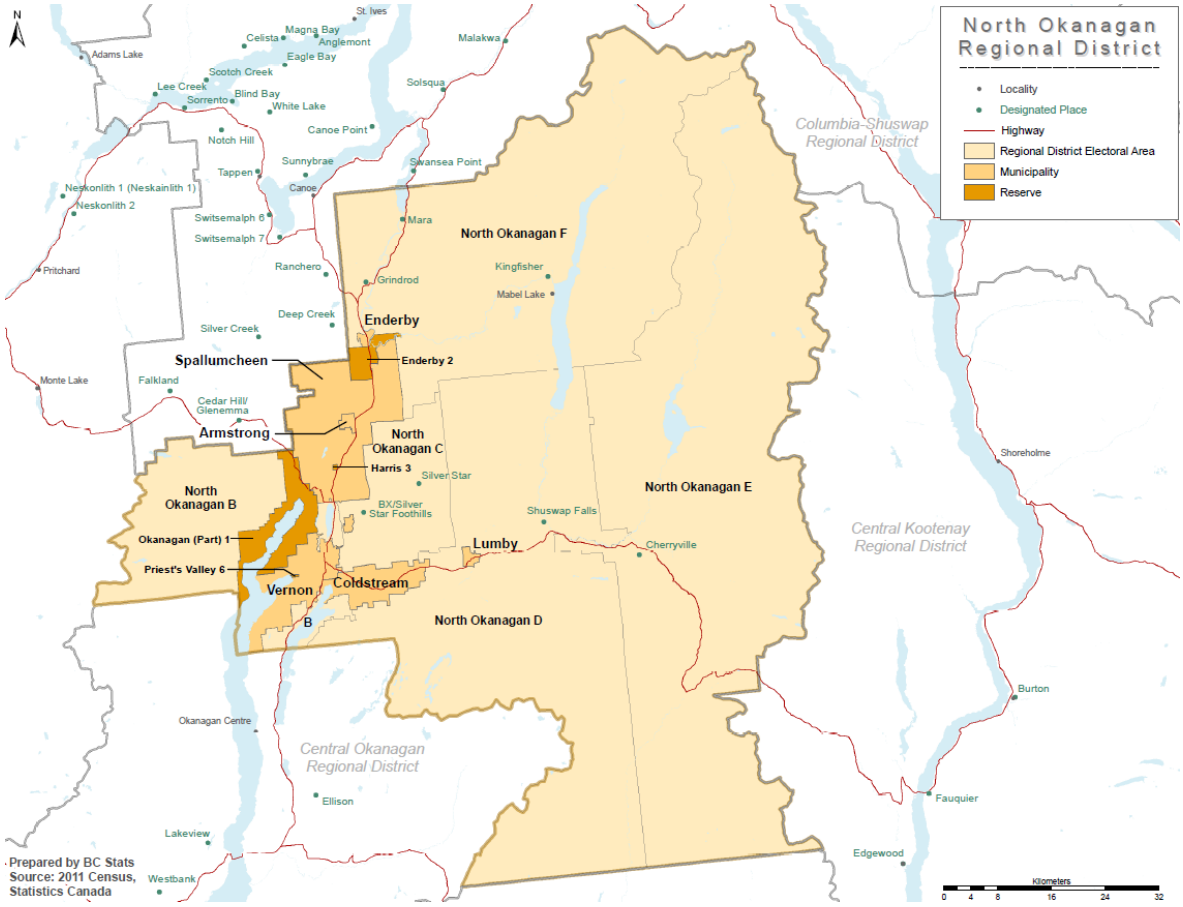

Figure 2-1. Map of Regional District of North Okanagan

Source: (BC Ministry of Environment and Climate Change Strategy, n.d. [2])

The plan also included consultation with the First Nations. The following Indian Reserves are located fully and in part in the RDNO under control of the Okanagan and Splatsin First Nations:

- Enderby Indian Reserve No. 2;
- Harris Indian Reserve No. 3;
- Okanagan Indian Reserve No. 1 (only partly within the RD); and
- Priest's Valley Indian Reserve No. 6.

[2] https://www2.gov.bc.ca/gov/content/data/geographic-data-services/land-use/administrative-boundaries/census-boundaries

2.2.1 Population and Employment

In 2016, the population of the RDNO was 84,354, which represents a change of 3.8% from 2011 as outlined in Table 2-2. This compares to the provincial average increase of 5.6% and the national average of 5.0% as reported by Statistics Canada. Approximately 60% of the population collectively reside in the communities of Vernon and Coldstream. Population growth in the five-year period 2006 to 2011 was a modest 1% per annum and has slowed to 0.8% per annum with more rapid growth occurring in Vernon and Coldstream.

Table 2-2: Population Change

Years	Population counts	Population change
2006 (census)	77,301	-
2011 (census)	81,237	+5.1% (from 2006-2011)
2016 (census)	84,354	+3.8% (from 2011-2016)
2026 (projected)	94,250	(+1.12% Growth/annum)[1]

[1] RDNO Regional Growth Strategy Estimated Growth Rate (http://www.rdno.ca/bylaws/Bylaw_2500.pdf)

2.2.2 Housing and Economic Data

The 2016 census data reported by Stats Canada reports that in 2016, there were 35,875 private dwellings occupied in the RDNO which represent a change of 6.3% from 2011. The total number of dwelling in the RDNO is 39,970. Single-detached houses represented 64.2% of all occupied private dwellings in this region in 2016. A summary of the distribution of dwelling types is summarized in Table 2-3.

Table 2-3: Proportion of Occupied Dwelling Types (Statistics Canada 2016)

Occupied Dwelling Type	Proportion	Number
Single Detached Homes	64.2%	23,032
Row Houses, Duplex, and Semi-Detached Homes	17.4%	6,242
Apartment Buildings	13.9%	4,987
Other (mobile homes and other single attached houses)	4.5%	1,614
Total	**100%**	**35,875**

The region's employment is distributed across several sectors; the largest employment generators in the RDNO include retail trade, health care, construction and manufacturing.

2.2.3 Collection

There is curbside recycling collection for close to 100% of RDNO single family residences (SF RES). Garbage is collected weekly in most municipalities, which equates to approximately 62% of RDNO households, all with a two bag/can limit. Some residents need to contact private haulers to arrange for a subscription based service as there is no collection services provided or administered by their municipalities or the RDNO. Weekly curbside organics collection is not provided in any areas; however, most municipalities have a twice yearly curbside and drop off yard waste collection in spring and fall (e.g., Coldstream). For the purposes of this report, organics is defined to include yard waste and food scraps (including wasted food).

Multi-family residential (MF RES) properties with more than four units were required to contact and register for recycling collection services through Recycle BC-registered haulers.

A summary of the existing residential curbside collection programs is provided in Table 2-4.

Table 2-4: Residential Curbside Collection

Municipality or Electoral Area	Households[1]	Regular Curbside Collection Service		
		Garbage	Recycling	Yard Waste
Vernon	17,798	Yes	Yes	No[2]
Armstrong	2,132	Yes	Yes	No[2]
Enderby	1,391	Yes	Yes	No[2]
Lumby	563	Yes	Yes	No[2]
Coldstream	3,915	No[3]	Yes	No[2]
Spallumcheen	2,001	No[3]	Yes	No[2]
Electoral Area B	1,284	No[3]	Yes	No
Electoral Area C	1,497	No[3]	Yes (part)	No
Electoral Area D	1,106	No[3]	Yes (part)	No
Electoral Area E	431	No[3]	No	No
Electoral Area F	1,737	No[3]	Yes (part)	No
Total Households with Publicly-Contracted Collection	-	21,884	33,855	0
Total Households without Publicly-Contracted Collection	-	11,971	0	33,855
Total Households in RDNO Municipalities and Electoral Areas	-	33,855	33,855	33,855

[1] 2016 Stats Canada Census Households with Usual Residents

[2] The City of Vernon provides a yard waste collection service in the spring and fall over a one week period as well as a spring chipping program conducted over a two-week collection period. Enderby, Lumby, Armstrong and Spallumcheen (3 subdivisions only) also provide a one-day only spring and/or fall yard waste collection service. Coldstream provides a seasonal drop off service.

[3] Collection services can be arranged by the resident through the private sector on a subscription basis

2.2.4 Facilities

Municipal solid waste (MSW) in the region can be directed for management to any authorized site or facility identified in the plan. Authorized sites or facilities can be found on the facilities map in Figure 2-2 and are listed below.

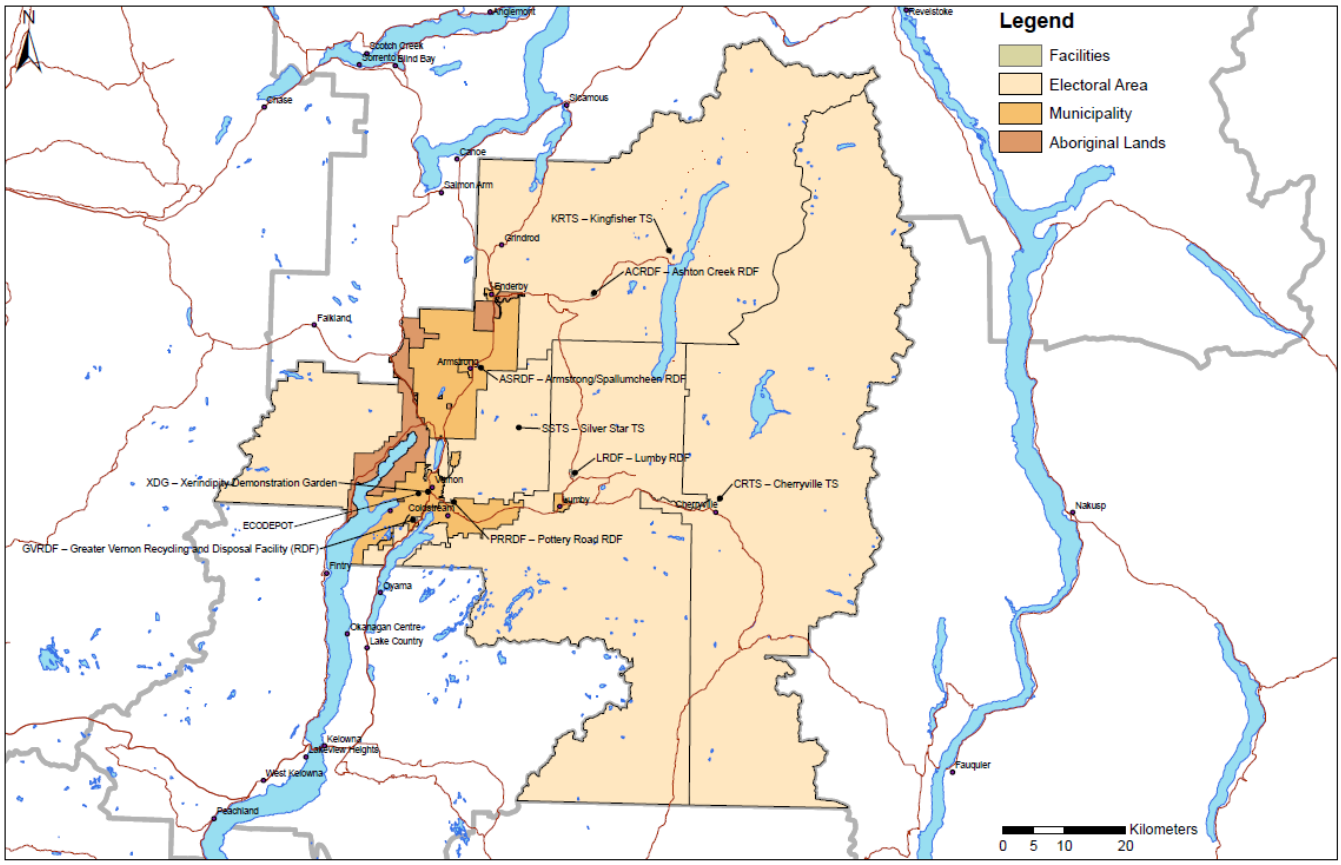

Figure 2-2. RDNO Facilities Map

2.2.4.1 Existing Facilities

There are three transfer stations that accept MSW including:

- Cherryville Transfer Station, located at 205 Aumond Road in Cherryville (Electoral Area E) at a closed landfill site [Crown Lease] – waste is transferred to the Lumby Recycling and Disposal Facility (LRDF)
- Kingfisher Transfer Station, located at 150 Beattie Road near Mabel Lake (Electoral Area F) at a closed landfill site – waste is transferred to the Armstrong Spallumcheen Recycling and Disposal Facility (ASRDF)
- Silver Start Transfer Station, located at 9695 Silver Star Road at Silver Star Mountain Ski Resort (Electoral Area C) [Crown Lease] – waste is transferred to the GVRDF

There are three active disposal facilities, or landfills, that exist in RDNO.

- LRDF (OC #15282) is the smallest of the three landfills, receiving 1,841 tonnes in 2016, and is located at 221Trinity Valley Road near Lumby (Electoral Area D). The plan for this site is to continue filling the east half of the footprint and to evaluate converting the facility into a construction and demolition waste site only to mitigate environmental issues. The estimated closure year is 2071.

- Armstrong Spallumcheen Recycling and Disposal Facility (ASRD) (OC #15284) received 11,419 tonnes in 2016, a small increase (1.3%) from 2015, and is located at 3367 Powerhouse Road in Spallumcheen. The plan for this site is to focus on filling the unlined north half of the existing footprint so that a partial closure (Phase 1) can be constructed in 2019 to mitigate environmental Issues. A landfill gas collection system is also being evaluated for implementation in 2019. The estimated closure year is 2027

- Greater Vernon Recycling and Disposal Facility (GVRDF) (OC #15286) received 28,926 tonnes in 2016, an increase of 1.7% from 2015, and is located at 120 Birnie Road near Vernon (Electoral Area B). The plan for this site is to focus filling on the upper northeast bench of the footprint to maximize landfill gas extraction. A conceptual design for a lateral expansion area on the 99 acre parcel adjacent to and west of the current footprint was completed in 2015. The estimated closure year for the existing footprint is 2059 and for the expanded footprint is 2081.

- Eco Depot

  - Located at Interior Freight and Bottle Depot (in Vernon), the Eco Depot accepts Household Hazardous Waste (HHW) from residents and is open seven days per week. This depot replaced annual roundups for HHW in the region. Interior Freight and Bottle Depot also accepts most EPR-managed products as well so is considered a one-stop-drop facility.

- Composting Facility

  - The Regional Yard Waste Composting Facility (RYWCF) is located at the GVRDF and was commissioned in 2011. This facility produces the RDNO branded compost called “rdno-gro”. The RYWCF accepts chipped yard and garden waste, as well as chipped logs and stumps and the RDNO’s Duteau Creek Water Treatment Plant sludge, which is composted in large windrows, turned, watered and monitored regularly and then screened to produce a Class A compost. The rdno-gro is distributed to the public and landscaping businesses on a self-load basis starting in the spring of each year. Residents and landscaping businesses can drop off yard waste free of charge all year round at the GVRDF yard waste tipping area. This material is chipped by the GVRDF operations contractor regularly and hauled and placed into windrows at the RYWCF.

- Backyard Composting Demonstration Garden (Xerindipity Garden)

  - The Xerindipity Garden was constructed in 2005 to provide a venue for demonstrating backyard composting and to hold education seminars on topics such as ‘how to compost in your backyard’, ‘grass-cycling’, ‘water wise gardening’, etc. The facility property is leased from the City of Vernon and is co-managed by the RDNO’s Greater Vernon Water Utility. It’s location beside the Okanagan Science Center and the Arts Council of the North Okanagan facilities inside the City’s Polson Park makes it ideal for promoting environmental and waste reduction initiatives.

2.2.4.2 Closed Facilities

- Ashton Creek Recycling & Disposal Facility (RDF) [final closure 1997] (OC #15287), located near Enderby off Mabel Lake Road (Electoral Area F)

- Cherryville RDF [final closure 2016] (OC #15285)

- Kingfisher RDF [final closure 2003] (OC #15281)

- Pottery Road RDF [final closure 2015] (PR 15289), located at 288 Pottery Road near Vernon (Electoral Area C)

2.3 Waste Disposal

When RDNO waste disposal data is organized according to "hauler type", or by generator type (residential, Industrial, Commercial and Institutional [ICI], and Construction & Demolition [C&D]) that delivers it to disposal facilities, the distribution of garbage is reported in Table 2-5. When broken down by "hauler type", commercial haulers deliver SF RES garbage to disposal facilities primarily using rear or side load packer trucks and on behalf of municipalities and subscription customers (private curbside collection contracts) (20%); commercial haulers deliver MF RES, ICI and C&D waste from the three sectors primarily using front load, roll off and other large trucks and trailers (62%); and self-haul customers deliver residential, ICI and C&D waste using an assortment of small personal vehicles and tip the materials into containers at each facility, including the transfer stations (18%).

Table 2-5: Current Garbage Disposal by Hauler

Hauler	Estimated Garbage by Hauler (20171)	
	Tonnes	Percent
Single Family (SF RES) Municipal and Subscription Curbside	9,059	20%
ICI (including Multi-Family Residential [MF RES] and C&D)	28,084	62%
Self-Haul (SF RES, ICI, and C&D)	8,153	18%
Total	**45,296**	**-**

[1] Annualized based on extrapolation of actual scale data from March to November 2017.

However, as discussed in the 2017 RDNO Current Solid Waste System Report, curbside garbage collection is only provided by the municipalities of Vernon, Armstrong, Enderby and Lumby. The remaining 35% of SF RES households in Coldstream Spallumcheen and the Electoral Areas either subscribe to a private collection service or self-haul their household garbage to the nearest RDNO RDF. If those households that currently receive curbside recycling collection service from Recycle BC were to also receive curbside garbage collection, the proportion of garbage collected from SF RES households through a municipal program increases significantly as shown in Table 2-6.

Table 2-6: Adjusted Garbage Disposal by Hauler

Hauler	Estimated Garbage by Hauler (2017[1])	
	Tonnes	Percent
SF RES Municipal and Subscription Curbside	14,059	30%
ICI (MF RES and C&D)	26,584	60%
Self-Haul (SF RES, ICI and C&D)	4,653	10%
Total	**45,296**	**-**

[1] Annualized based on extrapolation of actual scale data from March to November 2017.

2.4 Waste Composition

Figure 2-3 shows the adjusted 2012 waste composition results that represent aggregated results from across sectors. These results were adjusted to remove yard waste, given the 2016 program adjustment that permitted free year-round yard waste drop-off at all facilities and the corresponding reduction of yard waste in the garbage.

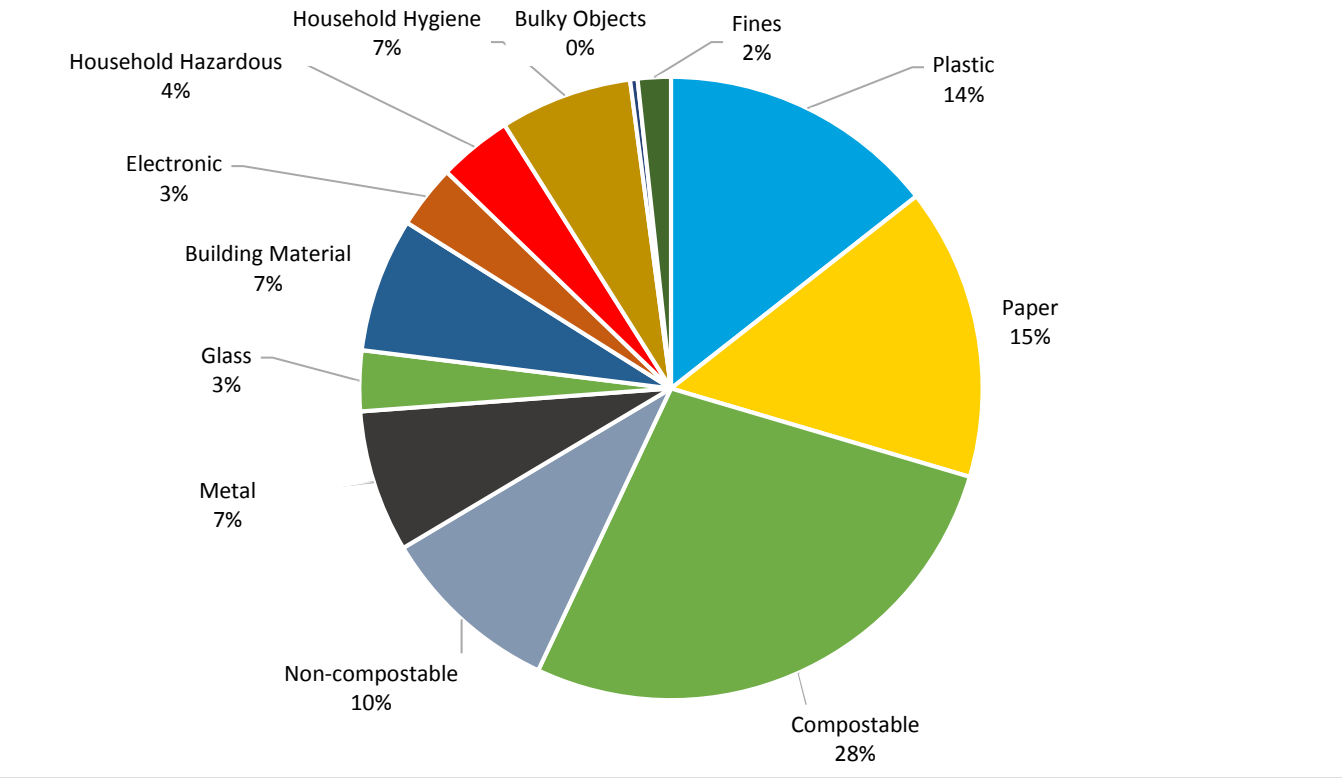

Figure 2-3: Waste Composition Results (2012 Adjusted) by Weight

As is done in other jurisdictions, about 15% of the paper portion of the above graph can be added to the Compostable portion of the graph, increasing the Compostable quantity in the waste stream to 30%.

2.5 Waste Management System Participants

Table 2-7 provides a list of the various organizations that contribute to MSW management in the RDNO.

Table 2-7: Municipal Solid Waste Management Participants

Who	Roles in Solid Waste Management
Federal Government	▪ Regulates waste management facilities under federal jurisdiction
Provincial Government	▪ Approves Solid Waste Management Plans as regulated through the Environment Management Act ▪ Regulates Product Stewardship programs through the Recycling Regulation ▪ Authorizes discharges to the environment through permits and operational certificates ▪ Responsible for enforcement of Provincial regulations and the conditions set out in discharge permits and operational certificates ▪ Various Ministries have several other regulatory authorities related to waste management
Regional District of North Okanagan	▪ Develops plans to provide big picture oversight of waste management in the region ▪ Owns and operates waste management facilities ▪ Through regional plans and plan implementation (including bylaws), works to meet regional waste disposal goals and targets and ensures that the communities have access to RDNO facilities and services ▪ Collaborates and cooperates with local organizations, businesses and agencies to implement plans and new programs ▪ Ensures that legislative and policy requirements are followed, including monitoring and reporting ▪ Supports the provision of Product Stewardship programs in the RDNO ▪ Provides waste management related education and promotion of programs
RDNO Member Municipalities	▪ Collaborate with RDNO to support SWMP Update implementation through Memorandum of Understanding, provide collection services, and consult with RDNO on operational activities under regional jurisdiction.
Product Stewardship Producers and Agencies	▪ Ensures reasonable and free consumer access to collection facilities ▪ Collects and processes stewarded products ▪ Coordinates local government delivery as a service provider where applicable ▪ Provides and/or funds education and marketing ▪ Provides deposit refunds to consumers (where applicable) ▪ Monitors and reports on key performance indicators such as recovery rates to the Province on a regional district basis (when possible)
First Nations Communities	▪ Provides waste management services to residents and businesses
Non-Profit Sector	▪ Applies for waste reduction funding through the available grant programs ▪ Engages in and promotes reuse and upcycling
Residents and Businesses	▪ Responsible for carrying out proper waste reduction, recycling and disposal activities ▪ Collaborates and cooperates with local government initiatives
Neighbouring Jurisdictions	▪ Identifies and engages in opportunities for collaboration and cooperation

2.6 Key Issues

The key issues for developing this plan emerged through ongoing discussions with the RSWAWG and are summarized below. The options outlined in Section 3.0 Goals and Strategies address the issues listed.

1. Almost 30% of the current waste stream is comprised of compostable organics

2. Not all households receive curbside garbage collection resulting in less diversion potential compared to a

three-stream system (recycling, organics, and garbage)

3. Over 60% of the current waste stream is collected through commercial haulers.
4. There are currently insufficient programming and behaviour change resources to support the first levels of the pollution prevention hierarchy including rethink, reduce and reuse initiatives.
5. No staff resources are currently focused on supporting and implementing residential and ICI waste reduction programs, including collection and diversion efforts.
6. ASRDF is reaching capacity, there are emerging and ongoing environmental issues at the ASRDF and LRDF, and additional land has been purchased beside the GVRDF to allow for mitigation of environmental issues and lateral expansion of the site, reconfiguration of the disposal system may be necessary to mitigate issues and increase efficiency in the system.
7. The RDNO has no disaster debris management plan.

3.0 GOALS AND STRATEGIES

To meet the disposal rate target of 350 kg per person, below are the recommended program and policies to be implemented over the next ten years. The recommendations are split into two types: Reduce, Reuse and Recycle and Residual Management.

For each option, a table is included that describes the costs associated with the proposed program. It is of note that municipalities are responsible for collection programs with RDNO providing planning and education/behavior change support. This affords the opportunity for further local engagement during the implementation process to customize solutions based on population density and geographical variation, while still utilizing industry best practices and meeting the SWMP Update goals and 350 kg per capita per year target. While the RDNO is ultimately responsible for these costs, they may be recovered through increased current tipping fees, new tipping fees or increased taxation as further addressed in Section 5.0 Finance and Administration. Note that staffing needs are listed for each table and the related cost is consolidated in Section 3.1.5 Establish Staff Positions.

3.1 Reduce, Reuse and Recycle

3.1.1 Increase Organics Diversion

Issue: Almost 30% of the current waste stream is comprised of compostable organics.

A. Review and adopt an Organics Diversion Strategy based on the four options considered in the Organics Management Options Study to provide clear direction with respect to policy (disposal restrictions), collection (kitchen scraps or food and yard waste combined, expanded curbside collection or current municipal collection programs only); processing (public or private, in-region or out-of-region); and transfer out of region.

B. Develop an implementation plan for the RDNO Organics Management Options Study (Carey McIver & Associates Ltd., 2017), as per Appendix E to address residential and ICI sectors.

C. Provide additional staff resources to consult with applicable stakeholders including municipal partners and solid customers, processors, and commercial haulers.

D. Implement the processing infrastructure component of the Organics Management Options Study.

Table 3-1: Organics Diversion: Estimated New Costs

Actions	Estimated Capital Cost	Estimated Operating Cost
Organics Diversion Strategy Implementation for Residential and ICI	-	Staff
Organics Diversion Processing Infrastructure (Transfer Station only)	-[2]	-[1]

[1] Assumes existing staff will operate the new organics transfer component of the RDF
[2]Costs will vary depending on option selected. Initial options are provided in Appendix E. Organics Managemnt Options Report 2017

3.1.2 Reduce Disposal from SF and MF Residential Households

Issue: Not all households receive curbside garbage collection resulting in less diversion potential compared to a three-stream system (recycling, organics, and garbage) provided at the municipal level.

A. Expand curbside garbage collection to all SF RES households that currently receive curbside recycling collection (Expanded Curbside Collection). Consider clear bag options.

B. Implement a One Bag/Can Limit for SF RES households that currently receive municipal curbside garbage collection, expand to all SF RES households if Expanded Curbside Collection is implemented.

C. Undertake a study to determine the demand for curbside collection of yard waste as well as the implications of switching to automated collection, for both SF RES and MF RES. As a transition strategy prior to full collection, consider food scraps drop off locations, such as farmers markets and community gardens, to accommodate community members who want to divert food scraps.

D. Implement a kitchen scraps collection program for SF RES households that currently receive municipal curbside garbage collection; expand to all SF RES households if Expanded Curbside Collection is implemented. Implement a One Bag/Can Limit with every other week garbage collection service.

E. Design and implement behaviour change (education and promotion) programming using a community-based social marketing (CBSM) approach.

F. Consideration for pilots will be discussed when the community is engaged during consultation.

G. Provide additional staff resources to consult with municipal partners and customers to recommend policy decisions regarding implementation of expanded curbside collection: number and location of households, trial areas, types of materials collected (kitchen scraps only or food and yard waste), type of cooperation with Recycle BC's Blue Box Program, and type of collection system (manual or automated).

Table 3-2: SF Residential Household Disposal Reduction: Estimated New Costs

Actions	Estimated Capital Cost	Estimated Operating Cost
SF Residential Household Program Disposal Reduction Implementation	-	$50,000 to be allocated in year 2 of the SWMP to determine most efficient and effective collection methods in cooperation with municipalities $67,000 to be allocated across years 2-4 of the SWMP for promotion and behavior change with staff support

3.1.3 Reduce Disposal for Sectors Served by Commercial Haulers (ICI, Multi-family Res and C&D Waste)

Issue: Over 60% of the current waste stream is collected through commercial haulers.

A. Review the effectiveness of the current level of application/enforcement of the Regulated Material (R03) recycling and disposal fee and consider implementing disposal bans on EPR and other recyclable materials including kitchen scraps and addressing other existing bylaw policies such as secure loads. Consider use of a "regulate, collaborate, communicate, educate and enforce" model.

B. Review the impact of disposal bans on illegal dumping levels and implement an illegal dumping prevention and enforcement program if required.

C. Explore waste stream management licensing options to ensure a level playing field to support private sector market development for recycling materials.

D. Work with private sector to ensure markets for diverted materials, with a focus on wood and compost, by banning these items from disposal and encouraging the development of private sector infrastructure to process and market non-residential recyclable materials.

E. Design and implement behavior change (education and promotion) programming using a CBSM approach.

F. Provide the additional staff resources to implement disposal bans, including enforcement and education, for MF RES in particular.

Table 3-3: Reduce Disposal for Sectors Served by Commercial Haulers: Estimated New Costs

Actions	Estimated Capital Cost	Estimated Operating Cost
ICI, MF RES, and C&D Disposal Reduction Implementation	-	$50,000 to be allocated across years 3-5 of the SWMP with staff support

3.1.4 Develop Programs to Actively Promote Waste Reduction and Reuse Initiatives

Issue: There are currently insufficient programming and behaviour change resources to support the first levels of the pollution prevention hierarchy including rethink, reduce and reuse initiatives.

A. Continue to demonstrate backyard composting through the Xerindipity Garden at Polson Park and deliver the Composter Rebate Program.

B. Continue to administer the Waste Reduction Initiatives Fund for not-for-profit organizations that need seed capital funding for new or amended programs.

C. Provide behavior change and education programs including a kitchen scraps reduction campaign (e.g., Love Food Hate Waste)

D. Advocate with senior governments to modify the existing Recycling Regulation (e.g., adjust recovery rates from 75 to 85%) and expand the list of EPR products covered in the regulation (e.g., mattresses, drywall, carpet, textiles). For current and future programs, consider options for creating a "one stop" drop off for EPR products and pursue opportunities to support local efforts—through interregional collaboration or other—for end market management.

Table 3-4: Waste Reduction and Reuse Initiatives: Estimated New Costs

Actions	Estimated Capital Cost	Estimated Operating Cost
Waste Reduction and Reuse Initiatives Implementation	-	$50,000 to be used across year 2 and 4 of the SWMP with staff support

3.1.5 Establish Staff Positions to Develop, Implement and Provide Ongoing Efficiency to Ensure Program Effectiveness

Issue: No staff resources are currently focused on supporting and implementing residential and ICI waste reduction programs, including collection and diversion efforts.

A. Re-establish a waste reduction program planner to oversee the expansion of curbside collection, develop region-wide messaging, tools and template documents for municpilaties to adapt, and other programs and campaigns to optimize efficiency and effectiveness of behaviour change efforts.

B. Establish a staff position that collaborates with key stakeholders, including haulers and businesses, and provides educational support and other services, including providing support for organics program development and implementation.

Table 3-5: Staff Positions: Estimated New Costs

Actions	Estimated Capital Cost	Estimated Operating Cost
Staff Positions to Drive Program Implementation	-	$193,310 for two staff positions, including annual benefits

3.2 Residual Management

3.2.1 Develop Centralized Disposal Plan with Additional Landfill Capacity

Issue: ASRDF is reaching capacity, there are emerging and ongoing environmental issues at the ASRDF and LRDF, and additional land has been purchased beside the GVRDF to allow for mitigation of environmental issues and lateral expansion of the site, reconfiguration of the disposal system may be necessary to mitigate issues and increase efficiency in the system. Additionally, GVRDF access issues continue to be a challenge since highway upgrades in the 1970s.

A. GVRDF – A conceptual design for a lateral expansion has been developed to extend the landfill footprint to the west of its current boundary resulting in a potential 30 years of additional disposal capacity. The current footprint is expected to last until 2059. The expansion will need to commence within the next ten years to secure a permit amendment from the Province. Major permit amendments can take five years or more and must be approved in the SWMP prior to the application stage.

B. Regarding GVRDF access, the Ministry of Transportation and Infrastructure has a current project underway to address infrastructure challenges along the full corridor, including the section near the GVRDF. Congestion and routing issues can also be addressed by reducing the amount of traffic going to the site.

C. ASRDF – Unless waste reduction measures are enhanced significantly, it is expected that the current landfill capacity will be filled by 2027 (9 years). The planned phase one closure (north unlined section) will help mitigate environmental issues at this site starting in 2019. It is recommended that the landfill be closed as soon as the capacity is reached and a self-hauler transfer station be constructed, with all large loads (front load,

rear and side load, and roll off trucks) going directly to the GVRDF. Options for waste transfer will be studied to determine the best overall option.

D. LRDF – The most financially sustainable model for landfill operation, environmental protection and closure warrants preserving landfill space at this site only for inert C&D waste with a transfer station put into place to accommodate self-haul loads only. The timing for this change should be determined within the next five years, and may result in some reduction in operating costs related to landfill maintenance and service hours.

E. Hesperia Landfill – The City of Vernon has hired a consultant to help with regulatory compliance for their Hesperia Landfill (Upper Bench Row Road), which is operated by the City of Vernon as a demolition, land clearing, and construction material disposal facility. The landfill is authorized under Operational Certificate (OC) 15288 to dispose of up to 15,200 m3 of demolition and construction wastes, comprised of inert material such as clean fill and concrete, each year. The OC, which was issued by the Ministry in 1998, states that is in accordance with the RDNO SWMP. This landfill was included in the original SWMP, but is has not been included in any of the updates because RDNO was unaware that operations were on-going at this landfill. The City of Vernon has recently approached the Ministry to discuss amending the OC to increase the annual maximum discharge rate and to revise some of the OC clauses that are not necessarily applicable to their operations. The Ministry has also recommended that the City of Vernon seek a formal amendment for these changes. However, for the Ministry to consider an amendment, the landfill needs to be included in the RDNO's regional SWMP.

F. Kingfisher and Cherryville – Optimize efficiencies with respect to extra bin hauling, stock piling, and other operational elements.

Table 3-6: Centralized Disposal Plan Design and Construction: Estimated New Costs

Actions	Estimated Capital Cost	Estimated Operating Cost
GVRDF Lateral Expansion – Investigation and Design	$100,000 to be allocated in year three of the SWMP	-
ASRFD Transfer Station Development	$2.5 million with $250,000 to be allocated for design in year 8 and $2.25 million for year 10 construction	-
LRDF Transition to C&D Landfill with Self-haul Drop-off Bay	$300,000 to be allocated in years 5 and 6 for design and construction	-

3.2.2 Prepare a Disaster Response Plan

Issue: The RDNO has no debris management plan.

A. Address disaster response waste (e.g., docks, Styrofoam, sandbags, burned buildings, fires) – Ensure solutions for disaster materials management are developed before a disaster occurs so systems can be put into place to manage the rapid increase in materials that are often generated after a disaster. This effort is likely to need inter-departmental collaboration and resource sharing.

There are no additional costs associated with disaster response plan preparation.

3.3 Resulting Diversion Potential

The recommended actions have the potential to reduce the amount of solid waste disposed in the RDNO by approximately 150 kg per capita per year, as shown in Table 3-7. This means the disposal rate would be 350 kg per capita per year, meeting the Provincial and RDNO's disposal rate target.

Table 3-7: Diversion Potential with Programs Implemented

Material Grouping by Hauler Type	Hauler Contribution to Landfill	Diversion Potential out of Landfill (%)	Diversion Potential out of Landfill (kg/capita)
Residential	**30%**		
EPR-PPP		60%	12
EPR-non-PPP		40%	5
Other recyclable		30%	3
Compostable		90%	48
Building Material		20%	2
Residential Diversion Potential			**69**
ICI	**60%**		
EPR-PPP		60.0%	16
EPR-non-PPP		40.0%	10
Other recyclable		30.0%	6
Compostable		30.0%	31
Building Material		33.0%	10
ICI Diversion Potential			**74**
Self-Haul	**10%**		
EPR-PPP		50%	2
EPR-non-PPP		40%	2
Other recyclable		30%	0
Compostable		20%	0
Building Material		20%	3
Self-Haul Diversion Potential			**7**
Potential Additional Diversion from Landfill			**150**
Estimated Annual Disposal (assuming 500 kg/capita)			**350**

Table 3-8 provides a list of items that are included in the material groupings listed above.

Table 3-8: Category Items

Category	Included Items (e.g.)
EPR-PPP (SF RES)	Packaging and Printed Paper Materials (Residential Managed by Recyclable BC)
PPP (ICI)	Packaging and Printed Paper Materials
EPR-non PPP	Electronics, Batteries, Used Oil, and Containers, Etc.
Other Recyclable	Textiles and Plastic Film
Compostable	Compostable Food and Compostable Paper
Building Materials	Drywall, Masonry, Clean Wood, and Metals

4.0 PLAN MONITORING AND MEASUREMENT

4.1 Regional Solid Waste Advisory Working Group

The RSWAWG will monitor the implementation of the plan and make recommendations to increase its effectiveness. A description of the RSWAWG tasks and make up are included in the preliminary terms of reference which can be found in Appendix C.

4.2 Annual Reporting

RDNO will compile data from RDNO sites on all residual disposal activities in the regional district and provide annual information to the Ministry's online disposal calculator.

4.3 Five-Year Effectiveness Review

Five years into the implementation of this Plan, RDNO will carry out a review of the plan's implementation and effectiveness, as prescribed by the Ministry. This review should result in a report that is made publicly available but does not need to be submitted to the Ministry for approval. This review may include:

- Overview of all programs or actions undertaken in the first five years to support the plan goals and targets, including status and implementation costs for each
- Description and forecasted budget for programs or actions not yet started and status, including explanations for delays or cancellations of plan components
- Five-year trend information for waste disposal per person
- Five-year trend of greenhouse gases emitted and avoided, if available
- Any significant changes that might impact the solid waste management system over the next five years.

Table 4-1: Five-Year Effectiveness Review

Actions	Estimated Capital Cost	Estimated Operating Cost
Effectiveness Review Implementation	-	$25,000 to be allocated for year 5 of the SWM Plan

4.4 Waste Composition Studies

In advance of the five-year review noted, a multi-season waste composition study on the residual waste management stream is proposed for year 1 and year 5, if appropriate, in advance of the next SWMP Update to assess the success of current waste diversion programs and policies and identify opportunities for additional diversion.

Table 4-2: Waste Composition Studies

Actions	Estimated Capital Cost	Estimated Operating Cost
Waste Composition Studies	-	$100,000 to be allocated in years 2 and 6 of the SWM Plan

4.5 Plan Flexibility and Risk

The SWMP lays out the high level goals, costs, and timelines for solid waste program implementation in the RDNO. A number of factors may affect the cost and timeline to implement each strategy including external changes to priorities, partner programs, and regulations, hauler collection and processing capacity, market fluctuations, and internal variations in priorities and availability of budget and staff time to impement programs. The SWMP is intended to be flexible in the implementation of plan components, either directly, or in cooperation with municipalities, or through private firms and/or non-profit organizations. While the SWMP provides flexibility in implementation depending on internal and external factors, the following risks should be considered:

- Achieving the identified disposal target is dependent on successful implementation of all strategies identified in Section 3.0.
- Costs provided are conceptual level estimates and may differ from the actual costs to implement programs depending on the details of program or infrastructure design and timing of implementation. As a result, major programs and infrastructure are expected to undergo further assessment prior to implementation.
- The success of most items is dependent on allocation of staff to adequately design, implement, and assess programs.
- Several items are dependent on partnerships with local, regional, or provincial organizations which may experience changes in priority throughout the SWMP timeframe.
  - Implementation of expanded curbside collection for garbage and organics depends on municipalities to collect materials from residents.
  - Increasing access to ICI recycling depends on private sector and other collection providers to consistently provide and expand collection and processing services available in the future.
  - Increasing C&D waste diversion depends on the private sector to provide alternatives to disposal for these materials.

- The success of reduce, reuse, and recycle strategies will be affected by education and behaviour change programs.
- The Recycling Regulation is not easy to amend and additional EPR products may not be added in a timely manner.
- The Ministry may require changes to the operation of regional disposal facilities through orders and updates to Permits and Operational Certificates which would impact the timelines and priorities for investment at disposal facilities.

As the preparation of this SWMP was completed to meet requirements from the Ministry, and no consultation with Ministry staff was required or desired by the Ministry in the development of the draft SWMP, it remains an unknown as to whether or not the RDNO has satisfied the Ministry's intentions with respect to this SWMP. Statements with respect to plan implementation flexibility have therefore been included..

Should their be any disputes related to the SWMP, the procedures in Appendix D. Plan Dispute Resolution Procedures will be utilized.

As program planning and implementation is pursued over time, the life cycle analysis model generated for the 2017 Organics Managemement Options Study will be utilized to assess costs and benfits of new programs as they are approved for implementation over the next ten years. The Solid Waste Management System Cost Analysis – Organics Diversion RDNO BC (XCG, 2017) is located in Appendix F.

5.0 FINANCE AND ADMINISTRATION

The strategies, actions and costs associated with meeting the first two goals have been discussed in previous sections and represent significant changes and improvements to the MSW management system in the RDNO. This section of the plan presents a summation of the estimated costs (in 2017 dollars) to the RDNO for the proposed solid waste management system and addresses options for how the implementation of the Plan will be financed.

Table 5.1 provides a five-year financial plan reflecting the proposed programs.

Table 5-1: Five-Year Financial Plan

RDNO FINANCIAL PLAN	2018	2019	2020	2021	2022
REVENUE					
Tipping Fees	$ 5,840,000	$ 5,951,700	$ 5,900,000	$ 5,900,000	$ 5,900,000
Tax Requisition	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 420,000
Grants	$ 202,500	$ 1,767,500	$ 2,500	$ 2,500	$ 2,500
Interest Income	$ 36,910	$ 44,437	$ 35,736	$ 36,461	$ 36,599
Sundry Income	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000
Transfer from Operating Reserve	$ 1,308,500	$ -	$ -	$ -	$ -
Transfer from Statutory Reserve	$ 55,000	$ 391,800	$ 37,000	$ 334,600	$ -
Recycled Commodities Revenue	$ 86,000	$ 95,600	$ 97,232	$ 98,897	$ 100,595
Other income - Gravel Royalties	$ 8,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000
Rental and Lease Income	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000
TOTAL OPERATING REVENUE	**$ 7,962,910**	**$ 8,680,037**	**$ 6,501,468**	**$ 6,801,458**	**$ 6,468,694**
EXPENDITURES					
Existing Operating Expenditures					
Waste Reduction/Recycling Polices and Program	$ 35,000	$ 35,700	$ 36,414	$ 37,142	$ 37,885
Recycling Operations	$ 342,000	$ 348,840	$ 355,817	$ 362,933	$ 370,191
Landfill and RDF Operations	$ 3,198,130	$ 3,197,656	$ 3,261,609	$ 3,326,841	$ 3,393,378
Adminstration (Including Wages & Benefits)	$ 750,910	$ 763,887	$ 749,164	$ 794,748	$ 810,643
Other (Monitoring, Studies, Eco Depot)	$ 204,000	$ 208,080	$ 212,243	$ 216,488	$ 220,817
Transfer to Operating Reserve	$ 319,370	$ 643,074	$ 657,053	$ 598,706	$ 497,780
Transfer to Statutory Reserve - Landfill Closure	$ 1,550,000	$ 1,100,000	$ 1,100,000	$ 1,100,000	$ 1,100,000
Total Annual Existing Operating Expenditures	**$ 6,399,410**	**$ 6,297,237**	**$ 6,372,300**	**$ 6,436,858**	**$ 6,430,694**
Existing Capital Expenditures					
Closure & Post-Closure	$ 55,000	$ 391,800	$ 37,000	$ 334,600	
Capital Expenditures	$ 1,508,500	$ 1,991,000	$ 129,168	$ 30,000	$ 38,000
Total Annual Existing Capital Expenditures	**$ 1,563,500**	**$ 2,382,800**	**$ 129,168**	**$ 364,600**	**$ 38,000**
Total Annual Existing Expenditures	**$ 7,962,910**	**$ 8,680,037**	**$ 6,501,468**	**$ 6,801,458**	**$ 6,468,694**
Revenue - Expenditures	$ -	$ -	$ -	$ -	$ -
PROPOSED Operating Expenditures					
Increase organics diversion					
Reduce Disposal from SF Residential Households		$ 42,000	$ 15,000	$ 10,000	
Reduce Disposal from Commercial Haulers			$ 25,000	$ 15,000	$ 10,000
Develop Programs to Actively Promote Waste Reduction and Reuse Initiatives		$ 25,000		$ 25,000	
Establish staff positions (2 FTE + benefits)		$ 193,310	$ 193,310	$ 193,310	$ 193,310
Prepare a Disaster Response Plan	$ -				
Five Year Review					$ 25,000
Waste Composition study		$ 50,000			
Total Annual Proposed Operating Expenditures	**$ -**	**$ 310,310**	**$ 233,310**	**$ 243,310**	**$ 228,310**
PROPOSED Capital Expenditures					
Increase organics diversion (assumes private compost facility)					
GVRDF Lateral Expansion (Investigation and Design)			$ 100,000		
ASRDF Transfer Station Development					
LRDF Transition to C&D Landfill					$ 150,000
Hesperia Landfill (City of Vernon)					
Total Annual Proposed Capital Expenditures	**$ -**	**$ -**	**$ 100,000**	**$ -**	**$ 150,000**
Total Annual Proposed Expenditures	**$ -**	**$ 310,310**	**$ 333,310**	**$ 243,310**	**$ 378,310**
TOTAL OPERATING EXPENDITURES	**$ 6,399,410**	**$ 6,607,547**	**$ 6,605,610**	**$ 6,680,168**	**$ 6,659,004**
REVENUE SOURCE TBA	**$ -**	**$ (310,310)**	**$ (333,310)**	**$ (243,310)**	**$ (378,310)**
TOTAL CAPITAL EXPENDITURES	**$ 1,563,500**	**$ 2,382,800**	**$ 229,168**	**$ 364,600**	**$ 188,000**
TOTAL EXPENDITURES	**$ 7,962,910**	**$ 8,680,037**	**$ 6,501,468**	**$ 6,801,458**	**$ 6,468,694**
Revenues - Expenses	$ -	$ -	$ -	$ -	$ -

Note: This table assumes only costs to RDNO. Costs for individual jurisdictions will depend on how the SWMP is implemented.

6.0 PLAN SCHEDULE

6.1 Plan Implementation Schedule

Table 6-1 provides the planned implementation schedule for the Solid Waste Management Plan from 2018 to 2027.

Table 6-1: Implementation Schedule

Proposed Implementation Schedule	2018	2019	2020	2021	2022
REDUCE, REUSE, REYCLCE					
Increase organics diversion					
Adopt Organics Diversion Strategy and develop Implementation Plan					
Reduce Disposal from SF Residential Households					
Determine best options for collection service adjustments					
Design and implement behavior change and education program					
Reduce Disposal for Sectors Served by Commercial Haulers					
Develop disposal bans					
Plan and implement an illegal dumping prevention and enforcement program					
Support level playing field and market development					
Design and implement behavior change and education programs					
Develop Programs to Active Promote Waste Reduction and Reuse Initiatives					
Compost demonstration and backyard composting programs					
Continue to administer the Waste Reduction Initiatives Fund					
Design and implement behavior change and education programs					
Establish staff positions to develop, implement and provide ongoing efficiency for program effectiveness					
Re-establish a Waste Reduction Program Planner to oversee expanion to universal collection and organics diversion					
Establish a staff position that collaborates with key stakeholders including haulers and businesses, provides educational support and other services, including providing support for organics program development and implementation					
RESIDUAL MANAGEMENT					
Develop centralized disposal plan with additional landfill capacity					
GVRDF Lateral Expansion					
ASRDF Transfer Station Development					
LRDF Transition to C&D Landfill					
Hesperia Landfill (City of Vernon)					
Prepare a Disaster Response Plan					
PLAN MONITORING AND EFFECTIVENESS					
Five Year Review					
Waste Composition study					

7.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
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APPENDIX A

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LIMITATIONS ON USE OF THIS DOCUMENT

GEOENVIRONMENTAL

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APPENDIX B

SWMP TECHNICAL MEMORANDA

- Current Solid Waste Management System Report (March 21, 2018)
- Technical Memorandum 1: Solid Waste Management Plan Disposal Option Information (March 21, 2018)
- Technical Memorandum 2: Reduce, Reuse and Recycle (March 21, 2018)
- Technical Memorandum 3: System Recap, Bylaws, Policies, Plan Options (March 21, 2018)

Current Solid Waste Management System Report

(March 21, 2018)

TETRA TECH

Current Solid Waste Management System Report

PRESENTED TO

Regional District of North Okanagan

MARCH 21, 2018
ISSUED FOR USE
FILE: SWM.SWOP03478-01

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EXECUTIVE SUMMARY

Tetra Tech Canada Inc. (Tetra Tech) has been retained by the Regional District of North Okanagan (RDNO) to update its Regional Solid Waste Management Plan (SWMP).

This report describes the current conditions for solid waste management in the RDNO. This report will be presented to the Regional Solid Waste Advisory Working Group (RSWAWG) at their second meeting to ensure a common understanding of the breadth of solid waste management activities in the RDNO. This basis is intended to inform further discussions as to the direction for the Draft SWMP Update.

The proposed 2017 Draft SWMP Update will review existing solid waste management policies and programs, identify and evaluate options for reduction and diversion, residual management, and financing, and also set the RDNO's waste management principles, targets and strategies for the next ten years.

The process to review and update the SWMP will be conducted in four steps. The first step is an assessment of the current system and a report on the implementation status of the 2011 SWMP to develop a long and short list of options for consideration in the 2017 Draft SWMP Update. The second step is a detailed analysis and evaluation of priority options that will be completed and presented in a series of three technical memorandums. The first technical memorandum will focus on waste diversion and reduction options, the second technical memorandum will focus on disposal options, and the third technical memorandum will focus on a financial review of the options and the overall system. The third step is completion of a community and stakeholder consultation process to engage the public, key stakeholders, and First Nations to provide input on the selected options. The fourth step is the development and writing of the 2017 Draft SWMP Update for submission to the British Columbia Ministry of Environment and Climate Change Strategy (Ministry) for approval.

Chapter 2 of this report provides an overview of the guiding principles, goals and targets for the updated SWMP. The 2002 SWMP identified a target of 0.55 tonnes per capita (550 kg per capita) based on an original target of 50% reduction in waste disposal based on 1990 levels. The RDNO has consistently met its 550 kg per capita target since 2011, and Chapter 3 presents a summary of the 2011 SWMP strategies. There is an opportunity during this Draft SWMP Update to set interim targets to move towards the provincial disposal target of 350 kg per capita. The phasing can be informed by the timeline set for optimizing existing and implementing new waste reduction and diversion programs that have the capacity to reduce the disposal per capita.

Chapter 4 of this report provides a summary of each part of the solid waste system in the RDNO. This includes the sources where waste is generated, collection and depot programs that service the sources where waste is generated, the processing infrastructure for recycling and composting, and a summary of the recycling and disposal facilities that are operated by the RDNO.

Based on the inputs above, a review of previous RDNO SWMPs, Ministry guidelines, overall trends in waste management and recycling, and the current system reporting, a long list of options has been developed for discussion in Chapter 5. The list is divided into three categories: waste reduction and diversion, disposal and financing. The RDNO has recently developed a Solid Waste Management System Financial Model for the active recycling and disposal facilities (RDFs) and transfer stations that can be used to assess the priorities. Discussion at the second RSWAWG meeting will add to and confirm the long list of options and will confirm the evaluation criteria to be used to generate a short list of the high priority options to be evaluated in detail.

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ACRONYMS & ABBREVIATIONS

Acronyms/Abbreviations	Definition
ACRDF	Ashton Creek Recycling and Disposal Facility
ASRDF	Armstrong/Spallumcheen Recycling and Disposal Faculty
BC	British Columbia
C&D	Construction and Demolition
CBS	Community Based Social Marketing
CRDF	Cherryville Recycling and Disposal Facility
CSRD	Columbia Shuswap Regional District
DLC	Demolition, Landclearing and Construction
DOCP	Design, Operations and Closure Plan
EMA	Environmental Management Act
EPR	Extended Producer Responsibility
GHG	Greenhouse Gas
GVRDF	Greater Vernon Recycling and Disposal Faculty
HHW	Household Hazardous Waste
ICI	Industrial, Commercial and Institutional (does not include heavy industry)
KRDF	Kingfisher Recycling and Disposal Facility
LRDF	Lumby Recycling and Disposal Faculty
MF	Multi-family
Ministry	BC Ministry of Environment and Climate Change Strategy
MRF	Material Recovery Facility
MSW	Municipal Solid Waste
OC	Operational Certificate
PRRDF	Pottery Road Recycling and Disposal Facility
RDF	Recycling and Disposal Facility
RDNO	Regional District of North Okanagan
RSWAWG	Regional Solid Waste Advisory Working Group
SF	Single Family
SWMP	Solid Waste Management Plan
WTEF	Waste-to-energy Facility

KEY DEFINITIONS

Term/Key Word	Descriptions
Advisory Committee	An advisory committee established to support the development of the solid waste management plan. Can include both a public and a technical advisory committee, or a single advisory committee to fulfil the role of both the public and technical advisory committees where a single committee better reflects the demographic or geographic nature of the regional district.
MATERIALS	
Waste or Waste Material	Also known as *solid waste*. A solid matter (object) discarded by its user. All items collected for disposal and/or further processing, including solid waste bound for disposal (landfill or other), recyclables, and organics.
Disposal or Landfill Material i.e., garbage	Material that is sent to landfill or other end disposal. Reframed from 'garbage' or 'refuse' since waste characterization studies generally show up to 90% of this stream can be recycled or composted.
Organic Material	Also known as *organics*. Decomposable, compostable matter that can be safely managed through an organics processing facility (e.g., composting and anaerobic digestion) to produce energy and/or compost, a soil amendment. Examples include: food scraps, food-soiled paper, and leaf and yard debris.
Source Separated Organics (SSO)	Organic material that is sorted (separated), at its point of generation, from all other material streams. This includes all compostable materials that are collected in designated containers bound for organics processing.
Recyclable Material	Also known as *recyclables*. Material that can be reprocessed to create a new product; such materials include: beverage containers, paper, cardboard, glass, light metals, and plastics.

LIMITATIONS OF REPORT

Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Regional District of North Okanagan, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in the Appendix or Contractual Terms and Conditions executed by both parties.

1.0 INTRODUCTION

Tetra Tech Canada Inc. (Tetra Tech) has been retained by the Regional District of North Okanagan (RDNO) to update its Regional Solid Waste Management Plan (SWMP).

In 1989, the Waste Management Act [now the Environmental Management Act (EMA)] was amended to require all regional districts to prepare and submit solid waste management plans to the British Columbia (BC) Ministry of Environment and Climate Change Strategy (Ministry) for approval by the year 1995. The purpose of the SWMP is to provide the RDNO with a guiding document that will direct the Region's solid waste management activities over the next 5 to 10 years. The intention of the SWMP is a planning document that outlines a framework for managing solid waste in their region, keeping in mind local circumstances, community goals, disposal capacity, environmental protection, community support, operational capacity and financial sustainability.

The RDNO's first SWMP was completed in 1995, and updated SWMPs have been completed in 2002 and 2011. The updated plan in 2011 did not receive final approval by the Ministry.

The proposed 2017 Draft SWMP Update will review existing solid waste management policies and programs, identify and evaluate options for reduction and diversion, residual management, and financing, and also set the RDNO's waste management principles, targets and strategies for the next ten years.

The process to review and update the SWMP will be conducted in four steps. The first is an assessment of the current system and a report on the implementation status of the 2011 SWMP to develop a long and short list of options for consideration in the 2017 Draft SWMP Update. The second step is a detailed analysis and evaluation of priority options, and developing and writing the 2017 Draft SWMP Update. The third step is completion of a community and stakeholder consultation process to engage the public, key stakeholders, and First Nations to provide input on the selected options. The fourth step is finalize the 2017 Draft SWMP Update for submission to the Ministry for approval.

This current system assessment report outlines the current solid waste management system in the RDNO. This information includes a summary of the current system, as well as an overview of the anticipated developments and trends that have been identified by the research including provincial goals and targets.

2.0 GUIDING PRINCIPLES, GOALS AND TARGETS

2.1 Guiding Principles

A solid waste management plan provides regional districts – and their residents and businesses – clear direction on how they will achieve their solid waste goals. The province has provided the following guiding principles to follow in the development of their solid waste management plans:

- Promote zero waste approaches and support a circular economy
- Promote the first 3 Rs (Reduce, Reuse and Recycle)
- Maximize beneficial use of waste materials and manage residuals appropriately
- Support polluter and user-pay approaches and manage incentives to maximize behaviour outcomes
- Prevent organics and recyclables from going into the garbage wherever practical
- Collaborate with other regional districts wherever practical
- Develop collaborative partnerships with interested parties to achieve regional targets set in plans
- Level the playing field within regions for private and public solid waste management facilities.

During this planning process, the Regional Solid Waste Advisory Working Group's (RSWAWG) reviewed these guiding principles, as well as the principles used in all prior RDNO solid waste management plans, and created an integrated set of principles to guide the development of this plan update.

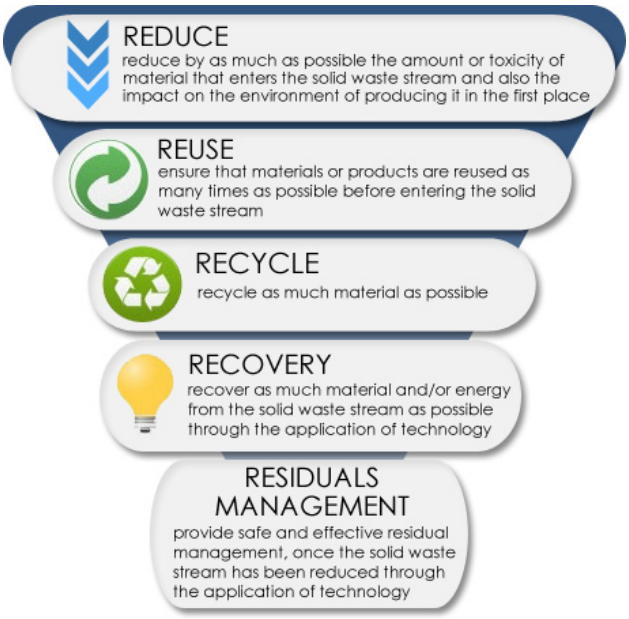

Figure 2-1: The Pollution Prevention Hierarchy
Source: (BC Ministry of Environment and Climate Change Strategy, n.d.[1])

2.2 Goals and Targets

The Ministry has established waste disposal as an annual reporting requirement for regional districts and set a provincial target of 350 kg per capita per year to be achieved by 2020. A second performance measure set by the Ministry is to have 75% of the population in BC covered by an organic waste disposal restriction by 2020. Through a separate Recycling Regulation, the Ministry oversees an extended producer responsibility (EPR) program that sets 75% recovery targets for products covered through the program (e.g., beverage containers, packaging and printed paper, electronics, and other items).

The 2002 SWMP identified a target of 0.55 tonnes per capita (550 kg per capita) based on an original target of 50% reduction in waste disposal based on 1990 levels. The RDNO has consistently met its 550 kg per capita target since 2011. There is an opportunity during this Draft SWMP Update to set interim targets to move towards the provincial disposal target of 350 kg per capita. The phasing can be informed by the timeline set for optimizing existing and implementing new waste reduction and diversion programs that have the capacity to reduce the disposal per capita.

As a signatory to the Climate Action Charter, RDNO is working towards reducing greenhouse gas (GHG) emissions derived from corporate operations which includes the transportation and diversion of solid waste. In working towards fulfilling the commitments of the Climate Action Charter, RDNO will conduct annual inventories of GHG emissions and seek opportunities for reducing emissions. With respect to solid waste management, RDNO will include fuel management reporting requirements to populate the corporate GHG emissions inventory and encourage the use of fuel efficient vehicles. Energy efficiency opportunities will also be investigated in facilities used in the diversion of solid waste. The RDNO Regional Growth Strategy proposes to established regional GHG reduction targets of 15% by 2020 and 25% by 2030 from the 2007 baseline. Solid waste management makes up 4.6% of regional community GHG emissions, therefore, initiatives that result in waste reduction, waste diversion or transportation reductions within the SWMP will contribute to achieving these GHG reduction targets.

[1] http://www2.gov.bc.ca/gov/content/environment/waste-management/zero-waste

3.0 2011 SOLID WASTE MANAGEMENT PLAN UPDATE REVIEW

3.1 2011 Solid Waste Management Plan Update Objectives

The objectives of the 2011 SWMP review were to evaluate the status of current waste reduction initiatives and the quantity of waste currently being disposed. Seventy-one potential waste reduction initiatives were identified, and eleven were selected for in-depth evaluation. The primary objective of the Draft SWMP Update was to create a feasible plan and identify initiatives which would allow RDNO to reduce the per capita disposal rate from 0.63 tonnes to 0.55 tonnes.

3.2 2011 Solid Waste Management Plan Update Strategies

The 2011 SWMP Update consisted of sixteen main strategies, which are captured in **Error! Reference source not found.**.

Table 3-1: 2011 Solid Waste Management Plan Update Strategies

No.	Strategy	Description	Status
1.	**Organic Waste Management Strategy**	Determine the best management strategy for organic waste including wood and yard waste from the DLC, residential, commercial, industrial, and agricultural sectors; and kitchen scraps from the residential, commercial, industrial and agricultural sectors.	Ongoing
2.	**Expanded Curbside Collection**	Determine the economic viability of an Expanded Curbside Collection Program for all residential generated materials, including garbage, compostables, and recyclables.	Ongoing
3.	**Implement One Bag/Can Limit**	Consider a weekly one bag/can limit for households with a municipal curbside collection service. Since 1996 the limit has been set at two cans per week; given new diversion opportunities, there is increased viability for shifting to a new norm of one can per week	Ongoing
4.	**Blue Box Recycling Program for Businesses**	Determine the best method for including businesses in the Blue Box Recycling Program.	Ongoing
5.	**Upgrade Communicatio ns Tools**	Upgrade the RDNO website and other communication tools to help residents, businesses and others determine what materials can be recycled	Ongoing
6.	**Enhance Service at GVRDF for Commercial Haulers**	Evaluate the economic and operational implications of providing enhanced service for commercial haulers at the Greater Vernon Recycling and Disposal Faculty (GVRDF). Enhancements could include early openings and a dedicated commercial scale. Being addressed through ongoing operations and major capital works, including the addition of a third lane in 2018 to assist commercial haulers	Ongoing
7.	**Audits of Large Waste Generators**	Consider offering a comprehensive waste audit to the 15 largest waste generators in the Region. Currently to be addressed through behavior change programs that provide audit support	Not currently being pursued
8.	**DLC Waste Management Strategy**	Examine mechanisms for further diversion of DLC waste, including but not limited to, private and public resource recovery parks and partnerships with industry.	Partially pursued via permitting mechanisms for City of Vernon,

No.	Strategy	Description	Status
			working to implement with other municipalities
9.	**Non-Typical Municipal Solid Waste Management**	Examine efficiencies and environmental protection needs with respect to including management of non-typical municipal solid wastes such as agricultural (e.g., plastics and slaughter waste) and industrial wastes (e.g., ash and wood), and water and wastewater treatment plant wastes in the SWMP.	Partially pursued by using Tolko Mill outputs to supplement daily cover, accepting Duteau Creek Water Treatment Plant sludge for composting, and accepting animal fatalities from agricultural operations
10.	**Blue Bag Recycling Program Improvements**	Evaluate the curbside Blue Bag Program and the Drop Centre Program to determine if the program should be expanded to include materials such as textiles, fluorescents, agriculture plastics, and other plastic products.	Partially pursued via Drop Centres (Recycle BC oversees Blue Bag Program)
11.	**Development Cost Charges**	Determine how local governments can include solid waste management infrastructure in their Development Cost Charge (DCC) bylaws by 2016.	Pursued but not currently viable
12.	**Inter-Regional Solid Waste Management Committee**	If interest exists, facilitate cooperation of southern interior solid waste management staff, municipal councils, and regional district Boards of Directors through an interregional Solid Waste Management Committee.	Pursued but not currently viable
13.	**Monitor Waste to Energy Technology**	Monitor waste to energy technology as it becomes accessible to small communities in Canada	Pursued but not currently viable
14.	**Eco-Depots**	Evaluate eco-depot concepts and locations especially with respect to customer convenience and land use in the region.	Completed.
15.	**Blue Bag Processing Facility**	Continue to operate the current Blue Bag processing system and facility with minor capital improvement until such time as more details about the provincial EPR program for packaging and printed paper are known.	No longer required.
16.	**More Frequent Free Styrofoam Collection Events**	Consider increasing the number of free Styrofoam collection events until Styrofoam packaging becomes part of an industry stewardship program	No longer required

4.0 EXISTING SOLID WASTE MANAGEMENT SYSTEM

The solid waste management flow diagram, pictured in Figure 4-1, captures the five important stages that typically exist and make up the waste management system in the region.

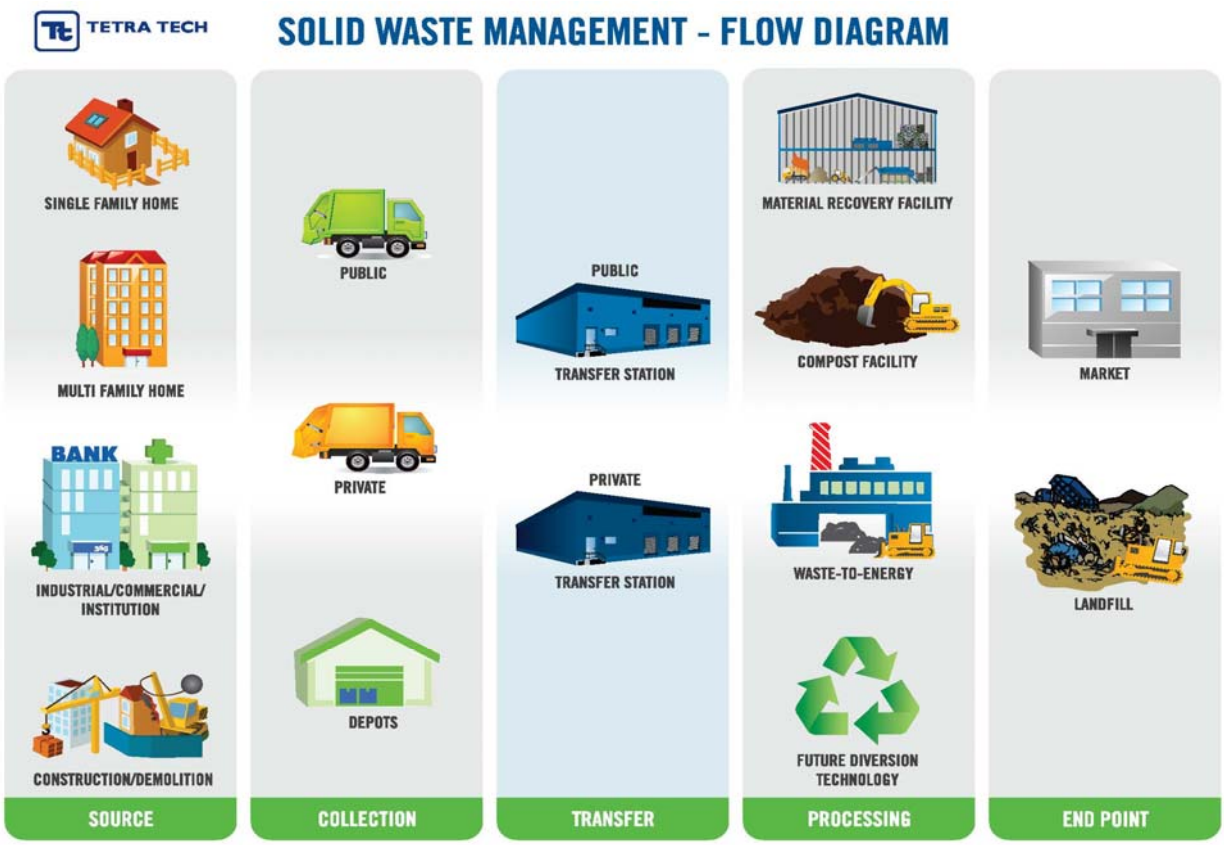

Figure 4-1: Solid Waste Management Flow Diagram

The following sections provide a summary of each part of the system that exists in the RDNO, from source generation through to materials being recycle and composted and put back into the market, or disposal at the landfill.

4.1 Sources

4.1.1 Plan Area

The SWMP applies to the entire RDNO. The land area of the RDNO is 7,503 square kilometres and the population density is 11.2 people per square kilometre. Regional districts are modeled after federations composed of municipalities and electoral areas, each of which have representation on the regional board. RDNO municipalities and electoral areas include Armstrong, Coldstream, Enderby, Lumby, Spallumcheen, Vernon, B – BX/Swan Lake, C – BX/Silver Star, D – Rural Lumby, E-Cherryville, and F- Rural Enderby. A map of the RDNO is included in Figure 4-2.

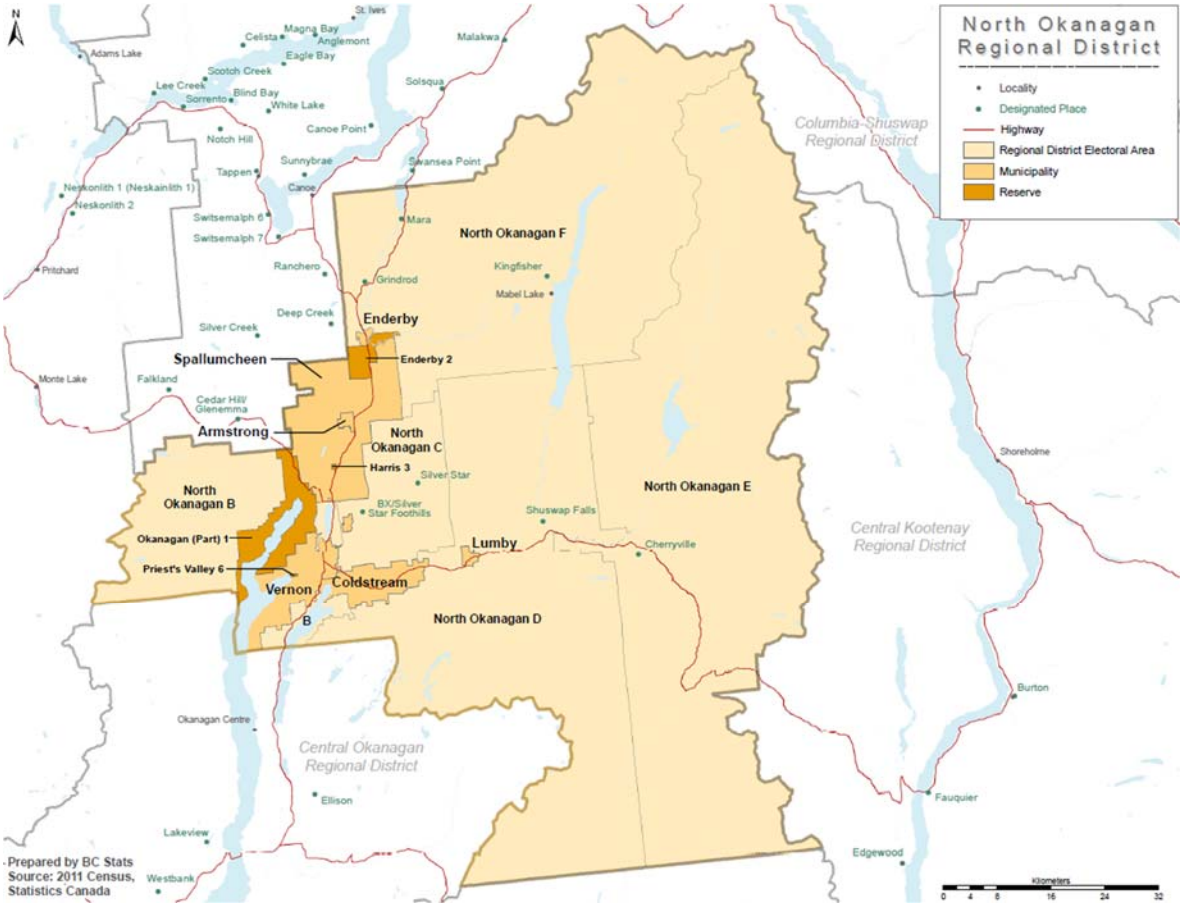

Figure 4-2: Map of Regional District of North Okanagan

Source: (BC Ministry of Environment and Climate Change Strategy, n.d.[2])

The plan will include consultation with the First Nations. The following Indian Reserves are located fully and in part in the RDNO:

- Enderby Indian Reserve No. 2;
- Harris Indian Reserve No. 3;
- Okanagan Indian Reserve No. 1 (only partly within the RD); and
- Priest's Valley Indian Reserve No. 6.

4.1.2 Population and Employment

In 2016, the population of the RDNO was 84,354, which represents a change of 3.8% from 2011 as outlined in Table 4-1. This compares to the provincial average of 5.6% and the national average of 5.0% as reported by Statistics Canada. Approximately 60% of the population collectively reside in the communities of Vernon and

[2] https://www2.gov.bc.ca/gov/content/data/geographic-data-services/land-use/administrative-boundaries/census-boundaries

Coldstream. Population growth in the five-year period 2006 to 2011 was a modest 1% per annum and has slowed to 0.8% per annum with more rapid growth occurring in Vernon and Coldstream.

Table 4-1: Population Change

Years	Population counts	Population change
2006 (census)	77,301	-
2011 (census)	81,237	+5.1% (from 2006-2011)
2016 (census)	84,354	+3.8% (from 2011-2016)
2026 (projected)	94,250	(+1.12% Growth/annum)[1]

[1] RDNO Regional Growth Strategy Estimated Growth Rate (http://www.rdno.ca/bylaws/Bylaw_2500.pdf)

4.1.3 Housing and Economic Data

The 2016 census data reported by Stats Canada reports that in 2016, there were 35,875 private dwellings occupied in the RDNO which represent a change of 6.3% from 2011. The total number of dwelling in the RDNO is 39,970. Single-detached houses represented 64.2% of all occupied private dwellings in this region in 2016. A summary of the distribution of dwelling types is summarized in Table 4-2.

Table 4-2: Proportion of Occupied Dwelling Types (Source: Statistics Canada 2016[3])

Occupied Dwelling Type	Example	Proportion	Number
Single Detached Homes		64.2%	23,032
Row Houses, Duplex, and Semi-Detached Homes		17.4%	6,242
Apartment Buildings		13.9%	4,987
Other (mobile homes and other single attached houses)		4.5%	1,614
Total		**100%**	**35,875**

[3] http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CD&Code1=5937&Geo2=PR&Code2=59&Data=Count&SearchText=North%20Okanagan&SearchType=Begins&SearchPR=01&B1=All&GeoLevel=PR&GeoCode=5937&TABID=1

The primary range of employment and job sectors is summarized on Figure 4-3. The largest employment generators in the RDNO include retail trade, health care, construction and manufacturing.

Figure 4-3: Range of Employment[4]

4.1.4 Garbage Disposed

A total of 43,020 tonnes of garbage were disposed at the Regions three disposal facilities in 2016. This includes materials disposed from residential, industrial, commercial and institutional (ICI), and demolition and land clearing (DLC) generators.

Of tonnage disposed, 63% (26,971 tonnes) was from the residential sector, 35% (15,290 tonnes) was from the ICI sector with the remaining 2% generated from the DLC sector (759 tonnes). The DLC tonnage is relatively low compared to some regions where DLC can make up to 20% to 30% of the waste stream depending on population growth, diversion programs, and available disposal options. The data representing the quantity of waste disposed by sector is wholly dependent on the decisions made at the disposal facility scales as to the category chosen for each load. These numbers are atypical with respect to other regional districts in BC.

When RDNO scale data is organized according to who (residential, ICI or Construction and Demolition [C&D]) delivers it to disposal facilities, the picture changes significantly as indicated in Table 4-3. When broken down by “hauler type”, commercial haulers deliver single family (SF) residential garbage to disposal facilities primarily using rear or side load packer trucks and on behalf of municipalities and subscription customers via curbside public or private collection programs (20%); commercial haulers deliver multi-family residential (MF), ICI and C&D waste

[4] http://www.rdno.ca/docs/PolicyArea5-EconomicDevelopment.pdf

from the three sectors primarily using front load, roll off and other large trucks and trailers (62%) and self-haul customers deliver residential, ICI and C&D waste into containers at each facility, including the transfer stations, primarily using an assortment of small personal vehicles (18%). When viewed this way the biggest potential for diversion is in the ICI sector.

Table 4-3: Current Garbage Disposal by Hauler

Hauler	Estimated Garbage by Hauler (2017[1])	
	Tonnes	Percent
Single Family (SF RES) Municipal and Subscription Curbside	9,059	20%
ICI (including Multi-Family Residential [MF RES] and C&D)	28,084	62%
Self-Haul (SF RES, ICI, and C&D)	8,153	18%
Total	**45,296**	**-**

[1] Annualized based on extrapolation of actual scale data from March to November 2017.

However, curbside garbage collection is only provided by the municipalities of Vernon, Armstrong, Enderby and Lumby. The remaining 35% of SF households in Coldstream Spallumcheen and the Electoral Areas either subscribe to a private collection service or self-haul their household garbage to the nearest RDNO recycling and disposal facility (RDF). If those households that currently receive curbside recycling collection service from Recycle BC were to also receive curbside garbage collection, the proportion of garbage collected from SF households through a municipal program increases significantly as shown in Table 4-4.

Table 4-4: Adjusted Garbage Disposal by Hauler

Hauler	Estimated Garbage by Hauler (2017[1])	
	Tonnes	Percent
SF Res Municipal and Subscription Curbside	14,059	30%
ICI (MF Res and C&D)	26,584	60%
Self-Haul (SF Res, ICI and C&D)	4,653	10%
Total	**45,296**	**-**

[1] Annualized based on extrapolation of actual scale data from March to November 2017.

4.1.4.1 Garbage Generation Rate and Disposal per Capita

Using the total tonnage disposed and population data, the per capita disposal rate is calculated. In 2016 the calculated per capita disposal rate was 500 kg per capita. This is somewhat increased from the 2014 disposal rate, which was 469 kg per capita. Figure 4-4 shows the kg per capita disposal rate in RDNO over the last 10 years. The disposal rate decreased significantly between 2007 and 2011 and the disposal rate has been relatively consistent since 2011.

The most recently reported data shows that the provincial 2015 disposal rate was 497 kg per capita annually, which is down 72 kg since 2012. In 2015, RDNO's disposal rate was lower than the provincial average; however, the 2016 RDNO disposal rate has risen slightly to 500 kg per capita. Figure 4-5 presents the average BC disposal rate as well as the disposal rates in neighboring BC regional districts. The lowest and highest waste generation rate regional

districts in the Province are also indicated. RDNO's disposal rate trends slightly lower than the neighboring regional districts.

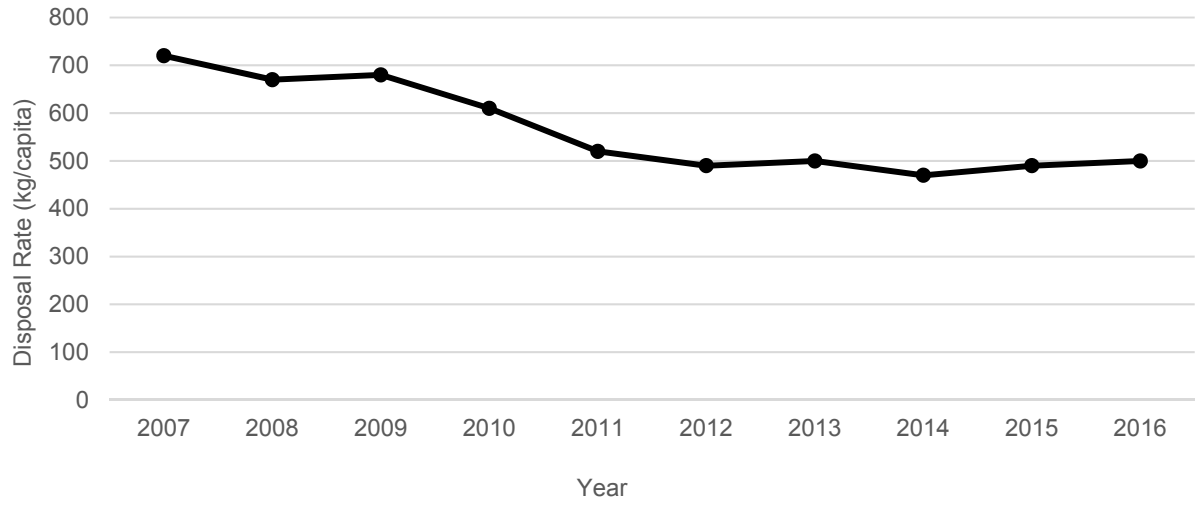

Figure 4-4: Disposal Rate (kg/capita)[5]

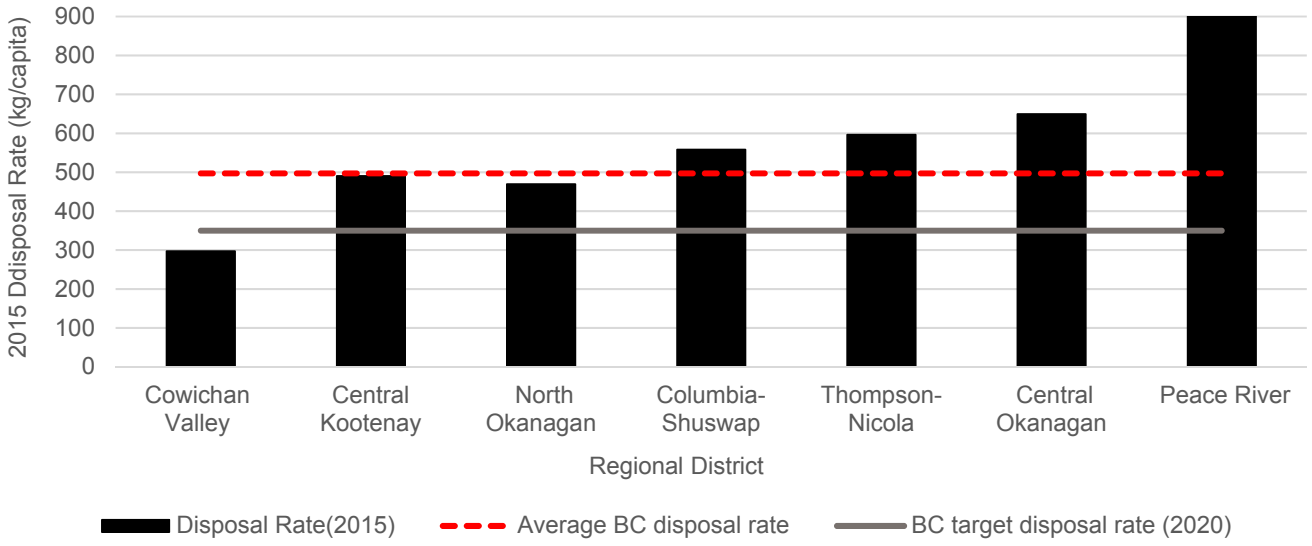

Figure 4-5: Disposal Rates in Neighboring Regional Districts[6]

BC has set provincial waste disposal targets with a long-term goal of lowering the municipal solid waste disposal rate to 350 kg per person by 2020. As reported on the Ministry website, the variability in disposal rates from one region to the next is influenced by factors such as population density, economic activity, tourist and transient population fluctuations, distance to recycling markets, the role of various stewardship agencies operating in an area

[5] Figure adapted from 2016 Solid Waste Management Plan Annual Report
[6] Data reported by BC Ministry of Environment and Climate Change Strategy http://www.env.gov.bc.ca/soe/indicators/sustainability/municipal-solid-waste.html

and the capacity and infrastructure in place in a region. While disposal rate data don't tell the whole story, they are useful in setting the stage for continuous improvement in waste management in BC.

4.1.4.2 Garbage Composition

The last waste composition study in RDNO was completed in 2012 by TRI Environmental Consulting. The samples were sorted into 71 categories and the mass of each category was determined by weighing individual material types. The waste composition for each of the 12 primary categories and each of the secondary categories for each waste source sector was calculated as the mean for all samples within the sector. The overall waste composition results for the primary categories at each recycling and disposal facility (RDF), and the overall average for the RDNO is outlined in Table 4-5.

Table 4-5: 2012 Waste Composition

Primary	ASRDF	GVRDF	LRDF	RDNO Average
Paper	16.6%	10.8%	8.0%	**12.2%**
Plastic	14.8%	10.8%	17.7%	**12.1%**
Compostable Organics	28.3%	37.1%	24.6%	**34.3%**
Non Compostable Organics	7.9%	9.8%	3.4%	**9.0%**
Metals	4.5%	7.6%	4.9%	**6.7%**
Glass	5.4%	1.8%	2.0%	**2.7%**
Building Material	6.2%	7.7%	16.2%	**7.7%**
Electronic Waste	1.0%	3.6%	1.0%	**2.8%**
Household Hazardous	4.3%	3.1%	1.8%	**3.3%**
Household Hygiene	6.8%	5.4%	2.5%	**5.6%**
Bulky Objects	0.8%	0.5%	5.3%	**0.8%**
Fines	2.2%	1.0%	1.2%	**1.3%**

Compostable organics make up the largest portion of the waste at 34.3% while paper and plastic were the second largest at 12.2% and 12.1%, respectively.

During the recent RDNO Organics Management Options Study completed by Carey McIver & Associates, it was estimated that the following organic material composition changes have occurred:

- Landfilled Kitchen Scraps – It is assumed that this quantity has not changed since 2012 since no initiatives to increase kitchen scraps diversion have been implemented. The total amount of landfilled kitchen scraps is estimated at (18%) of the total garbage stream, or 7,593 tonnes disposed in 2016.
- Landfilled Yard Waste – In 2012, it was found that approximately 5,000 tonnes of organic material was disposed. However, yard waste drop off increased from 6,500 tonnes in 2012 to 14,000 in 2016, thus, it is assumed that the yard waste remaining in the disposal stream is minimal.
- Landfilled Clean Wood Waste – In 2012, it was found that approximately 1,600 tonnes of clean wood waste disposed. However, wood waste drop off increased from 19,362 tonnes in 2012 to 26,753 in 2016, thus, it is assumed that the wood waste remaining in the disposal stream is minimal.

4.1.4.3 Recycling

Recycling collection and diversion is primarily accomplished in the following manner:

- Materials collected for diversion/recycling at an RDNO RDF and transfer stations;
- Materials collected curbside for Recycling by Recycle BC;
- Materials collected curbside from businesses in Vernon by the City of Vernon's contractor;
- Materials collected for recycling at the Eco-Depot and other sites that manage EPR steward-managed materials;
- Materials collected curbside by Tip-It waste solutions in Spallumcheen; and
- Materials collected for recycling from ICI and MF sources by private haulers.

The total quantity of materials collected and managed at the RDFs is summarized in Table 4-6.

Table 4-6: Quantities of Recyclable Materials Collected and Managed at RDFs and RDNO Programs

Material	2016
Asphalt Roofing	1,206 tonnes
Batteries (Auto)	11 tonnes
Crushable Material (e.g. concrete)	17,552 tonnes
Expanded Polystyrene	8 tonnes
Gypsum (Drywall)	1,597 tonnes
Household Hazardous Waste	196 drums, 148 cont., 4,000 L (Collected at the Eco Depot)
Mattresses & Boxsprings	7,445 units
Metal (Scrap)	2,391 tonnes
Packaging & Printed Paper (Blue Box)	5,094 tonnes (Collected through all programs including curbside)
Propane Tanks	40 tonnes
Refrigeration Units (Ozone Removal)	2,615 units
Tires	1 tonne
Wood	26,753 tonnes
Yard Waste	14,097 tonnes

The quantities of material diverted from disposal through other reduce, reuse, recycle programs outside the RDNO's jurisdiction and responsibility include EPR programs managed by the agencies listed below. The known quantities of recycled material collected by EPR stewards are reported by the EPR stewards through annual reports posted on their websites. EPR stewards are required to report annually; however, they are not required to report by tonnage, so no total tonnage can be calculated.

Table 4-7: Extended Producer Responsibility Programs

EPR Stewardship Programs	
AlarmRecycle	Health Products Stewardship Association
BC Used Oil Management Association	LightRecycle
BC Brewers' Recycled Container Collection Council	Recycle BC
Call2Recycle	Outdoor Power Equipment Institute of Canada
Canadian Battery Association	ReGeneration
Electrical Equipment Manufacturers Association	Recycle My Cell
Electronic Products Recycling Association	Thermostat Recovery Program
Electro Recycle Small Appliance Recycling Program	The TELUS Return and Recycle Program
Encorp Pacific (Canada)	Tire Stewardship BC

In 2016, Recycle BC reported a total curbside and depot collection amount of 3,881 tonnes of blue box materials form a total of 84,354 residents. This represents a capture of 46.0 kg per capita (serviced). Figure 4-6 presents the average BC recycling recovery reported by Recycle BC, as well as the recycling recovery rate in neighbouring BC regional districts. RDNO's recycling rate is above the provincial average, and approximately 7 kg per capita less than that of Central Okanagan and 10 kg per capita less that the Cowichan Valley.

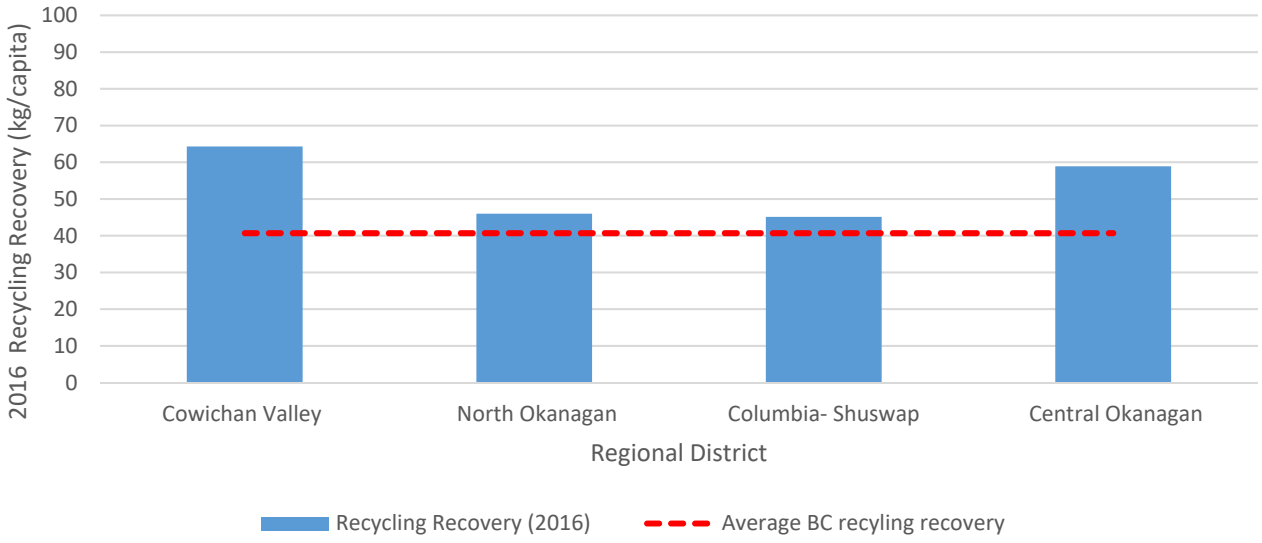

Figure 4-6: Recycling Recovery in Neighboring Regional Districts[7]

4.2 Collection

A summary of the existing residential curbside collection programs is provided in Table 4-8.

There is expanded curbside recycling collection for a majority of RDNO SF residences. Since May 2014, the program has been managed by Recycle BC, the EPR non-profit industry-led and financed organization managing packaging and printed paper. Recycle BC currently provides blue box collection across the region to SF residences,

[7] Data reported by Recycle BC https://recyclebc.ca/wp-content/uploads/2017/06/Recycle-BC_Annual-Report_2016_FINAL.pdf

with the exception of the Township of Spallumcheen, where the Township offers the service. Homes in Electoral Areas B, C, D and F receive curbside service but no homes in Electoral Area E and some in the more remote areas of Electoral Areas C, D and F are not included in the recycling collection service program.

The municipalities of Vernon, Armstrong, Enderby, and Lumby administer curbside garbage collection for their SF residents, which equates to approximately 62% of RDNO households. Garbage is collected weekly in these areas, all with a two bag/can limit. Residents in Coldstream, Spallumcheen and all Electoral Areas can contact private haulers to arrange for a subscription based service as there is no collection services provided or administered by their municipalities or the RDNO.

Weekly curbside organics collection is not provided in any areas; however, Vernon, Armstrong, Enderby, Lumby and Spallumcheen (some subdivisions only) all have a twice yearly curbside seasonal yard waste collection in spring and fall.

Table 4-8: Residential Curbside Collection

Municipality or Electoral Area	Households[1]	Regular Curbside Collection Service		
		Garbage	Recycling	Yard Waste
Vernon	17,798	Yes	Yes	No[2]
Armstrong	2,132	Yes	Yes	No[2]
Enderby	1,391	Yes	Yes	No[2]
Lumby	563	Yes	Yes	No[2]
Coldstream	3,915	No[3]	Yes	No[2]
Spallumcheen	2,001	No[3]	Yes	No[2]
Electoral Area B	1,284	No[3]	Yes	No
Electoral Area C	1,497	No[3]	Yes (part)	No
Electoral Area D	1,106	No[3]	Yes (part)	No
Electoral Area E	431	No[3]	No	No
Electoral Area F	1,737	No[3]	Yes (part)	No
Total Households with Publicly-Contracted Collection	-	21,884	33,855	0
Total Households without Publicly-Contracted Collection	-	11,971	*0*	33,855
Total Households in RDNO Municipalities and Electoral Areas	-	33,855	33,855	33,855

[1] 2016 Stats Canada Census Households with Usual Residents

[2] The City of Vernon provides a yard waste collection service in the spring and fall over a one week period as well as a spring chipping program conducted over a two- week collection period. Enderby, Lumby, Armstrong and Spallumcheen (3 subdivisions only) also provide a one-day only spring and/or fall yard waste collection service. Coldstream provides a seasonal drop off service.

[3] Collection services can be arranged by the resident through the private sector on a subscription basis

MF properties with more than four units that had participated in the RDNO Blue Bag Recycling Program did not automatically receive Recycling BC service after May 16, 2014. They were required to contact and register for recycling collection services through Recycle BC-registered haulers. These MF properties did not include mobile home complexes and strata complexes currently receiving individual unit curbside service. Recycle BC contracted haulers offer free recycling collection in Vernon, Armstrong, Enderby, and Lumby for building managers requesting the service. The number of apartments with access to recycling services is not tracked by the RDNO.

4.2.1 Eco-Depot

The Interior Freight and Bottle Depot (in Vernon) is a full-service drop-off station that collects all recyclable materials including blue box materials and most EPR-managed products. It has been a bottle depot since 1981 and it has continued to expand the recyclable materials that it accepts. In 2015, it was awarded the contract with the RDNO to become a drop-off depot for residential quantities of household hazardous waste for free including all transport of dangerous goods classes of hazardous waste not accepted under BC EPR programs (except explosives)

The Interior Freight and Bottle Depot is also the location of a full service EPR collection depot, and the commercial material recycling facility for private haulers that collect recyclable materials such as paper and cardboard.

There are also several private drop-off locations throughout RDNO for specific (or multiple) EPR-managed materials including bottle depots and electronic waste drop-off locations. The RDNO also provides Drop Centres for packaging and printed paper at each RDF and transfer station to service residents and businesses that do not have a Recycle BC or other contracted service provider.

4.3 Processing

4.3.1 Material Recovery Facilities

RDNO managed a recycling facility at the Vernon landfill until 2013, when it was destroyed by a fire. Since then, curbside recycling materials are now managed by Recycle BC and they currently transport those items to a materials recycling facility (MRF) in Kelowna. The Drop Centre material collected at RDNO RDFs and transfer stations is transported to private MRFs in Kelowna and Vernon by RDNO's contractor.

4.3.2 Composting Facilities

4.3.2.1 Regional Yard Waste Composting Facility

The only composting facility in RDNO is at the GVRDF where it was constructed in 2011. It accepts yard waste from the Greater Vernon area from residents and landscaping businesses free of charge and all loads currently by-pass the scale. Yard waste materials are placed into windrows on the composting pad and manually turned for aeration. Windrows receive non-potable water from the GVRDF leachate storage pond on a daily basis from May to November. Kitchen scraps and bio-solids are not accepted at this facility, however domestic water treatment plant solids are accepted from April to October

Residents and businesses are not charged for drop-off of their yard waste. Since spring 2016, this Class A compost has been made available to residents at no charge (self-loaded at the drop off area) and has been marketed as 'rdno•gro'.

4.3.2.2 Spa Hills Composting Facility

The Spa Hills composting facility is in the neighbouring Columbia Shuswap Regional District (CSRD) that accepts yard and kitchen scraps along with other organics. While this facility is not in RDNO, it was considered in the recent RDNO Organics Management Options Study as a currently operating facility that can be utilized for processing of RDNO's food scraps if a food scrap collection program were to be implemented.

Currently, the facility has a process design capacity of 4,000 tonnes per year with the ability to upgrade to 12,000 tonnes per year. It is expected to have sufficient capacity to accept food scraps from both the CSRD and RDNO.

At least 50% of materials composted at Spa Hills Farm are used as soil conditioner and fertilizer on-site, as per the requirements of the Agricultural Land Commission Act (Agricultural Land Reserve Use, Subdivision and Procedure Regulation), while the remaining compost is offered for sale.

4.3.3 Waste-to-Energy Facilities

RDNO does not have any waste-to-energy facilities (WTEF). In the 2011 SWMP Update, the advisory board identified this as a priority. In BC, there is one active waste to energy facility in Burnaby, BC, which started operation in 1988. The Ministry expects local governments to have a minimum target of 70% reduction of waste before utilizing a WTEF as a waste management option. The 70% target is calculated only from reduce, reuse, and recycle initiatives in the RDNO.[8]

4.4 Transfer and Disposal Facilities

The RDNO manages three transfer stations – Cherryville Transfer Station, Kingfisher Transfer Station, and Silver Star Transfer Station, and three active RDFs. In addition there are four closed landfills that need to be continuously monitored and maintained.

Each RDF currently accepts a number of the same items for reuse and recycling to ensure residents and businesses have convenient access and opportunity to divert items from disposal. Each site operates using the same fee structure for all materials, and a copy of this is included in Appendix A (Schedule A of Bylaw No. 2701, 2015). The current MSW tipping fee is $100/tonne.

In BC, regional districts have been closing small landfill sites as it is not economical to continue to upgrade the sites to meet updated environmental criteria. There is a trend to move towards building transfer stations in remote areas, and investing funds in the expansion and development of a centralized facility or facilities depending on local circumstances. Siting a new landfill is an extremely difficult task and is not likely to occur. Funds are directed instead into expanding current landfill sites and conserving airspace to maximize the landfill life.

4.4.1 Transfer Stations

The RDNO manages three transfer stations – Cherryville Transfer Station, Kingfisher Transfer Station, and Silver Star Transfer Station and Table 4-8 includes details for the three RDNO-run transfer stations.

[8] http://www2.gov.bc.ca/gov/content/environment/waste-management/garbage/waste-to-energy

Table 4-8: Transfer Station Details

	Cherryville Transfer Station	Kingfisher Transfer Station	Silver Star Transfer Station
Location	In Electoral Area E. 205 Aumond Road (just off Sugar Lake Road), approximately 20 km northeast of the Village of Lumby and 6.5 km north of Cherryville.	In Electoral Area F. 150 Beattie Road, approximately 35 km north of the City of Enderby.	9695 Silver Star Road, 0.7 km west of Silver Star Ski Resort
Hours	Tuesday and Saturday, 9:00 am to 4:00 pm	November 1 to March 31: Sundays, 9:00 am to 4:00 pm April 1 to October 31: Wednesdays and Sundays, 9:00 am to 4:00 pm	Open 7 days per week, 24 hours per day.
Site History	Landfill closed in 2008. Operating as transfer station since 2008.	Landfill closed in 2003. Operating as a transfer station since 2003.	Operated since 2000
2016 Tonnage	227 tonnes	123 tonnes	369 tonnes
Service Population	1,010	300 (population varies seasonally)	98 (population varies dramatically on a seasonal basis)
Accepted Materials	▪ All refuse ▪ Batteries ▪ Tires ▪ Yard waste and wood waste (all mixed together and ground) ▪ Propane tanks ▪ White goods and other metals ▪ Blue bag materials ▪ Electronic waste ▪ Concrete and other crushables	▪ All refuse ▪ Batteries ▪ Tires ▪ Yard waste and wood waste (all mixed together and ground) ▪ Propane tanks ▪ White goods and other metals ▪ Blue bag materials ▪ Electronic waste ▪ Waste gypsum drywall	▪ Soft garbage (no construction waste or large items) ▪ Printed Paper and Packaging (PPP) ▪ Glass jars

Three active disposal facilities, or landfills, exist in RDNO. Table 4-9 summarizes the key features of each RDF.

Table 4-9: Active Recycling and Disposal Facilities

	Lumby RDF[9]	Armstrong Spallumcheen RDF[10]	Greater Vernon RDF[11]
Location	In Electoral Area D at 221 Trinity Valley Road, approximately 5.5 km north of the centre of the Village of Lumby.	In the District of Spallumcheen at 3367 Powerhouse Road, approximately 2.0 km north of the centre of the City of Armstrong.	In Electoral Area "B" at 120 Birnie Road, approximately 5 km south of the centre of the City of Vernon.
Hours	9:00 am to 4:00 pm, Thursday to Sunday (year-round)	**"Summer Hours" (March to November):** Monday to Friday, 8:00 am to 4:30 pm Saturday, 8:30 am to 4:00 pm **"Winter Hours" (December to February):** Monday to Friday, 8:00 am to 4:00 pm Saturday, 9:30 am to 3:30 pm	**"Summer Hours" (March to November):** Monday to Friday, 8:00 am to 4:30 pm Saturday, 8:30 am to 4:00 pm **"Winter Hours" (December to February):** Monday to Friday, 8:00 am to 4:00 pm Saturday, 9:30 am to 3:30 pm
Permitted Filling Rate	5,000 tones/year	80 m^3/day	45,000 tonnes/year
Operational Details	▪ Scale house ▪ Single vehicle scale for inbound and outbound traffic ▪ Single face for residential self-haulers and commercial haulers ▪ Uses alternate daily cover system ('Revelstoke Iron Grizzly' steel plates)	▪ Scale house ▪ Single vehicle scale for inbound and outbound traffic ▪ Two tipping areas, one for residential self-haulers and one for commercial haulers ▪ Uses alternate daily cover system ('Revelstoke Iron Grizzly' steel plates)	▪ Scale house ▪ Two vehicle scales, one for inbound and one for outbound traffic ▪ Two tipping areas, one for residential self-haulers and one for commercial haulers ▪ Uses alternate daily cover system ('Revelstoke Iron Grizzly' steel plates) ▪ Landfill gas collection and flaring
2016 Operation and Maintenance Expenditures	$219,835.69	$842,864.73	$1,686,274.18.
2016 MSW Tonnage	1,841 tonnes	11,419 tonnes	28,296 tonnes
Communities Serviced	▪ Lumby ▪ Rural Lumby (Electoral Area D)	▪ Armstrong, ▪ Spallumcheen ▪ Enderby ▪ Splatsin First Nation ▪ parts of Rural Enderby (Electoral Area F) ▪ parts of the Okanagan Indian Band lands	▪ Vernon ▪ Coldstream ▪ Electoral Area B ▪ Electoral Area C ▪ part of the Okanagan Indian Band lands
Service Population	4,505 residents	17,184 residents	61,655 residents

[9] LRDF 2016 annual report
[10] ASRDF 2016 annual report
[11] GVRDF 2016 annual report

	Lumby RDF[9]	Armstrong Spallumcheen RDF[10]	Greater Vernon RDF[11]
Year of Projected Closure	2074	2034	2051
Accepted Materials	▪ MSW ▪ Batteries ▪ Tires ▪ Yard and Garden Waste ▪ Wood Waste ▪ Propane Tanks ▪ White Goods and Other Metals ▪ Blue Bag Materials ▪ Glass Jars and Bottles ▪ Drywall ▪ Concrete and other Crushable Material	▪ MSW ▪ Batteries ▪ Tires ▪ Yard and Garden Waste ▪ Wood Waste ▪ Propane Tanks ▪ White Goods and Other Metals ▪ Blue Bag Materials ▪ Glass Jars and Bottles ▪ Drywall ▪ Fluorescent Bulbs & Tubes ▪ Concrete and other Crushable Material ▪ Styrofoam	▪ MSW ▪ Batteries ▪ Tires ▪ Yard and Garden Waste ▪ Wood Waste ▪ Propane Tanks ▪ White Goods and Other Metals ▪ Blue Bag Materials ▪ Glass Jars and Bottles ▪ Drywall ▪ Asphalt shingles ▪ Fluorescent Bulbs & Tubes ▪ Concrete and other Crushable Material ▪ Styrofoam

4.4.2 Active Recycling and Disposal Facility Challenges and Future Plans

In 2016 the Ministry developed and released the second edition of Landfill Criteria for Municipal Solid Waste[12] that builds on the original 1993 document. The new Criteria outline Ministry expectations for best management practices at landfills and provide more information for Ministry staff and stakeholders to ensure clarity and consistency in regulatory approach across the province.

In the RDNO, each Active RDF is currently undergoing the development of updated Design, Operations and Closure Plans (DOCPs) to be submitted to the Ministry following the updated Landfill Criteria.

4.4.2.1 Lumby Recycling and Disposal Facility

The LRDF is the smallest of RDNO's three landfills, receiving 1,841 tonnes in 2016.

Ongoing environmental monitoring is performed at LRDF. Notable recommendations from the 2016 Environmental Monitoring Report included:

- Evaluate potential trends in contaminants in on-site wells to determine whether or not a landfill leachate plume may be developing downgradient and whether down-gradient domestic well users may be impacted;
- Review the use of gravel cover materials, which may be insufficient for use as intermediate cover. Also review grading of the filling areas and ditching to ensure proper stormwater management; and
- Develop an Environmental Monitoring Plan to be updated annually, since the Operational Certificate (OC) was approved in 2000 and the environmental monitoring program enclosed within is outdated.

Installation of the Stage A stormwater management program is planned for 2017. The 2010 Draft Operations and Closure Plan has to date not been approved, so will therefore be updated with recent changes to the filling plan,

[12] BC Ministry of Environment and Climate Change (2016). Landfill Criteria for Municipal Solid Waste, Second Edition.http://www2.gov.bc.ca/assets/gov/environment/waste-management/garbage/landfill_criteria.pdf

property boundary (increased downgradient buffer) and monitoring plan in 2017. The new BC Landfill Criteria will be used to update the DOCP.

4.4.2.2 Armstrong Spallumcheen Recycling and Disposal Facility

In 2016, the ASRDF received 11,419 tonnes, which is a small increase (1.3%) from 2015. However, tonnage at ASRDF increased significantly between 2014 and 2015, which is largely attributable to a change in ownership of a local waste management company. In 2015, MSW from Electoral Areas B and C, which had previously been disposed at GVRDF, was disposed at ASRDF[10].

A challenge faced at the ASRDF is the limited availability of good cover material for intermediate or side cover. Often, chipped wood waste mixed 50/50 with soil is used for cover. This soil is accepted at no charge (or at a nominal charge) and managed according to RDNO policy and procedures. Furthermore, bottom ash from the Tolko Co-Generation Facility in Spallumcheen is delivered to the ASRDF when available and used as cover to supplement the wood chips and soil[10].

In early 2015 a leachate breakout occurred on a portion of the landfill, and staff focused on the design of a final closure system for the unlined north end of the landfill. GHD Ltd. (consulting engineers) was hired to develop a closure design and stormwater management system for this part of the ASRDF. This Phase 1 Closure Design is expected to be submitted to the MOE for review in 2017. It is expected that the area to be capped will have capacity for at least two more years of waste, making 2018 the year the cap is expected to be completed.

Once the Phase 1 Closure design is finalized, the DCOP will be updated with the new design and in accordance with the newly updated BC Landfill Criteria for Municipal Solid Waste. In addition, XCG Consultants have completed an update to the existing hydrogeological assessment of the site, including a comprehensive geophysical investigation (EM-31) and an evaluation of options for managing the stored leachate. A leachate aeration pond and new poplar tree plantation are being developed in 2017, based on the recommendations from this investigation. This upgraded system is expected to be completed in 2017 and to be incorporated into an updated DOCP.

In 2016, the eleven year-old phytoremediation poplar tree plantation on the southwest boundary was harvested. Another poplar tree plantation was planted in early 2017, and the development of a new evaporation pond is currently in the planning stages.

Ongoing environmental monitoring is performed at the ASRDF. Notable recommendations from the 2016 environmental monitoring report included:

- Repeat sampling program as conducted in 2016 and assess trends of exceedances and property boundary conditions;
- Evaluate potential trends for Boron, Cadmium, Chloride, Conductivity, Iron, Magnesium, Manganese, Nitrate, Selenium, Sodium, Sulphate, TDS, and Uranium;
- Assess and report on the options for resolving leachate migration issues around the ASRDF; and
- Further assessment of landfill gas migration by Golder Associates including installation of two additional gas monitoring wells along the property boundary.

4.4.2.3 Greater Vernon Recycling and Disposal Facility

In the next five to ten years, filling will be focused on the upper northeast bench of the footprint in order to maximize landfill gas extraction. XCG Consultants developed a conceptual design for an expansion area in the 99 acre parcel adjacent to and west of the current footprint in 2015. This concept will be used for planning purposes during this Draft SWMP Update.

GVRDF has cover material readily available due to customers who bring in clean soil or hydrocarbon impacted soil (contamination levels less than Hazardous Waste) to the facility. This soil is then mixed with wood chips at a ratio of 50/50 and used as cover material.

The GVRDF has a landfill gas control system which was installed in 2015. The total volume of methane destroyed at the landfill gas flare station in 2016 was 410.7 tonnes. This system is estimated to capture 21.1% of the generated landfill gas.

A new OC was issued on February 17, 2017. This OC requires the following documents be submitted:

- Updated DOCP by December 31, 2017;
- Spray irrigation report by December 31, 2017; and
- Annual report by April 30 each year.

Ongoing environmental monitoring is performed at the GVRDF. Notable recommendations from the 2016 environmental monitoring report included:

- Continue to evaluate potential trends in contaminants;
- Monitor a well that showed increased concentrations of contaminants in 2016;
- Investigate the placement of a new groundwater monitoring well on Kalamalka Lakeview Drive; and
- Pursue options recommended in the Golder Associates Geotechnical Assessment report for controlling seepage from the Leachate Pond Dam.

4.4.3 Closed Landfills

There are four closed landfills in RDNO. Two of these sites (Cherryville and Kingfisher) are currently used as transfer stations. All sites have ongoing environmental monitoring. Details of all closed landfills are presented in Table 4-10 and key recommendations from the ongoing environmental monitoring programs are included in the sections below.

Table 4-10: Closed Landfills

	Ashton Creek RDF[13]	Cherryville RDF[14]	Kingfisher RDF[15]	Pottery Road RDF[16]
Location	In Electoral Area F in off Mabel Lake Road, approximately 15 km northeast of the City of Enderby.	In Electoral Area E at 205 Aumond Road, approximately 20 km northeast of the Village of Lumby, 6.5 km north of Cherryville.	In Electoral Area F at 150 Beattie Road, approximately 35 km north of the City of Enderby.	In Electoral Area 'C' on Pottery Road, approximately 2 km east of the eastern boundary of the City of Vernon.
Closure Date	Stopped landfilling waste in 1996; final closure completed in 1997.	Stopped landfilling waste in 2008; final closure completed in 2016	2003	Stopped landfilling waste in 1986; final closure completed in 2015
Current Site Use	None	Transfer Station (since 2008)	Transfer Station (since 2003)	None
Future site use	None planned	Transfer station	Transfer Station	Recreational, specifically a disc golf course, trails and a bike skills park.
Facility operations in 2016	▪ Environmental monitoring	▪ Final closure activities (south filling area graded, north pit filled with compost facility overs mixed with gravel, and cover system applied on both filling areas) ▪ Fencing and gates realigned ▪ Environmental monitoring ▪ Transfer station operation activities	▪ Environmental monitoring ▪ Transfer station operation activities	▪ Environmental monitoring ▪ Fencing repairs ▪ Ditching repairs
2016 Environmental Monitoring Cost	$1,457	$1,297 (does not include transfer station operations costs or final closure costs)	$1,143 (does not include transfer station operations costs)	$8,185

4.4.3.1 Ashton Creek Recycling and Disposal Facility

Ashton Creek RDF (ACRDF) closed in 1997. Ongoing environmental monitoring is performed at the ACRDF. Recommendations from the 2016 environmental monitoring report included[13]:

- Continue with the currently established sampling program and assess trends of exceedances;
- Evaluate potential trends in Aluminum, Cadmium, Iron, Manganese, pH, Selenium, Sulphide, and Zinc in 2017; and
- Include Dissolved Sulphide in the sampling parameters to detect possible exceedances of the Aquatic Life Guideline.

[13] 2016 ACRDF report
[14] 2016 CRDF report
[15] 2016 KRDF report
[16] 2016 PRRDF report

4.4.3.2 Cherryville Recycling and Disposal Facility

The final closure of Cherryville RDF (CRDF) was completed in 2016. The site has been used as a transfer station since 2008. Ongoing environmental monitoring is performed at the CRDF. Recommendations from the 2016 environmental monitoring report included[14]:

- Repeat sampling program as conducted in 2016 and assess trends of exceedances;
- In 2017, re-evaluate potential trends in selenium, sulphate, and conductivity; and
- Reassess direction of groundwater flow based on newly installed monitoring well (MW16-01).

4.4.3.3 Kingfisher Recycling and Disposal Facility

The Kingfisher RDF (KRDF) has been used as a transfer station since 2003. Ongoing environmental monitoring is performed at the KRDF. Recommendations from the 2016 environmental monitoring report included[15]:

- Repeat sampling program as conducted in 2016 and assess trends of exceedance; and
- Evaluate potential trends in Cadmium, Chloride, Copper, Dissolved Oxygen, Sulphate, and Zinc in 2017.

4.4.3.4 Pottery Road Recycling and Disposal Facility

The Pottery Road RDF (PRRDF) stopped landfilling waste in 1986; the final closure was completed in 2015. RDNO plans to eventually use the site as a recreational facility, including a disc golf course, trails and a bike skills park.

Ongoing environmental monitoring is performed at the PRRDF. Recommendations from the 2016 environmental monitoring report included[16]:

- Repeat sampling program in 2017 and assess trends of exceedances;
- Evaluate potential trends in Ammonia, Arsenic, Chloride, Iron, Manganese, and Sodium in 2017;
- Assess possible impacts and necessary changes to the monitoring program due to landfill closure activities that took place late in 2014 and in 2015;
- Investigate a Total Chromium exceedance; and
- Continue monitoring erosion, vegetation and impacts of closure by completing a grid walk of the site in 2017.

4.5 Supporting Programs

A number of projects and programs are undertaken to support the overall solid waste management system. Notable projects that have been implemented or are ongoing include:

- New signs at RDF facilities for location of material drop off;
- Waste Reduction Initiatives Fund;
- Backyard Composter Rebate Program;
- Membership in BC Product Stewardship Council (regular information sharing), Southern Interior Waste Managers Association, Recycling Council of BC, and Solid Waste Association of North America;
- Xerindipity Garden - outdoor environmental education and demonstration centre;

- Recycling Hotline run by the Recycling Council of BC; and
- Ongoing education and centralization of information for residents.

5.0 OPTIONS AND PRIORITIES

This report describes the current conditions for solid waste management in the RDNO. This report will be presented to RSWAWG at their second meeting to ensure a common understanding of the breadth of solid waste management activities in the RDNO. This basis is intended to inform further discussions as to the direction for the Draft SWMP Update.

At the RSWAWG meeting on June 13, the following initial priorities were identified by Working Group members for consideration as the update is developed.

- 'Sensible sustainability';
- Beneficial use of organics;
- Ultimate fate of RDNO disposal sites;
- Frustration with privatized waste hauling;
- Diversion for businesses;
- Food scraps recycling;
- Reduction of landfilled waste; and
- Recycling and reusing.

Based on the inputs above, a review of previous RDNO SWMPs, Ministry guidelines, overall trends in waste management and recycling, and the current system reporting, the following long list of options has been developed for discussion. The list is divided into three categories: waste reduction and diversion, disposal and financing. The RDNO has recently developed a Solid Waste Management System Financial Model for the active RDFs and transfer stations that can be used to assess the priorities. Discussion at the second RSWAWG meeting will add to and confirm the long list of options and will confirm the evaluation criteria to be used to generate a short list of the high priority options to be evaluated in detail.

Waste Reduction and Diversion Options

The kg per capita waste disposal rate has been static since 2011.

- Determine the logistics and costs for implementing expanded and compulsory residential refuse collection in areas currently receiving only subscription service and curbside recycling services.
- Review recent organics management strategy study results (by XCG Consultants) and determine additional options to evaluate.
- Evaluate rdno-gro markets;
- Assess wood waste management options:
  - Closed RDFs no longer have a use for wood and yard waste that is currently dropped off at the KRDF and CRDF. Should this material continue to be diverted through these transfer stations?

  - RDFs currently use diverted clean (pallets, cut-ends, etc.) and dirty (dimensional wood, furniture, etc.) wood as a cover material (mixed with soil 50/50). Higher and better uses for clean wood material potentially exist.

- Evaluate what programs are needed to reach 350 kg per capita disposal rate (approximately 10,000 tonnes/year reduction in disposal).
- Evaluate Recycle BC's program to determine if improvements can be made working cooperatively or simultaneously.
- Evaluate behavior change program opportunities that utilized community based social marketing (CBSM) techniques such as removing barriers and building social norms for the preferred behavior.

Disposal Capacity Options

Current landfill space is expected to be consumed by 2051. The ASRDF has the most finite life (2034) and the GVRDF has lateral expansion potential. Long term plans for all three landfill sites is necessary in order to ensure future disposal capacity and where to direct investments in infrastructure.

- Determine the acceptability and feasibility of the proposed lateral expansion at the GVRDF and the course of action for investing in expansion.
- Work with the Ministry of Transportation and Infrastructure to ensure the GVRDF access off of and onto Highway 97 are improved as soon as possible.
- Evaluate ways to improve the performance of the landfill gas management system at GVRDF and ways to utilize the gas.
- Evaluate active gas management at ASRDF.
- Assess the financial efficiency of the ASRDF and LRDF.
- Develop a plan to improve all landfill leachate compliance issues;.
- Determine the feasibility of installing or pursuing a WTEF for RDNO refuse.

Financing Options

A financial model for the RDNO waste management facilities (in Excel format) is available to test the viability of SWMP priorities.

- Use the financial model to ensure waste diversion options do not result in financial instability in the short and long term.

6.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech Canada Inc.

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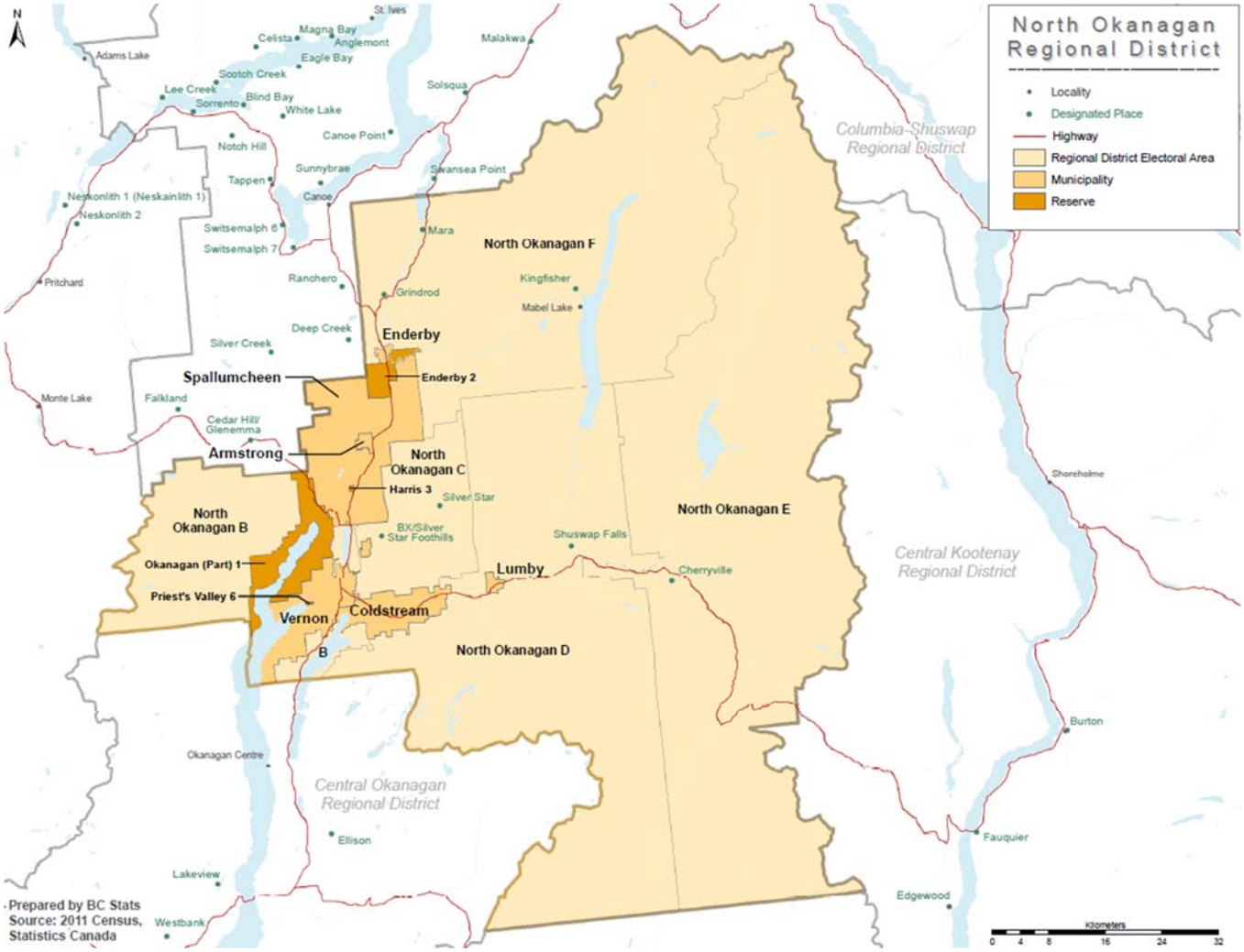
/bvb:lm

FIGURES

Figure 1 Map of Regional District of North Okanagan



APPENDIX A

RECYCLING AND DISPOSAL FEES

SCHEDULE "A"
Recycling and Disposal Fees

DESCRIPTION	PRICE LEVEL	PRODUCT CODE AT SCALE	UNITS	FEE	MIN. FEE
Drywall - Recyclable	1	DRYWALL - REC	tonne	$135.00	$5.00
Drywall - Recyclable: Out of Region	2	DRYWALL - REC	tonne	$325.00	$10.00
Drywall - Non Recyclable	1	DRYWALL - NON REC	tonne	$140.00	$5.00
Drywall - Non Recyclable: Out of Region	2	DRYWALL - NON REC	tonne	$325.00	$10.00
E-Waste [accepted at the Kingfisher (Hupel) and Cherryville RDFs only]	1	E-WASTE	unit	$5.00	$5.00
Fluorescent Tubes and Bulbs	1	FLUOR. BULBS	unit	$0.50	$1.00
Hydrocarbon Impacted Cover Material	1	HYDC - SOIL	tonne	$10.00	$10.00
Hydrocarbon Impacted Cover Material: Out of Region	2	HYDC - SOIL	tonne	$30.00	$25.00
Logs and Stumps - Clean and Grindable	1	LOGS & STUMPS – CLEAN	tonne	$20.00	$5.00
Logs and Stumps - Large, Dirty or Ungrindable	1	LOGS & STUMPS – DIRTY	tonne	$75.00	$10.00
Mattresses / Box Springs	1	MATTRESSES	unit	$8.00	$8.00
Propane Tanks	1	PROPANE TANKS	unit	$0.00	$0.00
Refrigerated Appliances	1	REFRIG	unit	$15.00	$15.00
Scale For Movers	1	SCALE USE	unit	$10.00	$10.00
Scrap Metal	1	METAL	tonne	$10.00	$5.00
Styrofoam	1	STYROFOAM	tonne	$97.00	$5.00
Tires - Passenger and Light Truck with or without rims	1	TIRES	unit	$5.00	$5.00
Tires - Medium Truck without rims	2	TIRES	unit	$10.00	$10.00
Tires - Medium Truck with rims	3	TIRES	unit	$35.00	$35.00
Unsecured Load	1	UNSECURED	tonne	$206.00	$10.00
Wood Waste - Clean	1	WOOD - CLEAN	tonne	$20.00	$5.00
Wood Waste - Dirty	1	WOOD - DIRTY	tonne	$20.00	$5.00
Yard and Garden Waste	1	YARD WASTE	tonne	$0.00	$0.00

NOTES

1. The fee for compost does not include loading. Bulk purchasers are to provide their own loading equipment.
2. For RDFs without scales, the following conversion factors apply when determining the tipping fee:
   Refuse: 0.40 tonnes/m^3
   Wood Waste: 0.25 tonnes/m^3

APPENDIX B

TETRA TECH'S LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

GEOENVIRONMENTAL

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Technical Memorandum 1: Solid Waste Management Plan Disposal Option Information (March 21, 2018)

TETRA TECH

TECHNICAL MEMO

ISSUED FOR USE

To:	Nicole Kohnert, P.Eng	**Date:**	March 21, 2018
c:		**Memo No.:**	1
From:	Monica Wallani, MBA, P.Eng. Michel Lefebvre, P.Eng.	**File:**	SWM.SWOP03478

Subject: Technical Memo No. 1 – Solid Waste Management Plan Disposal Option Information

1.0 INTRODUCTION

The Regional District of North Okanagan (RDNO) retained Tetra Tech Canada Inc. (Tetra Tech) to manage a review and update of the RDNO's 2011 Solid Waste Management Plan (SWMP). The 2017 Draft SWMP Update will review existing solid waste management policies and programs, identify and evaluate options for reduction and diversion, residual management, and financing, and also set the RDNO's waste management principles, targets and strategies for the next ten years. A summary of the project phases and deliverables is included on Figure 1-1.

The assessment stage included the issued for review Current Solid Waste System Report that was presented at the meeting on August 1, 2017. The report documented the current condition of the RDNO's solid waste management system, and was used as a basis for discussion for the direction of the Draft SWMP Update entering the second stage, "Analysis and Evaluation".

Within Stage Two, the first technical memorandum (tech memo) focuses on recovery and residuals management, the interrelated fourth and fifth Rs of the 5-R waste prevention hierarchy (pictured on Figure 1-2). The purpose of this first tech memo is to determine which options require further research and analysis and include in the list of options for financial analysis, and which should be eliminated from consideration within the RDNO's Draft SWMP Update. The second tech memo will also address the first three Rs – reduce, reuse, and recycle. The third and final tech memos will assess the financial implications and synergies for selected options for integration with the 2017 SWMP.

This tech memo will be presented to the Regional Solid Waste Advisory Working Group (RSWAWG) at the third meeting on September 21, 2017, to gather feedback on the options and recommendations. The Working Group's input will be sought on each of the tech memos and this advice will guide the selection of options for inclusion in the updated plan. The selected options will be researched in more detail to gauge their specific application within the RDNO, including estimated costs and determining how they align with other plan components. A draft plan update with preferred options will be prepared for review by the Working Group prior to undertaking community and stakeholder consultation. Once these three tech memos have been issued for review, the consultation stage will engage RDNO constituents from public and private sectors through to First Nations to align on the direction of the 2017 Draft SWMP Update. Finally, the 2017 Draft SWMP Update will be crafted based on the outcomes of the previous deliverables, including a consultation summary.

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The project consists of four stages, as shown on Figure 1-1: Project Phases and Associated Deliverables below.

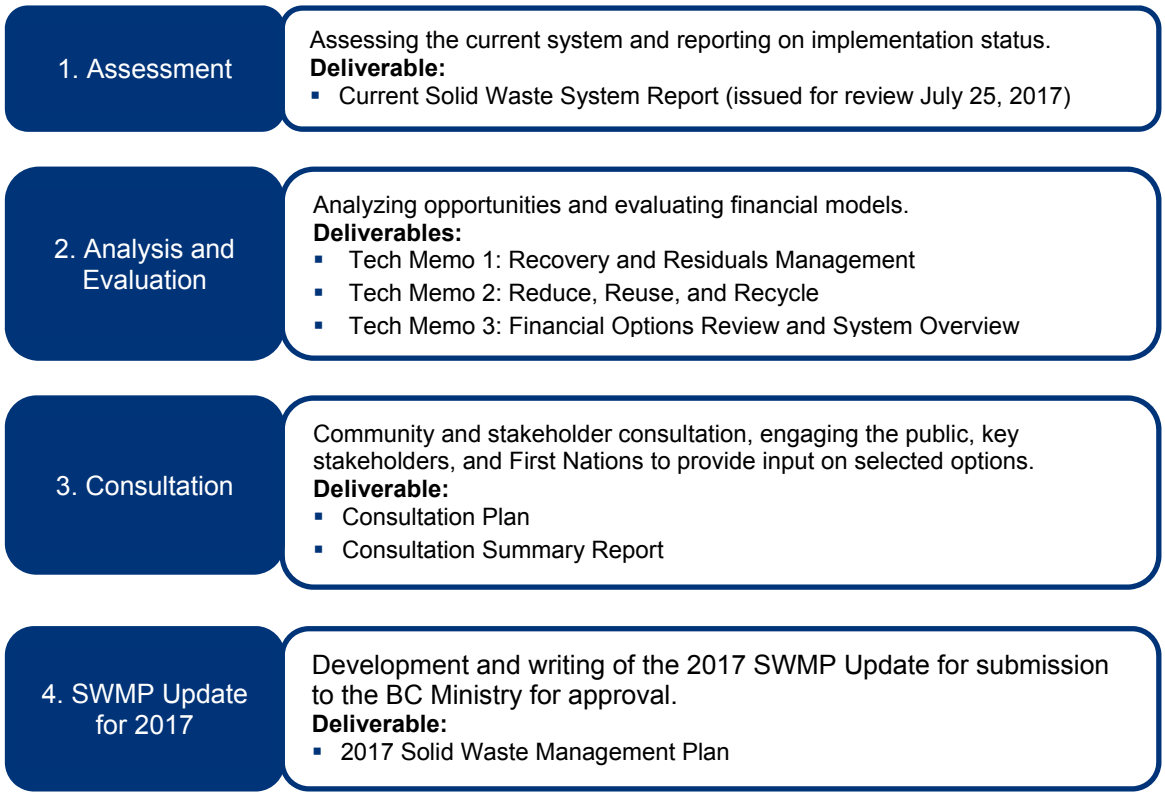

Figure 1-1: Project Phases and Associated Deliverables

1.1 Objective of Tech Memo 1

The waste prevention hierarchy (reduce, reuse, recycle, recovery, and residuals management) is a useful tool to evaluate opportunities to improve a solid waste management system (see Figure 1-2) and will be foundational for the RDNO's Draft SWMP Update. Where practical and feasible, the hierarchy order preference is for other waste management strategies to be undertaken after all opportunities for prevention and reduction at a higher level have been actively pursued. For example, after minimizing the amount of waste produced through reduction and reuse processes, the best practice is to divert as much useful and recyclable material as possible from the waste steam that is still being disposed. Opportunities for recycling should be explored after all opportunities for reduction and reuse of materials have been exhausted. Likewise, recovery is an option once all recycling opportunities are in place and fully optimized. Once these options have been exhausted, recovery technologies can be implemented prior to final disposal (landfilling) of any residuals to maximize the value of wasted resources.

In 2016, the calculated per capita disposal rate in the RDNO was 500 kg per capita, and a total of just over 43,000 tonnes of municipal solid waste (MSW) waste disposed of in the region's three landfills including 28,300 tonnes at the Greater Vernon Recycling and Disposal Facility (GVRDF), 11,419 tonnes at the Armstrong/Spallumcheen Recycling and Disposal Facility (ASRDF) and 1,841 tonnes at the Lumby Recovery and Disposal Facility (LRDF).

Recovery (fourth R) is the application of technology to recover material and/or energy from the solid waste stream as possible in a safe and environmentally sound manner. Section 2.0 of this memo provides an overview of a number of common recovery technologies to inform the options available to the RDNO. Section 2.0 also includes

some technologies that can be utilized to further optimize the recycling infrastructure, including capture of materials for recycling and energy recovery.

Section 3.0 provides an overview of key issues currently being investigated or resolved at the three landfill sites, and presents a summary of options available for improvement. Through the process of maximizing the first 4 R's, the residual management (fifth R) component of the waste stream is expected to be minimized.

The benefits to this approach are as follows:

- **Actions taken at higher levels in the waste prevention hierarchy can eliminate or reduce the environmental management costs of actions at lower levels**. For example, waste prevention programs can reduce costs associated with handling waste in the first place.

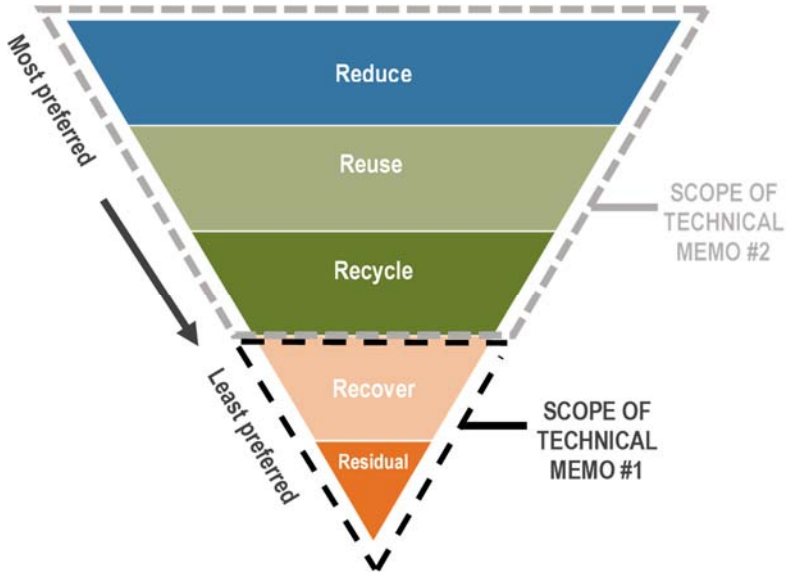

Figure 1-2: Waste Prevention Hierarchy

- **The waste prevention hierarchy can potentially reduce the environmental impacts of product manufacturing and distribution.** For example, reuse (and, to a lesser degree, recycling) will reduce the demand for and thus environmental impact of extracting and processing virgin resources, while the use of recycled materials can reduce the energy cost and virgin inputs needed to manufacturing new products.

As part of this tech memo, a brief summary of the technologies utilized in solid waste management systems to aid in the recovery of additional materials or energy are included for the information of the committee. Technology recovery and residual options explored in this tech memo include:

Technology Opportunities

a. Mixed Waste Material Recovery Facilities (mixed waste MRF)
b. Anaerobic Digestion

Recovery Opportunities

c. Landfill Gas Capture
d. Thermal Conversion
   i. Refuse Derived Fuel
   ii. Gasification
   iii. Pyrolysis
   iv. Waste to Energy (Incineration)

Residual Management

a. Transfer Stations
b. Active Landfills
c. Closed Landfills

2.0 TECHNOLOGY OPPORTUNITIES

As part of the 2011 SWMP, it was determined the next plan review would include a review of recovery opportunities including waste to energy. The previous plan update stated the following:

- Monitor waste to energy technology as it becomes accessible to small communities in Canada. Report on the feasibility of establishing a MSW to energy facility in the North Okanagan.

Table 2-1 provides a brief description of the recovery technologies and applicable inputs that are used as a feedstock, and outputs that are recovered with the technology. Recovery is typically taken to mean the conversion of non-recyclable waste materials (or materials which otherwise escape the recycling stream) into useable energy which includes heat, electricity and fuel. The most common forms of energy recovery from waste in Canada include landfill gas (LFG) collection and advanced thermal conversion technologies.

Table 2-1 Recovery Technologies

Classification	Recovery Technology and Description	Inputs ("Feedstock")	Valued Outputs
Technology Opportunities			
Mechanical	**Mixed Waste Material Recovery Facilities (Mixed Waste MRF)** Manual and/or automated sorting and segregation of waste on conveyer belts to capture and recover recyclables that would otherwise be sent to landfill.	Mixed MSW	Recyclables Organic Materials
Biological	**Anaerobic Digestion** Biological processes that enable microorganisms to break down biodegradable material in the absence of oxygen.	Organic Material	Methane – Energy Digestate, used for composting, direct land application, or dehydration
Recovery Opportunities			
Biological	**Landfill Gas Capture** Using wells to capture the natural by-product of the decomposition of organic material in landfills.	MSW	Methane - Energy
Mechanical and Thermal	**Refuse Derived Fuel** A solid fuel produced from pre-processing MSW into combustible components and selected waste with recoverable calorific value for use in Thermal processes.	Mixed MSW or Pre-screened MSW	Solid fuel that can be combusted to offset use of fossil fuel
Thermal	**Gasification** High temperature oxidation process (oxygen starved environment) to break down organic portions of waste into elemental compounds and produce a syngas.	Mixed MSW or Pre-processed high energy content MSW	Syngas
Thermal	**Pyrolysis** Form of gasification, using high heat while being starved of oxygen utilizing catalyst to enhance the process.	Typically woody biomass, paper products, plastics, etc.	Syngas Char
Thermal	**"Waste to Energy" (Incineration / Combustion)** Combustion process that generates high heat to create high temperature steam for energy generation	MSW	High pressure steam, electricity and/or district heating

2.1 Mixed Waste Material Recycling Facilities (mixed waste MRF)

There are three general categories of material recovery facilities (MRFs):

- Clean MRFs which takes in co-mingled or source separated recyclable materials which is then sorted and baled for their respective commodity markets;
- Mixed waste MRF (aka “Dirty” MRF) which takes in mixed MSW (i.e., garbage), or MSW with organics removed, that is then sorted and baled for their respective commodity markets and/or separated for further organics processing; and
- Hybrid MRFs which may take in several different materials streams, some of which may be source separated recyclables, and/or mixed MSW.

Many solid waste management jurisdictions in North America are considering the use of mixed waste MRFs as part of an overall integrated solid waste management system. Mixed waste MRFs typically consist of conveyor systems, bag splitters, screens and/or trommels to separate the waste into different size fractions. The waste stream then travels through a series of magnets, eddy current separators, air classifiers and hand sorters to divide the waste stream into the required constituent streams for removal of recyclables and organics depending on the facility design. The process does not produce the same quality of commodities as a clean recycling MRF because of contamination from putrescible materials such as food scraps, liquids and other contaminants. As a result, the market value for commodities from a mixed waste MRF is typically less than that of a typical MRF used to sort collected recyclables.

The effectiveness of mixed waste MRFs is dependent on the remaining composition of the waste stream and any upstream initiatives that could mitigate contamination from wet organic materials. A source separated organics program can benefit a solid waste system with a mixed waste MRF. Typically these facilities are considered as an added element in the waste management system to increase the diversion of recyclable and compostable material from within the MSW stream by sorting and removing recyclable materials contained within the garbage after curbside recycling and prior to disposal. This added operation can increase diversion; however, there is an added processing cost to the waste management system to build and operate the facility.

There are many design considerations that impact the effectiveness of mixed waste MRFs, and the labour or technology required to capture enough recyclable materials from the MSW to justify the additional cost of building and operating the facility. For example, an important consideration is the waste composition of the material entering the facility, and whether a community proposes to use this technology as its primary form of recycling and waste diversion or as a supplemental step to take out the remaining recyclable and divertible materials before the residuals (or garbage) stream is ultimately disposed. Typical diversion rates of approximately 10% to >50% have been estimated for mixed waste MRFs depending on the facility design, the composition of the incoming waste, and the effectiveness of the source-separated recycling program.

A mixed waste MRF could be used to enhance waste diversion and capture of recyclables for jurisdictions that choose not to divert waste. The target MSW stream is the garbage stream with an objective to reduce the amount of material requiring disposal and to extend the available disposal capacity within the region. The most likely scenario for a mixed waste MRF being economically feasible is in cooperation and participation with the member municipalities to achieve economies of scale. In the RDNO, with a primary goal of the SWMP to focus on the first three Rs in the waste prevention hierarchy, and currently having many waste division programs in place, it is unlikely that a mixed waste MRF would be used to replace existing diversion programs.

2.2 Anaerobic Digestion

Anaerobic digestion (AD) is a biological process where microorganisms break down biodegradable material in the absence of oxygen. The process is carried out by anaerobic micro-organisms that convert carbon-containing compounds (organics) to biogas in a contained process to optimize capture. The biogas is a mixture of methane (CH_4), carbon dioxide (CO_2), water, and other impurities. Total mass from the beginning to the end of the cycle is typically reduced by 30% to 40%.

Anaerobic systems are becoming increasingly popular for food scraps processing due to their ability to generate power and better contain odours for higher putrescible materials that can be used in limited amounts within open air composting systems. The technology has successfully operated at commercial scale for many years, particularly in the European Union. The art of building low-cost, reliable digesters is strictly dependent on the optimal adaptation of the design to the specific types of feedstock or substrate available. Their major drawback is that capital, operating and maintenance costs are high compared with aerobic composting systems.

The biogas is sequestered in storage tanks and can be sent through a combined heat and power unit ("CHP") to generate electricity, or be upgraded using scrubbing technologies for direct injection into the natural gas pipeline network or used as fuel for compressed natural gas ("CNG") vehicles. At the end of the digestion cycle, residual organic solids (digestate) can be used as a base material for composting to increase the biological value of the end product and optimize nutrient update to plants. The digestate material produced as a by-product is rich in soil nutrients and typically maintains high structural integrity which assists in erosion control. It can also be marketed as a fertilizer that has value for agricultural production.

AD is a common conversion technology for the organic fraction of MSW, agricultural waste, waste water treatment facilities, and other operations. It is carried out in an enclosed system, typically a stainless steel or concrete vessel that is connected to a computer system that monitors and controls air flow, temperature, moisture, and mixing. Retention times for all AD technologies depend on design specifics and feedstock characteristics, with a typical range of twelve to thirty days. There are a variety of systems available as described in Table 2-2 which are either referred to as "wet", involving high moisture content and often associated with waste water treatment and sludge, or "dry", which contain solid organics and yard debris from MSW.

The choice of which digester to use is driven by the existing or planned biomass handling system at the facility. Each type of digester has its own specialty and constraints. All technologies can capture methane and reduce pathogens, but they differ in cost, climate suitability, and the concentration of solids in feedstock. Typical technologies are detailed in Table 2-2 including information relevant to their potential application for the RDNO.

Table 2-2 Anaerobic Digestion (AD) Technologies

AD Technology	Details
Complete Mix Digestion **"Wet"** 	▪ Most commonly in municipal sewage sludge digestion practices, this process uses substrates in a slurry [1% to 15% organic total solids (TS) by mass], ▪ Waste entering the digester is mixed in order to uniformly distribute it. Waste is processed in a heated tank above or below ground. A mechanical or gas mixer keeps the solids in suspension so that the bacteria can decompose the feedstock. ▪ Generally suitable for liquid based feedstock (e.g., manure and pulped food waste) that has 2% to 15% solids. Therefore, this is often referred to as "wet AD." ▪ As this technology requires a considerable amount of preprocessing to process the organic fraction of MSW it is not considered a viable option for the RDNO.

AD Technology	Details
High Solids Digestion **"Dry"** 	▪ Dry AD can process solid substrates with as much as 40% to 50% total solids (TS) by mass. This is well within the range of available high "solid" or "stackable" substrates such as MSW, food waste, yard waste, and other organic substrates. ▪ The higher solids content equates to higher transport efficiencies in comparison to wet systems where 90% or more of the feedstock transported is simply water. ▪ The lack of stirring during the process means that not all materials are exposed to the methanogenic microbes vital to AD reactions, and the gas production suffers as a result. Depending on the preprocessing included dry AD can achieve a portion of the efficiencies (as low as 50% to 60%) of the production rates achieved by wet AD technologies. ▪ Numerous proprietary technologies have been developed to commercially execute dry AD. Most notable amongst these technologies are "garage style" digesters and assisted plug flow digesters. ▪ New innovations in the "dry" technology have begun to address smaller scale waste streams which align with the needs of the RDNO, and this could be a viable technology option.

Anaerobic digestion is an organic management processing option that can be taken into consideration given the amount of organics remaining in the RDNO's waste stream (approximately 30% according to the 2012 waste composition study). Typically, composting is a simpler and less capital intensive organic processing option than anaerobic digestion. For either technology to be feasible, source separated organics needs to be collected from generators and markets for the end products needs to be available from each process.

2.3 Landfill Gas Capture

MSW disposed of in landfill facilities generate LFG due to the anaerobic decomposition of organic material in the waste material. LFG, comprised primarily of methane and carbon dioxide in combination with trace contaminants, is a significant source of greenhouse gas emissions. The capture of LFG from municipal landfills, and destruction via flaring or utilization of the captured gas offers the following environmental benefits:

- Reduced net greenhouse gas emissions associated with the destruction of methane, which has a global warming potential (GWP) 25 times greater than that for carbon dioxide;
- Reduced emissions of odours that may be associated with the LFG; and
- Development of LFG utilization opportunities typically associated with direct use (boiler fuel) options, the processing of renewable natural gas, and renewable electrical power generation projects.

The RDNO has a long-term goal to develop a LFG green energy project at the GVRDF. In preparation of this, a LFG management system has been implemented at the GVRDF and is currently flaring the collected gas. This existing project has set the groundwork for future energy recovery utilizing this gas.

Landfill gas must be monitored at all landfill sites in BC for health and safety reasons, and also to reduce impacts to air quality. The BC guidelines required that a landfill site that is estimated to generate greater than 1,000 tonnes or more of methane per year must ensure that a LFG management plan is prepared for the landfill site and an active gas collection system installed to reduce fugitive LFG emissions to the atmosphere. In the RDNO, the GVRDF exceeds the 1,000 tonnes per year threshold and is therefore required to capture and reduce methane emissions. The ASRDF and LRDF produce less than 1,000 tonnes of methane per year each and are therefore not regulated to collect and destroy LFG. LFG is monitored at the ASRDF and is further described below.

A LFG capture system typically consists of a series of vertical gas extraction wells joined through a system of lateral pipes, which are connected to a main header pipe that conveys the gas to a treatment facility. At the GVRDF, the gas treatment facility is comprised of an extraction plant equipped with a utility flare. It is estimated by the US EPA that a new engineered landfill can capture roughly 60% of LFG during operation depending on system design and effectiveness, and up to 90% of the methane can be captured after a geomembrane cover is placed on the landfill during closure. The LFG system at GVRDF was commissioned in April of 2015. The total quantity of methane destroyed at the LFG flare station in 2016 was 411 tonnes, with a carbon dioxide equivalent of 10,270 tonnes.

Landfill gas monitoring probes are installed at the ASRDF in native soils around the perimeter of the landfill to monitor the subsurface migration horizontally and vertically through the soil. Monitoring started in 2011 when a number of probes were installed to assess a LFG migration issue on the south side of the landfill footprint. Probes are sampled on a quarterly basis, or more frequently as needed, to determine if LFG is migrating away from the landfill, indicating the possible need for LFG control. Generally, LFG migration probes are installed at or near the landfill property boundary as migration beyond the boundary may impact neighbouring structures.

Landfill gas capture technologies are well proven commercially, and provide the potential to capture energy and/or reduce greenhouse gas emissions from landfill. With regards to implementing LFG capture at other landfills within the RDNO (for example the ASRDF and LRDF), so far only the GVRDF meets the trigger levels under the BC Landfill Gas Regulation.

The candlestick flare at the GVRDF is being used as the primary instrument to destroy LFG at this site. Data is being collected with respect to LFG quantity and quality in order to facilitate the development of a suitable and sustainable beneficial use, green energy project at the GVRDF.

The highest potential next step for the RDNO with regards to the LFG collection system include:

- Continue with the evaluation of the current LFG management system at GVRDF and implement options for repurposing the collected gas beyond flaring on site as soon as possible: for example, processing and injection into the natural gas grid, or generating electricity;
- Further expand the landfill capacity at the GVRDF can allow for expansion of the existing LFG infrastructure allowing for optimal LFG recovery;
- Minimize the quantity of organics in the MSW disposed through implementation of a source-separated organics diversion program, thus significantly reducing the potential for LFG generation; and
- Complete the current investigation on the ASRDF LFG migration issue to determine the impacts and develop and implement mitigation strategies if required.

2.4 Thermal Technologies

2.4.1 Refuse Derived Fuel

Refuse-derived fuel ("RDFuel") are fuels made from the combustible components of MSW, including commercial, industrial and consumer waste. RDFuel can replace virgin biomass being used for energy production. Therefore RDFuel can be used to replace finite resources like fossil fuels, and also decrease the volume of waste being landfilled.

Photo 1: Typical Refuse Derived Fuel (RDFuel)Pellet

From within the MSW stream, all materials that are inert, i.e., non-combustible, and those which have practical value as recyclables are removed prior to treatment. This may include ferrous and non-ferrous metals, glass, gypsum board, plaster, rock, and dirt. What remains is ideally an assortment of plastics and fibre. The Btu value of RDFuel is determined by the caloric content of the material it contains. Typically, a higher plastics content equates to higher heating values for the resulting fuel. The fibre component may also include cardboard, boxboard, and other cellulosic fractions such as wood scrap or any biomass in the waste stream being processed.

Sorting and processing can incorporate shredding, size screening, magnetic separation, coarse shredding and final refinement. Final refinement can include further shredding of the sorted material, or dehydrating the combustible waste portion using various pre-processing technologies. RDFuel is typically produced as fluff, but is usually baled or densified into pellets to make storage and transportation more economical. Most RDF processing facilities are located near a source of MSW, but once the RDFuel product is prepared, it may be transported long distances to an incinerator, gasifier or other such facility for use.

RDFuel can be utilized as clean burning fuel to be co-fired with or replace coal, petroleum coke and other fuels in cement kilns, industrial boilers and at utilities generation plants. The fuels generated by these technologies are typically classified as clean burning (when used to off-set coal) and can be used as a partial [normally up to 10%] coal substitute. RDFuel can also be used in conjunction with other technologies such pyrolysis and gasification.

Feasibility of Creating Refuse Derived Fuel for the Regional District of North Okanagan

RDFuel is currently gaining momentum as both an alternative to landfill and a cleaner burning fuel due to innovations in related pre-processing technology. The long term hope in the industry is that this technology will be able to address dry material, including MRF residuals as part of an integrated system even for relatively low throughput facilities. This technology would likely be deployed as part of an integrated waste recovery system for MSW and would typically require complex mechanical sorting systems on the front-end. At this time, the RDNO's existing MSW stream does not have sufficient quantities necessary to make investments in processing technology worthwhile; however, there are specific source separated material streams such as clean and dirty wood that could be utilized by a private processer. These materials could be put to a higher and better use as a fuel source than currently used as alternative daily cover at the landfill.

2.4.2 Gasification

Gasification is a partial combustion process where the oxygen level is limited in order to convert organic or other fossil fuel based carbon-rich materials into a carbon-rich ash and a series of gases including carbon monoxide, hydrogen and carbon dioxide. This conversion of solid material into gas (fuels) and other desired end products is called synthesis and the gas therefore is known as synthetic gas or (syngas).

Photo 2: Gasification Plant

While gasification is a more complex technology than incineration, it allows for the recovery of valuable products (i.e., syngas) which can be processed into usable chemicals (fuels, alcohols, etc.). The syngas is typically used to fuel a boiler and generate electricity via a steam turbine, although further processing can convert syngas into easy to use biofuels like synthetic gasoline and diesel. The energy derived from gasification and combustion of the syngas is considered to be a source of renewable energy if the gasified compounds were obtained from biomass or other natural sources. One perceived advantage of gasification is that its use can be considered potentially more efficient than direct combustion of the original fuel, since the resultant clean syngas product typically has the ability to be used directly in gas engines, to produce methanol and hydrogen or be converted into other synthetic fuels.

Gasification has been developed in various formats, and several versions of gasification equipment are available or in various stages of commercialization although commercially. Gasification has not achieved as high a level of acceptance as traditional combustion because of its relatively high complexity and high capital costs.

This technology is growing in popularity in large part because of the wide variety of potential feedstock that may be processed, as well as the perceived level of variability that may be acceptable. Thus the benefits of gasification are considered to be increased efficiency, greater variety of end products, and fewer back-end pollution control requirements than incineration or pyrolysis, although, similarly to traditional incineration and pyrolysis, it requires a consistent, high volume of feedstock to be economically sustainable.

Among the primary challenges facing waste gasification technologies is to reach an acceptable energy returned on energy invested ratio, as the efficiency of converting syngas to electric power may be offset by the often significant power consumption required in preprocessing, the use of oxygen and the gas cleaning process. In addition, the build-up of residue in the reactor necessitates frequent shutdown for cleaning. This makes what should be the benefit of a continuous feed system potentially irrelevant. True capital and operating costs of a system are still unknown until a full commercialization cycle can be completed, making it difficult to compare to alternatives.

Gasification's Feasibility for the Regional District of North Okanagan

Commercialization efforts remain elusive due, in large part, to the uncertainty of both capital costs and ongoing operating costs. Similar to incineration, this technology is expected to be capital intensive, necessitating deployment in large metropolitan areas where aggregation may help to leverage economies of scale. While there is potential value in small scale gasification designs deployed in an integrated waste handling technology suite, larger scale commercialization must be realized first. Since gasification technology is more complex, more expensive than other thermo-chemical technologies, and has limited commercial viability, at this time it is not recommended as a viable option for the RDNO in the next ten years.

2.4.3 Pyrolysis

Pyrolysis is a method of applying heat (thermal energy) to organic materials to decompose them. Pyrolysis occurs in the absence of oxygen, sometimes with the addition of a catalyst to spur the reaction. Pyrolysis in the waste industry typically refers to transforming solids like plastics, tires or biomass, into gases, liquids and a solid by-product rich in carbon content. The products of the pyrolysis process and their uses are described in Table 2-3.

Table 2-3: Products of Pyrolysis; their Contents and Uses

Products of Pyrolysis	Contains	Uses
Char (or 'biochar')	▪ Solids with a high carbon content. Can also include inorganics or catalysts that were carried through the process.	▪ Typically burnt, or more recently incorporated as a soil amendment.
Non-condensable Gas	▪ Made up of hydrogen, methane, carbon monoxide and other non-condensable gases.	▪ May be used as a heat source, flared, or burned similarly to conventional natural gas.
Liquid Fuel	▪ Composed of dozens of organic chemicals. Pyrolysis 'oil' typically requires additional processing before replacing traditional fuels.	▪ Liquids undergo a process to separate water from other materials, after which they may be processed and refined into fuels, oils and chemicals.

In general, the technology is thought to have a great degree of flexibility as most organic compounds can be broken down to basic components using the pyrolysis process, and upgrades enable pyrolysis systems to generate a range of specific, valuable end products within the categories identified above.

Pyrolysis has been used for many years in the chemical industry to produce charcoal, activated carbon, methanol, and other chemicals from wood, which are then converted to compounds used to produce consumer products; e.g., turn coal into coke; convert biomass into syngas and biochar. It can also be used to neutralize waste into non-hazardous substances for safe disposal. Recently, experimental and pilot pyrolysis plants have been used to turn waste plastics back into usable oil and fuels; waste tires into carbon black (used to manufacture new tires) or fuel oil blends, and; biomass into fuels and chemicals for transportation.

Photo 3: Plastics Pyrolysis Facility

Pyrolysis' Feasibility for the Regional District of North Okanagan

The most crucial determinant of success for these technologies is the ability to aggregate and prepare the feedstock materials, since this ultimately determines the quality of the final product. End products must meet market standards for quality and quantity which impact the economics of the plant. Challenges exist for all forms of pyrolysis, with the relative variability or inconsistency of feedstock making it difficult to control the quality and uniformity of the final products. Pyrolysis is a technology with many potential applications for waste materials management, which helps explain the high degree of experimental activity currently taking place; however, there are no known facilities operating in Canada. Capital costs and operating costs tend to be higher due to the complexity of the process, varying feedstock quality, and additional processing requirements. Because this technology is generally considered to not be commercially viable for mixed waste due to its high variability, it is not being considered further for implementation in the RDNO. There could be opportunity to support a private facility that could be built in partnership with the forestry industry, and the RDNO could consider separating the clean wood received at the landfills, and

currently being sued for cover, and provide it instead to a private facility for a higher and more beneficial use (e.g., Tolko's Co-Gen in Spallumcheen).

2.4.4 Waste to Energy (Incineration/Combustion)

Waste remaining after diversion efforts must be dealt with. With declines in landfill capacity and significant challenges siting new landfills, long-term disposal options are a high priority for regional governments. Waste to Energy (WTE) technologies are often considered a viable alternative to landfills as they convert waste materials to fuel products which can be used in place of virgin fossil fuel. Depending on the technology, employing WTE can result in an 80% mass reduction (by weight), and 90% reduction in volume. The remaining material is in the form of bottom and fly ash that must be landfilled or recycled depending on available markets.

Photo 4: Burnaby WTE Facility.

Although all of the advanced recovery technologies covered in this section qualify as 'waste to energy', the most common and long-standing form of WTE processing is incineration, also known as combustion, defined as the burning of fuel to produce power and/or heat. This requires oxygen and high temperatures in an enclosed vessel. Incineration technology produces heat, ash residue, and gas, predominantly nitrogen (N_2), carbon dioxide (CO_2), and water vapour.

Heat generated by incineration is captured and used to heat industrial boilers to generate pressurized steam, which can be used for direct heating, or passed through steam turbine generators to produce electric power, as in the Metro Vancouver WTE facility pictured in Photo 4. The gas must be treated to meet regulatory emission requirements for chemical pollutants and particulates. Ash residues are produced in both light ("fly ash") and heavy fractions ("bottom ash"). Both forms tend to contain residual compounds, and are typically landfilled. Fly ash requires pre-processing to dampen it prior to landfilling. Some options for beneficial reuse of bottom ash are being practiced, for example, as an additive in road building. Environmental concerns associated with these systems include air emissions that could impact air quality.

WTE technologies need to be operated at their designed processing capacity to be economical. If they are designed and sized appropriately to meet anticipated long term disposal capacities, then ideally, the costs can be as projected. Two examples are summarized below to demonstrate this requirement, and a feasibility assessment of value for the RDNO is presented.

Durham Region Waste to Energy Facility

Durham Region in Ontario is commissioning their mass burn WTE facility (WTEF). It employs a similar thermal processing technology to Metro Vancouver's WTE facility in Burnaby. This facility is estimated to cost $260 million and process 140,000 tonnes per year. Although this facility cost $260 million, much of the foundation and infrastructure was designed for a 400,000 t/yr facility. This facility has elevated capital costs which affects its unit processing cost. The calculated unit processing cost for the Durham WTEF is estimated to be $250 per tonne. This includes a 20 year amortization at an interest rate of 6%. If the facility was built for its design capacity, the unit processing cost is estimated to be $150 per tonne. This includes the cost for disposal of the residuals.

City of Edmonton Waste to Energy Facility

The City of Edmonton in Alberta is also commissioning a WTE facility that uses gasification technology from Enerkem. This facility is one of the first commercial scale gasification facilities in North America and cost over $210 million. It is designed to process 100,000 tonnes of MSW annually.

The unit processing cost was calculated for the Enerkem facility. Additional pre-processing activities supports higher operating costs (estimated to be 20% higher than the Durham WTEF). The unit processing cost is estimated to be $195 per tonne.

Tri-Regional Waste to Energy Feasibility Study

In 2010, the Cowichan Valley Regional District, the Comox Valley Regional District, and the Regional District of Nanaimo conducted a Tri-Regional District Solid Waste Study. The study assessed the feasibility of thermal treatment (or WTE) technologies for MSW for the three southern Vancouver Island regional districts. The study assessed different technologies, considering the combined solid waste available from the three regional districts. Figure 2-1 illustrates the expected unit processing cost for thermal treatment technologies based on their design processing capacity. For the three regional districts, the design capacity was 200,000 tonnes per year. This indicates a unit processing capacity that is just over $100 per tonne in 2009 dollars.

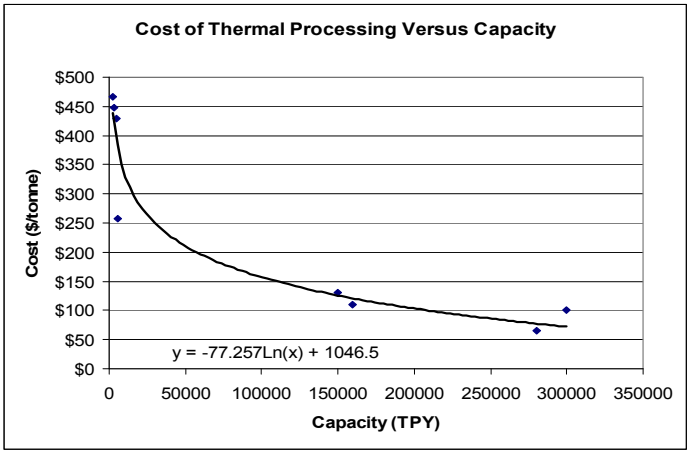

Figure 2-1: Cost of Thermal Processing Versus Capacity

Waste-to-Energy Feasibility for the RDNO

The combustion process is highly developed commercially and is available in numerous vendor specific designs. The technology is also highly complex and requires high upfront capital costs and long term contracts typically 20 to 30 years that guarantee a specific quantity of MSW. Currently in Canada there are four WTE facilities, and they are in located in highly populated areas with sufficient volume to sustain the economics of incineration. There have been a large number of proposals from companies that have come forward with smaller-scale WTE technologies; however, there is no full-scale operational facility in Canada that can be used as operating examples for the smaller scale WTE technologies. With the RDNO total garbage tonnage of 43,020 tonnes in 2016, and new diversion programs likely to decrease the total amount of MSW requiring disposal, it is recommended that a WTE plant not be considered for development or inclusion in the options for the 2017 Draft SWMP Update.

2.5 Technology Options Available and Priorities for Further Evaluation

The BC Ministry expects local governments to have a minimum target of 70% reduction of waste (or a 350 kg/capita/year) before utilizing WTE as a waste management option. The 70% target is calculated only from reduce, reuse, and recycle initiatives. When a region has sufficient reduction, reuse, and recycling, there is often not a viable business case for incineration/combustion technologies such as waste to energy, pyrolysis or gasification, which rely on a minimum threshold of feedstock to be financially viable. Likewise the production of refuse derived fuel technologies require certain minimum feedstock thresholds to develop a business case for the technology investment. Table 2-4 summarizes the recommendations for residuals management in the RDNO.

Table 2-4: Residual Management Options for Consideration in the Draft SWMP Update

Recovery Technology and Description	Inputs ("Feedstock")	Valued Outputs	Considerations for Draft SWMP Update
Technology Opportunities			
Mixed Waste Material Recovery Facilities (Mixed Waste MRF)	Mixed/MSW	Recyclables	Not recommended for this Draft SWMP Update.
Anaerobic Digestion	Organic Material	Methane – Energy Digestate, used for composting, direct land application, or dehydration	Keep as an option for organics processing when developing an organics program.
Recovery Opportunities			
Landfill Gas Capture	MSW	Methane – Energy	Options available including utilizing LFG at GVRDF, and expanding and further enhancing capture at GVRDF. Prevention and mitigation strategies include minimizing organics in landfills, and resolving migration issues at ASRDF.
Refuse Derived Fuel	Feedstock preparation including shredding and screening of MSW	Solid fuel for waste to energy technologies	Not recommended as a technology for the RDNO, however some source separated materials (wood, asphalt shingles) could potentially find better use in these markets through private facilities involved in wood waste management or with Energy BC.
Gasification	Pre-processed high energy content MSW	Syngas	
Pyrolysis	Typically woody biomass, paper products, etc.	Syngas Char	
"Waste to Energy" (Incineration / Combustion)	Feedstock preparation including shredding and screening of MSW	Electricity, high pressure steam, or district heat Metals	Not Recommended.

With respect to waste Recovery, current measures such as LFG capture are considered the most viable measures to capture energy from waste and mitigate environmental impacts from landfilling. With respect to residual waste, landfilling is the RDNO's only current residual management process. A review and evaluation of the transfer stations, active landfills, closed landfills, and proposed next steps in landfill management are presented in Section 3.0.

3.0 RESIDUAL MANAGEMENT

3.1 Active Landfills

3.1.1 Landfill Facilities Overview

Landfilling, as the primary residuals management strategy, has been part of the RDNO solid waste management system since the first SWMP was developed in 1995. Even with high diversion targets and diversion rates, landfills will continue to remain an essential component of the RDNO solid waste management system to deal with the residual waste which cannot be practically removed from the waste stream along with items not well designed for recycling that are disposed of as garbage. Since the first plan was developed for the RDNO in 1995, four small landfill sites have been closed. In both the 1995 and 2002 plans, the RDNO stated that existing regional landfills will remain in operation until they reach design capacity, while remaining environmentally and economically viable.

In BC, landfills are designed and managed to minimize risk to public health and safety and to ensure environmental protection. The “Landfill Criteria for Municipal Solid Waste” guidance document provides standards for siting, design, construction, operation and closure of MSW landfills. This guidance document, originally developed in 1993, was updated by the BC Ministry in 2016 to reflect the current best management practices and standards that have been developed over the years to enhance environmental protection.

Modern landfills are engineered and managed facilities for the disposal of solid waste residuals. They are designed, operated and monitored to ensure compliance with environmental criteria. Landfills have value measured by the amount of MSW that can be placed into available engineered disposal capacity termed “airspace”. It is typically advantageous to preserve the airspace to extend the lifetime capacity of a landfill as regions that exhaust their landfill capacity may have difficulty siting a new landfill. This can cause a region to require waste exporting, which can escalate costs. The economics of transfer and disposal out-of-region can be prohibitive and leave the region unable to deal with their own waste. Landfill capacity in the RDNO is estimated to be 34 years at the GVRDF, 17 years as the ASRDF and 57 years as the LRDF.

3.1.2 Operational Risks and Opportunities

Tetra Tech’s Current Solid Waste Management System Report provided an overview of the three operating landfills within the RDNO. Each year annual reports are produced by April 30 for each operation and close landfill as required by the BC Ministry. The reports are published on the RDNO website and submitted to the BC Ministry. Based upon these reports, it is understood that all currently available permitted landfill space is expected to be consumed by 2075. It is noted that the ASRDF has the most finite life (2034) while the GVRDF has lateral expansion potential. Long term planning with respect to all three landfill sites is necessary in order to ensure future residuals disposal capacity and where to direct investments in infrastructure. There are a number of studies underway including an update to the design, operations, and closure plans (DCOPs) for each landfill site, along with environmental investigations that can influence the ongoing economic viability of the LRDF and ASRDF sites. Table 3-1 provides a synopsis of the ongoing operations at each of the RDNO’s RDFs and provides a summary of the key risks and opportunities for consideration for a long term disposal plan for the RDNO.

Table 3-1 Recycling and Disposal Facility Information Matrix

Variable	Lumby RDF	Armstrong/Spallumcheen RDF	Greater Vernon RDF
Population served and capture area	4,505 residents	17,184 residents	61,655 residents
Distance from service area, and from the City of Vernon	6.5 km north of Lumby, and 33.5 km East from the City of Vernon.	2.0 km north of the City of Armstrong and 24.6 km north from the City of Vernon.	7 km southwest of the City of Vernon.
Filling rate (tonnes/year)	1,841 tonnes	11,419 tonnes	28,296 tonnes
Years until full/closure under current design plans	2074 (57 years)	2034 (17 years)	2051 (34 years)
Expansion capacity available	Yes - Potential expansion to the south	None	Yes – Current landfill is approximately 14 ha of the 79 ha site. Additional land to the west of the current landfill cells is available for expansion.
Tipping fee	Refuse/MSW $100/tonne, $5 minimum charge per load		
Approximate funds generated from tipping fees (2017 estimate)	**$220,000**	**$1,375,000**	**$3,600,000**
2016 direct operation and maintenance expenditures	$219,836 ($119/tonne)	$842,865 ($74/tonne)	$1,686,274 ($60/tonne)
Estimated 2016 funds transferred to landfill closure reserve	$29,456 ($16/tonne)	$182,704 ($16/tonne)	$452,736 ($16/tonne)
Total direct operation and closure (Does not include capital projects and shared expenses)	**$249,292 ($135/tonne)**	**$1,025,569 ($90/tonne)**	**$2,139,010 ($76/tonne)**
Estimated shared expenses (Administration, Eco-Depot, Composting Facility, Recycling Programs, etc.)	$753,000 + $800,000 (Capital Expenditures)		
Total RDNO landfill closure statutory reserve funds (2017)	$5,588,167 (Contribution are made to the reserve at a rate of $16/tonne)		
Estimated closure cost	Under review in development of updated Design, Operation and Closure Plans for each RDF		
Landfill design type	Unlined natural attenuation landfill	Historically an unlined attenuation landfill, 7 new landfill cells are lined	Unlined natural attenuation landfill
Significant work completed or underway since 2011 plan	▪ Land swap with property owner south of the landfill to create larger buffer area for natural attenuation to take place	▪ Phase one closure of area where leachate breakout occurred ▪ Installation of popular tree plantations and evaporation ponds for leachate control ▪ Construction of lined landfill cell (Cell 7) for new waste placement ▪ New leachate pump station and pump ▪ LFG migration investigation and mitigation	▪ Land acquisition to the east for landfill expansion, and preliminary conceptual design developed ▪ Installation of LFG capture system ▪ The filling plan for the next five to ten years is focused on the upper northeast bench of the footprint in order to maximize LFG extraction potential over the next 10 years ▪ Construction of the Regional Yard Waste Composting Facility was completed in the fall of 2011 ▪ New leachate pump stat and reservoir ▪ Upgraded entrance and storm water management

Variable	Lumby RDF	Armstrong/Spallumcheen RDF	Greater Vernon RDF
Site challenges	▪ Long term plan for groundwater quality and buffer zones for leachate impacts, possible leachate plume mitigating risks identified ▪ Stormwater planning ▪ Economics of operating a small landfill	▪ 2015 significant leachate breakout occurred ▪ Ongoing leachate plume and migration issues around the ASRDF and at the property boundary ▪ LFG migration identified at property boundaries and mitigation strategy under development ▪ Limited availability of good cover material for intermediate or side cover ▪ Residential properties are located in close proximity to the RDF leaving small buffer zones for contaminant management	▪ Site access from the highway - the left turn exiting the landfill onto the highway has bad sight lines and no space for acceleration before merging with traffic ▪ Seepage from the leachate pond identified, options for controlling seepage are being developed ▪ Ensure adequate stormwater control measures or storage capacity are in place ▪ Wood waste management (significant stockpiles)
Key risks	▪ Potential leachate plume below the property, slowly migrating south in the direction of groundwater travel	▪ Stormwater control, leachate plume migration to the north west and LFG migration. ▪ Risk that cost of mitigating the environmental risks makes the site financially unsustainable	▪ Landfill expansion will include significant quarrying of rock, and the cost for the new expansion airspace would be more than the existing airspace or constructing a new landfill at an alternative site ▪ Inability to mitigate leachate migration off site toward both lakes
Identified long term mitigation strategies or opportunities to minimized key risks	▪ Continue with hydrologic studies to identify leachate plume migration ▪ Determine if the economics of the current site operation is adding value, or if the option to close the site to MSW, and use available airspace for dry inert waste (construction and demolition material) to limit the ongoing environmental liabilities is a superior option	▪ Continue with hydrogeological studies to identify leachate plume migration, and resolve LFG migration issues ▪ Determine if the economics of the current site operation is adding value, or if the option to close the site to MSW, before 2034, and construction of a transfer facility is a superior option	▪ Continue with expansion area exploratory drilling to determine the geotechnical parameters for the area ▪ Consider utilization of LFG once more wells are turned on and the volume of LFG increases ▪ Consider locations for new recovery facility and location for regional compost facility

The RDNO will need to consider whether the budget for the ASRDF and LRDF site can be increased to address the additional requirements of the updated guidelines and ongoing environmental control measures, or if the closure of the landfill and installation of transfer stations would provide better economic and environmental performance. Additional studies currently underway may determine that additional control measures and infrastructure will be required, and this will dictate whether the continued operation of the sites are financially viable. If the sites cannot continue to operate over the long term for MSW, it may be necessary to construct transfer stations that would collect waste to be transferred to the GVRDF. The GVRDF would therefore become the centralized disposal facility for the region, and the property would undergo expansion and investment to address the new landfill criteria and optimize performance.

3.2 Closed Landfills

There are four closed landfills in the RDNO. Two of these sites (Cherryville and Kingfisher) are currently used as transfer stations. All sites have ongoing environmental monitoring programs to assess trends in groundwater quality. A summary for the four closed landfills are included in Table 3-2.

Table 3-2: Closed Landfills Information

	Ashton Creek RDF	Cherryville RDF	Kingfisher RDF	Pottery Road RDF
Closure date and activities	Stopped landfilling waste in 1996; final closure completed in 1997	Stopped landfilling waste in 2008; final closure completed in 2016	Stopped landfilling waste in 2002; final closure in 2003	Stopped landfilling waste in 1986; final closure completed in 2015, including purchase of a right of way to allow for natural attenuation of the leachate plume west of the landfill footprint
Current site use	None	Transfer Station (since 2008)	Transfer Station (since 2003)	None
Future site use	None planned	Transfer station	Transfer Station	Recreational, specifically a disc golf course, trails and a bike skills park.
Ongoing operations	▪ Environmental monitoring	▪ Environmental monitoring ▪ Transfer station operation activities	▪ Environmental monitoring ▪ Transfer station operation activities	▪ Environmental monitoring
Identified site risks	▪ Ongoing environmental monitoring is performed and evaluation of trends in exceedances for specific metals and leachate parameters			
Identified mitigation strategies or opportunities to minimized risks	▪ Long-term monitoring required for the length of this new plan to monitor the performance of environmental controls ▪ Repairs as necessary to fencing, ditching and cover area			

No new options have been developed for the closed landfill sites. Ongoing environmental monitoring and periodic site maintenance will be required for the foreseeable future. The post closure use of the Pottery Road RDF may be turned over to the Parks Department in the near future.

3.3 Transfer Stations

As reviewed in the Current System Assessment Report, the RDNO manages three transfer stations – Cherryville Transfer Station, Kingfisher Transfer Station, and Silver Star Transfer Station as summarized in Table 3-3.

Currently the Cherryville and Kingfisher transfer station facilities accept the majority of the recyclable materials that are accepted at the operating RDF facilities to encourage waste diversion and recycling. This current strategy to capture all recyclable materials requires the service to be offered at a subsidized rate, as the facilities are not able to capture the required funds to cover the costs of operating the transfer stations through tipping fees alone. Current service hours have been minimized to balance the budget for operating the sites while still ensuring residents have adequate site access.

Table 3-3: Transfer Station Information

	Cherryville Transfer Station	Kingfisher Transfer Station	Silver Star Transfer Station
Hours	Tuesday and Saturday, 9 am – 4 pm	November 1 – March 31: Sundays, 9 am – 4 pm April 1 – October 31: Wednesdays and Sundays, 9 am – 4 pm	Open 7 days per week, 24 hours per day.
Site history	Landfill closed in 2008. Operating as transfer station since 2008.	Landfill closed in 2003. Operating as a transfer station since 2003.	Operated since 2000
2016 tonnage collected	227 tonnes	123 tonnes	369 tonnes
Service population	1,010	300 (population varies seasonally)	98 (population varies dramatically on a seasonal basis)
Approximate funds generated from tipping fees (2017 estimate)	$29,000	$14,000	$116,814 (for transfer station operation)
2016 direct operation and maintenance expenditures	$67,700	$48,000	$116,814

Although no new options have been developed for the existing transfer stations, it may be necessary to assess the economics of continuing to collect wood and bulky items at the Kingfisher and Cherryville Transfer Stations. The costs to process and remove the wood chips and to accept the large bulky items (e.g., furniture) are increasing. It may be best to require these materials be hauled directly to the nearest RDF. The provision of recycling services at all transfer stations and RDFs in the region has been part of the ongoing strategy to maximize waste diversion. Identification of a clean wood waste market or uses on site is required to ensure the stockpiles of wood and other materials at the Cherryville and Kingfisher transfer stations is well managed.

4.0 OPTIONS AVAILABLE AND PRIORITIES FOR FURTHER EVALUATION

Based on a review of technology opportunities and residual management, the following scenarios and opportunities are under consideration for further evaluation in the economic analysis phase of the project and for potential inclusion in the updated plan. A more detailed review of technology option considerations is provided in Section 2.5 within the Table 2.4 Residual Management Options for Consideration in the SWMP. The selected scenarios and opportunities factored in what would still help to optimize reduction, reuse, and recycling and consider minimum feedstock thresholds needed to develop a business case.

- Anaerobic Digestion
  - Keep for consideration as an organics processing option when developing an organics program.
- Landfill Gas Capture
  - Continue with the evaluation of the current LFG system at the GVRDF and implement options for repurposing the collected gas beyond on-site flaring. For example, use the LFG for processing and injection into the natural gas grid, or to generate electricity; and
  - Minimize the quantity of organics in MSW through implementation of a source-separated organics program diverting these materials away from the landfill thus significantly reducing the potential for LFG generation.

- Thermal Technologies
  - Not recommended to pursue any thermal technologies for MSW treatment (as summarized in Table 2-4);
  - Include opportunities for some high energy source separated materials (clean and dirty wood) and identify markets for them through private thermal facilities involved in wood waste management or with Energy BC; and
  - Minimize costs associated with collection wood and other materials at transfer stations by having these materials direct hauled to local RDFs.

The options for potential residual management scenarios under consideration are summarized in Table 4-1.

Table 4-1 Summary of Residual Management Scenarios

Variable	Lumby	Armstrong	Vernon	Outcome
Current operation	▪ Monitor and evaluate site financial model and environmental performance, mitigate environmental issues as identified	▪ Monitor and evaluate site financial model and environmental performance, mitigate environmental issues as identified	▪ Monitor and evaluate site financial model and environmental performance, mitigate environmental issues as identified	▪ Minimize financial liability or operating three close proximity landfills
Modified operation scenario for consideration	▪ Convert to MSW transfer station, and preserve landfill space for inert C+D material only to limit environmental risks	▪ Close landfill early to mitigate environmental risks and construct a transfer station ▪ Develop LFG control system	▪ Confirm expansion design, and invest in the landfill expansion to improve site performance and create long term centralized disposal site for the region	▪ Development of long term disposal capacity for the RDNO ▪ Invest financial capital in GVRDF landfill site for optimal outcomes
Performance criteria for decision making	▪ Financially sustainable model for landfill operation and closure ▪ Environmental performance meets monitoring requirements	▪ Financially sustainable model for landfill operation and closure ▪ Environmental performance site upgrades meets monitoring requirements	▪ Financially sustainable model for landfill operation and closure ▪ Environmental performance site upgrades meets monitoring requirements	▪ Use financial performance for maintaining environmental standards and performance benchmarks to evaluate and determine potential early closure and site upgrades

Landfill capacity in the RDNO is estimated to be 34 years at the GVRDF, 17 years as the ASRDF and 57 years as the LRDF. The ASRDF has the most finite life (2034) and the GVRDF has lateral expansion potential which could extend site life beyond 2051. Long term plans for all three landfill sites is necessary in order to ensure future disposal capacity and where to direct investments in infrastructure. Pending confirmation from the RDNO Board and Regional Solid Waste Advisory Working Group, these options will undergo financial analysis for application scaled to the RDNO's current and future projected waste management status. The results of this analysis will be presented in Technical Memo No. 3, once all options further up the waste management hierarchy have been discussed and selections made through Technical Memo No. 2.

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6.0 CLOSURE

We trust this technical memo meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
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Attachment (1): Tetra Tech's Limitations on the Use of this Document

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Technical Memorandum 2: Reduce, Reuse and Recycle

(March 21, 2018)

TETRA TECH

TECHNICAL MEMO

ISSUED FOR USE

To:	Nicole Kohnert, P.Eng	**Date:**	March 21, 2018
c:		**Memo No.:**	2
From:	Monica Wallani, MBA, P.Eng. Carey McIver, MA Tamara Shulman, BA, M.Sc.	**File:**	SWM.SWOP03478

Subject: Technical Memo No. 2 – Reduce, Reuse, and Recycle

1.0 INTRODUCTION

The Regional District of North Okanagan (RDNO) retained Tetra Tech Canada Inc. (Tetra Tech) to manage a review and update of the RDNO's 2011 Solid Waste Management Plan (SWMP). The Draft SWMP Update will review existing solid waste management policies and programs, identify and evaluate options for reduction and diversion, residual management, and financing, and also set the RDNO's waste management principles, targets and strategies for the next ten years. A summary of the project phases and deliverables is included on Figure 1-1.

The assessment stage included the issued for review Current Solid Waste System Report that was presented at the meeting on August 1, 2017. The report documented the current condition of the RDNO's solid waste management system, and was used as a basis for discussion for the direction of the Draft SWMP Update entering the second stage, "Analysis and Evaluation".

Within Stage Two, the first technical memorandum (tech memo) presented on September 21, 2017, focused on recovery and residuals management, the interrelated fourth and fifth Rs of the 5-R waste prevention hierarchy (pictured on Figure 1-2). The outcome from the meeting and first tech memo include a list of options for financial analysis, and elimination of some options from consideration within the RDNO's Draft SWMP Update. This second tech memo will address the first three Rs – reduce, reuse, and recycle. The third and final tech memos will assess the financial implications and synergies for selected options for integration with the 2017 Draft SWMP Update.

This tech memo will be presented to the Regional Solid Waste Advisory Working Group (RSWAWG) at the fourth meeting on October 25, 2017, to gather feedback on the options and recommendations. Section 2.0 of this memo provides an overview the current reduction, reuse and recycling programs that are tracked by the RDNO. Section 3.0 provides analysis of the primary new options for consideration that have been identified throughout the meetings and analysis to date.

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The Working Group's input will be sought on each of the tech memos and this advice will guide the selection of options for inclusion in the updated plan. The selected options will be researched in more detail to gauge their specific application within the RDNO, including estimated costs and determining how they align with other plan components. A draft plan update with preferred options will be prepared for review by the Working Group prior to undertaking community and stakeholder consultation. Once these three tech memos have been issued for review, the consultation stage will engage RDNO constituents from public and private sectors through to First Nations to align on the direction of the Draft SWMP Update. Finally, the Draft SWMP Update will be crafted based on the outcomes of the previous deliverables, including a consultation summary.

The project consists of four stages, as shown on Figure 1-1: Project Phases and Associated Deliverables below.

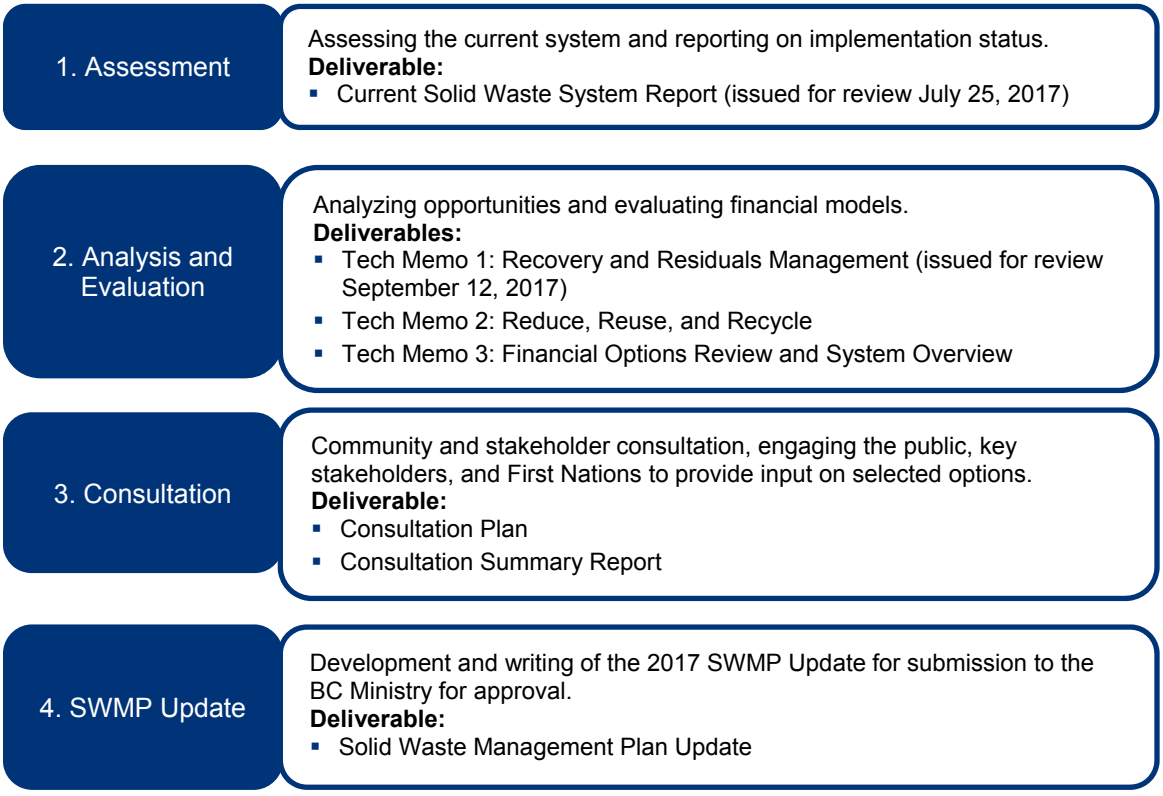


Figure 1-1: Project Phases and Associated Deliverables

1.1 Guiding Principles

The waste prevention hierarchy (reduce, reuse, recycle, recovery, and residuals management) is a useful tool to evaluate opportunities to improve a solid waste management system (see Figure 1-2) and will be foundational for the RDNO's Draft SWMP Update. Where practical and feasible, the hierarchy order preference is for other waste management strategies to be undertaken after all opportunities for prevention and reduction at a higher level have been actively pursued. For example, after minimizing the amount of waste produced through reduction and reuse processes, the best practice is to divert as much useful and recyclable material as possible from the waste steam that is still being disposed. Opportunities for recycling should be explored after all opportunities for reduction and reuse of materials have been exhausted. Likewise, recovery is an option once all recycling opportunities are in place and fully optimized. Once these options have been exhausted, recovery technologies can be implemented prior to final disposal (landfilling) of any residuals to maximize the value of wasted resources.

The benefits to this approach are as follows:

- **Actions taken at higher levels in the waste prevention hierarchy can eliminate or reduce the environmental management costs of actions at lower levels**. For example, waste prevention programs can reduce costs associated with handling waste in the first place.
- **The waste prevention hierarchy can potentially reduce the environmental impacts of product manufacturing and distribution.** For example, reuse (and, to a lesser degree, recycling) will reduce the demand for and thus environmental impact of extracting and processing virgin resources, while the use of recycled materials can reduce the energy cost and virgin inputs needed to manufacturing new products.

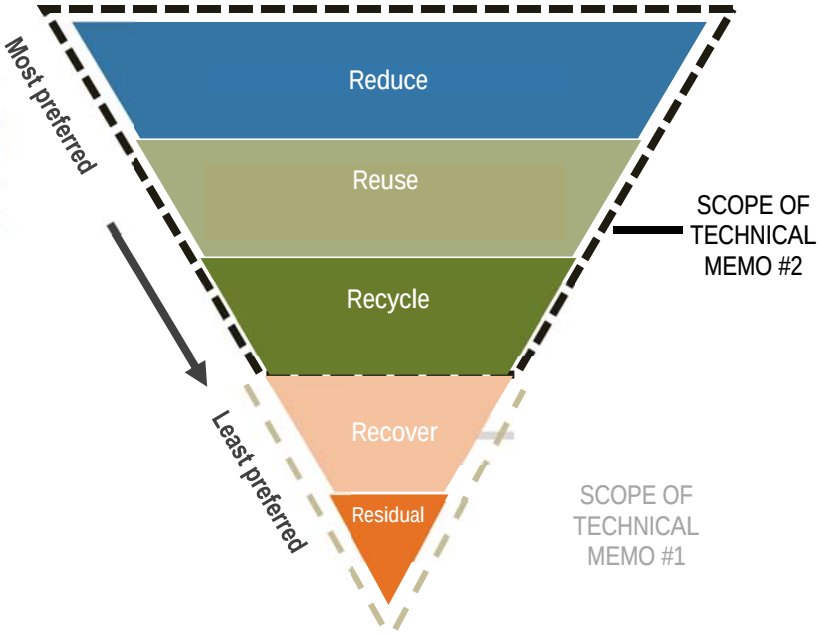


Figure 1-2: Waste Prevention Hierarchy

The province expects a solid waste management plan to provide regional districts—and their residents and businesses – with clear direction on how they will achieve shared solid waste goals. The province has provided eight guiding principles as summarized in Table 1-1 for regional districts to follow in developing their solid waste management plan. In addition to the guiding principles, the RDNO can include additional locally-relevant guiding principles in their solid waste management plans.

Table 1-1: Guiding Principles

	Provincial Guiding Principles
1	Promote zero waste approaches and support a circular economy.
2	Promote the first 3 Rs (reduce, reuse and recycle).
3	Maximize beneficial use of waste materials and manage residuals appropriately.
4	Support polluter and user-pay approaches and manage incentives to maximize behaviour outcomes.
5	Prevent organics and recyclables from going into the garbage wherever practical.
6	Collaborate with other regional districts wherever practical.
7	Develop collaborative partnerships with interested parties to achieve regional targets set in plans.
8	Level the playing field within regions for private and public solid waste management facilities.

1.2 Options Summary

There are a number of options to increase waste reduction, diversion and recycling in the RDNO. To aid in the analysis and development, the options have been summarized below into the following areas:

- Organics Diversion Programs
  - Provide organics diversion for residential, commercial including transfer station and composting facility requirements.
- Expanded Collection
  - Improve access to collection services including organics collection.
- Markets for Materials
  - Ensure markets for diverted materials, with a focus on wood and compost.
- Waste Reduction and Education Programs
  - Use a zero waste approach.
  - Institute kitchen scraps reduction campaigns.
  - Provide behaviour change and education programs.
- Reduction and Diversion Services and Support
  - Support on-site composting (e.g., Silver Star Mountain Resort).
  - Augment and expand extended producer responsibility (EPR) programs.
  - Consider special service needs for some rural areas, keeping in mind aging population and service requirements.
  - Continue Waste Reduction Initiatives Fund (WRIF).
  - Address disaster response waste (e.g., docks, Styrofoam, sandbags).
  - Evaluate opportunities for new programs (e.g., textiles).

1.3 Targets

The British Columbia (BC) Ministry of Environment and Climate Change Strategy (Ministry) has established waste disposal as an annual reporting requirement for regional districts and set a provincial target of 350 kg per capita per year to be achieved by 2020. A second performance measure set by the Ministry is to have 75% of the population in BC covered by an organic waste disposal restriction by 2020. Through a separate Recycling Regulation, the Ministry oversees an EPR program that sets 75% recovery targets for products covered through the program (e.g., beverage containers, packaging and printed paper, electronics, and other items).

The 2002 SWMP identified a target of 0.55 tonnes per capita (550 kg per capita) based on an original target of 50% reduction in waste disposal based on 1990 levels (1,100 kg per capita). The RDNO has consistently met its 550 kg per capita target since 2011. The RDNO can chose to continue with the current target or adopt the Provincial target, or develop a new RDNO-specific target. This tech memo recommends interim targets to move towards the

Provincial disposal target of 350 kg per capita over the next 10 years (by 2028). The phasing can be informed by the timeline set for optimizing existing and implementing new waste reduction and diversion programs with the capacity to reduce disposal per capita. The quantity of refuse to divert by 2028 through various programs is estimated to be 10,500 tonnes based, on today's disposal rate.

Following the primary options summarized in Section 1.2, the following impacts on the waste disposal rate could be achieved:

- Organics Diversion Programs (up to 5,000 tonnes or 59 kg per capita).
- Expanded Collection (2,000 tonnes to 3,500 tonnes or 24 kg to 41 kg per capita).
- Markets for Materials (no new diversion, required for effective delivery of current programs).
- Waste Reduction and Education Programs (depending on resources, up to 500 tonnes to 1,000 tonnes or 6 kg to 12 kg per capita).
- Reduction and Diversion Services and Support (depending on resources, up to 500 tonnes to 1,000 tonnes or 6 kg to 12 kg per capita).

If all programs were adopted and implemented, 10,500 tonnes of new diversion could be achievable. This is equivalent to an improvement in the waste disposal rate of up to 124 kg per capita. Looking at program options, if both organics diversion and expanded collection were implemented, a 400 kg per capita target could be achievable; with a full scale organics diversion program, a 450 kg per capita target would be achievable.

2.0 CURRENT PROGRESS TRACKING

As shown on Figure 2-1, the total kilograms of waste disposed per capita has been static since 2011.

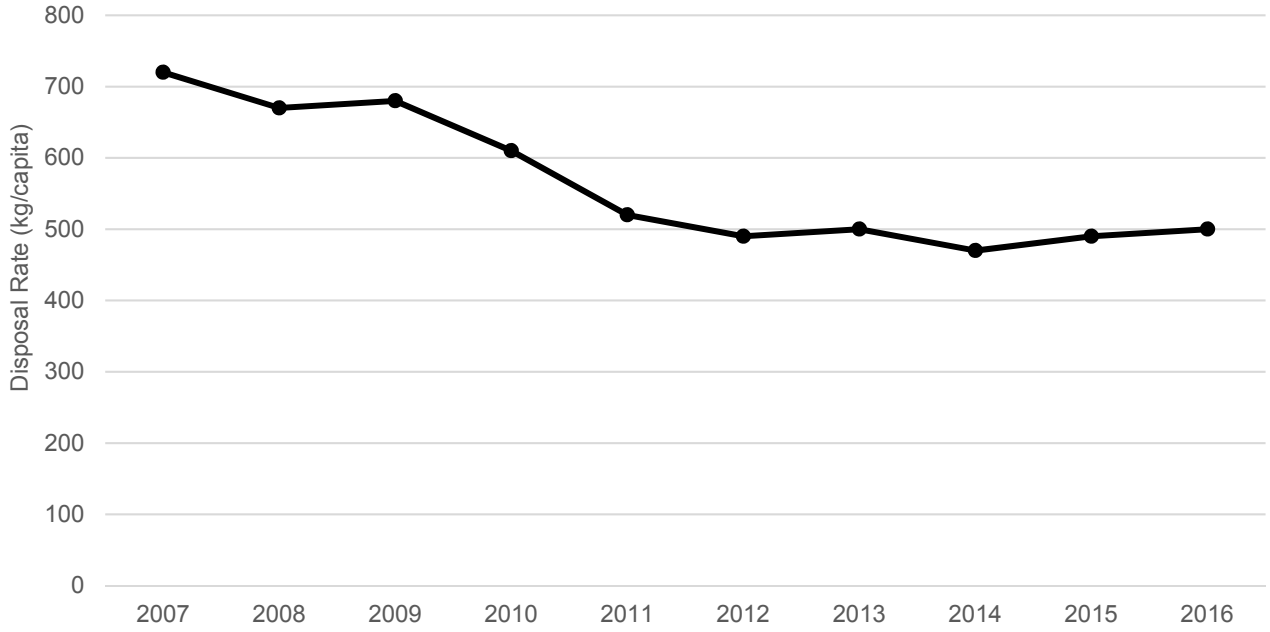


Figure 2-1: Disposal Rate (kg/capita)[1]

[1] Figure adapted from 2016 Solid Waste Management Plan Annual Report

Looking at all materials managed by the RDNO as shown on Figure 2-2, there have been more changes in the quantities of materials recycled. There has been an increase in the quantity of yard waste, metal, clean and dirty wood and crushable materials (rubble and concrete) that account for the increasing quantities or recyclable materials managed by the RDNO. Materials such as wood and crushed concrete are used in landfill operations, and yard waste collected at the Greater Vernon Recycling and Disposal Facility (GVRDF) is composted at the Regional Yard Waste Composting Facility at the GVRDF.

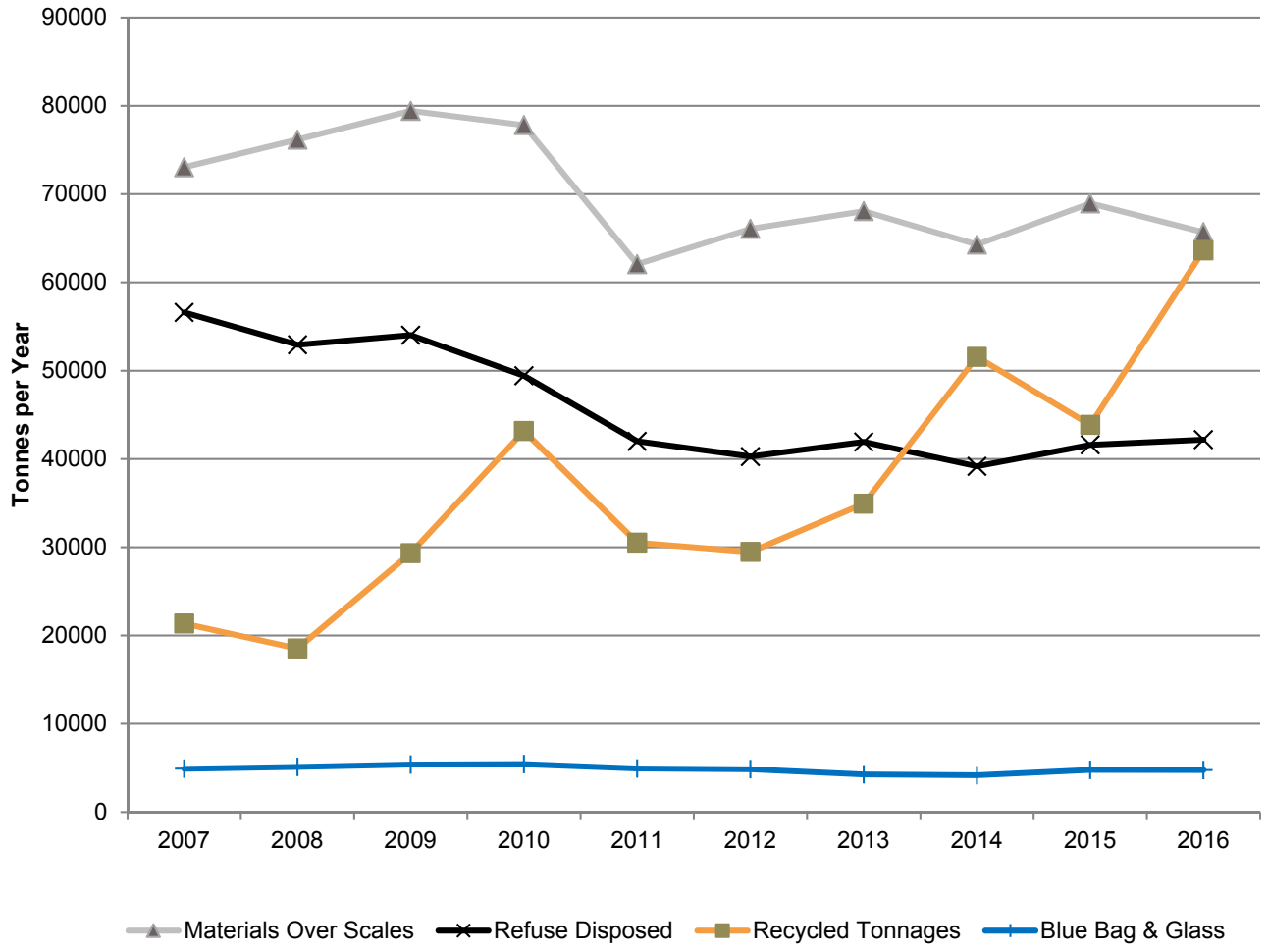


Figure 2-2: Disposal Rate (kg/capita)[1]

Table 2-1 outlines the core strategies from the 2011 plan that focused on reduction, reuse or recycling and can help explain the changes observed in the amount of materials managed at RDNO facilities. In 2015, the Interior Freight and Bottle Depot (in Vernon) was awarded the contract by the RDNO to become a drop-off depot (Eco Depot) for residential quantities of household hazardous waste (HHW) for free, including all transport of dangerous goods classes of hazardous waste not accepted under BC EPR programs (except explosives). Discussion on expanded curbside collection was postponed and will be included in this plan. Differential tipping fees have increased since 2011, and loads that contain regulated materials or construction and demolition waste are charged at more than double the cost of regular refuse or separated materials such as asphalt shingles, wood and drywall. These variable tipping fees provide incentive for customers to sort and separate prior to arriving and also at the facilities.

Table 2-1: 2011 Solid Waste Management Plan Update Strategies

Strategy	Description	2011 Estimated Diversion Potential	Implementation Period	Current Status
Eco-Depots	Evaluate eco-depot concepts and locations especially with respect to customer convenience and land use in the region.	N/A	2 years to 5 years	Completed.
Expanded Curbside Collection	Determine the economic viability of a Expanded Curbside Collection Program for all residential generated materials, including garbage, compostables, and recyclables.	5,000 tonnes/yr	2 years to 5 years	Ongoing
Demolition and Land Clearing (DLC) Waste Management Strategy	Examine mechanisms for further diversion of DLC waste, including but not limited to, private and public resource recovery parks and partnerships with industry.	13,400 tonnes/yr	1 year to 5 years	Partially pursued via permitting mechanisms for City of Vernon, working to implement with other municipalities
Organic Waste Management Strategy	Determine the best management strategy for organic waste including wood and yard waste from the DLC, residential, commercial, industrial, and agricultural sectors; and kitchen scraps from the residential, commercial, industrial and agricultural sectors.	4,750 tonnes to 7,000 tonnes/yr	1 year to 10 years	Ongoing, with options and cost analysis completed in 2017.

3.0 OPTIONS FOR CONSIDERATION

This section provides additional information and reviews options (not currently in place) that have been developed.

3.1 Organics Division

Reducing and diverting organic waste from landfill disposal has been an integral component of the RNDO solid waste management planning process. This is because organic waste, comprised primarily of wood waste, yard waste, and kitchen scraps, not only represents the largest component of landfilled waste in the region (34%) but also generates methane, a potent greenhouse gas (GHG), and leachate during decomposition in a landfill.

The 2011 SWMP included an Organics Waste Management Strategy that identified a range of initiatives and programs to divert organic waste from disposal over a 10-year time-period. Although there has been significant progress in diverting wood and yard wastes from landfill disposal, the RDNO has yet to consider the viability of expanding their organics diversion programs to include kitchen scraps. This initiative was identified in the Organics Management Strategy as an action to be considered for implementation within the next 10 years.

To provide input into the 2017 Draft SWMP Update, the RDNO engaged XCG Consulting Ltd. (XCG), in collaboration with Carey McIver & Associates Ltd. (CMA) and Maura Walker & Associates (MWA), to undertake a Facilities Life Cycle Cost Assessment and Organics (Food Waste) Management Options Study for the RDNO solid waste management system. The purpose of the study was to develop a full list of options and then select at least

four viable kitchen scraps diversion options and then determine the financial impact of each option on the RDNO solid waste management system relative to the status quo.

Two separate reports were prepared and presented to the RSWAWG at their first meeting on June 13, 2017. The following section summarizes the outcomes of these two studies and defines core options for next steps.

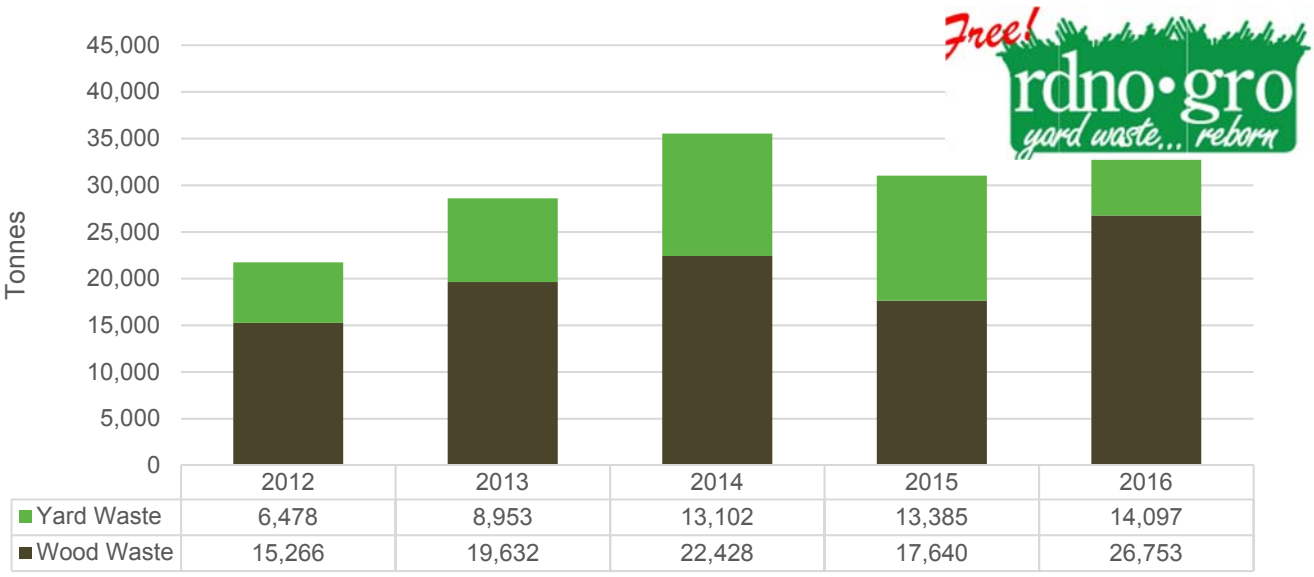
3.1.1 Current Organic Waste Management System

Since the 2011 Plan Update, the RDNO has implemented many of the reduction, collection and processing initiatives identified in the Organic Waste Management Strategy. With respect to reduction, the RDNO provides information on their website regarding backyard composting and grass-cycling, operates a backyard composter rebate program and provides support to Xerindipity, an outdoor environmental education centre. Xerindipity showcases composting, natural lawn care, pesticide free gardening, water-wise gardening, worm composting and xeriscaping.

To support the source separation of yard and wood wastes, under the RDNO Municipal Solid Waste Management Bylaw 2659, wood waste and yard waste have been classified as regulated materials, meaning that any loads of refuse containing these organic materials are charged at more than double the refuse tipping fee. As of July 1, 2016, the surcharge for loads containing regulated materials was $203 per tonne compared to the regular refuse rate of $100 per tonne. However, if customers deliver source separated loads of these materials, yard waste is free of charge and the tipping fee for wood waste is currently $20 per tonne.

The organics waste management collection system in the RDNO is based on residents and businesses delivering their yard and wood wastes to the either the GVRDF, the Armstrong Spallumcheen Recycling and Disposal Facility (ASRDF), the Lumby Recycling and Disposal Facility (LRDF) or two small transfer stations: Cherryville Recycling and Disposal Facility and Kingfisher Recycling and Disposal Facility.

Due to the regulated waste policy and tipping fee structure described above, as indicated on Figure 3-1, the quantities of source separated wood and yard wastes delivered to RDNO facilities has been increasing over the last five years. Although yard waste quantities have been increasing steadily over the last five years, it is important to note that the quantity of wood waste received on an annual basis is more affected by local economic activity and the existence of private sector alternatives than for yard waste.



	2012	2013	2014	2015	2016
Yard Waste	6,478	8,953	13,102	13,385	14,097
Wood Waste	15,266	19,632	22,428	17,640	26,753

Figure 3-1: Wood and Yard Waste Diversion 2012-2016

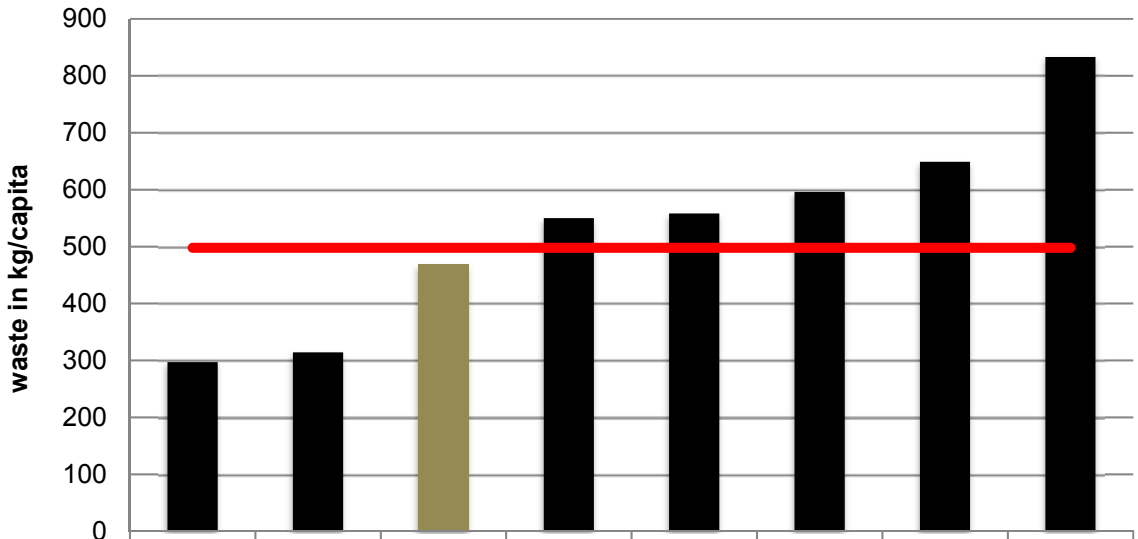
With respect to yard waste, regional yard waste composting operations at the GVRDF began in the spring of 2012. The composted and screened yard waste, known as rdno•gro is used for various landscaping projects in the region as well as for landfill closures. Limited quantities of rdno•gro are also made available to residents for personal use, free of charge.

Wood waste delivered to the RDNO facilities is chipped and used primarily as landfill cover (50/50 wood/soil) but also as bio-cover on top of intermediate cover to improve aesthetics and odour.

With respect to yard waste collection programs, as discussed in the Current Solid Waste Management System Report, there are currently no regular weekly curbside collection services for organics, either yard or kitchen scraps, in the RDNO. Most municipalities offer only spring and fall chipping and leaf collection services. Curbside garbage collection is also not universal in the region, where only the municipalities of Vernon, Armstrong, Enderby and Lumby provide curbside garbage collection services to their residents. However, curbside recycling services are available to most of the households in the region, except some very rural homes.

3.1.2 Best Management Practices and Innovation in British Columbia

The RDNO does not need to look beyond BC to find examples of best practices in organic waste management. As indicated on Figure 3-2, the municipal solid waste management system in the RDNO also performs well when compared to regional districts with similar population and level of economic activity. However, there are still two regional districts with better performance: the Cowichan Valley Regional District (CVRD) and the Regional District of Nanaimo (RDN).



	CVRD	RDN	RDNO	RDOS	CSRD	TNRD	CORD	RDFFG
Disposal Rate	297	314	469	550	558	596	649	833
BC Average	498	498	498	498	498	498	498	498

Figure 3-2: Disposal Rates in Regional District with Similar Populations 2015

The difference in disposal rates can be attributed, in large part, to the implementation of organics diversion strategies in these two Vancouver Island regional districts. In 2006, both the CVRD and RDN introduced bans on the disposal of commercial organic wastes to reduce GHG emissions, preserve landfill capacity and reduce waste export disposal costs. Residential collection programs followed roughly 5 to 7 years later in both those regional districts.

In 2015, the Capital Regional District (CRD) and Metro Vancouver implemented organics disposal bans from both the commercial and residential sector. As a result, in 2015 roughly 66% of the population of BC was covered by an organic waste disposal ban. There are also numerous municipal collection programs in regional districts that have not implemented disposal bans (e.g., Grand Forks, Abbotsford, and Comox). Consequently, with respect to best practices in organic waste management, these BC local governments can provide practical and effective examples to other regional districts wishing to maximize their waste reduction efforts.

The CMA study provided examples of best management practices implemented by local governments in BC that could be applicable to the RDNO. These included: regional district policies such as kitchen scraps disposal bans (RDN, CVRD, CRD, and Metro Vancouver); kitchen scraps collection programs (RDN, Grand Forks, and Port Coquitlam) and reduction programs such as Love Food Hate Waste (Metro Vancouver) and Compost Coaching (North Shore Recycling Program).

3.1.3 Organics Management Opportunities in the Regional District of North Okanagan

Prior to developing viable kitchen scraps management options for the RDNO, the study team gathered information on: available feedstock quantities; local compost processing capacity and costs; as well as opportunities and costs for reduction, collection and transfer services.

3.1.3.1 Feedstock Quantities

To provide an estimate of additional organic feedstock quantities available in the RDNO, the study team compared results from two methods: estimates based on waste composition data (when actual data isn't available) and estimates based on actual data available from similar communities.

As indicated above, the CMA study identified that the RDN and the CVRD on Vancouver Island have the lowest disposal rates in BC. Both regional districts implemented disposal bans on commercial sector kitchen scraps in 2006, and all households in the RDN and most of the households in the CVRD have curbside kitchen scraps collection service. Table 3-1 provides residential curbside collection data for four communities that are comparable to the RDNO.

Table 3-1: Curbside Kitchen Scraps Collection Data for RDN and CVRD

Curbside Program	Households	Person/HH	Est. Pop	Kitchen Scraps		
				Tonnes/yr	kg/hh/yr	kg/cap/yr
RDN						
City of Nanaimo	27,600	2.3	63,480	3,505	127	55
RDN Service Area	28,130	2.2	61,886	3,151	112	51
Total	**55,730**		**125,366**	**6,656**	**119**	**53**
CVRD						
Town of Ladysmith	3,410	2.3	7,843	436	128	56
District of North Cowichan	10,640	2.3	24,472	1,075	101	44
Total	**14,050**		**32,315**	**1,511**	**108**	**47**
Average					**117**	**52**

Based on an average of 117 kg per household, or 52 kg per capita per year for residential kitchen scraps, Table 3-2 provides an estimate of potential kitchen scraps diversion by recycling and disposal facility (RDF) service area in the RDNO.

Table 3-2: Residential Curbside Kitchen Scraps Estimate for the RDNO

Site	Service Area	Households	Person/HH	Pop. Est.	Kitchen Scraps Estimate	
					117 kg/hh/yr	52 kg/cap/yr
GVRDF	Vernon	17,381	2.2	38,238	2,034	1,988
	Coldstream	3,980	2.7	10,746	466	559
	Electoral Area B	1,376	2.5	3,440	161	179
	Electoral Area C	1,342	2.6	3,489	157	181
	Sub-Total	*24,079*		*55,913*	*2,817*	*2,907*
ASRDF	Armstrong	2,099	2.4	5,038	246	262
	Spallumcheen	1,820	2.6	4,732	213	246
	Enderby	1,063	2.1	2,232	124	116
	Electoral Area F	876	2.4	2,102	102	109
	Sub-Total	*5,858*		*14,104*	*685*	*733*
LRDF	Lumby	759	2.4	1,822	89	95
	Electoral Area D	492	2.5	1,230	58	64
	Electoral Area E	335	2.3	771	39	40
	Sub-Total	*1,586*		*3,823*	*186*	*199*
TOTAL		**31,523**		**73,840**	**3,688**	**3,840**

Table 3-2 indicates that if households in the RDNO were serviced by curbside kitchen scraps collection programs like those provided in the RDN and CVRD, roughly 3,800 tonnes of kitchen scraps could be diverted from landfill disposal. However, given that roughly 32% of RDNO households do not receive expanded mandatory curbside garbage collection, it is unlikely that this much kitchen scraps would be recovered from the residential sector.

Table 3-3 provides an estimate of kitchen scraps based on curbside collection in the municipalities that currently provide a garbage collection service at 52 kg per capita annually and a drop-off service at the GVRDF, ASRDF, and LRDF based on estimated recovery rate of 10 kg per capita per year. This drop-off estimate is based on data from a drop-off kitchen scraps pilot program operated by the Powell River Regional District. Using this methodology, the residential kitchen scraps estimate is reduced to 2,700 tonnes.

Table 3-3: Residential Kitchen Scraps Estimate – Curbside + Drop-Off

Site	Service Area	Households	Person/HH	Pop. Estimate	Food Waste Tonnes
GVRDF	Vernon	17,381	2.2	38,238	1,988
	Coldstream	3,980	2.7	10,746	107
	Electoral Area B	1,376	2.5	3,440	34
	Electoral Area C	1,342	2.6	3,489	35
	Sub-Total	*24,079*		*55,913*	*2,165*
ASRDF	Armstrong	2,099	2.4	5,038	262
	Spallumcheen	1,820	2.6	4,732	47
	Enderby	1,063	2.1	2,232	116
	Electoral Area F	876	2.4	2,102	21
	Sub-Total	*5,858*		*14,104*	*446*

Site	Service Area	Households	Person/HH	Pop. Estimate	Food Waste Tonnes
LRDF	Lumby	759	2.4	1,822	95
	Electoral Area D	492	2.5	1,230	12
	Electoral Area E	335	2.3	771	8
	Sub-Total	*1,586*		*3,823*	*115*
TOTAL		**31,523**		**73,840**	**2,726**

With respect to kitchen scraps from the industrial, commercial, and institutional (ICI) sector, based on the RDN average recovery rate of 23 kg per capita, the RDNO could expect to recover roughly 2,000 tonnes of kitchen scraps from this sector.

Consequently, as indicated in Table 3-4, the total amount of kitchen scraps that could potentially be diverted from landfill is roughly 5,000 tonnes per year. This includes 2,000 tonnes of kitchen scraps from households in the City of Vernon plus 1,000 tonnes of kitchen scraps from households in the rest of the RDNO, as well as 2,000 tonnes of waste from the ICI sector.

Table 3-4: RDNO Kitchen Scraps Feedstock Estimate

Sector	Tonnes Per Year
Vernon (Residential)	2,000
Rest of RDNO (Residential)	1,000
Commercial	2,000
Total	**5,000**

3.1.3.2 Processing Capacity and Costs

The availability of cost-effective and reliable organic waste processing capacity is essential to the development of organics management options. The regional yard waste composting facility at the GVRDF is a mechanically aerated (turned with an excavator) open windrow facility and is not designed to process kitchen scraps.

To divert kitchen scraps from RDNO landfills, the RDNO will need to have a processing (composting) facility available that can manage this stream effectively. To achieve this, the RDNO can take advantage of existing private sector processing capacity or construct its own capacity. The CMA report provides a detailed discussion of processing capacity and costs associated with the privately-owned and operated Spa Hills Farm Composting facility located in the Columbia Shuswap Regional District (CSRD) as well as costs associated with constructing a new kitchen scraps processing facility at the GVRDF.

3.1.3.3 Collection Opportunities and Costs

With respect to residential garbage collection, as discussed in the Current Solid Waste System Report, although all households receive curbside collection of recyclables, curbside garbage collection is not universal throughout the RDNO. All municipally operated collection systems are contracted-out to two main private collection companies: Waste Connections and Tip-It Waste Solutions. CMA met with representatives from these two companies to discuss the opportunity to expand their services to include curbside collection of organic waste. CMA also met with representatives from the City of Vernon to gauge their interest in providing curbside collection of kitchen scraps

only or yard waste and kitchen scraps. In all cases, current service providers are supportive of providing organics collection programs.

The issue that current residential service providers will need to resolve is whether to expand collection to include kitchen scraps-only or to both food and yard waste. This is an important issue since the addition of yard waste collection entails an increase in collection costs without a corresponding increase in diversion. In other words, given the high level of yard waste diversion already achieved through drop-off sites, curbside collection would not necessarily result in increased yard waste diversion. An audit to determine the amount of yard and garden debris in the garbage could be considered during peak spring season to gauge the potential impact of adding yard waste into curbside programs.

This is because residents that were previously self-hauling their yard waste to drop-off sites, would now be putting this material out at the curb. This may be a costly convenience. The kitchen scraps-only collection programs in the RDN and CVRD cost in the range of $100 to $168 per household per year for weekly kitchen scraps and bi-weekly garbage collection. However, programs in BC that collect food and yard waste can cost $200 per household per year or more depending on whether the service is manual or automated cart based.

Although the City of Vernon has expressed an interest in implementing a curbside collection program for kitchen scraps and yard waste, a new yard waste drop-off facility in the north end of the City may be a more cost-effective option for the yard waste component of organic waste. In any case, each municipality in the RDNO will need to assess the costs and benefits of adding food only or food and yard waste to their current collection program. Since the scope of this study is limited to the financial impact of diverting additional organics from RDNO operated RDFs, cost estimates were not developed for municipal curbside collection programs.

With respect to organics diversion from the ICI sector, CMA met with the major private haulers in the region (Waste Connections of Canada, Waste Management Canada, and Tip-It Waste Solutions). All three companies were supportive of providing kitchen scraps collection services to their customers. Waste Connections and Waste Management, in particular, have experience with commercial kitchen scraps collection systems due to the existence of disposal bans in the Lower Mainland and parts of Vancouver Island.

Depending on the quantity of kitchen scraps, generators use plastic garbage cans to collect kitchen scraps from kitchens while private haulers utilize plastic carts and metal bins to collect kitchen scraps outside of commercial establishments.

The only concern expressed by these companies regarding the implementation of either residential or commercial kitchen scraps diversion programs, was the lack of a convenient and accessible processing facility in the RDNO. Although the Spa Hills Farm composting facility is within a reasonable haul distance from population centres in the RDNO, haulers report that the access to the facility is not ideal given the condition of the roads to and within the farm. Consequently, they indicated that for organic waste diversion to Spa Hills to be successful, a local transfer facility would need to be constructed by the RDNO.

3.1.4 Organic Management Options

Based on an assessment of the current organic waste management system, a review of best practices in BC as well as organic waste management opportunities available in the RDNO, the CMA study selected the four options based on environmental, social and economic criteria. These four options are organized around the following assumptions with respect to policy, collection, processing and diversion.

3.1.4.1 Policy Assumptions

Under the RDNO Municipal Solid Waste Management Bylaw 2659, wood waste and yard waste have been classified as regulated materials, meaning that the any loads of refuse containing these organic materials are charged at more than double the refuse tipping fee. To support source separation of kitchen scraps, the study team assumes that the RDNO will designate kitchen scraps as a regulated material under the bylaw, either for kitchen scraps generated by the ICI sector or for both ICI and residential kitchen scraps. These two alternatives are recognized in the list of options.

3.1.4.2 Collection Assumptions

If the RDNO designates ICI kitchen scraps as a regulated material, the CMA study assumed that private haulers would provide collection services to their ICI customers. However, given that curbside garbage collection is not universal throughout the RDNO, the list of options recognizes two collection scenarios for residential waste. Based on discussions with staff from the City of Vernon, it is possible that the city may expand their curbside collection service to include kitchen scraps (and potentially yard waste) without residential kitchen scraps classified as a regulated material. Alternatively, if the RDNO chooses to classify ICI and residential kitchen scraps as a regulated material, this would force the implementation of curbside garbage and kitchen scraps collection programs across the region.

3.1.4.3 Processing Assumptions

As discussed in Section 4.2, if the RDNO chooses to regulate kitchen scraps, the only viable processing options are to either transfer the material 38 km out-of-district to the Spa Hills Farm Composting Facility near Silver Creek in the CSRD, or construct a public or private composting facility at the GVRDF. These alternatives are reflected in the list options developed by the study team.

3.1.4.4 Diversion Assumptions

As discussed previously, the RDNO already diverts significant quantities of yard waste and wood waste from landfill disposal. Consequently, the diversion impacts identified in the long-list are limited to kitchen scraps only. Although this is clear for options that transfer kitchen scraps to Spa Hills, options that involve the construction of a composting facility at the GVRDF identify new diversion of kitchen scraps and existing diversion of yard waste. This is because the capital costs associated with constructing a processing facility are based on a design capacity that includes equal parts kitchen scraps and yard waste as a bulking amendment. It is assumed that this yard waste is already being diverted at the GVRDF.

3.1.5 Short List Options

3.1.5.1 Option 1: ICI Plus City of Vernon, Permanent Transfer to Private CSRD Facility

Designate ICI kitchen scraps as a regulated material. City of Vernon implements curbside collection program for residential kitchen scraps. Construct a permanent transfer station at the GVRDF and contract with Spa Hills for transfer and processing.

Rationale

This option provides moderate diversion (4,000 tonnes per year), has a high potential for public support based on discussions with City of Vernon staff, moderate capital costs ($1 Million), low technical risk and a moderate ease of implementation.

3.1.5.2 Option 2: ICI Plus RDNO Residential – Permanent Transfer to Spa Hills Farm

Designate ICI and residential kitchen scraps as a regulated material. Implement a region-wide expanded curbside collection program. Construct a permanent transfer station at the GVRDF and contract with Spa Hills for transfer and processing. Construct small transfer facilities at ASRDF and LRDF for self-haul only.

Rationale

This option provides high diversion (5,000 tonnes per year), has a moderate potential for public support due to concerns regarding expanded collection programs, and moderate capital costs ($1 million), low technical risk and a moderate ease of implementation.

3.1.5.3 Option 3: ICI Only, Public Facility at GVRDF

Designate ICI kitchen scraps as a regulated material. Construct publicly owned and operated organics composting facility at GVRDF.

Rationale

This option provides low diversion (2,000 tonnes per year), may have low public support due to higher capital investment than Spa Hills Farm options, has moderate capital costs ($1.6 Million) and moderate technical risk due to the potential for odour but will be easy to implement as there would be no change in residential collection service levels.

3.1.5.4 Option 4: ICI Plus RDNO Residential, Public Facility at GVRDF

Designate ICI and residential kitchen scraps as a regulated material. Implement region-wide curbside collection program. Construct publicly owned and operated organics composting facility at GVRDF. Construct small transfer facilities at ASRDF and LRDF for self-haul only.

Rationale

This option provides high diversion (5,000 tonnes per year), may have low public support due to higher capital costs, has moderate capital costs ($4 Million) and moderate technical risk due to the potential for odour. However, there will be some implementation challenges due to issues associated with expanded collection.

3.1.6 Financial Impact of Short-List Options

As discussed above in the introduction to this section, the purpose of the organics management options study was to develop four viable organic diversion options and then determine their financial impact on the RDNO solid waste management system. To do this, XCG prepared a financial model of the current solid waste system (statues quo) that would provide answers to the following questions:

- Is the current status quo model balanced (i.e., does the current revenue stream meet the solid waste management system expenses, including long-term capital requirements)?
- What would be the estimated capital and operational costs of implementing each of the four organics diversion options?
- What would be the impact to the site life of the existing landfills?
- What would be the impact relative to the status quo model.

XCG's cost analyses of the four waste diversion options presented above were completed using the net present value (NPV) methodology to facilitate comparison of alternatives. If the NPV of the analysis is positive, it indicates that the cash flow into the system, in this case revenue from tipping fees, recycling and taxation is sufficient to cover the cash flow out of the system. A negative NPV is the result of inadequate cash flow to cover all expenditures and is not financially sustainable in the long-term without reducing the expenditures or increasing revenues.

The full analysis included all cost assumptions that are presented in the XCG study presented to the Working Group at their first meeting. The following Table 3-5 provides a summary of the results with respect to organics diverted, average cost per tonne of organics, NPV and impact on the site life existing landfills.

Table 3-5: Summary of Financial Impact of Short-List Options

Option	Organics Diverted (tonnes)	Average Cost per tonne	NPV	Site Life Impact
Status Quo			22,969,799	
Option 1 (ICI Ban and Vernon, Spa Hills)	4,000	$140	8,985,732	GVRDF 3 yrs
Option 2 (ICI and Residential Ban, Spa Hills)	5,000	$157	2,994,959	GVRDF 3 yrs ASDRF 1 yr LRDF 6 yrs
Option 3 (ICI Ban, RDNO Owned)	2,000	$189	13,627,867	GVRDF 1.5 yrs
Option 4 (ICI and Residential Ban, RDNO Owned)	5,000	$206	-3,110,126	GVRDF 3 yrs ASDRF 1 yr LRDF 6 yrs

As indicated in Table 3-5, while each option provides significant diversion from disposal, each option is more costly than the status quo. While Option 1 to Option 3, each have a positive NPV, meaning that system is balanced and would not result in any reduction in expenditures or increase to revenues, Option 4, where the RDNO constructs a publicly owned and operated organic composting facility at GVRDF, is not balanced and would require a reduction in expenditures or an increase in revenues. Nevertheless, all four options increase the site life of existing facilities and reduce the generation of methane, a potent GHG.

Input from the RSWAWG and the public will be required to select a sustainable organic management option that reconciles environmental, social and economic imperatives. Organic management options also interrelate with landfill gas capture options presented in Tech Memo 1, as some of the methane produced by organics decomposing in a landfill can be captured and utilized. The financial implications will include analysis of the costs of implementing both programs.

3.2 Expanded Collection

Expanded collection refers to ensuring all residents and businesses have equal access to recycling, organics, and garbage services. If these programs are accessible, grouped, and convenient, participation in diversion programs increases and can be further incentivized through collection schedule changes (i.e., switch to every other week garbage collection with weekly organics collection). The overall strategy is to ensure recycling and organics diversion programs and services are available and convenient for everyone at home, at work and on the go.

3.2.1 Residential Curbside

As discussed in the previous section, the quantities of materials that can be expected to be diverted for recycling and organics programs increase if a convenient and easy to use service is offered. Curbside recycling programs have been developed for a majority of residents in the RDNO since they have shown much higher capture rates of recyclables when compared to drop-off depots programs. With the implementation of an organics program along with garbage collection, the provision of a expanded residential curbside organics program would actively support diversion efforts. By adding every other week garbage along with organics, many jurisdictions have seen a garbage reduction of over 35%.

Additional environmental, social and economic advantages have been demonstrated through expanded collection programs and most municipalities have moved to this collection model to recognize these benefits which can include:

- Consistent level of service for all residents;
- Ability to expand programs to improve waste reduction (organics and yard waste collection);
- Ability to implement user pay programs through cart based collection;
- Standard limits on number of bags or cart sizes to influence use of recycling and organics programs;
- Potential decreases in backyard burring and illegal dumping;
- Improved safety due to fewer vehicles on the roads;
- Accountability of the service provider (customers have a collective say on service issues);
- Certainty (one provider under detailed contract with local government to provide service);
- Fewer trips to the landfill; and
- Lower cost due to servicing efficiencies.

Through this process, the RDNO could assist with the implementation of an expanded collection service through a regional or subregional tendering process, with the member municipalities having the option to manage contracts themselves. The RDNO has the option to investigate implementing automated curbside collection, using carts, for all areas currently being served by Recycle BC's packaging and printed paper recycling program.

If implemented, expanded collection will increase the amount of material diverted if an organics collection program is developed, reduce the number of self-haulers driving to RDFs through many neighborhoods, in turn reducing the number of vehicles on the road and their associated GHG emissions. This will contribute to regional and local GHG reduction targets that are set within the Regional Growth Strategy and Official Community Plans. This type of expanded program would also potentially assist with reducing the amount of solid waste burned in the rural areas and increase the amount of compostable and recyclable material diverted from landfill.

The key next step for potential implementation would include:

- Determine the logistics and costs for implementing expanded and compulsory residential organics and refuse collection in areas currently receiving only subscription service and curbside recycling services.
  - Collection types (automated or manual).
  - User pay options (based on cart sizes).

- Conduct the appropriate negotiation process to establish the contract rates and service areas, and determine who will manage the contract (RDNO or Municipality).
- Arrange and hold public meetings to inform the residents of the new service. Provide cost, schedule, and service specifications information.
- Develop and approve a service establishment bylaw.
- Develop and approve a rate bylaw (consider a blended rate if one expanded rate cannot be negotiated with the haulers).

3.2.2 Multi-family Residential and Industrial, Commercial and Institutional

Similar to residential single family properties, jurisdictions are using both disposal restrictions along with requirements for recycling and organics services so the infrastructure is put in place to support increased participation and overall diversion.

- Develop bylaw adjustments to actively promote and require recycling and organics diversion. The bylaws call for the establishment of additional diversion infrastructure and services for sectors not directly serviced by public jurisdictions. The bylaws are first promoted through outreach and technical assistance initiatives, with enforcement set in place over time as part of an integrated "carrot and stick" approach.
- Several BC jurisdictions have recently instituted mandatory recycling and composting by-laws that require multi-family residential complexes and ICI sector businesses and institutions to provide separate collection for food scraps and other organics, recyclables and garbage, including the District of Squamish[2] and the Resort Municipality of Whistler[3].
- In concert with these bylaws, jurisdictions also provide technical assistance to actively supporting system setup and facilitate behaviour change to optimize systems use. For example, the nongovernmental association AWARE was contracted to conduct site visits to multi-resident stratas and businesses in Squamish and Whistler prior to and following the bylaw adoption to require mandatory recycling and organics collection services. City of Whitehorse actively promotes commercial composting to reinforce regulatory changes by offering green cart service directly and engaging a local service provider, Zero Waste Yukon, to provide business assistance[4].

Next steps include conducting a scan of similar legislation to draft the appropriate model bylaw amendments that can be used by municipalities. Municipalities would be required to submit the bylaw changes for review and approval with RDNO, publicize the requirement, and put a system in place to monitor and enforce compliance after an educational grace period.

3.3 Markets for Materials

It is important to ensure materials that are diverted from disposal are being utilized following the waste reduction hierarchy and that markets are available to utilize the material that is diverted. Materials currently being diverted that have had difficulties finding markets include yard and wood wastes. Both materials can end up being stockpiled as more material is diverted and generated than is needed or markets available. Stockpiling can impact operations

[2] District of Squamish, 2017. Section 5.0 Multiple-Unit Residential and Industrial, Commercial and Institutional Collection: https://squamish.civicweb.net/FileStorage/76336035401545779F58F103938C6A2D-Solid%20Waste%20Bylaw%20No.%202547,%202017.docx

[3] Resort Municipality of Whistler, 2017. Solid Waste Storage, Signage and Transport, Section 9: https://www.whistler.ca/sites/default/files/2017/Sep/meeting-package/agenda/24152/2017-09-19_regular_council_package_final.pdf

[4] City of Whitehorse, 2017. Commercial and Multi-family Organic Diversion. http://www.whitehorse.ca/departments/environmental-sustainability/waste-diversion/additional-information/ici-organic-collection

by increasing operation time required to manage the materials, and increase fire risks during summer months. Additional costs may be incurred to move the materials or reduce stockpiles regularly, and if no uses for the materials are found they would need to be disposed once there is no longer space available for storage.

- Evaluate rdno•gro markets for utilizing compost generated at GVRDF.
- Assess wood waste management markets and options.
- RDFs currently use diverted clean (pallets, cut-ends, etc.) and dirty (dimensional wood, furniture, etc.) wood as a cover material (mixed with soil 50/50). Higher and better uses for clean wood material potentially exist in partnership with the forestry industry or other industries and manufacturing.
- Closed RDFs no longer have a use for wood and yard waste that is currently dropped off at the Kingfisher RDF and Cheryyville RDF. Material could be accepted only at active RDFs to allow smaller transfer sites to control costs.

Next steps for market analysis usually includes conducting studies with industry experts to identify potential markets, or develop potential working groups and business plans. The Southern Interior Waste Managers Association recently agreed to conduct a wood waste inventory to determine the quantities and quality of wood waste available for reuse and recycling in the southern BC regional districts generated through the local government RDFs.

3.4 Waste Reduction and Education Programs

Combining a zero waste approach with waste reduction and robust education programs creates the foundation for behaviour change over time to support a culture shift in how we use resources. The section below outlines some key components to inform how programs can be rolled out efficiently and effectively.

Zero Waste Approach

RDNO could consider adopting zero waste as a guiding principle for the SWMP. The term ‘zero waste’ has been adopted by a wide range of institutions, municipalities, businesses, non-profits, and even countries (e.g., Zero Waste New Zealand). These organizations and institutions use a broad range of policy definitions for zero waste; for some, it is an overarching policy framework for materials management, others consider it to be an aspirational or actual goal to pursue (generally considered to be 90% or 95% diversion and above). The Ministry recently conducted a Zero Waste Business case that found moving towards zero waste will reduce costs, generate business and, support the creation of new jobs[5]. The common thread across zero waste initiatives is the intent to optimize waste management systems by employing approaches such that:

- Waste prevention is the key message with a focus on approaches such as improved product design, kitchen scraps prevention, and green purchasing;
- A strong emphasis is placed on reuse, repair, and the sharing-economy to reduce consumption of raw materials; and
- Diversion of materials, in the form of recycling, composting and anaerobic digestion, is maximized before sending materials for disposal.

[5] BC Ministry of the Environment and Climate Change Strategy, 2017. Zero Waste. https://www2.gov.bc.ca/gov/content/environment/waste-management/zero-waste

Food Waste Prevention

Kitchen scraps reduction and rescue has become paramount in recent years. The United Nations Food and Agriculture Organization (FAO) estimated that a third of food produced for human consumption is lost or wasted globally, amounting to 1.3 billion tons (imperial) per year. Far more food is wasted per capita in the industrialized world compared with developing countries. In BC, the Ministry has taken the initiative to provide kitchen scraps reduction tools[6] for residential and commercial sectors including a Food Waste Reduction Toolkit tailored to municipalities. For example, RDNO could consider adopting a well-established residential kitchen scraps prevention campaign called Love Food Hate Waste. This program was initially designed by WRAP, a UK organization and is now being utilized by Canadian municipalities. Metro Vancouver has adapted the Love Food Hate Waste program for Canadian municipalities and has resources available to share with participating jurisdictions[7]. It is designed to raise awareness to reduce the amount of "avoidable" kitchen scraps in the region by partnering with business and government to design and implement campaigns and tools to actively promote behaviour change. Based on recent studies, up to 60% of kitchen scraps found in residential waste streams is comprised of "avoidable" kitchen scraps. When this percentage is applied to RDNO, approximately 12% (estimated 3,000 tonnes) of the landfilled waste was food that could have been eaten.

Behaviour Change and Education Programs

In addition to continuing to promote waste reduction and diversion programs through vivid print and electronic communications tools, social media (e.g., Facebook, Twitter, YouTube), hands on technical assistance, and other behaviour change tools can be integrated into education efforts. The behaviour change tactics derived from community-based social marketing (CBSM) can provide a framework for how to most effectively target a specific behaviour such as increasing recycling participation or diverting food scraps for specific audiences to address barriers and reinforce benefits of an activity. Derived from social marketing by Doug McKenzie-Mohr, an environmental psychologist, CBSM offers a myriad of behaviour change tools that can be incorporated into existing and future education initiatives. Examples of CBSM behaviour based tools include:

- Commitment – By agreeing to a small request, people have subsequently been found to be far more likely to agree to a larger request. As a result, many CBSM-based programs ask people for a verbal or written pledge or agreement.
- Prompts – Prompts can also be used to encourage people to engage in positive behaviour. By providing visual or auditory aids, people are reminded to perform a particular action. Prompts often take the form of a sticker or tag posted in close proximity to the action. Distributing kitchen containers to serve as a prompt for diverting food scraps can be effective; they can be distributed at a recycling depot as done in Whistler, and are a common tool to distribute as part of residential organics collection programs.
- Norms – Norms guide how we behave and are largely influenced by the behaviour of those around us. If members of our community, especially our immediate networks, are living sustainably, we are more likely to do the same. When norms have a visible element, be it a blue recycling box or a sign that says "We Compost," they can have a more significant impact on behaviour change.
- Social Diffusion – New behaviours are frequently adopted because friends, colleagues, or competitors have changed certain behaviours. To encourage social diffusion, make commitments to new behaviours public and visible (such as adding a sticker for another environmental behaviour to the side of a collection container) and/or recruit well known and respected opinion leaders in the community to promote a specific behaviour.

[6] BC Ministry of Environment and Climate Change Strategy, 2017. Food Waste Reduction Tools & Resources. http://www2.gov.bc.ca/gov/content/environment/waste-management/recycling/organics/tools-resources

[7] Metro Vancouver, 2017. Love Food Hate Waste Canada. http://www.lovefoodhatewaste.ca

- Communication – The more relevant messages are to a group, the more likely it is to captivate someone's attention. It is also important to make messages easy to remember and provide personal or community goals and targets, then provide feedback on success to the community. By generating opportunities for person-to-person, word-of-mouth contact, personalized messages spread through diffusion in an influential way, which ultimately personalizes the message.

- Incentives/Disincentives – Closely pairing an incentive, or reward, to specific positive behaviour can have a substantial impact on encouraging sustainable activities. This strategy is particularly useful when motivation to engage in action is low or people are not doing the activity as effectively as they could. It is recommended to use non-monetary awards, such as award certificates and social approval. Programs with monetary incentives and budgetary implications, such as discount programs for compost bins, serve as valuable incentives as well, on a case-by-case basis. A disincentive, such as having to pay for parking that was once free, is related behaviour change mechanism.

- Convenience – Consider the external barriers related to a project, how they can be overcome, and what resources are needed to successfully address them. A behaviour must be relatively convenient in order to become a new habit. For example, many businesses have various sizes of colour-coded containers to make food scraps collection convenient from point of generation through to how it is consolidated at the loading dock.

3.5 Reduction and Diversion Services and Support

Several reduction and diversion services and support could be beneficial for RDNO to pursue as part of the Draft SWMP Update. Below is a list of programs and support services that have been identified during the plan update:

- Support on-site composting – There is an opportunity for larger business and institutions in the region, such as Silver Star Mountain Resort, to establish smaller scale on-site composting or anaerobic digestion systems. In addition to removing food scraps and other organic materials from the waste stream, there are additional benefits related to positive public relations and staff morale. Metro Vancouver commissioned a study that provides an overview of organics collection and processing options entitled Onsite Organics Management Options Review[8] that may be of benefit for a resort community. A summary of the study was also published in Biocycle Magazine[9] in 2015.

- Augment and expand EPR programs – The Canadian Council for Ministers of the Environment (CCME) continues to provide guideline updates for Canada-wide implementation of EPR programs[10]. For example, products not yet in the BC Recycling Regulation that are recommended for Canada-wide EPR include carpet, textiles, and furniture. RDNO can continue to stay abreast of industry trends through conferences and annual updates[11] as provided by the CCME and the BC Product Stewardship Council (BCPSC). There is also an opportunity to advocate for new programs through direct correspondence with the Ministry or through associations of which RDNO is a member (e.g., BCPSC). The management by the RDNO of materials such as mattresses, propane tanks and drywall through well managed programs presents an opportunity to justify the expansion of EPR to these materials.

- Continue WRIF – The RDNO currently administer a fund where individuals, community groups and non-profit organizations, including school groups, are eligible to apply for WRIF funding. Funding is available for capital items needed to implement initiatives that contribute to waste reduction in the RDNO. Examples of projects that

[8] Metro Vancouver, 2014. On-site Organics Management Options Review. http://www.metrovancouver.org/services/solid-waste/SolidWastePublications/On-site_Organics_Management_Options_Review-Dec-14.pdf

[9] Biocycle, 2015. Evaluating On-site Organics Management Options. https://www.biocycle.net/2015/08/18/evaluating-on-site-organics-management-options/

[10] Canadian Council for Ministers of the Environment, 2009. Canada-wide Action Plan for Extended Producer Responsibility. http://www.ccme.ca/files/current_priorities/waste/pn_1499_epr_cap_e.pdf

[11] EPR Canada, 2017. 2016 Extended Producer Responsibility Summary Report. http://www.eprcanada.ca/

have received WRIF funding include: developing square metre garden plots, establishing composting systems at schools, and implementing event recycling[12]. Next steps for program enhancement could include making additional funds available, changing the criteria to include other program aspects beside capital, and/or advertising the fund more widely. The fund could support programs such as development of a toy library, tool library, repair café, rebuild centres, zero waste events, kitchen scraps reduction, kitchen catcher give-away, etc. As part of grant program development, conduct further inquiry to determine the expected impact/return for the type and amount of grants.

- Address disaster response waste (e.g., docks, Styrofoam, sandbags, fires) – Ensure solutions for disaster materials management are developed before a disaster occurs so systems can be put into place to manage the rapid increase in materials that are often generated after a disaster.
- Evaluate opportunities for new programs on an ongoing basis (textiles, etc.) – An ongoing strategy is ensuring the resources are available to research and develop new diversion programs as opportunities exist. Currently around the province, there are pilot projects looking at programs for the diversion of textiles and couch and armchair deconstruction. Resources include staff time and involvement in networking.

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[12]RDNO, 2017. Waste Reduction Initiatives Fund. http://www.rdno.ca/index.php/services/engineering/solid-waste/education-awareness/waste-reduction-initiatives-fund

5.0 CLOSURE

We trust this technical memo meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech Canada Inc.

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/bvb:lm

Attachment (1): Tetra Tech's Limitations on the Use of this Document

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GEOENVIRONMENTAL

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Technical Memorandum 3: System Recap, Bylaws, Policies, Plan Options

(March 21, 2018)

TETRA TECH

TECHNICAL MEMO

ISSUED FOR USE

To:	Nicole Kohnert, P.Eng.	**Date:**	March 21, 2018
c:		**Memo No.:**	3
From:	Carey McIver, MA Tamara Shulman, BA, M.Sc.	**File:**	SWM.SWOP03478-01
Subject:	Tech Memo 3 – System Recap, Bylaws, Policies, and Plan Options		

1.0 INTRODUCTION

The Regional District of North Okanagan (RDNO) retained Tetra Tech Canada Inc. (Tetra Tech) to manage a review and update of the RDNO's 2011 Solid Waste Management Plan (SWMP) Update. The Draft SWMP Update in progress is to review current solid waste management policies and programs, identify and evaluate options for additional reduction and diversion, residual management, and financing, and also set the RDNO's waste management principles, targets, and strategies for the next ten years. A summary of the project phases and deliverables is included on Figure 1-1.

During the Stage One Assessment, the current system was reviewed and potential gaps and opportunities were identified in a Current Solid Waste System Report. For Stage Two Analysis and Evaluation, two Technical Memoranda (Tech Memo) have been issued to assess opportunities for and evaluate: recovery and residual management (Tech Memo 1); and reduce reuse and recycle options (Tech Memo 2).

This third Tech Memo is the final memorandum to be presented to the Regional Solid Waste Advisory Working Group (RSWAWG) at the sixth meeting on January 31, 2018, to gather feedback on the options and recommendations. The Sections are as follows:

- Section 2.0 – Recap and Reframe:
  - Provides updated information on garbage disposal by sector, waste composition, potential diversion, greenhouse gas (GHG) implications (full GHG Tech Memo provided separately), current financials and staff, priorities from the 2011 SWMP as captured in the 2016 Annual Report and a recap of the issues that must be addressed in this plan review and update.
- Section 3.0 – Reviews and evaluates RNDO solid waste-related bylaws and policies.
- Section 4.0 – Summarizes plan options and identifies initial resource needs.

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The Working Group's input is being sought on each Tech Memo to help guide the selection of options for inclusion in the updated plan. The selected options will be further refined for the draft plan with 10 year costs and diversion estimates. A draft plan update with preferred options will be prepared for review by the Working Group prior to undertaking community and stakeholder consultation. Once these three Tech Memos and the preliminary plan have been reviewed, the consultation stage will engage RDNO constituents from public and private sectors through to First Nations to align on the direction of the Draft SWMP Update. The Draft SWMP Update will be finalized based on consultation feedback, approved by the RSWAWG, adopted by the full Board, and submitted to the Province.

Figure 1-1: Solid Waste Management Planning Steps

The stages of this project fit within the Ministry-defined steps as follows:

Step 1: Initiate the Process – Establish the project.

Step 2: Set the Plan Direction – Identify principles, goals and targets and assess the current system:

- Deliverable: Current Solid Waste System Report (July 25, 2017).

Step 3: Evaluate Options – Analyze opportunities, evaluate financial implications, and conduct consultation:

- Deliverables:
  - Tech Memo 1: Recovery and Residuals Management (September 12, 2017).
  - Tech Memo 2: Reduce, Reuse, and Recycle (October 25, 2017).
  - Tech Memo 3: System Recap, Finance, Bylaws, and Policies, and Plan Options (January 31, 2018).
  - Consultation Plan.

Step 4: Prepare and Adopt the Plan – Develop and finalize draft plan for submission to the British Columbia (BC) Ministry of Environment Climate Change and Strategy (Ministry):

- Deliverables:
  - Consultation Summary Report.
  - Solid Waste Management Plan Update (Issued for Review and Issued for Use).

2.0 RECAP AND REFRAME

At the fifth meeting of the RSWAG on December 6, 2017, the Study Team delivered a Power Point presentation which recapped and reframed information that had been provided in the Current Solid Waste System Report (July 2017) and Tech Memo No.2 – Reduce, Reuse, Recycle (October 2017). The updated information and data along with additional items for consideration are provided below to serve as the foundation for plan option development.

2.1 Garbage Disposal by Hauler

The Ministry has established waste disposal as an annual reporting requirement for regional districts and set a provincial target of 350 kilograms (kg) per capita per year to be achieved by 2020. A second performance measure set by the Ministry is to have 75% of the population in B.C. covered by an organic waste disposal restriction by 2020. As discussed in the Current Solid Waste Management System Report, in 2016 the disposal rate in the RDNO was 500 kg per capita which is slightly higher than the 2015 average provincial disposal rate of 497 kg per capita. Although the RDNO has been very successfully at reducing disposal from 1990 levels, there is significant potential to increase waste diversion even further. For example, in 2016, the Cowichan Valley Regional District (CVRD) and the Regional District of Nanaimo (RDN), similar size and demographic regions, reported disposal rates of 358 and 349 kilograms per capita respectively.

Reviewing garbage disposal by type and sector allows planners to target "best practice" policies and programs to maximize diversion such as those implemented in the CVRD and RDN. The RDNO Annual Reports and Tetra Tech's Current Solid Waste Management System both report on tonnage by type of waste and jurisdiction as classified by scale clerks when loads enter the facilities. This reporting indicates that residential waste represents 63% of waste disposed at RDNO landfills, industrial, commercial, and institutional (ICI) waste represents 35% and construction and demolition (C&D) waste 2%. These numbers are atypical with respect to other regional districts in BC.

When RDNO scale data is organized according to who (residential, ICI or C&D) delivers it to disposal facilities, the picture changes significantly as indicated in Table 2-1. When broken down by "hauler type", commercial haulers deliver single family (SF) residential garbage to disposal facilities primarily using rear or side load packer trucks and on behalf of municipalities and subscription customers via curbside public or private collection programs (20%); commercial haulers deliver multi-family residential (MF), ICI and C&D waste from the three sectors primarily using front load, roll off and other large trucks and trailers (62%) and self-haul customers deliver residential, ICI and C&D waste into containers at each facility, including the transfer stations, primarily using an assortment of small personal vehicles (18%). When viewed this way the biggest potential for diversion is in the ICI sector.

Table 2-1: Current Garbage Disposal by Hauler

Hauler	Estimated Garbage by Hauler (2017[1])	
	Tonnes	Percent
Single Family (SF RES) Municipal and Subscription Curbside	9,059	20%
ICI (including Multi-Family Residential [MF RES] and C&D)	28,084	62%
Self-Haul (SF RES, ICI, and C&D)	8,153	18%
Total	**45,296**	**-**

[1] Annualized based on extrapolation of actual scale data from March to November 2017.

However, as discussed in the Current Solid Waste System Report, curbside garbage collection is only provided by the municipalities of Vernon, Armstrong, Enderby and Lumby. The remaining 35% of SF households in Coldstream, Spallumcheen and the Electoral Areas either subscribe to a private collection service or self-haul their household garbage to the nearest RDNO recycling and disposal facility (RDF). If those households that currently receive curbside recycling collection service from Recycle BC were to also receive curbside garbage collection, the proportion of garbage collected from SF households through a municipal program increases significantly as shown in Table 2-2.

Table 2-2: Adjusted Garbage Disposal by Hauler

Hauler	Estimated Garbage by Hauler (2017[1])	
	Tonnes	Percent
SF RES Municipal and Subscription Curbside	14,059	30%
ICI (MF RES and C&D)	26,584	60%
Self-Haul (SF RES, ICI and C&D)	4,653	10%
Total	**45,296**	**-**

[1] Annualized based on extrapolation of actual scale data from March to November 2017.

2.2 Waste Composition

Figure 2-1 shows the adjusted 2012 waste composition results that represent aggregated results from across sectors. These results were adjusted to remove yard waste, given the 2016 program adjustment that permitted free year-round yard waste drop-off at all facilities and the corresponding reduction of yard waste in the garbage.

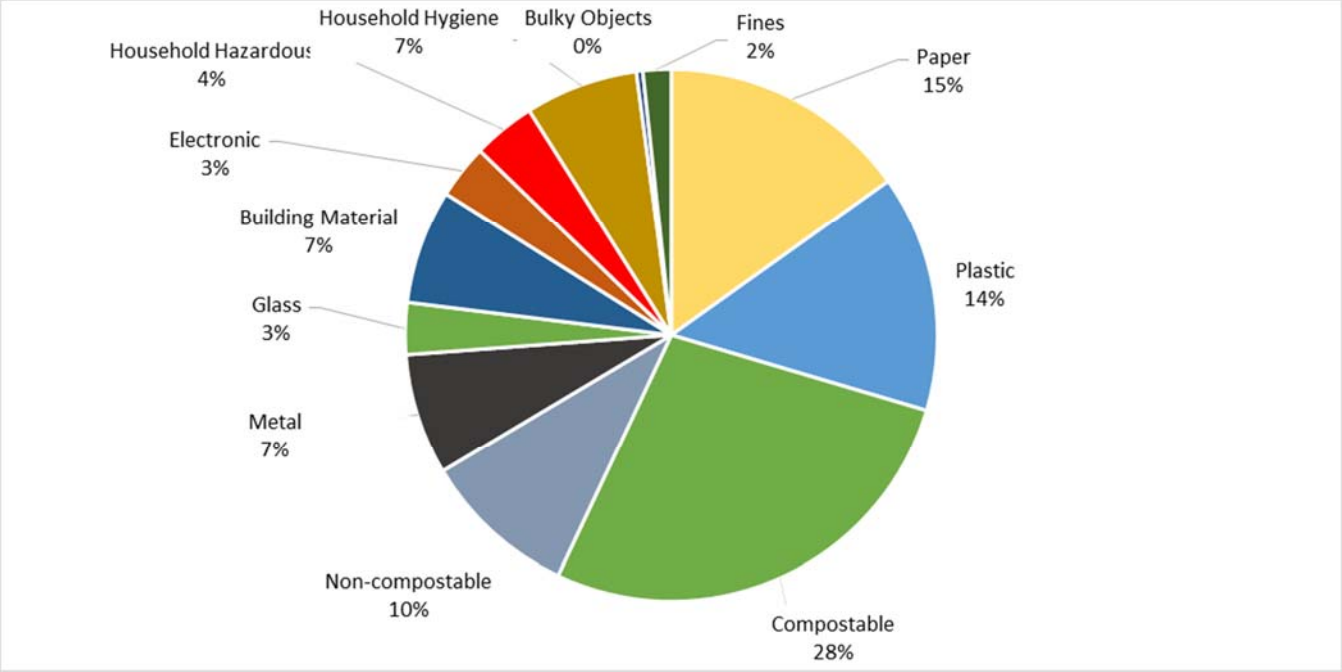

Figure 2-1: Waste Composition Results (2012 Adjusted)

2.3 Potential Diversion

Table 2-3 provides a mid-range and high-range estimate of the additional diversion that could be achieved by implementing the diversion strategy options across sectors (i.e., residential, ICI). As stated in Section 2.1, it is assumed that the residential universal collection will be considered as one of the programs in the plan. Therefore, the hauling distribution used here is 30%-60%-10% for residential, ICI and self-haul, respectively as identified above in Table 2-2. The level of diversion achieved by a given program can be affected by program maturity (new programs often take a few years before higher capture rates are achieved) and level of supporting activities employed (e.g., financial signals, communication, enforcement). As shown in the table, together, the diversion strategy components are expected to achieve an estimated disposal rate between 350 to 432 kg per capita per year. If the target for this plan were to be set at a disposal rate of 400 kg per capita; to achieve this target, a 30% reduction in the per-capita amount of garbage currently landfilled would be required. To meet the Provincial target or 350 kg per capita, a per capita garbage reduction of 44% would be required.

Table 2-3: Potential Waste Diversion

	Contribution to Landfill by Hauler Type	Material Contribution to Landfill	Diversion Potential if 20% of Targeted Material was Diverted	Diversion Potential if 30% of Targeted Material was Diverted	Diversion Potential if 44% of Targeted Material was Diverted
SF RES Municipal and Subscription Curbside	30%				
EPR-PPP		12.9%	0.8%	1.1%	1.7%
EPR-non-PPP		8.3%	0.5%	0.7%	1.1%
Other recyclables		5.6%	0.3%	0.5%	0.7%
Compostables		35.4%	2.1%	3.1%	4.7%
Building Material		8.0%	0.5%	0.7%	1.1%
Residential Diversion Potential			4.2%	6.2%	9.4%
ICI (MF RES and C&D)	60%				
EPR-PPP[1]		9.1%	1.1%	1.6%	2.4%
PPP		8.5%	1.0%	1.5%	2.3%
Other recyclables		6.9%	0.8%	1.2%	1.8%
Compostables		34.5%	4.1%	6.1%	9.2%
Building Material		9.8%	1.2%	1.7%	2.6%
ICI Diversion Potential			8.3%	12.2%	18.4%
Self-Haul (SF RES, ICI and C&D)	10%				
EPR-PPP		7.0%	0.1%	0.2%	0.3%
EPR-non-PPP		9.6%	0.2%	0.3%	0.4%
Other recyclables		2.6%	0.1%	0.1%	0.1%
Compostables		4.5%	0.1%	0.1%	0.2%
Building Material		27.9%	0.6%	0.8%	1.2%
Drop-Off Diversion Potential			2.1%	2.8%	4.3%
Potential Additional Diversion from Landfill			**13.52%**	**20.0%**	**30.0%**
			68 kg/c	**100 kg/c**	**150 kg/c**
Estimated Annual Disposal[2]			**432 kg/c**	**400 kg/c**	**350 kg/c**

[1] EPR-PPP: Extended Producer Responsibility (EPR) – Printed Paper and Packaging (PPP)
[2] Calculated based on current disposal rate of 500 kg per capita.

Table 2-4 provides a list of items that are included in the categories listed above.

Table 2-4: Category Items

Category	Included Items (e.g.)
EPR-PPP (SF RES)	Packaging and Printed Paper Materials (Residential Managed by Recyclable BC)
PPP (ICI)	Packaging and Printed Paper Materials
EPR-non PPP	Electronics, Batteries, Used Oil, and Containers, Etc.
Other Recyclable	Textiles and Plastic Film
Compostable	Compostable Food and Compostable Paper
Building Materials	Drywall, Masonry, Clean Wood, and Metals

2.4 Financials and Staffing

The RDNO's current operating revenue totals $6.4 million with 84% of it derived from tipping fees. The budget is currently balanced with the current solid waste management system aligning to $6.4 million annually. Over 40% of the expenses are for facility operations and 1% is allocated for policies and programs. Table 2-5 summarizes the 2017 RDNO Financial Plan.

Table 2-5: Financial Plan

FINANCIAL PLAN	2017	%
OPERATING REVENUE		
Tipping Fees	$5,342,000	83%
Tax Requisition	$420,000	7%
Grants	$2,500	0%
Interest Income	$11,389	0%
Sundry Income	$2,001	0%
Transfer from Operating Reserve	$501,814	8%
Transfer from Statutory Reserve	$50,000	1%
Recycled Commodities Revenue	$77,500	1%
Other income - Gravel Royalties	$3,000	0%
Rental and Lease Income	$4,000	0%
TOTAL OPERATING REVENUE	**$6,414,204**	**100%**
OPERATING EXPENDITURES		
Waste Reduction/Recycling – Policies and Programs	$73,000	1.1%
Waste Reduction/Recycling	$779,000	12.1%
Greater Vernon RDF (GVRDF)	$1,389,400	21.7%
Armstrong / Spallumcheen RDF (ASRDF)	$810,300	12.6%
Lumby RDF (LRDF)	$206,800	3.2%
Cherryville RDF (CRDF)	$67,700	1.1%
Kingfisher RDF (KRDF)	$48,000	0.7%
Silver Star Solid Waste	$116,814	1.8%
Administration and Overheads	$781,189	12.2%
Other	$411,000	6.4%
Capital Expenditures	$800,000	12.5%
Closure & Post-Closure	$50,000	0.8%
Transfer to Operating Reserve	$225,000	3.5%
Transfer to Reserve/Landfill Closure	$656,000	10.2%
TOTAL OPERATING EXPENDITURES	**$6,414,203**	**100%**
NET REVENUE/(EXP)	**1**	**-**

Staffing costs (Administration) cover part of the General Manager position and a clerical position, and a full-time Regional Engineering Services Manager, Recycling and Disposal Facilities Operations Manager and Environmental Technician, along with management and operations staff for the three active RDFs. The staff structure is shown in Figure 3-1 below.

The Regional Engineering Services Manager is responsible for the development, implementation, management and coordination of capital projects, plans, policies, programs and activities associated with solid waste management planning, improvements and compliance such as landfill capital plans, environmental monitoring and closure planning as well as various other engineering services such as transit, air quality, drainage and street lights. The Engineering Technician – Solid Waste reports to the Engineering Services Manager to work with a technical team of engineers, technologists, operators and other RDNO staff to contribute to the efficient and effective delivery of sampling, monitoring, program delivery, and data compilation services for the solid waste management function.

The Recycling and Disposal Facilities Operations Manager provides leadership and overall management relative to the six RDNO RDFs (landfills, transfer stations and composting facility) including contract management. There are five Inspectors and eight scale attendants reporting to this Manager. Scale Attendants operated the scales and Inspectors inspect vehicles and direct customers to ensure that municipal solid waste and recyclable materials are deposited in the appropriate locations and enforce the facility bylaw and policies.

Prior to 2014, a Waste Reduction Coordinator position reported to the Recycling and Disposal Facilities Operations Manager. This position was omitted in 2014 when Recycle BC took over the RDNO's Blue Bag Curbside Collection Program. This means that waste reduction and diversion planning, delivery, public outreach and communication initiatives are spread thinly between the two Managers and the Engineering Technician, with no one position having a direct responsibility for program design and implementation as well as education and promotion. Given that updated garbage disposal by sector shows that over 60% of the current garbage disposal is derived from ICI sources and close to 30% of the overall waste stream is comprised of compostable organics, it is clear that additional staff resources need to be allocated to develop and implement new waste reduction and diversion initiatives for both the ICI and residential sectors if the RDNO wants to achieve more waste diversion.

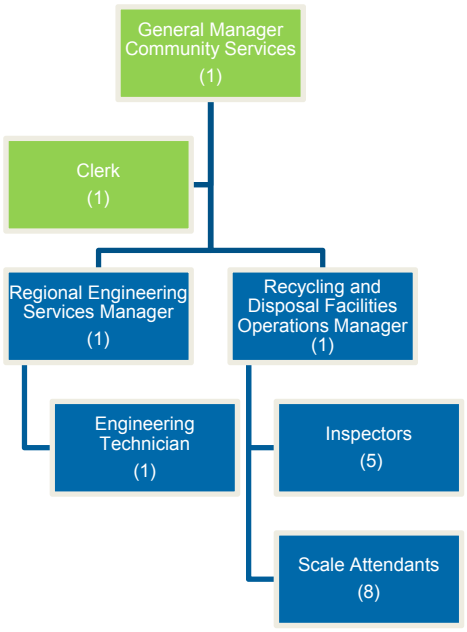

Figure 3-1: Current Staffing Structure

2.5 Priorities from 2011 Solid Waste Management Plan

The 2011 SWMP Update identified a total of 16 strategies; 10 through the main strategy and another six derived through additional consultation. The strategies below are grouped by current status so current priorities can be factored into continued options development. Note that the 2011 Plan vetted and prioritized options based on previous plans.

For Plan Consideration.

- **Organics Management Strategy** – Determine the best management strategy for organic waste including wood and yard waste from the DLC, residential, commercial, industrial, and agricultural sectors; and kitchen scraps from the residential, commercial, industrial, and agricultural sectors.
- **Expanded Residential Curbside Collection** – Determine the economic viability of a Expanded Residential Curbside Collection Program for all residential generated materials, including garbage, compostables, and recyclables.
- **Implement One Bag/Can Limit** – Consider a weekly one bag/can limit for households with a municipal curbside collection service. Since 1996 the limit has been set at two cans per week; given new diversion opportunities there is increased viability for shifting to a new norm of one can per week.
- **Blue Bag Recycling Program for Businesses** – Determine the best method for including businesses in the Blue Bag Recycling Program. To date only the City of Vernon has implemented a program, however other member municipalities have expressed some interest.
- **Upgrade Communications Tools** – Upgrade the RDNO web site and other communication tools to help residents, businesses and others determine what materials can be recycled.
- **Enhance Service at GVRDF for Commercial Haulers** – Evaluate the economic and operational implications of providing enhance service for commercial haulers at the GVRDF. Enhancements could include early openings and a dedicated commercial scale. Being addressed through ongoing operations and major capital works, including the addition of a third lane in 2018 to assist commercial haulers.

Not currently being pursued.

- **Audits of Large Waste Generators** – Consider offering a comprehensive waste audit to the 15 largest waste generators in the Region. Currently to be addressed through behaviour change programs that provide audit support.
- **Demolition and Land Clearing (DLC) Waste Management Strategy** – Examine mechanisms for further diversion of DLC waste, including but not limited to, private and public resource recovery parks and partnerships with industry. Currently to be addressed through building and demolition permitting processes.
- **Non-Typical Municipal Solid Waste Management** – Examine efficiencies and environmental protection needs with respect to including management of non-typical municipal solid wastes such as agricultural (e.g., plastics and slaughter waste) and industrial wastes (e.g., ash and wood), and water and wastewater treatment plant wastes in the SWMP. Currently addressed on a case by case basis with support from provincial and federal government agencies.
- **Blue Bag Recycling Program Improvements** – Evaluate the curbside Blue Bag Program and the Drop Centre Program to determine if the program should be expanded to include materials such as textiles, fluorescents, agriculture plastics, and other plastic products (Recycle BC is responsible for residential recycling for packaging and printed paper.) Currently being considered only when senior levels of government develop new programs (e.g. additions to the BC Recycling Regulation for Extended Producer Responsibility [EPR]).

Pursued but not currently viable.

- **Development Cost Charges** – Determine how local governments can include solid waste management infrastructure in their Development Cost Charge (DCC) bylaws by 2016.
- **Inter-Regional Solid Waste Management Committee** – If interest exists, facilitate cooperation of southern interior solid waste management staff, municipal councils, and regional district Boards of Directors through an interregional Solid Waste Management Committee.
- **Monitor Waste to Energy Technology –** Monitor waste to energy technology as it becomes accessible to small communities in Canada.

Completed.

- **Eco-Depots** – Evaluate eco-depot concepts and locations especially with respect to customer convenience and land use in the region.

No longer required.

- **Blue Bag Processing Facility** – Continue to operate the current Blue Bag processing system and facility with minor capital improvement until such time as more details about the provincial EPR program for packaging and printed paper are known.
- **More Frequent Free Styrofoam Collection Events** – Consider increasing the number of free Styrofoam collection events until Styrofoam packaging becomes part of an industry stewardship program.

3.0 BYLAWS AND POLICIES

Policies and bylaws define the “rules of the road” for how solid waste should be managed in the RDNO. They can also be applied to address many of the issues identified during the Draft SWMP Update. The following sub-sections describe current RDNO solid waste bylaw components as well as provide an overview of policies and bylaw amendments or additions that could be considered in the RDNO.

3.1 Bylaw Review

RDNO Municipal Solid Waste Management Bylaw No. 2659

There are typically two types of bylaws that local governments adopt to manage solid waste: collection service bylaws and facility regulation bylaws. Collection service bylaws regulate the curbside collection of garbage, recyclables and organics from primarily single family residential customers, although in some cases, such as in the City of Vernon the curbside collection service for recyclables is also available to some ICI customers. Facility regulation bylaws apply to RDFs and establish regulations, conditions of use as well as user fees and penalties. The RDNO regulates and sets fees at its RDFs under Municipal Solid Waste Management Bylaw No. 2659, as amended. Table 3-1 provides an outline of the sections and schedules to this bylaw.

Table 3-1: RDNO Municipal Solid Waste Management Bylaw 2659

Sections	Schedules	
Interpretation, Schedules and Definitions	Schedule A	Recycling and Disposal Fees
Regulations, Conditions of Use and General	Schedule B	Regulated Material
Exemptions, Violations and Penalties	Schedule C	Recyclable Material
Inspections and Dispute Mechanism	-	

The bylaw defines certain materials as prohibited waste, controlled waste, regulated material and recyclable material. Prohibited Waste means solid waste designated to be inappropriate for disposal at an RDF for environmental, regulatory or legal reasons, or for reasons related to the safe and efficient operation of the RDF. Controlled Waste means solid waste that requires preapproval by the Manager for disposal at an RDF and because of its inherent nature and quantity, may require special handling and/or disposal techniques. Regulated and Recyclable Materials means those materials listed in Schedules B and C that are considered to have alternative drop off opportunities (can be diverted from disposal).

Table 3-2 lists the materials that are included as Prohibited Waste, Controlled Waste, Regulated Material and Recyclable Material in Bylaw 2659.

Table 3-2: Prohibited Waste, Controlled Waste, Regulated Material and Recyclable Material

Prohibited Waste	Controlled Waste	Regulated Material	Recyclable Materials
▪ Liquid or semi-solid including septage ▪ Hazardous Waste ▪ Solid Waste on fire or smouldering ▪ Automobiles etc. ▪ Renderable Products ▪ Slaughterhouse, fish hatchery etc. ▪ Biomedical Waste	▪ Screenings from municipal treatment plants etc. ▪ Condemned foods ▪ Animal feces ▪ Bloody furniture ▪ Sawdust ▪ Bulky Waste ▪ Clinical/Laboratory Waste ▪ Carcasses ▪ Contaminated Soil ▪ Waste Asbestos ▪ Foundry Dust ▪ Food Processing Waste ▪ Septage Waste ▪ Noxious Weeds ▪ Logs and Stumps- large, dirty, ungrindable ▪ Infested Vegetation ▪ Tire – Oversize, and ▪ Preserved Wood.	▪ Stewardship Products ▪ Asphalt Roofing ▪ Batteries ▪ Box Springs ▪ Crushable Material for Aggregate ▪ Drywall, Recyclable ▪ Fluorescent Tubes and Bulbs ▪ Glass Jars and Bottles ▪ Logs and Stumps – Clean and Grindable ▪ Mattresses ▪ Propane Tanks ▪ Recyclable Material ▪ Refrigeration Appliances ▪ Scrap Metal ▪ Soil or other Fill Material ▪ Styrofoam ▪ Tires ▪ Wood Waste – Clean and Dirty ▪ Yard and Garden Waste	▪ Aluminum-cans, trays, foil ▪ Cardboard ▪ Mixed Paper ▪ Newspaper ▪ Plastics includes #1, #2, #3, #4, #5, #6, and #7 plastic labelled containers and plastic film ▪ Tin Cans

Under the Regulations Section, the bylaw states that no person shall:

- Bring Prohibited Waste to a RDF unless acceptance is specifically authorized in writing by both the Regional District and the B.C. Government

- Bring Controlled Waste to a RDF unless preapproved by the Manager
- Deposit Regulated Material in locations at a RDF that are not specifically designated for the material type by signage or verbal or written instructions
- Deposit Recyclable Material in locations at a RDF that are not specifically designated for the material type by signage or verbal instructions.

Tipping Fees

A tipping fee schedule has multiple purposes. Applying tipping fees to incoming waste is how the RDNO funds current operations, future capital expansion and final closure costs. In addition, through the application of variable rates to the different waste streams, the RDNO provides a financial incentive to their customers to separate and divert Regulated and Recyclable Materials from disposal.

Similarly, tipping fees can be set at a level that encourages waste generators to seek out lower-cost private sector alternatives, like a private recycling depot or scrap metal yard, which avoids the RDNO having to store and subsequently transport the material to recycling facility or market. Another purpose for the tipping fee schedule is to track the quantities of the different categories of waste that are handled at the facilities. Having detailed information on the volumes and revenues associated with each waste stream is invaluable for planning purposes.

Under the current fee schedule the tipping fee for regular refuse is $100 per tonne while the fee for refuse containing Regulated Material (other than drywall) is roughly double that fee at $203 per tonne while the fee for any refuse containing drywall is $303 per tonne. Controlled Waste is charged at $174 per tonne.

It is important to note that Regulated Material is not banned from disposal. If customers choose to dispose of a Regulated Material, they are subject to higher recycling and disposal fees. This “carrot” approach puts the onus on the RDNO to provide sufficient resources at RDF’s (the back-end) to enforce the bylaw. Regional district’s that have gone beyond variable tipping fees to full disposal bans have had greater success at diversion as discussed in the following section.

3.2 Policy Overview

3.2.1 Disposal Bans

To encourage even more source-separation and diversion without relying solely on variable tipping fees, many regional districts and municipalities implement disposal bans on recyclable and compostable materials. This is a low-cost policy tool used to signal to waste generators and waste collection companies that they are expected to separate and recycle/compost specific materials for which alternatives are readily available (e.g. cardboard, metal, yard waste).

Disposal bans are enforced at the point of disposal (i.e. at transfer stations and landfills) through the application of significant surcharges on garbage found to contain banned materials. To ensure sustained success, disposal bans require the local government to work closely with ICI waste generators and particularly commercial waste haulers in the design, start up and on-going maintenance of this policy. The RDN, whose disposal ban on cardboard was implemented in 1992, has a consistent approach whenever they introduce a new disposal ban:

1. **Regulate** (decide to ban a waste stream with a readily available alternative to landfilling)
2. **Collaborate** (work with affected stakeholders to determine the timing of implementation and the ramp up of enforcement measures)
3. **Educate** (make sure all haulers and waste generators are aware of the upcoming new disposal ban, and plan to communicate regularly)
4. **Enforce** (enforce the disposal ban at the point of disposal).

Approaches to Disposal Ban Enforcement

The approach to enforcing disposal bans has evolved over the last decade as regional districts have gained more experience with this policy tool. Enforcement is only one component of an integrated approach to implementing a disposal ban. As indicated in Figure 4-1, collaboration with waste haulers and generators is essential not only during the design of a disposal ban but also during implementation.

Many regional districts have discovered that the need to enforce a disposal ban is short-term and minimal if adequate up-front collaboration with waste haulers, supported by effective education of waste generators, results in diversion becoming "business-as-usual". In effect, waste haulers become the enforcers since the implementation of a disposal ban provides them with an opportunity to increase their market share if they can provide more cost-effective collection options to their customers.

Figure 3-1: Integrated Disposal Ban Design and Implementation

Nevertheless, local governments do need to provide some level of enforcement. With respect to disposal bans on cardboard, mixed waste paper and scrap metal, some local governments such as the Capital Regional District, who contract out disposal operations, have dedicated bylaw enforcement officers at the landfill inspecting loads at the working face and issuing fines if required. In the RDN, bans are enforced at the landfill by RDN equipment operators who notify a supervisor to inspect the load, take pictures and then advise the scale clerk to apply a surcharge to the

load. This information is then passed on to a Zero Waste Compliance Officer who follows up with the hauler and generator to educate then on compliance options.

It is important to note that the goal of the surcharge is not to make money for the regional district but to provide an opportunity to educate. In most cases the first infraction results in a warning while the second infraction results in a surcharge. However, based on experience, most infractions occur within the first six to twelve months of ban implementation after which fines are minimal as waste diversion becomes business as usual.

Metro Vancouver (MV) refined this approach with the introduction of their food scraps disposal ban in January 2015. From 2012-2013, MV planned their organics diversion strategy in collaboration with stakeholders and then released their implementation strategy in 2014. The strategy was based on a phased implementation approach as illustrated in Figure 5-1 below. Although the ban was effective January 2015, the first six months was considered as an education period with no surcharge on tipping fees. However, from July to December 2015, if a hauler arrived with a load at a transfer station or disposal facility containing more than 25% food scraps, a 50% surcharge was applied to their tipping fee. This 20% threshold was reduced to 10% in 2016 and then down to 5% in 2017.

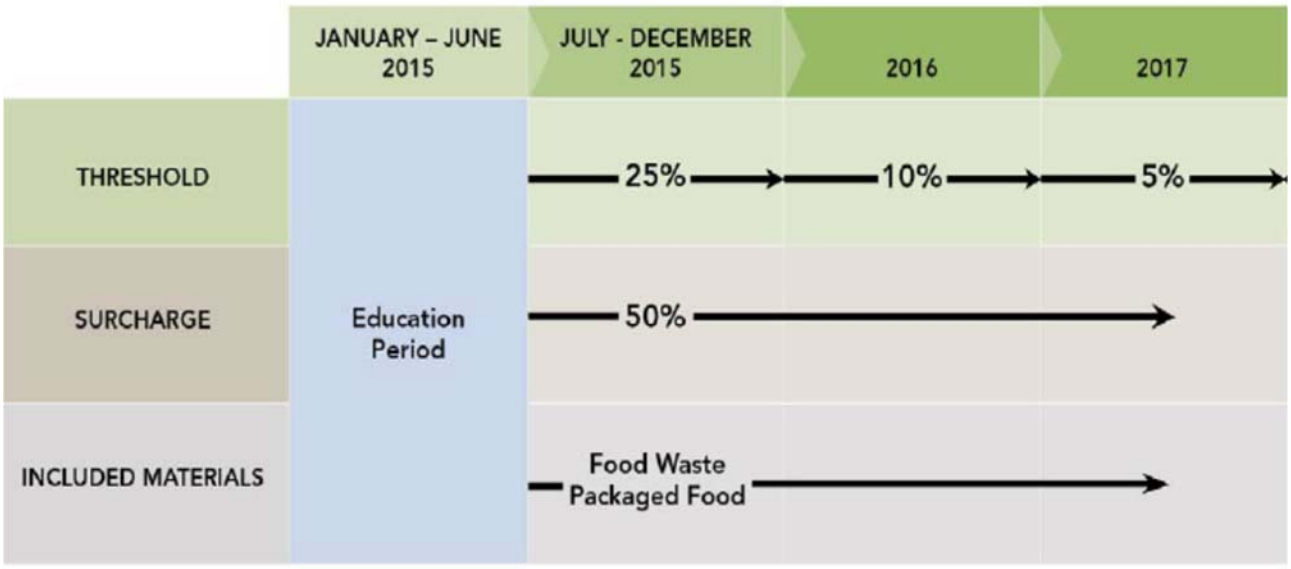

Figure 5-1: Metro Vancouver Organics Disposal Ban Phased Implementation

Although MV hired contracted enforcement staff at their facilities to inspect incoming loads for food waste, most regional districts have used their own staff to enforce disposal bans on a wide range of materials. This is because, as discussed above, enforcement activity is usually short-term while waste generators and haulers adjust to new waste management behaviours.

MV's phased approach was extremely successful and has been adopted by other regional districts as they introduce their own disposal bans. Most recently, in April 2017 the Regional District of Fraser-Fort George approved a commercial cardboard diversion program that will apply phased surcharges and thresholds to loads containing cardboard. This program will be implemented by regional staff.

3.2.2 Waste Stream Management Licensing

The BC *Environmental Management Act* (the Act) grants the authority and responsibility to manage all municipal solid waste and recyclables to the province's regional districts. As part of this authority, under Section 24 of the Act,

regional districts are responsible for developing and implementing SWMPs that provide long term visions for the management of municipal solid waste, including waste diversion and disposal activities.

For the purposes of implementing an approved SWMP, Section 25 of the Act contains provisions for the regulation of solid waste management facilities and haulers by regional districts. As per the Act, this tool can be used by regional districts, if they so choose, to regulate their local solid waste industry by achieving operational and administrative control over privately-owned and/or publicly-owned facilities and haulers managing recyclable material and municipal solid waste in their region.

The Act allows regional districts to create bylaws respecting the following:

- The types and quantities of waste materials managed at a site;
- The types and quantities of waste materials transported within the regional district (*haulers*);
- The operation, closure and post-closure of a waste management site;
- The fees and charges applied to waste management activities;
- The recording and submission of waste management information;
- The requirement to hold a license;
- The requirement to comply with a code of practice; and
- The requirement for operators of sites to obtain risk insurance or provide some form of security.

In particular, the Act allows for the licensing system to establish different prohibitions, conditions, requirements, and exemptions for different classes of sites, operations, activities, waste or recyclables. This means that each license can be case specific.

Therefore, waste stream management licensing is another potential tool for the RDNO to employ to assert control over the waste management system.

Licenses can be used to administer and enforce any bylaw developed by a regional district under the Act's authority. The Act provides for two types of licenses that a regional district can issue: a waste stream management license (WSML) issued to the owner or operator of a site that accepts and manages municipal solid waste; and, a hauler license issued to a hauler.

Regional Districts may choose to regulate their local solid waste industry for the following reasons:

- To ensure the diversion of recyclable material;
- To prevent abandonment of large quantities of solid waste or recyclable material;
- To track the movement of municipal solid waste and recyclable material;
- To assist in determining success in meeting waste reduction goals;
- To establish minimum administrative and operational requirements for facilities;
- To encourage private sector investment in waste management (through the establishment of a level playing field); and

- To protect the public interest by managing the flow of municipal solid waste to regional district facilities to ensure financial sustainability.

Examples of Regional Districts with Licensing Bylaws

MV introduced a regulatory program to ensure proper management of privately operated municipal solid waste and recycling facilities in their 1995 SWMP. These facilities are regulated by the Municipal Solid Waste and Recyclable Material Regulatory Bylaw which specifies operating requirements so as to protect the environment and public health, protect the region's land base in accordance with the host municipality's zoning and land use policies, ensure that regional, municipal and private facilities operate to equivalent standards, and to achieve the objectives of the MV Integrated Solid Waste and Resource Management Plan.

Under the Bylaw, licenses are required for the following types of privately owned facilities: disposal facilities; material recovery facilities, transfer stations, composting facilities, storage facilities and certain types of brokering facilities.

In another example, RDN and CVRD, working in partnership, adopted Waste Stream Management Licensing Bylaws No. 1386 (RDN) and 2570 (CVRD) in 2004. Under these bylaws, the RDN and the CVRD are authorized to license all private or non-government operated municipal solid waste diversion and recycling facilities within their respective regions.

The bylaws were established under the authority of both the RDN and CVRD SWMPs and were approved by the Ministry of Environment in 2005. The bylaws are a response to concerns by the recycling industry in both districts regarding competing businesses that operate with low standards. The photograph below shows one example of an undesirable operation competing with legitimate recycling operations prior to the establishment of a licensing system.

Pile of waste drywall being "stored" on private land in the CVRD

The bylaws create a level set of standards for the recycling and composting industry that protects private sector investment in local solid waste management infrastructure, and enhances diversion in the regions. They are also intended to shield taxpayers from the risk and expense related to clean-up of poorly operated and/or abandoned facilities. In both the RDN and the CVRD, the WSML bylaws help improve the quality of data received from private diversion and recycling facilities, as they are required to submit monthly material statements to the districts. Improved data reporting allows both the RDN and CVRD to effectively track progress towards their waste reduction goals and to plan future programs and program improvements.

In the three regional districts discussed above, the license application process includes a 45-day public consultation period for new applications. License applications are reviewed by staff; and if applications are acceptable, staff also issues the license. Any applicant or licensee affected by the staff decision may appeal the decision to the Board.

The three regional districts also operate their respective licensing systems on a self-financing basis, in that license application, amendment and annual administration fees have been designed to pay for the regulatory program. In MV, the application fees range from $500 to $5,000 depending on the type of facility, with an annual administration fee of $1,000 for all licensed facilities. In the RDN and CVRD system, license application fees range from $100 to $1,000 depending on the type of facility, with an annual administration fee of $100 - $500 depending on the type of facility.

All three regulatory schemes require staff time to review applications, inspect facilities and enforce license requirements. For the RDN in particular, staff time dedicated to the WSML bylaw, at 1 Full-time Equivalent (FTE) annually, exceeds the revenue generated by the system. However, the RDN reports that the documented diversion attributed to the WSML system has been worth the expense.

Nevertheless, as part of their SWMP Review, the RDN will be reviewing the fee structure contained in their WSML, to determine whether the fees should be adjusted to more accurately reflect costs.

3.2.3 Codes of Practice Bylaws

Code of Practice bylaws are another approach to facility regulation, that is similar to waste stream management licensing, but instead of licensing all solid waste management facilities, code of practice bylaws seek to establish operating standard *for a specific type* of solid waste facility. This is the approach the Capital Regional District (CRD) has undertaken with the development of the Composting Facilities bylaw and the Salt Spring Island Transfer Station bylaw.

This approach to facility regulation limits the authority to only those types of facilities that the CRD deemed necessary to assert some level of operating standards. As an example, the CRD implemented the *Salt Spring Island Transfer Station Regulation Bylaw 2810* in 2002. The purpose of the bylaw is to regulate and license the operation of facilities that are used for the management of municipal solid waste or recyclable material on Salt Spring Island (SSI). Under this bylaw, transfer stations must not contaminate ground or surface water or generate unacceptable levels of odour, vectors, litter or dust. This bylaw also requires performance security.

The bylaw was put in place to address the development of private sector transfer stations on Salt Spring Island to ensure that they met minimum desired operating standards and created a level playing field.

In summary, adoption of a waste stream management licensing or code of practice bylaw could provide the RDNO with tools that can provide a level of local government control over the operation of private sector solid waste facilities, and could also be used to diminish the potential for facilities that operate at a low standard.

3.2.4 Support Expansion of EPR Programs

EPR is a provincial policy tool that aims to shift the responsibility for end-of-life management of products (physically and economically) to their manufacturer and retailers (called “producers”) and away from local governments. This policy is intended to, among other things, create an incentive for producers to include environmental considerations in design of products.

Regional Districts can engage with the product stewards through facility agreements (collecting products for the stewards), program promotion, sharing knowledge and information and stewardship plan consultation. The RDNO

could take a hard stance or a more flexible and soft stance with respect to sharing the costs of managing the promotion, stockpiling, preparation for markets, and shipping of products that are the responsibility of EPR stewardship agencies (Stewards) in the region. The RDNO currently takes a fairly soft stance on supporting the stewards on and off the RDF sites. For example, the more recently implemented Major Appliances Program, the RDNO bares all the costs of Freon removal from the refrigerated appliances, moving the appliances from the drop off location to the stockpiles and managing the stockpiles. Fortunately this program is being amended so that costs are more shared with the steward. The SWMP should reflect how the RDNO wants to share in the responsibility of managing products with and for the Stewards, including continue to advocate for the continuation and expansion of product stewardship programs through Recycling Regulation enforcement and improvements; cover the full cost of program implementation; require an increased return for products in the program (i.e., from 75 to 100% especially for more established programs such as tires); and ensure that program access is readily available in more rural areas.

The Canadian Council for Ministers of the Environment (CCME) also continues to provide guideline updates for Canada-wide implementation of EPR programs. For example, products not yet in the BC Recycling Regulation that are recommended for Canada-wide EPR include carpet, textiles, and furniture. RDNO can continue to stay abreast of industry trends through conferences and annual updates as provided by the CCME and the BC Product Stewardship Council (BCPSC). There is also an opportunity to advocate for new programs through direct correspondence with the Ministry or through associations of which RDNO is a member (e.g., BCPSC). The management by the RDNO of materials such as mattresses, propane tanks and drywall through well managed programs presents an opportunity to justify the expansion of EPR to these materials.

4.0 ISSUES AND PLAN OPTIONS

4.1 Reduce, Reuse, and Recycling

This SWMP review process has identified issues and associated program and policy options available to reduce the current RDNO 500 kilogram per capital disposal rate. The issues and options are summarized below.

4.1.1 Option 1: Increase organics diversion

Issue: Almost 30% of the current waste stream is comprised of compostable organics.

A. Review and adopt an Organics Diversion Strategy based on the four options considered in the Organics Management Options Study to provide clear direction with respect to policy (disposal restrictions), collection (kitchen scraps or food and yard waste combined, universal collection or current municipal collection programs only); processing (public or private, in-region or out-of-region); and transfer out of region.

B. Develop an implementation plan for the organics strategy to address residential and ICI sectors.

C. Provide additional staff resources to consult with applicable stakeholders including municipal partners and solid customers, processors, and commercial haulers.

D. Implement the processing infrastructure component of the organics strategy.

4.1.2 Option 2: Reduce disposal from SF residential households

Issue: Not all households receive curbside garbage collection resulting in less diversion potential compared to a three-stream system (recycling, organics, and garbage).

A. Expand curbside garbage collection to all SF RES households that currently receive curbside recycling collection (Universal Collection). Consider clear bag options.

B. Implement a One Bag/Can Limit for SF RES households that currently receive municipal curbside garbage collection, expand to all SF RES households if Universal Collection is implemented.

C. Undertake a study to determine the demand for curbside collection of yard waste as well as the implications of switching to automated collection, for both SF RES and MF RES.

D. Implement a kitchen scraps collection program for SF RES households that currently receive municipal curbside garbage collection; expand to all SF RES households if Universal Collection is implemented. Implement a One Bag/Can Limit with every other week garbage collection service.

E. Design and implement behaviour change (education and promotion) programming using a community-based social marketing (CBSM) approach.

F. Provide additional staff resources to consult with municipal partners and customers to recommend policy decisions regarding implementation of universal curbside collection: number and location of households, trial areas, types of materials collected (kitchen scraps only or food and yard waste), type of cooperation with Recycle BC's Blue Box Program, and type of collection system (manual or automated).

4.1.3 Option 3: Reduce disposal from commercial haulers (ICI, Multi-family and C&D waste)

Issue: Over 60% of the current waste stream is collected through commercial haulers.

A. Review the effectiveness of the current level of application/enforcement of the Regulated Material (R03) recycling and disposal fee and consider implementing disposal bans on recyclable materials including kitchen scraps and addressing other existing bylaw policies such as secure loads. Consider use of a "regulate, collaborate, communicate, educate and enforce" model.

B. Review the impact of disposal bans on illegal dumping levels and implement an illegal dumping prevention and enforcement program if required.

C. Explore waste stream management licensing options to ensure a level playing field to support private sector market development for recycling materials.

D. Work with private sector to ensure markets for diverted materials, with a focus on wood and compost, by banning these items from disposal and encouraging the development of private sector infrastructure to process and market non-residential recyclable materials.

E. Design and implement behaviour change (education and promotion) programming using a CBSM approach.

F. Provide the additional staff resources to implement disposal bans, including enforcement and education, for MF RES in particular.

4.1.4 Option 4: Develop programs to actively promote waste reduction and reuse initiatives

Issue: There are currently insufficient programming and behaviour change resources to support the first levels of the pollution prevention hierarchy including rethink, reduce and reuse initiatives.

A. Continue to demonstrate backyard composting and deliver the Composter Rebate Program.

B. Continue to administer the Waste Reduction Initiatives Fund for not-for-profit organizations that need seed capital funding for new or amended programs.

C. Provide behaviour change and education programs including a kitchen scraps reduction campaign (e.g., Love Food Hate Waste).

D. Advocate with senior governments to support expansion of EPR programs (e.g., mattresses, carpet, textiles).

4.1.5 Option 5: Establish staff positions to develop, implement, and provide ongoing efficiency to ensure program effectiveness

Issue: No staff resources are currently committed to supporting and implementing residential and ICI waste reduction programs, including collection and diversion efforts.

A. Re-establish a waste reduction program planner to oversee the expansion to universal collection.

B. Establish a staff position that collaborates with key stakeholders, including haulers and businesses, and provides educational support and other services, including providing support for organics program development and implementation.

4.2 Residual Management

This SWMP review process has captured issues and potential solutions to address residual management over the next ten year period, as outlined below.

4.2.1 Option 1: Develop centralized disposal plan with additional landfill capacity

Issue: The Armstrong/Spallumcheen RDF (ASRDF) is reaching capacity, there are emerging and ongoing environmental issues at the ASRDF and Lumby RDF (LRDF), and additional land has been purchased beside the Greater Vernon RDF (GVRDF) to allow for mitigation of environmental issues and lateral expansion of the site, reconfiguration of the disposal system may be necessary to mitigate issues and increase efficiency in the system.

A. GVRDF – A conceptual design for a lateral expansion has been developed to extend the landfill footprint to the west of its current boundary resulting in a potential 30 years of additional disposal capacity. The current footprint is expected to last until 2059. The expansion will need to commence within the next ten years in order to secure a permit amendment from the Province. Major permit amendments can take five years or more and must be approved in the SWMP prior to the application stage.

   Regarding GVRDF access, the Ministry of Transportation and Infrastructure has a current project underway to address infrastructure challenges along the full corridor, including the section near the GVRDF. Congestion and routing issues can also be addressed by reducing the amount of traffic going to the site.

B. ASRDF – Unless waste reduction measures are enhanced significantly, it is expected that the current landfill capacity will be filled by 2027 (9 years). The planned phase one closure (north unlined section) will help mitigate environmental issues at this site starting in 2019. It is recommended that the landfill be closed as soon as the capacity is reached and a self-hauler transfer station be constructed, with all large loads (front load, rear and side load, and roll off trucks) going directly to the GVRDF. Options for waste transfer will be studied to determine the best overall option.

C. LRDF – The most financially sustainable model for landfill operation, environmental protection and closure warrants preserving landfill space at this site only for inert C&D waste with a transfer station put into place to accommodate self-haul loads only. The timing for this change should be determined within the next five years.

D. Hesperia Landfill – The City of Vernon has hired a consultant to help with regulatory compliance for their Hesperia Landfill (Upper Bench Row Road), which is operated by the City of Vernon as a demolition, land clearing, and construction material disposal facility. The landfill is authorized under Operational Certificate (OC) 15288 to dispose of up to 15,200 m3 of demolition and construction wastes, comprised of inert material such as clean fill and concrete, each year. The OC, which was issued by the Ministry in 1998, states that is in accordance with the RDNO SWMP. This landfill was included in the original SWMP, but is has not been included in any of the updates because RDNO was unaware that operations were on-going at this landfill. The City of Vernon has recently approached the Ministry to discuss amending the OC to increase the annual maximum discharge rate and to revise some of the OC clauses that are not necessarily applicable to their operations. The Ministry has also recommended that the City of Vernon seek a formal amendment for these changes. However, for the Ministry to consider an amendment, the landfill needs to be included in the RDNO's regional SWMP.

4.2.2 Option 2: Prepare a disaster response plan

Issue: The RDNO has no debris management plan.

A. Address disaster response waste (e.g., docks, Styrofoam, sandbags, burned buildings, fires) – Ensure solutions for disaster materials management are developed before a disaster occurs so systems can be put into place to manage the rapid increase in materials that are often generated after a disaster. This effort is likely to need inter-departmental collaboration and resource sharing.

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6.0 CLOSURE

We trust this technical memo meets your present requirements. If you have any questions or comments, please contact the undersigned.

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Attachment (1): Tetra Tech's Limitations on the Use of this Document

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APPENDIX C

REGIONAL SOLID WASTE MANAGEMENT PLAN MONITORING WORKING GROUP, DRAFT TERMS OF REFERENCE

The Regional Solid Waste Management Plan Monitoring Working Group (PMWG) will be established by the RDNO Board and the Terms of reference will be adopted through the RDNO Board. The following are preliminary Terms of Reference.

1. Purpose and Scope

   The purpose of the PMWG is to advise the RDNO Board and staff on the implementation of the Solid Waste Management Plan. Tasks include:

   - Reviewing information related to implementation of the plan, including waste quantities, populations, and diversion rates for each plan component
   - Advising on each major plan review which will occur every five years
   - Providing recommendations regarding disputes arising during implementation of the plan that pertain to:
     - interpretation of a statement or provision in the plan, or
     - any other matter not related to a proposed change to the actual wording of the plan or an operational certificate
   - Ensuring adequate public consultation in matters that could significantly affect the public such as the opening or closure of local landfills and transfer stations.
   - Reviewing new facility applications and making recommendations to the Board

2. Authority

   The group makes recommendations to the RDNO Board via the Committee of the Whole. The Board is the final authority on decisions.

3. Membership

   The group shall consist of no more than 15 members appointed by the RDNO Board. Membership shall include representation of the various stakeholder groups.

   Memberships are for two-year periods, and may be renewed for up to two additional terms. (Membership should be staggered for two-year terms.)

4. Meeting arrangements

   - The Chair and Vice-Chair are elected annually from amongst the voting membership.
   - The group will meet at least once annually or at the call of the chair. Meetings will take place at the RDNO Boardroom unless otherwise specified. Members are expected to attend in person unless arrangements are made to participate by phone or online (e.g., via Skype).
   - Quorum shall be a minimum of 50% plus 1 voting members
   - The RDNO is responsible for taking minutes. Draft minutes are approved by the group at its next meeting.
   - The RDNO will prepare agendas in consultation with the Chair and Vice-chair. Agendas will be sent to PMWG members by email one week before the meeting and posted on the RDNO website.

- All group members are equal and have equal opportunity to contribute at meetings, and must respect the opinions of others.
- Members are encouraged to work collaboratively and to be committed to reaching consensus where possible, considering the best interests of the community. Any members unable to agree with the decision may have their objections noted in the minutes.
- Members who miss three consecutive Group meetings may have their membership revoked at the Board's discretion.
- In any proceeding, members must declare any real or perceived conflict of interest. The member involved should excuse themselves from proceedings that relate to the conflict unless explicitly requested to speak, on a majority vote to do so. Any subsequent information provided by the member will clearly be identified in the minutes as coming from a source perceived to be in a conflict of interest.
- Regular communications between meetings is by email or other acceptable form of electronic communication.
- Members of the public may observe meetings but will not have voting rights or speaking rights unless invited to speak by the Chair.

5. Reporting

   The group reports to the RDNO Committee of the Whole. Meeting minutes are provided to the Board of Directors and Board representatives that participate on the PMWG are expected to provide regular updates to the Board of Directors.

6. Resources and budget

   RDNO provides the meeting space and any refreshments, and staff to take minutes. Funds for any projects are from the general Solid Waste Managementn budget and subject to normal budgetary review and approvals.

   Participation in the committee is voluntary and there is no remuneration for members' time. Group members will be reimbursed for travel costs (mileage) in accordance with the kilometer rate set out in the current Director Remuneration and expense bylaw.

7. Deliverables

   The group shall provide:

   - An annual report on the implementation of the plan with staff assistance
   - Recommendations to the Board on changes required to the plan implementation.

8. Review

The terms of reference will be reviewed every year and updated as required. Changes to the terms of reference must be approved by the Board.

APPENDIX D

PLAN DISPUTE RESOLUTION PROCEDURES

The parties will make all reasonable efforts to attempt to resolve the dispute in an amicable manner without outside intervention. The Ministry of Environment and Climate Change Strategy does not become involved in resolving or making a decision in a dispute.

This dispute resolution procedure may apply to the following types of conflicts:

- Administrative decisions made by RDNO staff
- Interpretation of a statement, bylaw, policy or provision in the plan
- The manner in which the plan or facility Operational Certificates are implemented
- Any other matter not related to a proposed change to the wording of the plan or Operational Certificate.

Collaborative Decision Making and Dispute Resolution Procedure

Negotiation	▪ Parties involved in the dispute make all efforts to resolve the dispute on their own. ▪ Parties may make use of a facilitator
Plan Monitoring Working Group (if appropriate)	▪ Parties involved in the dispute will have opportunity to speak to the group ▪ Group will review, consider and provide recommendations to the Board
Board	▪ Parties involved in the dispute will have opportunity to speak to the Board ▪ Board will receive recommendations from the Working Grouip and settle the dispute; or, recommend mediation
Mediation	▪ Parties involved in the dispute agree on a mediator. If the parties cannot agree on a mediator, the matter shall be referred to the BC Mediation Roster Society of equivalent roster organization for selection of a mediator ▪ All efforts will be made to reach an agreement throughout mediation ▪ Costs for mediation are shared by the parties in dispute
Independent Arbitrator	▪ If the dispute cannot be resolved by a mediator, the matter will be referred to arbitration and the dispute will be arbitrated in accordance with the *Local Government Act* or *BC Commercial Arbitration Act* ▪ The arbitrator shall make a final, binding decision ▪ Costs for arbitration shall be apportioned at the discretion of the arbitrator

APPENDIX E

RDNO ORGANICS MANAGEMENT OPTIONS REPORT 2017

Carey McIver & Associates Ltd.

ENVIRONMENTAL CONSULTANTS

Regional District of North Okanagan

Organics Management Options Study

Draft for Discussion

Prepared by:

Carey McIver & Associates Ltd.

In Collaboration with:

Maura Walker & Associates

XCG Consulting Limited

Date: May 2017

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1 Introduction

Diverting organic waste from landfill disposal is a significant solid waste management issue in BC. This is because organic waste, comprised primarily of wood waste, yard waste, and food waste, not only represents the largest component of landfilled waste (35-40%), but also generates methane, a potent greenhouse gas, during decomposition in a landfill.

The Regional District of North Okanagan (RDNO) has been progressive and proactive in implementing policies and programs to divert wood waste and yard waste from landfill disposal. The RDNO has also acted to mitigate landfill methane emissions by constructing a landfill gas management system at the Greater Vernon Recycling and Disposal Facility.

Although there has been significant progress in diverting wood and yard wastes from landfill disposal, the RDNO has yet to consider the viability of expanding their organics diversion programs to include food waste. This initiative was identified under the Organic Waste Management Strategy contained in the 2011 Solid Waste Management Plan (SWMP) Update as an action to be considered for implementation within the next 10 years.

The RDNO is about to embark on a review of the implementation and effectiveness of their 2011 SWMP to ensure that it reflects current regional district needs as well as current market conditions, technologies and regulations. In accordance with the current Organic Waste Management Strategy, the viability of expanding existing organics diversion programs to include food waste is a significant component of the SWMP review process.

Expanded organics diversion is also essential to meeting the Province's new solid waste management goals: to lower the provincial municipal solid waste (MSW) disposal rate to 350 kilograms per person annually and to have 75% of the BC's population covered by organic waste disposal bans. To meet these goals the MOE is proposing that regional districts, as part of their SWMP process, adopt as a guiding principle, preventing organic waste including food waste from going into the garbage wherever practical.

In advance of the SWMP review, the RDNO engaged XCG Consulting Ltd. (XCG), in collaboration with Carey McIver & Associates Ltd. (CMA) and Maura Walker & Associates (MWA), to undertake a Facilities Life Cycle Cost Assessment and Organics (Food Waste) Management Options Study for the RDNO solid waste management system. The purpose of the study was to develop a full list of options and then select at least four viable food waste diversion options and then determine the financial impact of each option on the RDNO solid waste management system relative to the status quo.

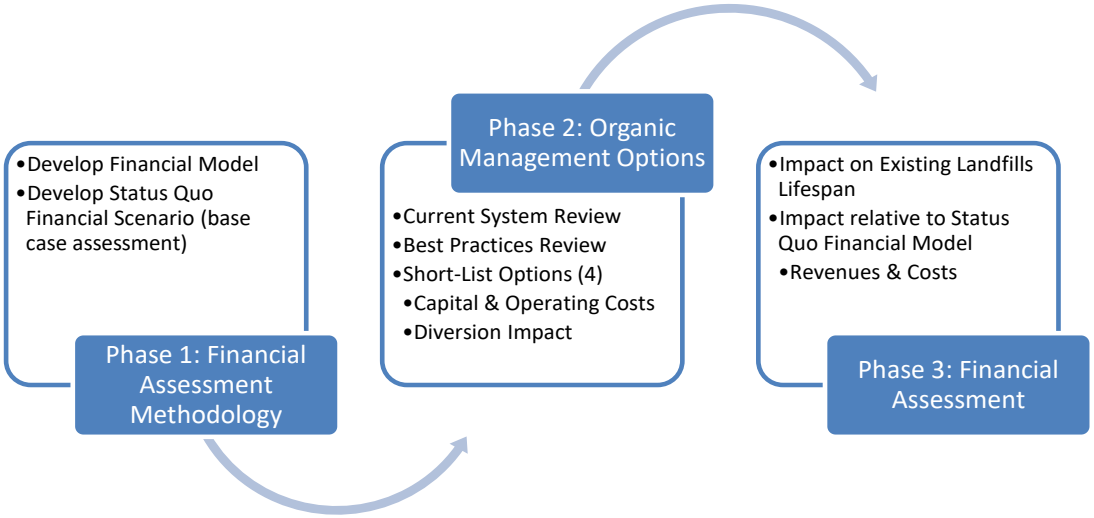
The RDNO has been very successful in reducing the regional MSW disposal rate to 500 kilograms per capita in 2016. This amount exceeds the target of 550 kilograms per capita set in the 2011 SWMP and is only slightly higher than the 2015 provincial average of 497 kilograms per capita (2016 provincial data is not yet available).

However, to contribute to the Province meetings its new targets, the RDNO will need to add food waste to their existing organics diversion programs. It is intended that the diversion options and associated financial impacts identified in this study will provide the information required to assess the practicality of diverting food waste from landfill disposal in the RDNO.

1.1 Objectives and Methodology

To determine the impact of organic (food) waste diversion on the current RDNO solid waste management system, the study was undertaken in three phases as described in Figure 1-1.

Figure 1-1: Project Methodology



In Phase 1, XCG determined the best methodology to carry out the financial analysis. In Phase 2, CMA and MWA developed four options to best manage organics (food waste) in the region for the next 10 years. In Phase 3, XCG ran the financial analysis for each of the four organics management options plus status quo (baseline scenario) to determine the impact of the options on the RDNO solid waste management system.

1.2 Overview and Structure of the Report

This report describes Phase 2 of the project: the development of four viable organics (food waste) diversion options for inclusion in the financial impact assessment (Phase 3). The report is structured as follows. Section 2 outlines the organics management strategy contained in the 2011 SWMP update as well as the implementation status of the strategy. Section 3 provides examples of best practices in organics management in BC which have informed the new Ministry of Environment (MOE) Service Plan targets for organic waste management. Section 4 outlines the organics management opportunities available in the RDNO including feedstock quantities, processing capacity and reduction, collection and transfer options. Section 5 provides a long-list of organics management options. Section 6 provides the short-list of four options including the development of evaluation criteria and the selection process. Section 7 provides a summary and conclusion to study.

2 Organic Waste Management in the RDNO

Reducing and diverting organic waste from landfill disposal has been an integral component of the RNDO solid waste management planning process. The RDNO developed their first SWMP in 1996 and has reviewed and updated the plan several times since then. A waste composition study completed in 2005 confirmed that organic waste represented the largest component of waste being landfilled in the region. Consequently, in 2008, the RDNO retained CH2M Hill to prepare an organic waste management strategy. This strategy underwent a public review process and was approved as part of the 2011 SWMP Update. The following sections describe the components and implementation status of this strategy.

2.1 2011 Organic Waste Management Strategy

The Organic Waste Management Strategy contained in the 2011 SWMP Update includes a range of initiatives and programs for implementation within a 10-year time-period. Table 2-1 outlines the individual actions and implementation schedule contained in the 2011 strategy.

Table 2-1: 2011 Organic Waste Management Strategy & Implementation Schedule

Component		Program Details
	Within 0-2 Years	
1	**Natural Landscaping and Yard Care Program**	RDNO will continue to promote natural yard care (e.g. xeriscaping, herbicide reduction, grass-cycling) as a means of reducing yard waste generation
2	**Master Composter Program**	Develop a Master Composter program, possibly with neighbouring regions, to encourage backyard composting of yard wastes, thereby reducing the impacts on the regional infrastructure. Through periodic workshops (including "Train the Trainer) offered at the Compost Demonstration Garden (Xerindipity) and educational resources, the program will teach appropriate methods of composting suitable for RDNO climate and conditions.
3	**Backyard Composter/ Vermicomposter Incentive Program**	Determine the effectiveness of the existing composter sale held bi-annually to see if more subsidized sales are warranted.
4	**Mandatory Yard Waste Separation**	Periodically inspect loads of refuse to determine if yard waste is being disposed and apply surcharges as per the Municipal Solid Waste Management Bylaw
5	**Expanded Yard Waste Drop-Off Network**	Determine the possibility of expanding the existing network of yard waste drop off depots by providing three new drop-off depots in Coldstream, Enderby and north end of Vernon.

	Component	Program Details
6	**Expanded Christmas Tree Collection Program**	Determine the possibility of providing a drop-off service in Enderby, Lumby, Spallumcheen and Armstrong.
7	**Improved Wood Waste Segregation Program**	Segregate wood and yard waste at recycling and disposal facilities (RDF) into its most useful components for existing operations and programs: small debris for composting directly, large branches, clean wood, dirty wood, stumps and logs.
8	**Regional Yard Waste Composting Facility**	Construct the planned facility at the Greater Vernon Recycling and Disposal Facility (GVRDF) and produce a good quality marketable product. Cost recovery through GVRDF user fees should be the primary funding mechanism.
9	**Promote Development of Private Facilities**	Provide waste characterization information to private food waste composting facility developers, and establish policies and bylaws to provide a framework for facilities to operate within (e.g. Waste Stream Management Licenses)
10	**Mulch Production (Feasibility Study Only)**	Assess the demand for mulch in the region and if positive then determine the possibility of filling the demand using clean wood waste received at RDFs.
11	**Regional Coordination of Wood Waste Management**	Work with adjacent jurisdictions to coordinate wood waste uses and supply contracts to reduce competition for existing markets
	Within 3-5 Years	
12	**Periodic Yard Waste Collection Programs**	Facilitate curbside collection in all population centres, including expanding the collection period and ensuring consistent specifications.
	Within 5-10 Years	
13	**Seasonal Yard Waste Collection Programs**	Facilitate enhanced curbside collection in all population centres, including expanding the frequency (more seasons) and adding other organics such as food waste.
14	**Expanded Regional Composting Initiative for Food Scraps**	Once the regional composting facility is functioning well, determine the feasibility of adding other organics such as specific food scraps to this facility or if a separate facility should be built or used on a contract basis (private facility)

2.2 Current Organic Waste Management System

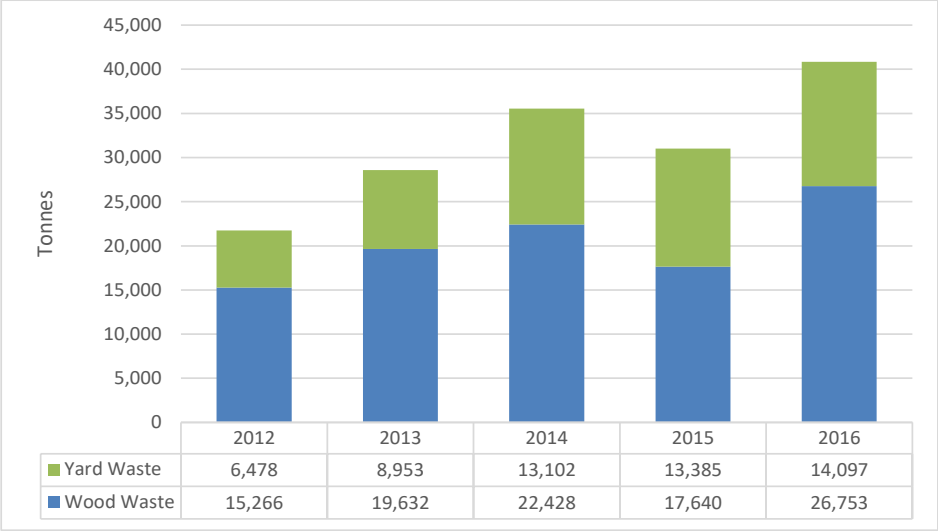
Since the 2011 Plan Update the RDNO has implemented many of the reduction, collection and processing initiatives identified in the Organic Waste Management Strategy. With respect to reduction, the RDNO provides information on their website regarding backyard composting and grass-cycling, operates a backyard composter rebate program and provides support to Xerindipity, an outdoor environmental education centre. Xerindipity showcases composting, natural lawn care, pesticide free gardening, water-wise gardening, worm composting and xeriscaping.

To support the source separation of yard and wood wastes, under the RDNO Municipal Solid Waste Management Bylaw 2659, wood waste and yard waste have been classified as regulated materials, meaning that any loads of refuse containing these organic materials are charged at more than double the refuse tipping fee. As of July 1, 2016, the surcharge for loads containing regulated materials was $203 per tonne compared to the regular refuse rate of $100 per tonne. However, if customers deliver source separated loads of these materials, yard waste is free of charge and the tipping fee for wood waste is currently $20 per tonne.

The organics waste management collection system in the RDNO is based on residents and businesses delivering their yard and wood wastes to the either the Greater Vernon Recycling and Disposal Facility (GVRDF), the Armstrong Spallumcheen Recycling and Disposal Facility (ASRDF), the Lumby Recycling and Disposal Facility (LRDF) or two small transfer stations: Cherryville Recycling and Disposal Facility and Kingfisher Recycling and Disposal Facility.

Due to the regulated waste policy and tipping fee structure described above, as indicated in Figure 2-2, the quantities of source separated wood and yard wastes delivered to RDNO facilities has been increasing over the last five years.

Figure 2-1: Wood & Yard Waste Diversion 2012-2016



	2012	2013	2014	2015	2016
Yard Waste	6,478	8,953	13,102	13,385	14,097
Wood Waste	15,266	19,632	22,428	17,640	26,753

Although yard waste quantities have been increasing steadily over the last five years it is important to note that the quantity of wood waste received on an annual basis is more affected by local economic activity and the existence of private sector alternatives than for yard waste.

Wood waste delivered to the RDNO facilities is chipped and used primarily as landfill cover (50/50 wood/soil) but also as bio-cover on top of intermediate cover to improve aesthetics and odour.

With respect to yard waste, regional yard waste composting operations at the GVRDF began in the spring of 2012. The composted and screened yard waste, known as rdno•gro is used for various landscaping projects in the region as well as for landfill closures. Limited quantities of rdno•gro are also made available to residents for personal use, free of charge.

With respect to yard waste collection programs, as indicated in Table 2-4, there are currently no regular weekly curbside collection services for organics, either yard or food wastes, in the RDNO. Curbside garbage collection is also not universal in the region, where only the municipalities of Vernon, Armstrong, Enderby and Lumby provide curbside garbage collection services to their residents. However curbside recycling services are available to most of the households in the region, except some very rural homes.

Table 2-2: Residential Curbside Collection Services in the RDNO

Service Area	Population 2011	Households 2014	Regular Curbside Collection Service		
			Garbage	Recycling	Organics
Municipal					
Vernon	38,150	17,381	Yes	Recycle BC	No
Coldstream	10,314	3,980	No	Recycle BC	No
Spallumcheen	5,060	1,820	No	Spallumcheen	No
Armstrong	4,815	2,099	Yes	Recycle BC	No
Enderby	2,932	1,063	Yes	Recycle BC	No
Lumby	1,731	759	Yes	Recycle BC	No
Sub-Total	63,002	27,102			
Electoral Areas					
Electoral Area B	6,248	1,376	No	Recycle BC	No
Electoral Area C	3,872	1,342	No	Recycle BC	No
Electoral Area D	2,848	492	No	Recycle BC	No
Electoral Area E	939	335	No	Recycle BC	No
Electoral Area F	4,328	876	No	Recycle BC	No
Sub-Total	18,235	4,421			
TOTAL	81,237	31,523			

The City of Vernon provides a leaf collection service in the spring and fall over a one week period as well as a spring chipping program conducted over a two- week collection period. Enderby, Lumby and Armstrong and Spallumcheen (3 subdivisions only) also provide a one-day only spring and/or fall yard waste collection service.

The RDNO offers free tipping at their five RDFs for yard waste under 20 cm in diameter year-round as of January 2016. In previous years the free tipping of yard waste occurred in the spring and fall for six weeks only in order to supplement and augment municipal programs and to reduce open burning.

The reduction, policy, collection and processing initiatives described above have contributed to a regional waste disposal rate of 469 kilograms per capital in 2015 with a slight increase to 500 kilograms per capita in 2016. This rate meets the target of 550 kilograms per capita contained in the 2011 Plan Update.

However, to reduce the regional disposal rate any further, the RDNO will need to consider other initiatives including an expanded regional composting initiative for food waste as recommended in the 2011 Organic Waste Management Strategy.

3 Best Practices Review

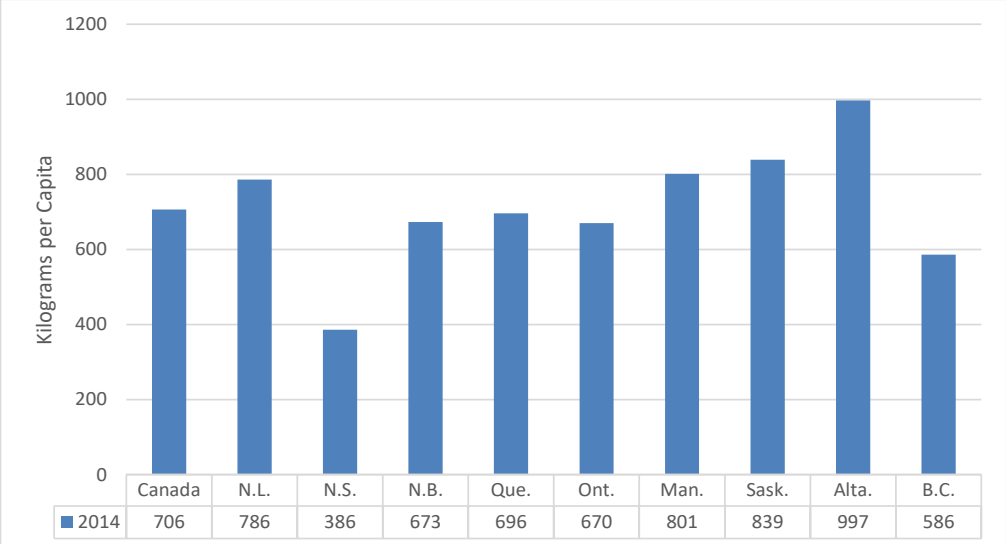
The RDNO does not need to look beyond BC to find examples of best practices in organic waste management. Municipal solid waste management (MSW) is an important environmental issue in BC. Over the last twenty-five years a dynamic system has evolved that provides efficient and effective MSW management services in the province. The following sections provide data on how the MSW management system in BC outperforms systems in similar jurisdictions as well as examples of best practices implemented by local governments in BC that could be applicable to the RDNO.

3.1 MSW Management System Performance in BC

This MSW management system in BC is guided by goals established by the Ministry of Environment (MOE) that aim to maximize waste reduction and diversion in the province. These ambitious goals, initially to reduce MSW disposal by 50% by the year 2000, and currently to reduce the provincial disposal rate to 350 kilograms per capita by 2020, have resulted in a MSW disposal rate that is significantly lower than systems in other provinces.

According to the Statistics Canada Waste Management Industry Survey for 2014, BC has the second lowest per capita MSW disposal rate in Canada. As indicated in Figure 3-1, the only province with a lower disposal rate was Nova Scotia, where organics have been banned from landfill disposal for the last decade.

Figure 3-1: Per Capita Disposal Rates for Canada and Selected Provinces 2014

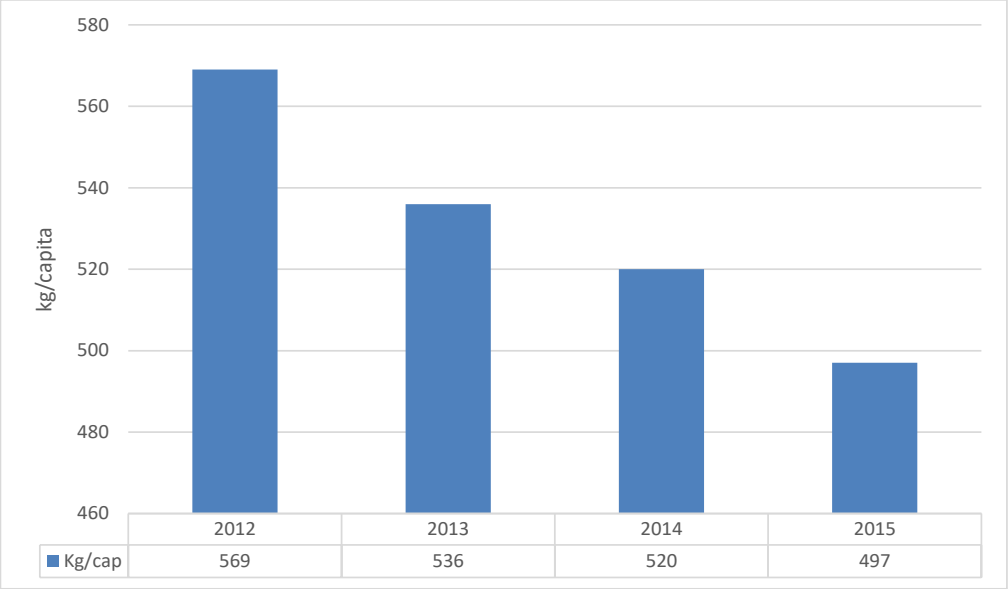


Source(s): Statistics Canada Disposal and Diversion of waste, by province and territory (Waste Disposal Per Capital) CANSIM tables 051-0001 and 153-0041(accessed May 2017)

Statistics Canada collects the BC disposal data from regional districts every two years and aggregates the results to the provincial level. Individual regional district data is not provided in the bi-annual reports. To provide more reliable and consistent annual data on MSW disposal by regional district, in 2012 the MOE developed the BC Waste Disposal Calculator. The reporting methodology in the BC Calculator is identical to that used by Statistics Canada to ensure comparability between systems.

The BC Waste Disposal Calculator is an on-line reporting tool that has so far collected MSW disposal data for 2012, 2013, 2014 and 2015. The results of each year's data call are posted on Environmental Reporting BC. Figure 3-2 illustrates the results reported to date.

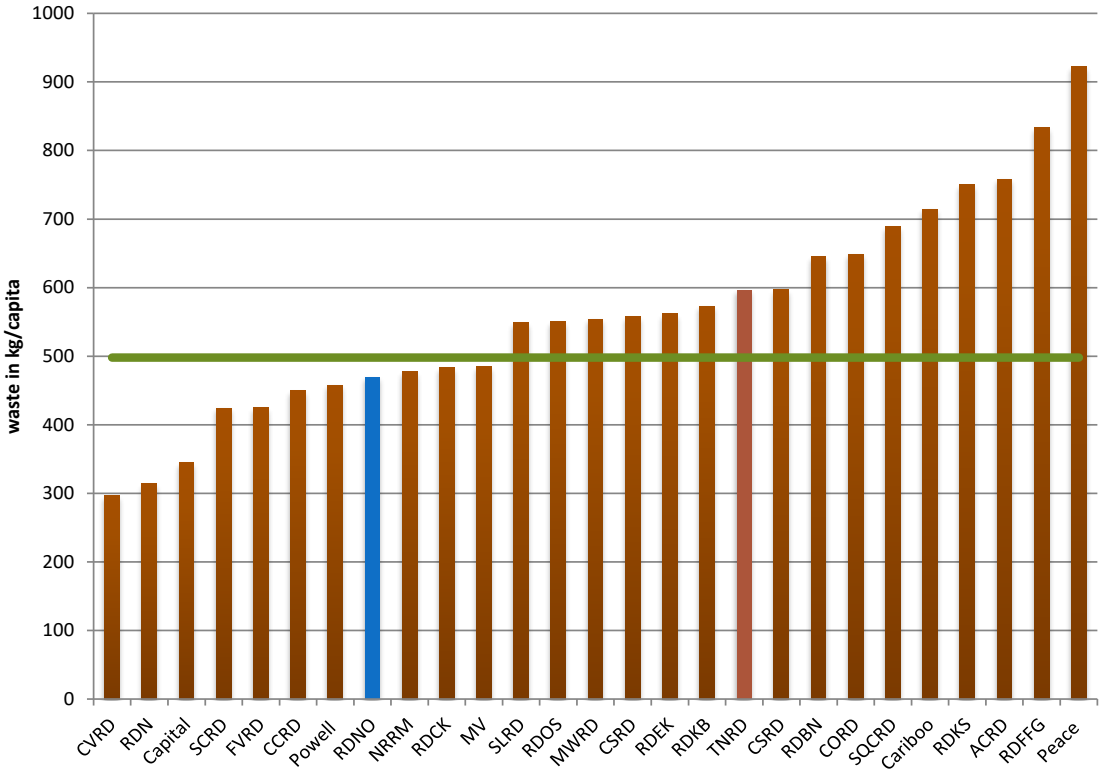
Figure 3-2: Per Capital Disposal Rate for BC 2012-2015



These results are also comparable to disposal reporting in the "green" State of California. According to the California Department of Resources Recycling and Recovery (CalRecycle) disposal reporting system, in 2014 California had a state-wide disposal rate of 745 kg compared to the Canadian disposal rate of 706 kg per capita reported by Statistics Canada. At 520 kg per capita for the provincial waste stream, British Columbia`s MSW management system outperformed this leading North American jurisdiction.

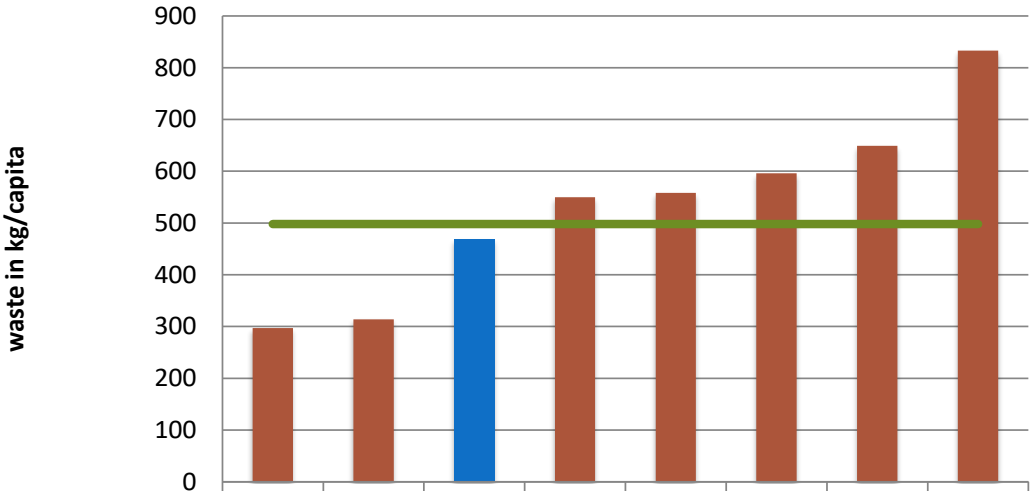
Individual regional district data for 2015 is presented in Figure 3-3 and indicates that at a reported 469 kilograms per capita, the 2015 disposal rate in the RDNO was less than the provincial average of 498.

Figure 3-3: Regional District Disposal Rates 2015



As indicated in Figure 3-4, the MSW management system in the RDNO also performs well when compared to regional districts with similar population and level of economic activity. However, there are still two regional districts with better performance: the Cowichan Valley Regional District (CVRD) and the Regional District of Nanaimo (RDN).

Figure 3-4: Disposal Rates in Regional Districts with Similar Populations 2015



	CVRD	RDN	RDNO	RDOS	CSRD	TNRD	CORD	RDFFG
Disposal Rate	297	314	469	550	558	596	649	833
BC Average	498	498	498	498	498	498	498	498

The difference in disposal rates can be attributed, in large part, to the implementation of organics diversion strategies in these two Vancouver Island regional districts. In 2006, both the CVRD and RDN introduced bans on the disposal of commercial organic wastes to reduce GHG emissions, preserve landfill capacity and reduce waste export disposal costs. Residential collection programs followed roughly 5-7 years later in both those regional districts.

In 2015, the Capital Regional District and Metro Vancouver implemented organics disposal bans from both the commercial and residential sector. As a result, in 2015 roughly 66% of the population of BC was covered by an organic waste disposal ban. There are also numerous municipal collection programs in regional districts that have not implemented disposal bans (e.g. Grand Forks, Abbotsford, and Comox). Consequently, with respect to best practices in organic waste management, these BC local governments can provide practical and effective examples to other regional districts wishing to maximize their waste reduction efforts.

3.2 Best Management Practices and Innovations in BC

In 2014, on behalf of the MOE, Maura Walker & Associates (MWA), developed a set of case studies on best management practices by local governments in BC to reduce and recycle organic wastes. These case studies are posted on the MOE website (http://www2.gov.bc.ca/gov/content/environment/waste-management/recycling/organics/organics-case-studies). Applicable best practices are summarized below to provide input to the development of organic management options in the RDNO. Best management practices that have been introduced since the development of the MOE case studies are also included.

3.2.1 Reduction Programs

Metro Vancouver -Love Food Hate Waste

Based on research in Europe and North America, RDNO residents may be wasting about 25 percent of all the food and drinks that they purchase. Metro Vancouver's Love Food Hate Waste Program aims to change this behavior through educating consumers about meal planning, and careful cooking and storage, so that consumers can enjoy eating over half of the food that they currently end up throwing away. Metro Vancouver has stated publicly that they are willing to share this program with other regional districts. The BC Ministry of Environment will also provide the US EPA's "Food Too Good to Waste" toolkit to regional districts at no charge. The RDNO could implement either one of these programs at a relatively low cost.

North Shore Recycling Program Compost Coaching

The former North Shore Recycling Program (NSRP) focused on waste reduction, recycling and composting for three municipalities along the North Shore in Vancouver. The NSRP was disbanded in 2015 when Recycle BC assumed responsibility for curbside recycling in the three municipalities. The Compost Coaching program was started in 2007 to reduce organics in the waste stream. A pilot program was conducted in 2008–2009 with full implementation in 2011–2013. The program addressed the Metro Vancouver goal of 70% diversion by 2015.

Compost Coaching is an outreach program that focuses on helping residents compost in their own backyards. The program looked at how much material was composted before and after the training, as well as how much waste was produced per household. Using a Community-Based Social Marketing (CBSM) approach, in the first year 156 residents learned how to improve their composting skills through hands on coaching at their residences. This coaching resulted in an additional 36 kg/capita/year of organic material composted on site for households that were already composting and 190 kg/capita/year for households that had not composted before.

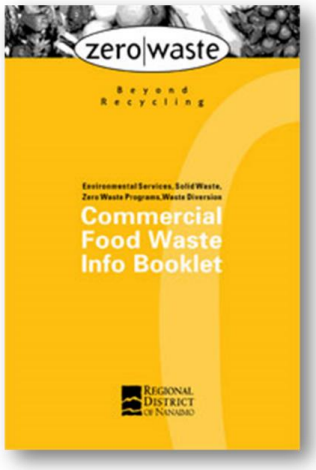
Households that participated in the program improved their composting skills, produced higher quality compost in a shorter time and reduced hazard from bears and pests.

3.2.2 Disposal Policies

Regional District of Nanaimo Commercial Food Waste Ban

A waste composition study completed in 2004 confirmed that 35% of total waste sent to landfill was compostable organic material. Consequently, in June 2005, in accordance with the RDN's Zero Waste Plan (2004) and the Organics Diversion Strategy (2005), the RDN introduced a landfill ban on the disposal of food waste from all commercial premises.

This ban was developed and implemented in collaboration with waste haulers, commercial food waste generators and composting companies. This collaborative approach ensured that all stakeholders had advanced notice of this important zero waste initiative.



In particular, waste haulers and their customers were encouraged to devise cost effective systems to comply with the ban that met their individual situation. The RDN's role was to facilitate communication, innovation, competition and compliance, but not get involved in direct program delivery. Enforcement consists of load inspections and surcharges at disposal facilities by staff as well as on-site education and compliance checks by the RDN's Zero Waste compliance officer.

Program results have been positive and economical. As a regulator, the RDN does not pay for collection or processing costs, consequently, at an in-house cost of $15 per tonne per year, the commercial organics ban has been an extremely cost-effective local government waste diversion initiative. In 2006 (the first year of the disposal ban on commercial food waste), over 4,200 tonnes of commercial food waste was diverted from disposal representing a recovery rate of 48% of the organic material in the waste stream and a reduction of 30 kg per capita.

Diverting this waste from disposal also contributed to reducing the RDN disposal rate from 553 kg per capita in 2005 to 517 kg per capita in 2006. However, since then this amount has levelled off to an average of 3,400 tonnes annually, which represents a recovery rate of 33% and a reduction of 21 kg per capita per year. Nevertheless, the commercial food waste ban and the organics diversion strategy are recognized as the one of the most significant contributors to the RDN's per capita disposal rate of 350 kg in 2012.

Capital Regional District Kitchen Scraps Diversion Strategy

In 2012, the Capital Regional District (CRD) approved a Kitchen Scraps Diversion Strategy that applied to both residential and commercial sectors. The strategy was phased-in over two years. From 2013-2014 the CRD offered an incentive for haulers to deliver kitchen scraps to approved facilities. In January 2015, the strategy culminated with a full disposal ban on kitchen scraps delivered to the Hartland Landfill. For the ICI sector, private haulers are required to provide food scraps collection services while the residential sector is serviced by a mixture of municipal and private collection services.

Although the CRD had originally secured processing capacity at a private facility in the region, due to odour concerns this option was discontinued and instead food waste is currently transferred to several out-of-region processing facilities. In the meantime, the CRD is investigating options for processing food wastes at the Hartland Landfill. Due to the introduction of the CRD Kitchen Scraps Diversion Strategy, the disposal rate in the CRD was 345 kilograms per capita in 2015.

Metro Vancouver Organics Disposal Ban

Metro Vancouver (MV) also introduced a disposal ban on organics in 2015. From 2012 to 2013 MV staff undertook stakeholder engagement and readiness surveys to inform their detailed planning for an organics disposal ban. In 2014, they announced the Organics Ban Implementation Strategy and continued consultation initiatives prior to the ban effective date of January 2015.

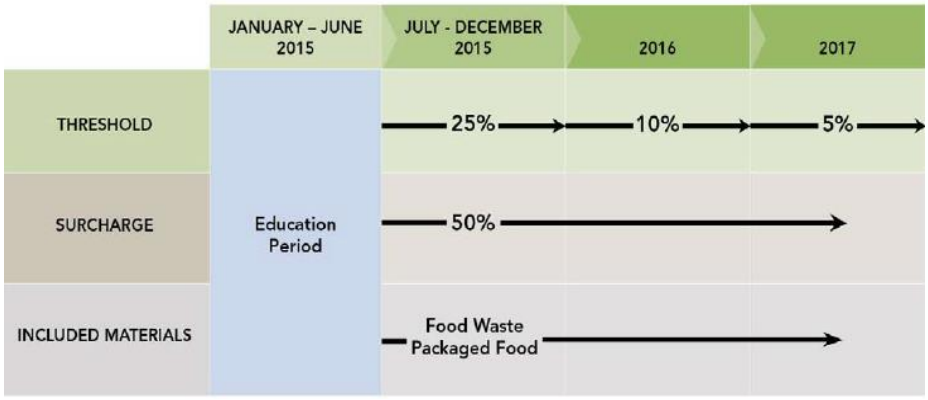
One of the successful components of the Metro Vancouver organics ban was the phased implementation schedule. As indicated in Figure 3-6, for the first six months after the ban was effective, there were surcharges or penalties applied to loads containing any amount of food waste.

However, following this six-month education period, for the next six months of 2015 any loads containing more than 25 percent food waste were subject to a surcharge of 50% of the MSW tipping fee. The threshold was then reduced to 10 percent in 2016 and 5 percent in 2017.

This declining threshold concept was fully supported by private sector haulers in Metro Vancouver because it allowed them to market their food waste collection services as a “carrot” with the declining threshold as a “stick” to ensure that their customers added separate food waste collection to existing garbage collection service.

Because of the Organics Disposal Ban the per capita disposal rate in Metro Vancouver declined from 520 kilograms per capita in 2014 to 485 kilograms per capita in 2015.

Figure 3-5: Metro Vancouver Organics Disposal Ban Phased Implementation Schedule



3.2.3 Collection Programs

RDN Green Bin Collection Program

The RDN Zero Waste Plan identifies organics diversion as the primary means to reach the goal of 75% diversion from landfill. Commercial and residential food waste diversion programs are essential to achieving this target. The Green Bin Program, a partnership of the RDN and its member municipalities, provides collection service to over 55,000 single-family households throughout the region, including urban and rural residents.

In 2012, the program collected 6,247 tonnes of kitchen scraps from 53,500 households. This represents 117 kg of food scraps per household or 43% reduction in waste sent to disposal. This equates to a diversion rate of 60%, which is more than double the pre-program diversion rate. However, based on a conservative estimate for self-haul yard waste from single-family residences of 150 kg annually, the residential diversion rate would be roughly 70% if this material was collected at the curb.

With respect to total waste disposal, in 2012 the RDN Green Bin Program diverted 42 kg per capita from landfill, contributing to a region-wide disposal rate of 350 kg per capita of which only 61 kg or 17% of total waste disposed come from households participating in the Green Bin Program.

Grand Forks Food Scraps Collection Service

The City of Grand Forks and the Regional District of Kootenay Boundary were one of the first BC local governments outside of Lower Mainland/Vancouver Island to provide residents with a Green Bin Food Scraps curbside collection service. The weekly curbside collection service became available to 1,830

Grand Forks' households in October 2012. The organic materials are processed in open windrows at the Grand Forks Landfill.

Prior to implementing the green bin program, Grand Forks collected an average of 264 kg of garbage per household per year. After implementation of the program, garbage collected at the curb decreased to 119 kg per household per year. This equates to a 55% reduction in waste sent to disposal. With the collection of 123 kg of food waste per household annually, the overall diversion rate increased from 18% with recycling to 62% with recycling and food waste collection.

Port Coquitlam Green Cart Program

The City of Port Coquitlam became the first city in Metro Vancouver to offer curbside collection of fruit and vegetable scraps in July 2008. In November 2009, they became the first city in the region to collect all food scraps, including meats, bones and food-soiled papers. Multi-family (MF) homes on the curbside collection program were included in April 2011, and in 2014 the program expanded to allow inclusion of any MFs that were qualified to join the program (e.g., no longer under private hauler contracts). In 2014 the City serviced 436 MF units and this is growing.

The City of Port Coquitlam provides fully automated waste collection services to over 12,000 residential properties throughout the City. The City provides 240-litre green waste carts to all properties that receive the service. Organics (commingled food and yard waste) are collected weekly (May to December) and bi-weekly the rest of the year. Garbage and recycling are collected bi-weekly year-round. Organic material is processed at the privately owned and operated Fraser Richmond Soil & Fibre (now Harvest Power) compost facility.

Diversion rate prior to the program was 55% (with collection of recyclables and vegetable/fruit peelings organics). A pilot study done by the City in 2009 found that alternate-week garbage pick-up as well as expanded kitchen waste collection garnered the best results. Port Coquitlam residents currently divert 63% of their household waste away from the landfill (through recycling and organics diversion) saving tens of thousands in disposal fees each year.

Combined with other waste reduction efforts such as alternate-week garbage pickup, the City's Green Cart Program diverted 480 kg food and yard waste per household in 2013 and reduced per household disposal rates from 634 kg per year to 450 kg per year, representing a reduction in per household disposal of 29%.

4 Organics Management Opportunities in the RDNO

Prior to developing viable organics management options for the RDNO, the study team gathered information on: available feedstock quantities; local compost processing capacity and costs; as well as opportunities and costs for reduction, collection and transfer services.

4.1 Feedstock Quantities

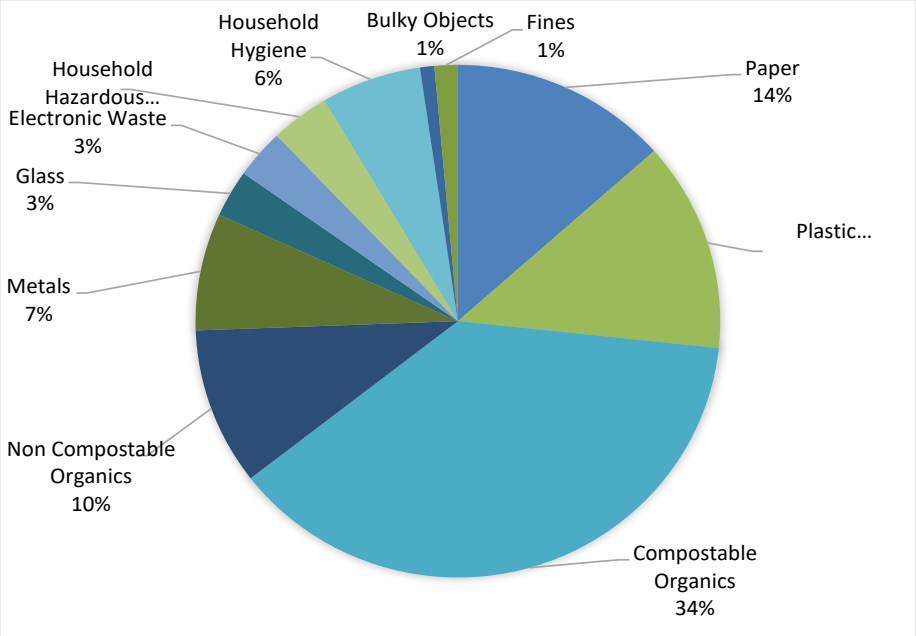
To provide an estimate of additional organic feedstock quantities available in the RDNO, the study team compared results from two methods: estimates based on waste composition data (when actual data isn't available) and estimates based on actual data available from similar communities.

Waste Composition Method

In 2012, the RDNO retained TRI Environmental Consulting (TRI) to undertake a solid waste composition study to update data obtained in 2005. The assessment of the overall composition of waste generated within the RDNO was undertaken at the GVRDF, the ASRDF, the LRDF, and three transfer stations.

The study confirmed that at 34% of the waste deposited at RDNO waste management facilities, compostable organics represented the largest component of the waste stream and thus the greatest opportunity for further waste reduction. This is illustrated in Figure 4-1.

Figure 4-1: RDNO Average Regional Waste Composition 2012



The following Table 4-1 provides a detailed description of compostable organics by type and percentage for the regional average residual waste stream in 2012.

Table 4-1: Breakdown of Compostable Waste 2012

Compostable Organics	Description	Percentage Waste Stream
Yard and Garden	Small yard waste (leaves, branches, grass clippings, soil	12%
Yard and Garden	Large yard wastes (over 15 cm diameter or 1 m long)	0%
Food Waste	Backyard compostable (fruits and vegetables)	9%
Food Waste	Backyard non-compostable (meat, bones, breads, non-liquid dairy, fats)	9%
Clean Wood	Clean wood	4%
Total		**34%**

Tables 4-2 to 4-4 provide a detailed estimate of compostable organics available in the residual waste stream by waste sector and recycling and disposal facility based on 2016 data.

Table 4-2: 2016 Estimate of Compostable Waste from Residential Sources

Facility	2016 Tonnes	Comp Organics	Food Scraps	Yard Waste	Non-Comp Organics
ASRDF	1,505	650	519	128	67
GVRDF	9,585	5,512	1,871	3,441	443
LRDF	1,105	541	244	286	47
Total	**12,195**	**6,702**	**2,635**	**3,854**	**557**

Table 4-3: 2016 Estimate of Compostable Waste from ICI Sources

Facility	2016 Tonnes	Comp Organics	Food Scraps	Yard Waste	Clean Wood	Non-Comp Organics
ASRDF						
GVRDF	8,369	3,261	1,956	1,028	277	536
LRDF						
Total	**8,369**	**3,261**	**1,956**	**1,028**	**277**	**536**

Table 4-4: 2016 Estimate of Compostable Waste from Drop-Off Sources

Facility	2016 Tonnes	Comp Organics	Food Scraps	Yard Waste	Clean Wood	Non-Comp Organics
ASRDF	3,521	522	274	119	129	366
GVRDF	15,536	2,325	272	297	1,755	3,579
LRDF	1,671	228	75	0	153	89
Total	**20,728**	**3,074**	**621**	**416**	**2,037**	**4,033**

Table 4-5 summarizes these estimates for the regional residual waste stream by sector.

Table 4-5: 2016 Estimate of Compostable Waste in Regional Residual Waste Stream by Sector

Sector	2016 Tonnes	Comp Organics	Food Scraps	Yard Waste	Clean Wood	Non-Comp Organics
Residential	12,195	6,702	2,635	3,854	0	557
ICI	8,369	3,261	1,956	1,028	277	536
RDO	20,728	3,074	621	416	2,037	4033
Total	**41,292**	**13,038**	**5,212**	**5,298**	**2,314**	**5,127**

As indicated in Table 4-5, based on the 2012 waste composition study, there could be an estimated 5,000 tonnes each of food waste and yard waste that could be diverted from the residual waste stream. However, as indicated in Figure 2-1, the amount of yard and garden waste delivered to RDNO regional recycling and disposal facilities has increased by from roughly 6,500 tonnes in 2012 to 14,000 in 2016. This would imply that the amount of yard waste remaining in the waste stream would be significantly less than 5,000 tonnes. Consequently, for the purposes of this exercise the study team assumed that the amount of yard waste currently remaining in the RDNO waste stream is quite minimal and would not be targeted for additional diversion.

With respect to food waste, it's estimated that only 30% to 50% of the food waste currently disposed by the ICI sector could be recovered for composting. For the residential sector, the estimated recovery rate is 70%. For the purposes of this exercise the study team estimates a 50% recovery rate which means that there could be roughly 2,500 tonnes of food waste available from all sectors as feedstock to an organics processing facility.

Actual Data Method

Section 3 of this report on best practices identified that the RDN and the CVRD on Vancouver Island have the lowest disposal rates in BC. Both regional districts implemented disposal bans on commercial sector food waste in 2006, and all households in the RDN and most of the households in the CVRD have curbside food waste collection service. Table 4-6 provides residential curbside collection data for four communities that are comparable to the RDNO.

Table 4-6: Curbside Food Waste Collection Data for RDN and CVRD

Curbside Program	Households	Person/HH	Est. Pop	Food Waste		
				Tonnes/yr	kg/hh/yr	kg/cap/yr
RDN						
City of Nanaimo	27,600	2.3	63,480	3,505	127	55
RDN Service Area	28,130	2.2	61,886	3,151	112	51
Total	55,730		125,366	6,656	119	53
CVRD						
Town of Ladysmith	3,410	2.3	7,843	436	128	56
District of North Cowichan	10,640	2.3	24,472	1,075	101	44
Total	14,050		32,315	1,511	108	47
				Average	**117**	**52**

Based on an average of 117 kilograms per household, or 52 kilograms per capita per year for residential food waste, Table 4-7 provides an estimate of potential food waste diversion by recycling and disposal facility service area in the RDNO.

Table 4-7: Residential Curbside Food Waste Estimate for the RDNO

Site	Service Area	Households	Person/HH	Pop. Est.	Food Waste Estimate	
					117 kg/hh/yr	52 kg/cap/yr
GVRDF	Vernon	17,381	2.2	38,238	2,034	1,988
	Coldstream	3980	2.7	10,746	466	559
	Electoral Area B	1376	2.5	3,440	161	179
	Electoral Area C	1342	2.6	3,489	157	181
3	*Sub-Total*	*24,079*		*55,913*	*2,817*	*2,907*
ASRDF	Armstrong	2099	2.4	5,038	246	262
	Spallumcheen	1820	2.6	4,732	213	246
	Enderby	1063	2.1	2,232	124	116
	Electoral Area F	876	2.4	2,102	102	109
	Sub-Total	*5858*		*14,104*	*685*	*733*
LRDF	Lumby	759	2.4	1,822	89	95
	Electoral Area D	492	2.5	1,230	58	64
	Electoral Area E	335	2.3	771	39	40
	Sub-Total	*1586*		*3,823*	*186*	*199*
	TOTAL	**31,523**		**73,840**	**3,688**	**3,840**

Table 4-7 indicates that if households in the RDNO were serviced by curbside food waste collection programs like those provided in the RDN and CVRD, roughly 3,800 tonnes of food waste could be

diverted from landfill disposal. However, given that roughly 32% of RDNO households do not receive curbside garbage collection, it is unlikely that this much food waste would be recovered from the residential sector.

Table 4-8 provides an estimate of food waste based on curbside collection in the municipalities that currently provide a garbage collection service at 52 kilograms per capita annually and a drop-off service at the GVRDF, ASRDF and LRDF based on estimated recovery rate of 10 kilograms per capita per year. This drop-off estimate is based on data from a drop-off food waste pilot program operated by the Powell River Regional District. Using this methodology, the residential food waste estimate is reduced to 2,700 tonnes.

Table 4-8: Residential Food Waste Estimate – Curbside + Drop-Off

Site	Service Area	Households	Person/HH	Pop. Estimate	Food Waste Tonnes
GVRDF	Vernon	17,381	2.2	38,238	1,988
	Coldstream	3,980	2.7	10,746	107
	Electoral Area B	1,376	2.5	3,440	34
	Electoral Area C	1,342	2.6	3,489	35
	Sub-Total	*24,079*		*55,913*	*2,165*
ASRDF	Armstrong	2,099	2.4	5,038	262
	Spallumcheen	1,820	2.6	4,732	47
	Enderby	1,063	2.1	2,232	116
	Electoral Area F	876	2.4	2,102	21
	Sub-Total	*5,858*		*14,104*	*446*
LRDF	Lumby	759	2.4	1,822	95
	Electoral Area D	492	2.5	1,230	12
	Electoral Area E	335	2.3	771	8
	Sub-Total	*1,586*		*3,823*	*115*
	TOTAL	**31,523**		**73,840**	**2,726**

With respect to food waste from the ICI sector, based on the RDN average recovery rate of 23 kilograms per capita, the RDNO could expect to recover roughly 2,000 tonnes of food waste from this sector.

Table 4-9: Food Waste Feedstock Estimate

Sector	Tonnes Per Year
Residential	
Vernon	2,000
Rest of RDNO	1.000
Sub-Total	*3,000*
Commercial	2,000
Total	**5,000**

Consequently, as indicated in Table 4-9, the total amount of food waste that could potentially be diverted from landfill is roughly 5,000 tonnes per year. This includes 2,000 tonnes of food waste from households in the City of Vernon plus 1,000 tonnes of food waste from households in the rest of the RDNO, as well as 2,000 tonnes of waste from the ICI sector.

4.2 Processing Capacity and Costs

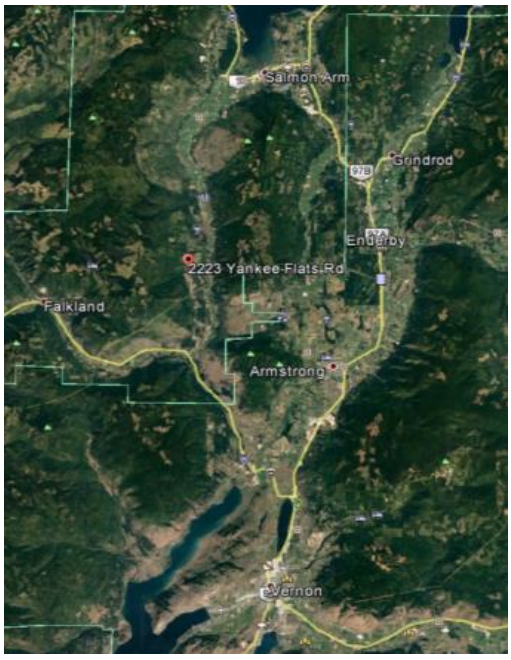
The availability of cost-effective and reliable organic waste processing capacity is essential to the development of organics management options. As discussed in Section 2-2, the regional yard waste composting facility at the GVRDF identified in the Organic Waste Management Strategy was fully operational by 2012. However, this mechanically aerated (turned with an excavator) open windrow facility is not designed to process food waste.

To divert food waste from RDNO landfills, the RDNO will need to have a processing (composting) facility available that can manage this stream effectively. To achieve this, the RDNO can take advantage of existing private sector processing capacity or construct its own capacity.

The only viable processing option currently available is the privately-owned and operated Spa Hills Farm Composting facility located in the Columbia Shuswap Regional District (CSRD). The following sections discuss the processing capacity and costs associated with this facility as well as the costs associated with constructing a new food waste composting facility at the GVRDF.

4.2.1 Spa Hills Farm Composting Facility

The Spa Hills Farm Composting Facility is located at 2223 Yankee Flats Road, near the small community of Silver Creek, 14 km south of Salmon Arm and 38 km northwest of Vernon. The farm is in Electoral Area D of the CSRD.



According to the facility Operating Plan, the farm is bordered on all sides by agricultural or rural residential properties. The nearest neighbour is over 100 metres from the compost storage area and there are approximately 12 residential properties within one kilometer of the site. The closest public institution is approximately 4-6 kilometres north of the composting site. These include Silver Creek Elementary School, a seniors centre, a church and a community hall.

The on-farm composting facility is registered under the Organic Matter Recycling Regulation (OMRR). OMRR, which falls under the Environmental Management Act, governs the production, quality and land application of certain types of organic matter.

OMRR sets requirements for compost facilities with respect to:

- Construction and operation;
- Leachate management;
- Odour management;
- Capacity, and,
- Process and quality criteria.

The Spa Hill Farms compost facility has a current process design capacity of 4,000 tonnes per year with a planned upgrade to 12,000 tonnes per year of food waste and virgin wood chips as a bulking agent (Figure 4-2). This means that the facility could process up to 6,000 tonnes of food waste per year which is enough capacity to accept food waste from both the CSRD and RDNO.

Figure 4-2: Phase 1 and 2 Compost Building and Storage Area at Spa Hill Farm

Organic materials composted at Spa Hills Farm are utilized as a soil conditioner and fertilizer on the farmed acreage (60 hectares). At a process design capacity of 12,000 tonnes per year, the production of finished product would be 3,000-4,000 tonnes per year. This compost will be applied to the fields as a fertilizer or soil conditioner either in the spring or in the fall. As per the requirements of the Agricultural Land Commission Act (Agricultural Land Reserve Use, Subdivision and Procedure Regulation**)**, a mininum of 50% of the compost will be utilized on the fram, with the balance offered for sale to other farmers and compost users.

When assessing the viability of Spa Hills Farm as composting option for the RDNO, the study team was concerned that this facility would fall under the 2016 amendment to the OMRR requiring all compost facilities that process food waste or biosolids, and have a production design capacity to produce 5,000 tonnes of compost or more per year to also apply for a Permit.

These new permit requirements include completion by the applicant of an Environmental Impact Study, an Operating Plan, and Odour Management Plan, a Leachate Management and a Public Notification Process. Of concern to the study team was the impact of the facility on the local community and the potential for the MOE to deny Spa Hills Farm a permit due to odour and traffic complaints from residents.

However, at a design production capacity of 3,000 to 4,000 tonnes of finished compost per year, Spa Hills is not subject to the OMRR amendment. Nevertheless, as a result of discussions with the professional agrologistretained by Spa Hills to prepare their opertating plan (Dr. John Paul), as well as Josh Mitchell, one of the owners, the study team is confident that Spa Hills would meet all the requirements of the permitting process, particularly with respect to public notification.

According to Josh Mitchell, since the facility was orignially funded under the federal Livestock Waste Tissue Initiative, a public notification process was undertaken prior to construction. Although some neighbours were concerned about odour impacts, to date there have no issues with neighbours regarding the operation of the facility.

Spa Hills Farm have been marketing their food waste collection and processing service to a wide range of businesses in the North Okanagan/Shuswap area including: restaurants, coffee shops, corporate offices, casinos, pubs/bars, resorts, golf courses, grocery stores, retirement homes and other farms. RDNO staff have been supportive of their efforts.

With respect to this organic waste management options study, Spa Hills would charge private haulers $110 per tonne to accept food waste delivered directly to their facility. If the RDNO chose to construct a transfer facility at the GVRDF, Spa Hills Farm would charge $250 per load to haul food waste from GVRDF to their compost facility as well as a processing fee of $110 per tonne.

4.2.2 New RDNO Facility

As stated previously, the regional yard waste composting facility at the GVRDF is not designed to process food waste. Consequently, the RDNO would need to construct a new facility to process this organic waste stream. Given the feedstock estimate developed in Section 4.2 of up to 5,000 tonnes of food waste, which then requires 5,000 tonnes of bulking amendment per year it is likely that an actively aerated composting system will be the most appropriate technology.

There are typically seven types of composting systems that utilize active aeration: aerated static pile, enclosed aerated static pile (tunnel), static containers, agitated containers, channel, agitated bed and rotating drum. Active aeration is a common feature in all these technologies. There are many subtle variations in the design of composting systems, and system designers and vendors use these variations to provide a balance between processing efficiency and capital costs.

For the purposes of this study, we have assumed the capital cost of processing capacity is $400 per tonne (i.e. a 10,000 tonne per year composting facility, processing 5,000 tonnes of food waste and 5,000 tonnes of bulking amendments, would cost $4million to construct) and $90 per tonne operating cost. These estimates are based on an enclosed, aerated static pile system and reflect actual capital and operating costs of Gore composting systems currently operating in BC

4.3 Reduction Opportunities

The aim of an organic waste reduction programs is to reduce the generation of organic waste as well as to minimize the need for collection services and infrastructure to manage organic wastes. As discussed in Section 2.2 of this report, the RDNO already provides information on their website regarding backyard composting and grasscycling, operates a backyard composter rebate program and provides support to Xerindipity, an outdoor environmental education centre.

However, to enhance these current initiatives, the RDNO could implement a Compost Coaching program as discussed in Section 3.2.1 as well as implement a campaign targeting food waste reduction such as Metro Vancouver's Love Food Hate Waste. These programs should be considered as essential support to any organic waste diversion option selected by the RDNO.

Reduction options could also be targeted to small communities that are not likely to receive curbside collection of organic waste, as an alternative approach to collection and processing.

4.4 Collection Opportunities and Costs

Under this project task, the study team met with key stakeholders collecting MSW from residential and ICI sectors to obtain data and information on current collection systems as well as how and at what cost these systems could be expanded to collect organic waste. With respect to residential garbage collection, as discussed in Section 2.2, although all household receive curbside collection of recyclables, curbside garbage collection is not universal throughout the RDNO.

Table 4-9 provides an outline of garbage collection services delivered by municipalities in the RDNO.

Table 4-10: Garbage Collection Services in the RDNO

Municipality	Households	Service Description			
	2014	Garbage	Service Type	Contractor	Expiry
Vernon	17,381	Yes	Public/Contract	Progressive	2021
Coldstream	3,980	No	Private/Subscription	Not applicable	None
Spallumcheen	1,820	No	Private/Subscription	Not applicable	None
Armstrong	2,099	Yes	Public/Contract	Progressive	NA
Enderby	1,063	Yes	Public/Contract	Tip-It Waste Solutions	2018
Lumby	759	Yes	Public/Contract	Progressive	NA

As indicated in Table 4-9, all municipally operated collection systems are contracted-out to two main private collection companies: Progressive Waste Services and Tip-It Waste Solutions. The study team met with representatives from these two companies to discuss the opportunity to expand their services to include curbside collection of organic waste. The study team also met with representatives from the City of Vernon to gauge their interest in providing curbside collection of food waste only or yard waste and food waste. In all cases, current service providers are supportive of providing organics collection programs.

The issue that current residential service providers will need to resolve is whether to expand collection to include food waste-only or to both food and yard waste. This is an important issue since the addition of yard waste collection entails a significant increase in collection costs without a corresponding increase in diversion. In other words, given high level of yard waste diversion already achieved through drop off sites, curbside collection would not necessarily result in increased yard waste diversion.

This is because residents that were previously self-hauling their yard waste to drop-off sites, would now be putting this material out at the curb. This may be a costly convenience. The food waste-only collection programs in the RDN and CVRD cost in the range of $100 to $168 per household per year for weekly food waste and bi-weekly garbage collection. However, programs in BC that collect food and yard waste typically cost over $200 per household per year or more depending on whether the service is manual or automated cart based.

Although the City of Vernon has expressed an interest in implementing a curbside collection program for food and yard waste, a new yard waste drop-off facility in the north end of the City may be a more cost-effective option for the yard waste component of organic waste. In any case, each municipality in the RDNO will need to assess the costs and benefits of adding food -only or food and yard waste to their current collection program. Since the scope of this study is limited to the financial impact of diverting additional organics from RDNO operated recycling and disposal facilities, cost estimates were not developed for municipal curbside collection programs.

With respect to organics diversion from the ICI sector, the study team met with the major private haulers in the region (Progressive Waste Systems, Waste Management Canada, and Tip-It Waste Solutions). All three companies were supportive of providing food waste collection services to their customers. Progressive and Waste Management in particular, have experience with commercial food waste collection systems due to the existence of disposal bans in the Lower Mainland and parts of Vancouver Island.

Depending on the quantity of food waste, generators use plastic garbage cans to collect food waste from kitchens while private haulers utilize plastic carts and metal bins to collect food waste outside of commercial establishments.

The only concern expressed by these companies regarding the implementation of either residential or commercial food waste diversion programs, was the lack of a convenient and accessible processing facility in the RDNO. Although the Spa Hills Farm composting facility is within a reasonable haul distance from population centres in the RDNO, haulers report that the access to the facility is not ideal given the condition of the roads to and within the farm. Consequently, they indicated that for organic waste diversion to Spa Hills to be successful, a local transfer facility would need to be constructed by the RDNO.

4.5 Transfer Opportunities and Costs

To obtain information on food waste transfer facilities and costs, the study team visited transfer sites at the Hartland Landfill in the CRD, Bings Creek Recycling Centre and Garbage Drop-Off Depot in the CVRD and the Church Road Transfer Station in the RDN.

The Hartland transfer site is handles roughly 33 tonnes per day, 5 days per week or 8,500 tonnes of food waste per year. As discussed in Section 3.2.2, when the CRD planned their food waste disposal ban, they had anticipated that food waste would be processed at private facilities on Vancouver Island including Foundation Organics in Saanich. However, when odour concerns at the site forced the CRD to prohibit the acceptance of food waste at this facility, a temporary transfer site had to be constructed at the Hartland Landfill.

As shown in Figure 4-3, the temporary transfer site consists of a two-level lock block wall structure where collection vehicles dump food waste directly into roll-off bins. These bins are fitted with metal lids that require mechanical winches to open and close. Since most collection vehicles arrive at the site between 12:30 pm and 2:30 pm, full containers are stored on the active landfill until a contracted transfer truck and trailer arrives at the site early each morning. The bins are then emptied into the trailer for transfer to a composting facility in Vancouver by ferry. The capital cost to build the transfer site was roughly $100,000 including provision of electrical service, lock block wall construction, and a leachate collection and pumping system.

Figure 4-3: Hartland Landfill Food Waste Transfer Site

The food waste transfer station at the Bings Creek facility handles 1,500 tonnes of food waste per year however capital costs were in the order of $90,000. This included construction of a concrete pad, leachate collection system and push wall for loading food waste into a roll-off container. As indicated in Figure 4-4, food waste is deposited on a concrete pad by curbside collection vehicles. An equipment operator then uses the push wall to load the food waste into a lidded roll-off container. The roll-off container is transferred to a local private composting facility daily. The food waste transfer site is operated by CVRD staff and did not require any additional personnel.

Figure 4-4: Bings Creek Food Waste Transfer Site

The RDN transfers food waste from their Church Road Transfer Station near Parksville to the Nanaimo Organic Waste composting facility in Nanaimo. As indicated in Figure 4-5, this is an engineered steel building structure with a concrete foundation and sealed concrete slab. Bays, upper and lower are equipped with automated steel roll-up doors to mitigate bird and vector concerns. The capital cost to build similar one bay structure at the GVRDF would be roughly $1 million.

Figure 4-5: Church Road Transfer Station

5 Long-List of Options

Based on the information and data collected in the previous tasks, and in collaboration with RDNO staff, the study team developed a long list of organics management options that are deemed to be the most practical, economical, environmentally sound, and socially acceptable to the RDNO. The long list contains eight options that are organized around assumptions with respect to policy, collection, processing and diversion.

Policy Assumptions

Under the RDNO Municipal Solid Waste Management Bylaw 2659, wood waste and yard waste have been classified as regulated materials, meaning that the any loads of refuse containing these organic materials are charged at more than double the refuse tipping fee. To support source separation of food waste, the study team assumes that the RDNO will designate food waste as a regulated material under the bylaw, either for food waste generated by the ICI sector or for both ICI and residential food waste. These two alternatives are recognized in the long-list of options.

Collection Assumptions

If the RDNO designates ICI food waste as a regulated material, the study team assumes that private haulers would provide collection services to their ICI customers. However, given that curbside garbage collection is not universal throughout the RDNO, the long-list of options recognizes two collection scenarios for residential waste. Based on discussions with staff from the City of Vernon, it is possible that the city may expand their curbside collection service to include food waste (and potentially yard waste) without residential food waste classified as a regulated material. Alternatively, if the RDNO chooses to classify ICI and residential food waste as a regulated material, this would force the implementation of curbside garbage and food waste collection programs across the region.

Processing Assumptions

As discussed in Section 4.2, if the RDNO chooses to regulate food waste, the only viable processing options are to either transfer the material 38 kilometres out-of-district to the Spa Hills Farm Composting Facility near Silver Creek in the CSRD, or construct a public or private composting facility at the GVRDF. These alternatives are reflected in the long list of options developed by the study team.

Diversion Assumptions

As discussed in Section 2, the RDNO already diverts significant quantities of yard waste and wood waste from landfill disposal. Consequently, the diversion impacts identified in the long-list are limited to food waste only. Although this is clear for options that transfer food waste to Spa Hills, options that involve the construction of a composting facility at the GVRDF identify new diversion of food waste (FW) and existing diversion of yard waste (YW). This is because the capital costs associated with constructing a processing facility are based on a design capacity that includes equal parts food waste and yard waste as a bulking amendment. It is assumed that this yard waste is already being diverted at the GVRDF.

Based on these assumptions, the long list of organic waste management options is described in Table 5-1.

Table 5-1: Long List of Organics Management Options

Option	Description	Capital Costs	Annual Operating Costs	Diversion Tonnes/year
	Processing at Spa Hills Farm			
1	**ICI Only – Direct Delivery** Designate ICI food waste as a regulated material at RDNO recycling and disposal facilities. Haulers deliver food waste directly to Spa Hills Farm.	None	None	2,000 FW
2	**ICI Only – Temporary Transfer** Designate ICI food waste as a regulated material. Construct a temporary transfer station at the GVRDF and contract with Spa Hills for transfer and processing.	$100,000	$110 per tonne (processing) $250 per load (transportation)	2,000 FW
3	**ICI Plus City of Vernon – Permanent Transfer** Designate ICI food waste as a regulated material. City of Vernon implements curbside collection program for residential food waste. Construct a permanent transfer station at the GVRDF and contract with Spa Hills for transfer and processing.	$1 Million	$110 per tonne $250 per load	4,000 FW *2,000 ICI +* *2.000 COV*
4	**ICI Plus RDNO Residential – Permanent Transfer** Designate ICI and residential food waste as a regulated material. Implement region-wide curbside collection program. Construct a permanent transfer station at the GVRDF and contract with Spa Hills for transfer and processing. Small transfer facility at ASRDF and LRDF-self haul only	$1 Million	$110 per tonne $250 per load	5,000 FW *2,000 ICI+* *2,000 COV+* *1,000 Rest of RDNO*
	Processing at New RDNO Facility			
5	**ICI Only – Public Facility** Designate ICI food waste as a regulated material. Construct publicly owned and operated organics composting facility at GVRDF.	$1.6 Million ($400 per tonne installed capacity)	$450,000 ($90 per tonne installed capacity)	2,000 FW 2,000 YW Design Capacity: 4,000
6	**ICI Only-Private Facility** Designate ICI food waste as a regulated material. Contract for privately owned and operated organics composting facility at GVRDF.	$1.6 Million ($400 per tonne installed capacity)	$450,000 ($90 per tonne installed capacity)	2,000 FW 2,000 YW Design Capacity: 4,000
7	**ICI Plus RDNO Residential – Public Facility** Designate ICI and residential food waste as a regulated material. Implement region-wide curbside collection program. Construct publicly owned and operated organics composting facility at GVRDF. Small transfer facility at ASRDF and LRDF-self haul only	$4 Million ($400 per tonne installed capacity)	$900,000 ($90 per tonne installed capacity)	5,000 FW 5,000 YW Design Capacity: 10,000

Option	Description	Capital Costs	Annual Operating Costs	Diversion Tonnes/year
8	**ICI Plus RDNO Residential – Private Facility** Designate ICI and residential food waste as a regulated material. Implement region-wide curbside collection program. Contract for privately owned and operated organics composting facility at GVRDF. Small transfer facility at ASRDF and LRDF-self haul only	$400 per tonne installed capacity $4 million	$900,000 ($90 per tonne installed capacity)	5,000 FW 5,000 YW Design Capacity: 10,000

6 Short-List Options

Using an evaluation methodology developed in consultation with RDNO staff, the study team selected four options to be considered for financial assessment in Phase 3 of the project. The evaluation methodology adopted by the study team was based on the following simple, practical but effective criteria and ranking system.

6.1 Evaluation Criteria and Ranking

Table 6-1 describes the evaluation criteria used to select the short-list options.

Table 6-1: Evaluation Criteria to Select Short-List Options

Criteria	Description
Environmental	
Preserve landfill capacity	Diverting food waste from landfill preserves landfill capacity. Due to limited landfill capacity, this was one of the main justifications for implemented food waste diversion programs in the RDN, CVRD, CRD and Metro Vancouver.
Reduce GHG emissions	Diverting food waste from landfill reduces greenhouse gas emissions. When food waste decomposes in a landfill it generates methane, a potent greenhouse gas. Although the RDNO has installed a landfill gas collection system at the GVRDF, the efficiencies of these systems are typically in the range of 50%. Diverting food waste from landfill serves to further reduce GHG emissions.
Social	
Public Support	Diverting food waste from landfill will be successful if programs are supported by both residents and businesses in the region.
Hauler Support	Diverting ICI food waste from landfill will be successful if private haulers support the addition of food waste to the list of regulated materials.
Economic	
Cost	Diverting food waste from landfill should be cost-effective
Financial Risk	Diverting food waste from landfill should have low financial risk
Technical Risk	Diverting food waste from landfill should have low technical risk
Ease of Implementation	Diverting food waste from landfill should not be difficult to implement

The ranking was based on a qualitative ranking of low, medium and high with respect each of the evaluation criteria. Table 6-2 provides an evaluation of Options 1-4, which are based on transfer to and processing at Spa Hills Farm and Options 5-8 based on processing at a new RDNO facility located at the GVRDF. Within each of the triple bottom line criteria: environmental, social and economic, the colour of the text reflects whether the criteria is a green light for go, a yellow light for caution or red light for stop.

Table 6-2: Options Evaluation

	Spa Hills Farm				New RDNO Composting Facility			
Criteria	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8
Environmental								
Tonnes Per Year	2,000	2,000	4,000	5,000	2,000	2,000	5,000	5,000
Diversion Potential	Low	Low	Moderate	High	Low	Low	High	High
GHG Reduction	Low	Low	Moderate	High	Low	Low	High	High
Social								
Public Support	High	High	High	Moderate	Low	Low	Low	Low
Hauler Support	Low	High	High	High	High	High	High	High
Economic								
Cost	Low	Low	Moderate	Moderate	High	High	High	High
Financial Risk	Low	Low	Moderate	Moderate	High	High	High	High
Technical Risk	Low	Low	Low	Low	Moderate	Moderate	Moderate	Moderate
Ease of Implementation	High	High	Moderate	Moderate	High	High	Moderate	Moderate

Table 6-3 provides a summary of the ranking for the options in Table 6-2.

Table 6-3: Options Evaluation Ranking Summary

Option	Description	Evaluation Summary
	Processing at Spa Hills Farm	
1	**ICI Only – Direct Delivery** ICI food waste a regulated material. Haulers to Spa Hills Farm directly.	*Environmental:* Low diversion (red light). *Social:* High public support (green light), the lack of support from haulers is significant (red light) *Economic:* Low rank for cost and risk (green light), high rank for ease of implementation (green light)
2	**ICI Only – Temporary Transfer** ICI food waste a regulated material. Temporary transfer station at the GVRDF. Spa Hills for transfer and processing.	*Environmental:* Low diversion (red light). *Social:* High public support (green light), high from haulers due to transfer at GVRDF (green light) *Economic:* Low rank for cost and risk (green light), high rank for ease of implementation (green light)
3	**ICI Plus City of Vernon – Permanent Transfer** ICI food waste a regulated material. City of Vernon voluntary collection program. Permanent transfer station at the GVRDF. Spa Hills for transfer and processing.	*Environmental:* Moderate diversion (yellow light). *Social:* High public support (green light), high from haulers (green light) *Economic:* Moderate rank for increase in capital costs & financial risk (yellow light), low technical risk (green light) moderate rank for ease of implementation (yellow light) due to new program
4	**ICI Plus RDNO Residential – Permanent Transfer** ICI food waste a regulated material. Region-wide residential curbside collection program. Permanent transfer station at the GVRDF. Spa Hills for transfer and processing. Self-Haul transfer facility at ASRDF &LRDF.	*Environmental:* High diversion (green light). *Social:* Moderate public support (yellow light) due to universal collection issues, high from haulers (green light) *Economic:* Moderate rank for capital costs and financial risks (yellow light), moderate rank for ease of implementation (yellow light) due to new program and universal collection issues
	New RDNO Composting Facility	
5	**ICI Only – Public Facility** ICI food waste a regulated material. Publicly owned and operated organics composting facility at GVRDF.	*Environmental:* Low diversion (red light). *Social:* Low support (red light) due to higher capital costs, high support from haulers (green light) *Economic:* High for increased costs and risk (red light), moderate for technical risk due to odour concerns (yellow light), high for ease of implementation (green light)
6	**ICI Only-Private Facility** ICI food waste a regulated material. Privately owned and operated organics composting facility at GVRDF.	*Environmental:* Low diversion (red light). *Social:* Low support (red light) due higher capital costs, high support from haulers (green light) *Economic:* High for increased costs and risk (red light), moderate technical risk due to odour concerns (yellow light), high for ease of implementation (green light)

Option	Description	Evaluation Summary
7	**ICI Plus RDNO Residential – Public Facility** ICI food waste a regulated material. Region -wide residential food waste collection program. Publicly owned and operated organics composting facility at GVRDF. Self-Haul transfer facility at ASRDF &LRDF.	*Environmental:* High diversion (green light). *Social:* Low support (red light) due to higher capital costs and universal collection issues, high support from haulers (green light) *Economic:* High for increased costs and risk (red light), moderate for technical risk due to odour concerns (yellow light), moderate for ease of implementation (yellow light) due to new program and universal collection issues
8	**ICI Plus RDNO Residential – Private Facility** ICI food waste a regulated material. Region-wide residential curbside collection program. Privately owned and operated organics composting facility at GVRDF. Self-Haul transfer facility at ASRDF &LRDF.	*Environmental:* High diversion (green light). *Social:* Low support (red light) due to higher capital costs and universal collection issues, high support from haulers (green light) *Economic:* High for increased costs and risk (red light), moderate for technical risk due to odour concerns (yellow light), moderate for ease of implementation (yellow light) due to new program and universal collection issues

6.2 Option Selection

The study team, in consultation with RDNO staff selected the following four options to be considered for financial assessment in Phase 3 of the project.

Option 1: ICI Plus City of Vernon, Permanent Transfer to Spa Hills Farm (Long-List 3)

Designate ICI food waste as a regulated material. City of Vernon implements curbside collection program for residential food waste. Construct a permanent transfer station at the GVRDF and contract with Spa Hills for transfer and processing.

Rationale

This option provides moderate diversion (4,000 tonnes per year), has a high potential for public support based on discussions with City of Vernon staff, moderate capital costs ($1 Million), low technical risk and a moderate ease of implementation.

Option 2: ICI Plus RDNO Residential – Permanent Transfer to Spa Hills Farm (Long-List 4)

Designate ICI and residential food waste as a regulated material. Implement a region-wide universal curbside collection program. Construct a permanent transfer station at the GVRDF and contract with Spa Hills for transfer and processing. Construct small transfer facilities at ASRDF and LRDF for self-haul only.

Rationale

This option provides high diversion (5,000 tonnes per year), has a moderate potential for public support due to concerns regarding universal collection programs, and moderate capital costs ($1 million), low technical risk and a moderate ease of implementation.

Option 3: ICI Only, Public Facility at GVRDF (Long-List 5)

Designate ICI food waste as a regulated material. Construct publicly owned and operated organics composting facility at GVRDF.

Rationale

This option provides low diversion (2,000 tonnes per year), may have low public support due to higher capital investment than Spa Hills Farm options, has moderate capital costs ($1.6 Million) and moderate technical risk due to the potential for odour but will be easy to implement as there would be no change in residential collection service levels.

Option 4: ICI Plus RDNO Residential, Public Facility at GVRDF (Long-List 7)

Designate ICI and residential food waste as a regulated material. Implement region-wide curbside collection program. Construct publicly owned and operated organics composting facility at GVRDF. Construct small transfer facilities at ASRDF and LRDF for self-haul only.

Rationale

This option provides high diversion (5,000 tonnes per year), may have low public support due to higher capital costs, has moderate capital costs ($4 Million) and moderate technical risk due to the potential for odour. However, there will be some implementation challenges due to issues associated with universal collection.

7 Summary/Conclusion

Diverting organic waste from landfill disposal is a significant solid waste management issue in BC. Although the RDNO has been progressive and proactive in implementing policies and programs to divert wood waste and yard waste from landfill disposal, the viability of expanding their organics diversion programs to include food wastes has yet to be considered.

Consequently, as a component of the upcoming review of the implementation and effectiveness of the 2011 SWMP, the RDNO retained XCG Consulting Ltd. (XCG), in collaboration with Carey McIver & Associates Ltd. (CMA) and Maura Walker & Associates (MWA), to undertake a Facilities Life Cycle Cost Assessment and Organics (Food Waste) Management Options Study for the RDNO solid waste management system.

The purpose of the study was to develop a full list of opportunities from which to select at least four viable food waste diversion options and then determine the financial impact of each option on the RDNO solid waste management system relative to the status quo.

Based on an assessment of the current organic waste management system, a review of best practices in B.C. as well as organic waste management opportunities available in the RDNO, the study team selected the following four options based on environmental, social and economic criteria:

Option 1: Regulate ICI food waste, City of Vernon residential collection, transfer to Spa Hills Farm

Option 2: Regulate ICI and residential food waste, transfer to Spa Hills Farm

Option 3: Regulate ICI food waste, construct publicly-owned composting facility at GVRDF.

Option 4: Regulate ICI and residential food waste, construct-publicly owned composting facility at GVRDF.

APPENDIX F

SOLID WASTE MANAGEMENT SYSTEM COST ANALYSIS – ORGANICS DIVERSION RDNO 2017

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XCG File No. 4-2209-07-01
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SOLID WASTE MANAGEMENT
SYSTEM COST ANALYSIS – ORGANIC DIVERSION
REGIONAL DISTRICT OF NORTH OKANAGAN
BRITISH COLUMBIA

Prepared for:
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1. INTRODUCTION

XCG Consulting Limited (XCG) was retained by the Regional District of North Okanagan (RDNO) to undertake a facilities life cycle costs assessment and organics management options study, as per XCG's proposal dated September 30, 2016. It is understood that the purpose of the organics management options study was to develop four viable organic diversion options and then determine their financial impact on the RDNO solid waste management system. In this report "organics" refers to food waste only. The results of the financial analysis would then be used to provide essential input to the Solid Waste Management Plan scheduled for 2017.

XCG partnered with Carey McIver and Associates (Carey McIver) and Maura Walker and Associates (Maura Walker) to undertake the organics management options study. The results of the organics management options study are discussed in the draft report entitled "RDNO Organic Management Options Study," (Study) (Carey McIver, May 2017).

In addition to the Study, it was understood that the RDNO wished to establish a simple, transparent, and flexible financial model which would be used to evaluate the four organics diversion options identified by Carey McIver and Maura Walker. It was further understood that the objective of the financial model would provide answers to the following:

- Is the current status quo model balanced (i.e. does the current revenue stream meet the solid waste management system expenses, including long-term capital requirements);
- What would be the estimated capital and operational costs of implementing each of the four organics diversion options;
- What would be the impact to the site life of the existing landfills; and
- What would be the impact relative to the status quo financial model.

The financial model assessment presented herein encompasses an appropriate time period for the assessment of the identified options (25 years), which is consistent with the time frame of the RDNO's solid waste management plan cycles, upcoming plan update, and estimated lifespan of the existing RDNO landfills. As such, the cost model assessment will most appropriately be considered a focussed solid waste management system cost analysis and not a life cycle cost assessment, as the time frame of the study will be focussed on a 25-year time period centred on the entire system revenues and costs versus the life cycle model for a given organics diversion system option. In addition, the cost analysis addresses the cost to implement, maintain, and operate the identified organic diversion options (per Section 6.2 - Option Selection of the Study) and the financial implications to the entire RDNO solid waste management system. Organic diversion tonnages for each option was provided in the Study.

2. BACKGROUND

The RDNO solid waste management infrastructure includes three landfills: the Greater Vernon Recycling and Disposal Facility (GVRDF), the Armstrong/Spallumcheen Recycling and Disposal Facility (ASRDF), and the Lumby Recycling and Disposal Facility (LRDF), and three transfer stations: Cherryville Recycling and Disposal Facility, Kingfisher Recycling and Disposal Facility and Silver Star. A description of these facilities is as follows.

2.1 Greater Vernon

The GVRDF is located approximately 4 kilometres south of Vernon, British Columbia, on Birnie Road, approximately 500 metres northwest of Highway 97 and approximately 1 kilometre northwest of Kalamalka Lake. The legal description of the property is Lot A, Section 16, Township 9, Osoyoos Division Yale District Plan KAP83248. The site encompasses an area of approximately 63 hectares, with the limit of waste encompassing an area of approximately 18 hectares.

The site accepts waste from the City of Vernon, the District of Coldstream, and the North Okanagan Electoral Areas "B" and "C."

The GVRDF is bounded to the east, west, and south by private land, and to the north by a Department of National Defence Rifle Range. Existing facilities located at the site include: a municipal solid waste landfill, maintenance shop, quonset, offices, residential drop off facility, recyclable material stockpiles, scale, scale house, landfill gas collection and flaring system, a leachate storage pond, a non-potable water reservoir, a leachate pump station, and regional yard waste composting facility.

2.2 Armstrong/Spallumcheen

The ASRDF is located east of the City of Armstrong on Powerhouse Road. The current legal description of the site is Lot 1, Plan 12928; Lots 4 and 5, Plan 2997; Lot 6, Plan 1847; Lot A, Plan 17833; Lot B, Plan 1825 except Plan 17833; Lot 2 and 3, Plan 21202, all of Section 4, Township 35; and the part of Lot 6 on Plan B1525, Plan 185; Section 5, Township 35; Kamloops Division Yale District.

The ASRDF comprises a solid waste landfill that accepts municipal solid waste from the Armstrong, Spallumcheen, and Enderby areas, as well as Electoral Area "F" and the Splatsin and Okanagan Indian Reserve. The site encompasses an area of approximately 18.9 hectares, with the limit of waste encompassing an area of approximately 5.5 hectares.

Existing facilities located at the site include: scale house, public tipping area, poplar tree plantation for irrigating leachate, a leachate pump station, a leachate storage pond, an irrigation valve station, storage building, recyclable material drop off areas and stockpiles, and municipal solid waste landfill.

2.3 Lumby

The LRDF is located approximately 6.5 kilometres north of Lumby at 221 Trinity Valley Road. The legal description of the site is SW ¼ of SE ¼, Section 13 of

Township 2 O.D.Y.D. The site property is bounded to the north, east, south, and west by residential properties. Gravel pits are located to the south and southwest of the site.

The site comprises a solid waste landfill that accepts municipal solid waste from the Village of Lumby, Electoral Areas "D" and "E" and parts of the District of Coldstream. The site encompasses an area of approximately 16.2 hectares, with the limit of waste encompassing an area of approximately 3.7 hectares.

Existing facilities located at the site include: scale house, potable water shed, recyclable material drop off areas and stockpiles, equipment shed, and municipal solid waste landfill.

2.4 Cherryville

The Cherryville Recycling and Disposal Facility is located east of Aumond Road, approximately 4 kilometres northeast of the junction of Highway 6 and Sugar Lake Road, and approximately 2 kilometres north of Cherryville. The RDNO leases the property from the Province of British Columbia.

The two landfill areas (north and south pits) have a cumulative area of approximately 1.4 hectares within an overall property of approximately 6.5 hectares. The site is surrounded by Crown Land to the east, west, and south, and a private gravel pit to the north.

In 2007, the RDNO elected to advance the closure of the landfill and construct a transfer station at the site for the purpose of reducing long-term operational costs and environmental impacts. A transfer station was constructed and landfilling ceased at the site in 2008. The transfer station includes a gate house, two concrete roll-off bin pads (plus railings and lock blocks), a reuse shed and waste diversion areas, and recycling bins. In 2016, the two landfill areas received final closure.

2.5 Kingfisher

The Kingfisher Recycling and Disposal Facility transfer station is located at 150 Beattie Road, approximately 3 kilometres north of Kingfisher. The legal description of the site is the SW ¼, Section 23, Township 19, R.6, W.6, Kamloops Division of Yale Land District. The site accepts municipal solid waste from Kingfisher and parts of Electoral Area "F." The site encompasses an area of approximately 0.65 hectares.

The transfer station is located at the closed landfill site (built in 2003), and currently includes two roll-off bin pads, a reuse shed, waste diversion areas, and recycling bins.

2.6 Silver Star

The Silver Star transfer station is located at 9695 Silver Star road and services only the residents and business of the Silver Star Mountain Ski Resort and community. The site only accepts soft garbage (no construction waste or large items) and blue bag recyclable material. The property is leased from the British Columbia Ministry of Transportation and Infrastructure and the transfer station was build in 2000.

3. COST ANALYSIS

Based upon direction provided by the RDNO and the organics management options presented in the Study, the following four alternatives were evaluated against the Status Quo:

- Alternative 1 (ICI Ban and Vernon, Spa Hills): The RDNO would implement a district wide Industrial, Commercial, and Institutional (ICI) ban on organics and the City of Vernon would implement curbside organic collection. In addition, the RDNO would construct a permanent enclosed transfer station at the GVRDF. The collected organics at the GVRDF would then be hauled to the Spa Hills Farm facility for processing. In total, approximately 4,000 tonnes of organics would be diverted per year.
- Alternative 2 (ICI and Residential Ban, Spa Hills): As in Alternative 1, the RDNO would implement a district wide ICI ban on organics and would extend the ban to residential organics. The City of Vernon, City of Armstrong, City of Enderby, Township of Spallumcheen, District of Coldstream, Village of Lumby, and surrounding electoral areas would implement curbside organic collection. The RDNO would construct a permanent enclosed transfer station at the GVRDF, and would install dedicated organic bins at the ASRDF and LRDF for self haulers. The organics collected at the ASRDF and LRDFs would then be hauled to the GVRDF. All organics collected at the GVRDF would be hauled to the Spa Hills Farm facility. In total, approximately 5,000 tonnes of organics would be diverted per year.
- Alternative 3 (ICI Ban, RDNO Owned): The RDNO would implement a district wide ICI ban on organics. The RDNO would construct and operate a fully enclosed compost facility at the GVRDF. In total, approximately 2,000 tonnes of organics would be diverted per year.
- Alternative 4 (ICI and Residential Ban, RDNO Owned): The RDNO would implement a district wide ICI and residential ban on organics. The City of Vernon, City of Armstrong, City of Enderby, Township of Spallumcheen, District of Coldstream, Village of Lumby, and surrounding electoral areas would implement curbside organic collection. The RDNO would construct and operate a fully enclosed compost facility at the GVRDF. Dedicated organic bins would be installed at the ASRDF and LRDF for self haulers. The organics collected at the ASRDF and LRDF would then be hauled to the GVRDF. In total, approximately 5,000 tonnes of organics would be diverted per year.

The following section provides a summary of the cost analysis completed for the above-noted alternatives.

3.1 Methodology

The cost analyses for all alternatives presented herein were completed using the net present value (NPV) methodology to facilitate comparison of the alternatives. The costs provided and the analyses completed are for comparison purpose only. The costs do not represent the “full cost accounting” for these alternatives. NPV compares the

value of a dollar today to the value of the same dollar in the future, taking inflation and interest into account. If the NPV of the analysis is positive, it indicates that the cash flow into the system, in this case revenues from tipping fees, recycling, and taxation is sufficient to cover the cash flow out of the system. A negative NPV is the result of inadequate cash flow to cover all the expenditures and is not financially sustainable in the long-term without reducing the expenditures or increasing revenues.

The calculation of NPV was based upon the following parameters:

- Discount interest rate of 1.5 percent;
- Inflation rate of 2.0 percent; and
- Real discount interest rate of negative 0.49 percent (calculated based upon the above discount interest rate and inflation value).

The real discounted interest rate was used to calculate NPV to account for future inflation, therefore making future revenue and expenses presented herein more transparent. If the real discount interest rate is negative (inflation greater than discount interest rate), as is the case in this analysis, it indicates that the real value or purchasing power of the revenues will have decreased, meaning additional revenues would be required to maintain the current purchasing power or services of the system. If the real discount interest rate is positive (inflation less than discount interest rate), the opposite holds true. Less revenue would be required to maintain the current purchasing power or services as the interest earned on the revenues would outpace the inflationary effect on those same items.

3.2 Reference Material and Assumptions

The information used to complete the cost analysis for the aforementioned alternatives was provided by the RDNO. The documentation used for this analysis included the following:

- The 2014, 2015, and 2016 Income Statement (budgeted and actual);
- The 2017 Income Statement (budgeted);
- The 2014, 2015, and 2016 GVRDF, ASRDF and LRDF Revenue by Product Code;
- The Long-Term Capital Expenditure Program;
- The 2017 Capital Budget;
- The Solid Waste Management Funding Policy (Board of Directors Minutes);
- The Tipping Fee Rate sheet;
- Organics Management Options – Progress Meeting Webinar Presentation (Carey McIver, April 2017); and
- "Organic Management Options," (Carey McIver, May 2017).

For the purpose of the cost analyses, the following assumptions were made with respect to the solid waste management system development and operations:

- The average of the actual waste tonnages landfilled for the last 3 years were used to estimate the 2017 waste tonnages landfilled for each landfill (including transfer stations). GVRDF – 29,199 tonnes, ASRDF – 11,932 tonnes, and LRDF – 1,925 tonnes;
- The average of the actual diversion tonnages for the last 3 years were used to estimate the 2017 diversion tonnages at each landfill (including transfer stations). GVRDF – 19,116 tonnes, ASRDF – 3,850 tonnes, and LRDF – 1,617 tonnes; and
- An annual growth rate for waste and diversion tonnages based on the British Columbia Stats Population Projection 2017 to 2041. For 2017 – 1.0 percent, 2018 to 2020 – 0.9 percent, 2021 to 2025 – 0.8 percent, 2026 to 2029 – 0.7 percent, 2030 to 2033 – 0.6 percent, 2034 to 2036 – 0.5 percent, and 2037 and beyond – 0.4 percent.

A breakdown of each waste and diversion category for each landfill are presented in Table 24.

Revenues associated with the solid waste management system were assumed to include the following (based on the RDNO's 2017 budget):

- Tipping fees from refuse and diverted material as per Table 25;
- Tipping fees Cherryville – $30,000;
- Tipping fees Kingfisher – $14,000;
- Silver Star Waste Collection Fees – $115,000;
- Property Taxes – $420,000 (ending in 2026);
- Recycling Revenue – $77,500; and
- Other Revenues (Royalties, Rental, Grants, Sundry) – $11,500.

Operation costs taken into consideration include the following (based on the RDNO's 2017 budget):

- Administration, Waste Reduction, and Recycling
  - Composting Facility Operations – $150,000;
  - Drop-Bin Service Contract – $150,000;
  - Other Programs (Grants, Backyard Composters, Glass) – $40,000;
  - Salaries and Benefits – $380,000;
  - Environmental Monitoring – $40,000;
  - Eco Depot – $100,000;
  - Overhead – $300,000;
  - Public Information – $35,000;
  - Fees (Moneris, Professional) – $35,000;
  - Reserve – Operating – $225,000;
  - Reserve – Closure – variable ($396,000 to $816,000);
  - Volume Surveys – $14,000; and

  - Other – $70,000 annually with the exception of the 5th year increasing to $150,000.

- GVRDF
  - Salaries and Benefits – $190,000;
  - Contract Services – $605,000;
  - Operation and Maintenance – $200,000;
  - Gypsum Recycling Program – $200,000;
  - Asphalt Roof Recycling – $100,000;
  - Organic Waste Program – $350,000;
  - Landfill Gas Plant – $15,000;
  - Contractor Metal – $25,000; and
  - Other – $50,000.
- ASRDF
  - Salaries and Benefits – $155,000;
  - Contract Services – $465,000;
  - Operation and Maintenance – Landfill – $115,000;
  - Operation and Maintenance – Transfer Station – $50,000;
  - Cover Provision – $7,000;
  - Organic Program – $85,000;
  - Poplar Tree Program – $35,000;
  - Contractor Metal – $10,000; and
  - Other – $20,000.
- LRDF
  - Salaries and Benefits – $44,000;
  - Contract Services – $120,000;
  - Operation and Maintenance – $25,000;
  - Cover Provision – $5,000;
  - Organic Program – $30,000;
  - Contractor Metal – $1,500; and
  - Other – $1,000.
- Cherryville
  - Contract Services – $33,000;
  - Operation and Maintenance – $32,000;
  - Contractor Metal – $1,500; and
  - Other – $1,500.
- Kingfisher
  - Contract Services – $25,000;
  - Operation and Maintenance – $20,000;
  - Contractor Metal – $1,000; and
  - Other – $1,500.

- Silver Star
  - Contract Services – $36,000;
  - Hauling Services – $16,000;
  - Operation and Maintenance – $6,500;
  - Utilities – $3,500; and
  - Other – $53,000.

For the purpose of this analysis, the following assumptions were made with respect to capital costs:

- For the 2017 year:
  - Multi-Site New Signage – $35,000;
  - Vehicle Replacement – $35,000;
  - ASRDF Leachate Management Expansion – $375,000;
  - ASRDF Phase 1 Closure Drainage Works – $50,000;
  - GVRDF Non-Potable Water Supply – $58,000;
  - GVRDF Entrance Upgrade – $197,000;
  - GVRDF Expansion Predesign – $100,000;
  - Operating and Closure Plan Reviews – $70,000; and
  - Solid Waste Management Plan Update – $95,000.
- Capital costs associated with the remaining years are based on the RDNO's Long-Term Capital Projects as shown on Table 26.

The following assumptions were made with respect to the operating and closure reserves:

- The 2017 opening balance of the closure reserve is $3,636,000. Annual contribution to the closure fund is based on a fixed unit rate per tonne of waste received at site. The fixed unit rate per tonne is as follows: 2017 - $16, 2018 - $17, 2019 - $18, 2020 - $19, and for 2021 onwards - $20;
- The 2017 opening balance of the operating reserve is $5,000,000. Fixed annual contribution rate of $225,000;
- Operating reserve capped at $5,000,000. Excess funds over $5,000,000 transferred to the closure reserve fund; and
- Interest earned on the closure and operating reserve at a rate of 1.75 percent.

3.3 Status Quo

The cost analysis was undertaken on the Status Quo in order to create a baseline to which all alternatives could be compared. A summary of the results of the cost analysis for each alternative is presented in Tables 1 to 3.

As the current financial model employed by the RDNO for the solid waste management system is to offset all expenses related to solid waste management with a combination of tipping fees, property taxes, and other revenues, the Status Quo was set up as a breakeven model for 2017. Overall, for the 25-year time frame, the NPV

for the Status Quo is positive $22,969,779. The operating reserve fund is adequately funded to cover the costs of the RDNO's long-term capital projects. The detailed calculations for the Status Quo are provided in Tables 4 to 7.

Under Status Quo, the project site life for the existing GVRDF landfill footprint is approximately 34 years to 2050; the project site life for the existing ASRDF landfill footprint is approximately 17 years to 2033; and the project site life for the existing LRDF landfill footprint is approximately 80 years to 2096. It is assumed that a transfer station would be constructed at the ASRDF in 2033 with refuse hauled to the GVRDF beginning in 2034.

3.4 Alternative 1

Under Alternative 1, the RDNO would implement a district wide ICI ban on organics in mid-2019 and the City of Vernon would implement curbside organic collection beginning in 2020. In addition, the RDNO would construct a permanent enclosed transfer station at the GVRDF in the first half of 2019. The collected organics would then be hauled by Spa Hills Farm to their facility for processing. Total organics diverted under Alternative 1 would be 4,000 tonnes.

For the purpose of Alternative 1, the following assumptions were made in regard to the organic diversion program:

- ICI organic collection of 1,000 tonnes starting in 2019 and stepping up to 2,000 tonnes in 2020 and then indexed to population growth thereafter;
- City of Vernon organic collection of 1,500 tonnes in 2020 and stepping up to 2,000 tonnes in 2021 and then indexed to population growth thereafter; and
- Hauling of organics from GVRDF to Spa Hills Farm at an average rate of five loads per week, total of 260 loads per year. Based on 2,000 tonnes per year, average load would per trip would be approximately 8 tonnes. Depending on actual tonnes received at GVRDF, more or less loads may be hauled per week.

Cost taken into consideration for this alternative include the following:

- Permanent enclosed transfer station at the GVRDF (capital cost) – $1,000,000 in 2019;
- Additional annual operational costs related to the enclosed transfer station - $25,000 in 2019 and stepping up to $50,000 in 2020;
- Hauling costs from GVRDF to Spa Hills Farm facility - $250 per load; and
- Tipping fee at the Spa Hills Farm facility - $110 per tonne of organics.

The NPV for Alternative 1, accounting for the additional costs to implement the above stated organic diversion program, is positive $8,985,732; a net cost increase of approximately $13,984,047 over 25 years compared to the Status Quo. Approximately $1,200,000 of the cost increase would be attributed to the operation and maintenance of the enclosed transfer station; and $12,800,000 for the hauling and tipping fees related to the Spa Hills Farm facility. On average, the annual cost to operate the organic diversion program is approximately $560,000 or $140 per tonne of organics.

The capital cost of $1,014,851 would be transferred from the operating reserves. The operating reserve fund is adequately funded to cover the costs of the RDNO's long-term capital projects. A detailed summary for the results for Alternative 1 is provided in Table 3 and detailed calculations are provided in Tables 8 to 11.

It is noted that the cost analysis undertaken for Alternative 1 does not include the cost associated with curbside organic collection for the City of Vernon. It is assumed that those costs would be the responsibility of the City of Vernon. Collection services can range from $100 to over $250 per household, depending on level of service.

Based on the organic diversion assumptions stated under Alternative 1, the projected site life for the GVRDF increases by approximately 3 years (to 2053) over the Status Quo. The site life for the ASRDF and LRDF would remain unchanged over the Status Quo. A summary of site life for each RDF is provided in Table 2.

3.5 Alternative 2

Under Alternative 2, the RDNO would implement a district wide ICI ban on organics in mid-2019 and a district wide residential ban on organics beginning in 2020. A district wide organic curbside collection program would be implemented by each municipality and electoral areas in 2020. The RDNO would construct a permanent enclosed transfer station at the GVRDF in the first half of 2019 and would install dedicated organic bins and related infrastructure at the ASRDF and LRDF for self-haulers. The collected organics would then be hauled by Spa Hills Farm to their facility for processing. Total organics diverted under Alternative 2 would be 5,000 tonnes per year.

For the purpose of Alternative 2, the following assumptions were made in regard to the organic diversion program:

- ICI organic collection of 1,000 tonnes starting in 2019 and stepping up to 2,000 tonnes in 2020 and then indexed to population growth thereafter;
- City of Vernon organic collection of 1,500 tonnes in 2020 and stepping up to 2,110 tonnes in 2021 and then indexed to population growth thereafter;
- ASRDF organic collection of 525 tonnes in 2020 and stepping up to 700 tonnes in 2021 and then indexed to population growth thereafter;
- LRDF organic collection of 143 tonnes in 2020 and stepping up to 190 tonnes in 2021 and then indexed to population growth thereafter;
- Hauling of organics from the ASRDF and LRDF at a rate of five loads per week, total of 260 loads per year per facility. The primary reason for hauling five loads per week is to control odours and vectors at each of the facilities and not based on organic tonnages. The average organic tonnage for each load will be relatively small (i.e. less than 3 tonnes for ARSDF and 1 tonne for LRDF). Depending on odours and vectors, it may be possible to reduce the number of loads per week; and
- Hauling of organics from GVRDF to Spa Hills Farm at a rate of five loads per week, total of 260 loads per year. Based on 5,000 tonnes per year, average load

per trip would be approximately 19 tonnes. Depending on Spa Hills Farm hauling equipment, additional hauling trips above 260 may be required.

Cost taken into consideration for this alternative include the following:

- Permanent enclosed transfer station at the GVRDF (capital cost) – $1,000,000 in 2019;
- Additional annual operational costs related to the enclosed transfer station at the GVRDF - $25,000 in 2019 and stepping up to $50,000 in 2020;
- Organic transfer bins and related infrastructure at the ASRDF and LRDF (capital cost) – $50,000 per site;
- Hauling costs from ASRDF to GVRDF – $270 per load;
- Hauling costs from LRDF to GVRDF – $202.50 per load;
- Hauling costs from GVRDF to Spa Hills Farm facility - $250 per load; and
- Tipping fee at the Spa Hills Farm facility - $110 per tonne of organics.

The NPV for Alternative 2, accounting for the additional costs to implement the above noted organic diversion program, is positive $2,994,959; a net increase in cost of approximately $19,974,819 over 25 years compared to the Status Quo. Approximately $1,660,000 of the cost increase would be attributed to the hauling of organics from the ASRDF to the GVRDF; $1,250,000 to the hauling of organics from the LRDF to the GVRDF; $1,200,000 to the operation and maintenance of the enclosed transfer station at the GVRDF; and $15,520,000 for the hauling and tipping fees related to the Spa Hills Farm facility. On average, the annual cost to operate the organic diversion program is approximately $785,000 or $157 per tonne of organics. The capital costs of $1,116,336 associated with the enclosed transfer station at the GVRDF and bins and related infrastructure at the ASRDF and LRDF would be transferred from the operating reserves. The operating reserve fund is adequately funded to cover the costs of the RDNO's long-term capital projects. A detailed summary of the results for Alternative 2 is provided in Table 3 and detailed calculations are provided in Tables 12 to 15.

It is noted that the cost analysis undertaken for Alternative 2 does not include the cost associated with curbside organic collection throughout the RDNO. It is assumed that those costs would be the responsibility of the respective municipality and electoral area. The RDNO would be responsible for providing the collection service in the electoral areas. It was assumed that the RDNO would implement the collection services as a revenue neutral service (i.e. the cost to the RDNO to provide the collection service would be recovered through user fees). Collection services can range from $100 to over $250 per household, depending on level of service.

Based on the organic diversion assumptions stated under Alternative 2, the projected site life for the GVRDF would increase by approximately 3 years (to 2053) over Status Quo. The site life of the ASRDF would increase by approximately 1 year (to 2034), and the site life of the LRDF would increase by approximately 6 years (to 2102). A summary of site life for each RDF is provided in Table 2.

3.6 Alternative 3

Under Alternative 3, the RDNO would implement a district wide ICI ban on organics in mid-2019. The RDNO would also construct a fully enclosed compost facility with the capacity of handling 4,000 tonnes of organics and yard and garden waste at the GVRDF in the first half of 2019. The collected organics would be mixed with yard and garden waste to produce the compost at a 50-50 rate (i.e. 2,000 tonnes organics and 2,000 tonnes of yard and garden waste).

For the purpose of Alternative 3, the following assumptions were made in regard to the organic diversion program:

- ICI organic collection of 1,000 tonnes starting in 2019 and stepping up to 2,000 tonnes in 2020 and then indexed to population growth thereafter.

Cost taken into consideration for this alternative include the following:

- Permanent enclosed compost facility at the GVRDF (capital cost) – $1,600,000 in 2019 ($400 per tonne processed, assume 4,000 tonne capacity); and
- Additional annual operational costs related to the enclosed compost facility at a rate of $90 per tonne.

The NPV for Alternative 3, accounting for the additional costs to implement the above noted organic diversion program, is positive $13,627,867; a net cost increase of approximately $9,341,911 over 25 years compared to the Status Quo. All of the increased costs would be attributed to the operation and maintenance of the enclosed compost facility. On average, the annual cost to operate the organic diversion program is approximately $375,000 or $189 per tonne of organics. The capital cost of $1,623,762 would be transferred from the operating reserves. The operating reserve fund is adequately funded to cover the costs of the RDNO's long-term capital projects. A detailed summary for the results for Alternative 3 is provided in Table 3 and detailed calculations are provided in Tables 16 to 19.

Based on the organic diversion assumptions stated under Alternative 3, the projected site life for the GVRDF increases by approximately 1.5 years (to mid-2052) over the Status Quo. The site life for the ASRDF and LRDF would remain unchanged over the Status Quo. A summary of site life for each RDF is provided in Table 2.

3.7 Alternative 4

Under Alternative 4, the RDNO would implement a district wide ICI ban on organics in mid-2019 and a district wide residential ban on organics beginning in 2020. A district wide organic curbside collection program would be implemented by each municipality and electoral areas in 2020. The RDNO would construct a permanent enclosed compost facility with the capacity of handling 10,000 tonnes of organics and yard and garden waste at the GVRDF in the first half of 2019 and would install dedicated organic bins and related infrastructure at the ASRDF and LRDF. The collected organics would be mixed with yard and garden waste to produce the compost at a 50-50 rate (i.e. 5,000 tonnes organics and 5,000 tonnes of yard and garden waste).

For the purpose of Alternative 4, the following assumptions were made in regard to the organic diversion program:

- ICI organic collection of 1,000 tonnes starting in 2019 and stepping up to 2,000 tonnes in 2020 and then indexed to population growth thereafter;
- City of Vernon organic collection of 1,500 tonnes in 2020 and stepping up to 2,110 tonnes in 2021 and then indexed to population growth thereafter;
- ASRDF organic collection of 525 tonnes in 2020 and stepping up to 700 tonnes in 2021 and then indexed to population growth thereafter;
- LRDF organic collection of 143 tonnes in 2020 and stepping up to 190 tonnes in 2021 and then indexed to population growth thereafter; and
- Hauling of organics from the ASRDF and LRDF at a rate of 5 load per week, total of 260 load per year per facility. As previously stated, the primary reason for hauling five loads per week is to control odours and vectors at each of the facilities and not based on organic tonnages. The average organic tonnage for each load will be m (i.e. less than 3 tonnes for ARSDF and 1 tonne for LRDF). Depending on odours and vectors, it may be possible to reduce the number of loads per week.

Cost taken into consideration for this alternative include the following:

- Permanent enclosed compost facility at the GVRDF (capital cost) – $4,000,000 in 2019 ($400 per tonne processed, assume 10,000 tonne capacity);
- Organic transfer bins and related infrastructure at the ASRDF and LRDF (capital cost) – $50,000 per site;
- Hauling costs from ASRDF to GVRDF – $270 per load;
- Hauling costs from LRDF to GVRDF – $202.50 per load; and
- Additional annual operational costs related to the enclosed compost facility at a rate of $90 per tonne.

The NPV for Alternative 4, accounting for the additional costs to implement the above noted organic diversion program, is negative $3,110,126; a net cost increase of approximately $26,079,905 over 25 years compared to the Status Quo. A negative NPV indicates that there are insufficient revenues to cover the anticipated expenses for the alternative. As such, to balance the system, additional revenues (i.e. higher tipping fee rates) or reduction in expenses would be required.

Approximately $1,660,000 of the cost increase would be attributed to the hauling of organics from the ASRDF to the GVRDF; $1,240,000 to the hauling of organics from the LRDF to the GVRDF; and $22,840,000 to the operation and maintenance of the enclosed compost facility at the GVRDF. On average, the annual cost to operate the organic diversion program is approximately $1,030,000 or $206 per tonne of organics. The capital costs of $4,160,890 associated with the enclosed compost facility at the GVRDF and bins and related infrastructure at the ASRDF and LRDF would be transferred from the operating reserves. The operating reserve fund is adequately funded to cover the costs of the RDNO's long-term capital projects. A detailed

summary of the results for Alternative 4 is provided in Table 3 and detailed calculations are provided in Tables 20 to 23.

It is noted that the cost analysis undertaken for Alternative 4 does not include the cost associated with curbside organic collection throughout the RDNO. It is assumed that those costs would be the responsibility of the respective municipality and district electoral area. The RDNO would be responsible for providing the collection service in the electoral areas. It was assumed that the RDNO would implement the collection services as a revenue neutral service (i.e. the cost to the RDNO to provide the collection service would be recovered through user fees). Collection services can range from $100 to over $250 per household, depending on level of service.

Based on the organic diversion assumptions stated under Alternative 4, the projected site life for the GVRDF would increase by approximately 3 years (to 2053) over Status Quo. The site life of the ASRDF would increase by approximately 1 year (to 2034) and the site life of the LRDF would increase by approximately 6 years (to 2102). A summary of site life for each RDF is provided in Table 2.

4. CONCLUSION

- The existing conditions for the RDNO's solid waste management system (Status Quo) are financially sustainable over the 25-year cost analysis for the day-to-day operations, capital expenditures, and reserve funding for the RDNO's landfills and transfer stations. The overall NPV of the waste management system was positive $22,969,779.
- If the RDNO were to implement a district wide ICI ban on organics along with the City of Vernon undertaking a curbside organic collection program with the collected organics hauled and processed at the Spa Hills Farm facility (Alternative 1), the overall NPV of the waste management system would be positive $8,985,732; a net cost increase of approximately $13,984,047 over the Status Quo. Approximately $12,800,000 of the cost increase would be attributed to the hauling and tipping fees related to the Spa Hills Farm facility. On average, the annual cost to operate the organic diversion program is approximately $560,000 or $140 per tonne of organics. Total capital costs associated with Alternative 1 to implement the organic diversion is $1,014,851. Total organics diverted under Alternative 1 would be 4,000 tonnes per year.
- If the RDNO were to implement a district wide ICI and residential ban on organics with the collected organics hauled and processed at the Spa Hills Farm facility (Alternative 2), the overall NPV of the waste management system would be positive $2,994,959; a net increase of approximately $19,974,819 over the Status Quo. Approximately $15,520,000 of the cost increase would be attributed to the hauling and tipping fees related to the Spa Hills Farm facility. On average, the annual cost to operate the organic diversion program is approximately $785,000 or $157 per tonne of organics. Total capital costs associated with Alternative 2 to implement the organic diversion is $1,116,336. Total organics diverted under Alternative 2 would be 5,000 tonnes per year.
- If the RDNO choose to construct a fully enclosed compost facility at the GVRDF and implement a district wide ICI ban on organics (Alternative 3), the overall NPV of the waste management system would be positive $13,627,867; a net increase in cost of approximately $9,341,911 over the Status Quo. All of the cost increase would be attributed to the operation and maintenance of the enclosed compost facility. On average, the annual cost to operate the organic diversion program is approximately $375,000 or $187 per tonne of organics. Total capital costs associated with Alternative 3 to implement the organic diversion is $1,623,762. Total organics diverted under Alternative 3 would be 2,000 tonnes per year.
- If the RDNO choose to construct a fully enclosed compost facility at the GVRDF and implement a district wide ICI and residential ban on organics (Alternative 4), the overall NPV of the waste management system would be negative $3,110,126; a net increase in cost of approximately $26,079,905 over the Status Quo. Approximately $22,840,000 be attributed to the operation and maintenance of the enclosed compost facility. On average, the annual cost to operate the organic diversion program is approximately $1,030,000 or $206 per tonne of organics. Total capital costs associated with Alternative 4 to implement the organic

diversion is $4,160,890. Total organics diverted under Alternative 4 would be 5,000 tonnes per year.

- It is noted that the cost analysis for Alternatives 2 and 4 do not include the cost associated with the residential curbside organic collection throughout the RDNO. It is assumed that those costs would be the responsibility of the respective municipality and electoral area. The RDNO would be responsible for providing the collection service in the electoral areas. It was assumed that the RDNO would implement the collection services as a revenue neutral service (i.e. the cost to the RDNO to provide the collection service would be recovered through user fees). Collection services can range from $100 to over $250 per household, depending on level of service.
- Implementation of one of the four alternatives would increase the site life of the GVRDF by up to 3 years, up to 1 year for the ASRDF, and up to 6 years for the LRDF over the Status Quo. Alternatives 1, 2, and 4 would increase the GVRDF site life by approximately 3 years and Alternative 3 would increase the site life by 1 year. Alternatives 2 and 4 would increase the ASRDF site life by 1 year and would increase the LRDF site life by 6 years while Alternatives 1 and 3 would have no affect on either the ASRDF or LRDF.
- An analysis of the operating reserve fund for each alternative indicates that the operating reserve fund is adequately funded over the 25-year cost analysis to cover the costs of the RDNO's long term capital projects and costs associated with the construction of either the fully enclosed transfer station (Alternatives 1 and 2) or compost facility (Alternative 3 and 4).

TABLES

Table 1 Cost Analysis Results Summary

Tables	Alternative Description	Net Present Value	Organics Diverted (tonnes)	Total Capital Cost - Organic Diversion	Total Operating Cost - Organic Diversion
4 - 7	Status Quo	22,969,779			
8 - 11	Alternative 1 (ICI Ban + Vernon, Spa Hills)	8,985,732	4,000	1,014,851	13,984,047
12 - 15	Alternative 2 (ICI Ban + Residential, Spa Hills)	2,994,959	5,000	1,116,336	19,637,049
16 - 19	Alternative 3 (ICI Ban, RDNO Owned)	13,627,867	2,000	1,623,762	9,341,911
20 - 23	Alternative 4 (ICI Ban + Residential, RDNO Owned)	-3,110,126	5,000	4,160,890	25,742,135

Table 2 Site Life Summary

Site	Status Quo		Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	Remaining Site Life (Years)	Closure Year	Remaining Site Life (Years)	Closure Year	Remaining Site Life (Years)	Closure Year	Remaining Site Life (Years)	Closure Year	Remaining Site Life (Years)	Closure Year
GVRDF	34	2050	37	2053	37	2053	36	2052	37	2053
ASRDF	17	2033	17	2033	18	2034	17	2033	18	2034
LRDF	80	2096	80	2096	86	2102	80	2096	86	2102

Table 3 Cost Analysis Detailed Summary

NPV - Status Quo 22,969,779

Status Quo	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Revenue																									
Administration	509,438	509,879	510,322	510,767	511,214	511,663	512,115	512,568	513,024	513,483	93,943	94,406	94,871	95,338	95,808	96,280	96,754	97,231	97,710	98,191	98,675	99,161	99,649	100,140	100,634
Greater Vernon RDF	3,774,755	3,740,057	3,822,472	3,906,459	4,946,348	4,039,798	4,092,176	4,145,233	4,198,978	4,249,200	4,300,023	4,351,454	4,403,500	4,451,743	4,500,515	4,549,821	4,599,668	4,645,438	4,691,663	4,738,349	4,780,737	4,823,505	4,866,655	4,910,191	4,954,117
Armstrong/Spallumcheen & Lumby	2,063,388	1,673,271	1,964,674	1,749,379	1,786,763	2,551,473	1,833,396	1,857,166	1,881,246	1,903,746	1,968,738	1,949,559	1,972,876	1,994,491	2,016,342	2,038,432	6,844,122	2,081,270	2,101,981	2,122,897	2,141,888	2,161,049	2,180,381	2,199,887	2,219,566
Transfer Stations	159,783	160,570	161,361	162,156	162,955	163,758	164,564	165,375	166,190	167,008	167,831	168,658	169,489	170,324	171,163	172,006	172,853	173,705	174,560	175,420	176,284	177,153	178,025	178,902	179,784
	6,507,365	**6,083,778**	**6,458,829**	**6,328,761**	**7,407,279**	**7,266,692**	**6,602,251**	**6,680,343**	**6,759,438**	**6,833,438**	**6,530,536**	**6,564,077**	**6,640,736**	**6,711,896**	**6,783,828**	**6,856,539**	**11,713,397**	**6,997,644**	**7,065,914**	**7,134,857**	**7,197,585**	**7,260,868**	**7,324,711**	**7,389,120**	**7,454,101**
Expenses																									
Administration	2,404,679	2,300,029	2,362,590	2,426,577	2,573,102	2,510,730	2,530,540	2,550,544	2,570,744	2,674,206	2,609,785	2,629,572	2,649,540	2,668,676	2,774,092	2,707,432	2,727,055	2,745,784	2,764,659	2,871,941	2,801,757	2,819,962	2,838,296	2,856,760	2,965,813
Greater Vernon RDF	2,266,108	1,752,136	1,760,767	1,769,441	2,736,415	1,786,916	1,795,719	1,804,565	1,813,454	1,822,388	1,831,365	1,840,386	1,849,452	1,858,563	1,867,719	1,876,919	1,886,165	1,895,456	1,904,794	1,914,177	1,923,606	1,933,082	1,942,605	1,952,174	1,961,791
Armstrong/Spallumcheen & Lumby	1,551,103	1,129,547	1,388,824	1,140,703	1,146,322	1,893,514	1,157,644	1,163,346	1,169,077	1,174,836	1,222,845	1,186,439	1,192,284	1,198,157	1,204,059	1,209,991	5,999,309	884,171	889,777	895,424	900,855	906,322	911,826	917,366	922,942
Transfer Stations	231,635	232,777	233,923	235,076	236,234	237,397	238,567	239,742	240,923	242,110	243,302	244,501	245,705	246,916	248,132	249,354	250,583	251,817	253,058	254,304	255,557	256,816	258,081	259,352	260,630
	6,453,526	**5,414,488**	**5,746,104**	**5,571,796**	**6,692,072**	**6,428,557**	**5,722,469**	**5,758,197**	**5,794,199**	**5,913,539**	**5,907,298**	**5,900,899**	**5,936,982**	**5,972,312**	**6,094,002**	**6,043,696**	**10,863,112**	**5,777,229**	**5,812,288**	**5,935,846**	**5,881,775**	**5,916,182**	**5,950,808**	**5,985,653**	**6,111,176**
Revenue Over Expenses																									
Administration	-1,895,241	-1,790,150	-1,852,268	-1,915,810	-2,061,888	-1,999,067	-2,018,425	-2,037,976	-2,057,720	-2,160,723	-2,515,842	-2,535,166	-2,554,669	-2,573,337	-2,678,284	-2,611,152	-2,630,301	-2,648,554	-2,666,949	-2,773,750	-2,703,082	-2,720,801	-2,738,647	-2,756,620	-2,865,179
Greater Vernon RDF	1,508,647	1,987,922	2,061,705	2,137,018	2,209,933	2,252,881	2,296,457	2,340,668	2,385,524	2,426,813	2,468,658	2,511,068	2,554,048	2,593,180	2,632,797	2,672,902	2,713,503	2,749,981	2,786,870	2,824,172	2,857,131	2,890,423	2,924,050	2,958,017	2,992,326
Armstrong/Spallumcheen & Lumby	512,285	543,724	575,851	608,676	640,441	657,960	675,752	693,820	712,168	728,910	745,893	763,119	780,593	796,333	812,282	828,441	844,813	1,197,099	1,212,203	1,227,473	1,241,033	1,254,726	1,268,555	1,282,521	1,296,624
Transfer Stations	-71,852	-72,206	-72,562	-72,919	-73,279	-73,639	-74,002	-74,367	-74,733	-75,101	-75,471	-75,843	-76,217	-76,592	-76,969	-77,349	-77,730	-78,112	-78,497	-78,884	-79,273	-79,663	-80,055	-80,450	-80,846
	53,838	**669,290**	**712,726**	**756,965**	**715,207**	**838,135**	**879,781**	**922,146**	**965,239**	**919,899**	**623,238**	**663,178**	**703,755**	**739,584**	**689,826**	**812,843**	**850,286**	**1,220,415**	**1,253,627**	**1,199,011**	**1,315,809**	**1,344,685**	**1,373,903**	**1,403,468**	**1,342,924**

NPV - Alternative 1 (ICI Ban + Vernon, Spa Hills) 8,985,732

Status Quo	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Revenue																									
Administration	509,438	509,879	510,322	510,767	511,214	511,663	512,115	512,568	513,024	513,483	93,943	94,406	94,871	95,338	95,808	96,280	96,754	97,231	97,710	98,191	98,675	99,161	99,649	100,140	100,634
Greater Vernon RDF	3,774,755	3,740,057	4,837,323	3,906,459	4,946,348	4,039,798	4,092,176	4,145,233	4,198,978	4,249,200	4,300,023	4,351,454	4,403,500	4,451,743	4,500,515	4,549,821	4,599,668	4,645,438	4,691,663	4,738,349	4,780,737	4,823,505	4,866,655	4,910,191	4,954,117
Armstrong/Spallumcheen & Lumby	2,063,388	1,673,271	1,964,674	1,749,379	1,786,763	2,551,473	1,833,396	1,857,166	1,881,246	1,903,746	1,968,738	1,949,559	1,972,876	1,994,491	2,016,342	2,038,432	6,844,122	2,081,270	2,101,981	2,122,897	2,141,888	2,161,049	2,180,381	2,199,887	2,219,566
Transfer Stations	159,783	160,570	161,361	162,156	162,955	163,758	164,564	165,375	166,190	167,008	167,831	168,658	169,489	170,324	171,163	172,006	172,853	173,705	174,560	175,420	176,284	177,153	178,025	178,902	179,784
	6,507,365	**6,083,778**	**7,473,681**	**6,328,761**	**7,407,279**	**7,266,692**	**6,602,251**	**6,680,343**	**6,759,438**	**6,833,438**	**6,530,536**	**6,564,077**	**6,640,736**	**6,711,896**	**6,783,828**	**6,856,539**	**11,713,397**	**6,997,644**	**7,065,914**	**7,134,857**	**7,197,585**	**7,260,868**	**7,324,711**	**7,389,120**	**7,454,101**
Expenses																									
Administration	2,404,679	2,300,029	2,362,590	2,426,577	2,573,102	2,510,730	2,530,540	2,550,544	2,570,744	2,674,206	2,609,785	2,629,572	2,649,540	2,668,676	2,774,092	2,707,432	2,727,055	2,745,784	2,764,659	2,871,941	2,801,757	2,819,962	2,838,296	2,856,760	2,965,813
Greater Vernon RDF	2,266,108	1,752,136	2,945,606	2,279,366	3,307,024	2,363,976	2,379,309	2,394,764	2,410,344	2,425,571	2,440,913	2,456,371	2,471,947	2,487,138	2,502,437	2,517,845	2,533,363	2,548,466	2,563,670	2,578,975	2,593,842	2,608,801	2,623,853	2,638,999	2,654,240
Armstrong/Spallumcheen & Lumby	1,551,103	1,129,547	1,388,824	1,140,703	1,146,322	1,893,514	1,157,644	1,163,346	1,169,077	1,174,836	1,222,845	1,186,439	1,192,284	1,198,157	1,204,059	1,209,991	5,999,309	884,171	889,777	895,424	900,855	906,322	911,826	917,366	922,942
Transfer Stations	231,635	232,777	233,923	235,076	236,234	237,397	238,567	239,742	240,923	242,110	243,302	244,501	245,705	246,916	248,132	249,354	250,583	251,817	253,058	254,304	255,557	256,816	258,081	259,352	260,630
	6,453,526	**5,414,488**	**6,930,942**	**6,081,721**	**7,262,681**	**7,005,617**	**6,306,059**	**6,348,396**	**6,391,089**	**6,516,723**	**6,516,846**	**6,516,884**	**6,559,476**	**6,600,887**	**6,728,721**	**6,684,622**	**11,510,309**	**6,430,239**	**6,471,164**	**6,600,644**	**6,552,010**	**6,591,901**	**6,632,056**	**6,672,478**	**6,803,625**
Revenue Over Expenses																									
Administration	-1,895,241	-1,790,150	-1,852,268	-1,915,810	-2,061,888	-1,999,067	-2,018,425	-2,037,976	-2,057,720	-2,160,723	-2,515,842	-2,535,166	-2,554,669	-2,573,337	-2,678,284	-2,611,152	-2,630,301	-2,648,554	-2,666,949	-2,773,750	-2,703,082	-2,720,801	-2,738,647	-2,756,620	-2,865,179
Greater Vernon RDF	1,508,647	1,987,922	1,891,717	1,627,093	1,639,324	1,675,822	1,712,867	1,750,469	1,788,634	1,823,629	1,859,110	1,895,083	1,931,554	1,964,606	1,998,078	2,031,976	2,066,305	2,096,972	2,127,994	2,159,374	2,186,896	2,214,704	2,242,802	2,271,192	2,299,877
Armstrong/Spallumcheen & Lumby	512,285	543,724	575,851	608,676	640,441	657,960	675,752	693,820	712,168	728,910	745,893	763,119	780,593	796,333	812,282	828,441	844,813	1,197,099	1,212,203	1,227,473	1,241,033	1,254,726	1,268,555	1,282,521	1,296,624
Transfer Stations	-71,852	-72,206	-72,562	-72,919	-73,279	-73,639	-74,002	-74,367	-74,733	-75,101	-75,471	-75,843	-76,217	-76,592	-76,969	-77,349	-77,730	-78,112	-78,497	-78,884	-79,273	-79,663	-80,055	-80,450	-80,846
	53,838	**669,290**	**542,738**	**247,040**	**144,598**	**261,075**	**296,192**	**331,947**	**368,349**	**316,715**	**13,690**	**47,193**	**81,261**	**111,010**	**55,107**	**171,917**	**203,088**	**567,405**	**594,750**	**534,213**	**645,574**	**668,967**	**692,655**	**716,643**	**650,475**

NPV - Alternative 2 (ICI Ban + Residential, Spa Hills) 2,994,959

Status Quo	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Revenue																									
Administration	509,438	509,879	510,322	510,767	511,214	511,663	512,115	512,568	513,024	513,483	93,943	94,406	94,871	95,338	95,808	96,280	96,754	97,231	97,710	98,191	98,675	99,161	99,649	100,140	100,634
Greater Vernon RDF	3,774,755	3,740,057	4,837,323	3,906,459	4,946,348	4,039,798	4,092,176	4,145,233	4,198,978	4,249,200	4,300,023	4,351,454	4,403,500	4,451,743	4,500,515	4,549,821	4,599,668	4,645,438	4,691,663	4,738,349	4,780,737	4,823,505	4,866,655	4,910,191	4,954,117
Armstrong/Spallumcheen & Lumby	2,063,388	1,673,271	2,066,160	1,749,379	1,786,763	2,551,473	1,833,396	1,857,166	1,881,246	1,903,746	1,968,738	1,949,559	1,972,876	1,994,491	2,016,342	2,038,432	2,060,764	6,888,192	2,101,981	2,122,897	2,141,888	2,161,049	2,180,381	2,199,887	2,219,566
Transfer Stations	159,783	160,570	161,361	162,156	162,955	163,758	164,564	165,375	166,190	167,008	167,831	168,658	169,489	170,324	171,163	172,006	172,853	173,705	174,560	175,420	176,284	177,153	178,025	178,902	179,784
	6,507,365	**6,083,778**	**7,575,166**	**6,328,761**	**7,407,279**	**7,266,692**	**6,602,251**	**6,680,343**	**6,759,438**	**6,833,438**	**6,530,536**	**6,564,077**	**6,640,736**	**6,711,896**	**6,783,828**	**6,856,539**	**6,930,040**	**11,804,565**	**7,065,914**	**7,134,857**	**7,197,585**	**7,260,868**	**7,324,711**	**7,389,120**	**7,454,101**
Expenses																									
Administration	2,404,679	2,300,029	2,362,590	2,426,577	2,573,102	2,510,730	2,530,540	2,550,544	2,570,744	2,674,206	2,609,785	2,629,572	2,649,540	2,668,676	2,774,092	2,707,432	2,727,055	2,745,784	2,764,659	2,871,941	2,801,757	2,819,962	2,838,296	2,856,760	2,965,813
Greater Vernon RDF	2,266,108	1,752,136	2,945,606	2,363,504	3,419,760	2,478,174	2,494,987	2,511,942	2,529,042	2,545,688	2,562,467	2,579,379	2,596,426	2,612,981	2,629,659	2,646,460	2,663,387	2,679,784	2,696,295	2,712,920	2,728,984	2,745,153	2,761,425	2,777,802	2,794,284
Armstrong/Spallumcheen & Lumby	1,551,103	1,129,547	1,490,309	1,265,991	1,272,228	2,020,040	1,284,793	1,291,122	1,297,482	1,303,874	1,352,518	1,316,751	1,323,238	1,329,756	1,336,307	1,342,890	1,349,505	6,163,074	1,024,650	1,030,961	1,037,060	1,043,198	1,049,376	1,055,593	1,061,851
Transfer Stations	231,635	232,777	233,923	235,076	236,234	237,397	238,567	239,742	240,923	242,110	243,302	244,501	245,705	246,916	248,132	249,354	250,583	251,817	253,058	254,304	255,557	256,816	258,081	259,352	260,630
	6,453,526	**5,414,488**	**7,032,428**	**6,291,147**	**7,501,323**	**7,246,341**	**6,548,887**	**6,593,350**	**6,638,191**	**6,765,878**	**6,768,073**	**6,770,204**	**6,814,909**	**6,858,329**	**6,988,190**	**6,946,136**	**6,990,529**	**11,840,460**	**6,738,661**	**6,870,126**	**6,823,358**	**6,865,128**	**6,907,178**	**6,949,508**	**7,082,578**
Revenue Over Expenses																									
Administration	-1,895,241	-1,790,150	-1,852,268	-1,915,810	-2,061,888	-1,999,067	-2,018,425	-2,037,976	-2,057,720	-2,160,723	-2,515,842	-2,535,166	-2,554,669	-2,573,337	-2,678,284	-2,611,152	-2,630,301	-2,648,554	-2,666,949	-2,773,750	-2,703,082	-2,720,801	-2,738,647	-2,756,620	-2,865,179
Greater Vernon RDF	1,508,647	1,987,922	1,891,717	1,542,955	1,526,588	1,561,624	1,597,189	1,633,291	1,669,936	1,703,512	1,737,556	1,772,075	1,807,074	1,838,763	1,870,857	1,903,361	1,936,281	1,965,654	1,995,369	2,025,429	2,051,753	2,078,352	2,105,230	2,132,390	2,159,833
Armstrong/Spallumcheen & Lumby	512,285	543,724	575,851	483,387	514,535	531,434	548,603	566,044	583,763	599,873	616,220	632,807	649,639	664,734	680,035	695,542	711,260	725,118	1,077,331	1,091,936	1,104,828	1,117,851	1,131,006	1,144,293	1,157,716
Transfer Stations	-71,852	-72,206	-72,562	-72,919	-73,279	-73,639	-74,002	-74,367	-74,733	-75,101	-75,471	-75,843	-76,217	-76,592	-76,969	-77,349	-77,730	-78,112	-78,497	-78,884	-79,273	-79,663	-80,055	-80,450	-80,846
	53,838	**669,290**	**542,738**	**37,613**	**-94,044**	**20,351**	**53,364**	**86,993**	**121,247**	**67,560**	**-237,537**	**-206,127**	**-174,172**	**-146,432**	**-204,362**	**-89,597**	**-60,490**	**-35,894**	**327,253**	**264,731**	**374,227**	**395,739**	**417,534**	**439,613**	**371,523**

NPV - Alternative 3 (ICI Ban, RDNO Owned) 13,627,867

Status Quo	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Revenue																									
Administration	509,438	509,879	510,322	510,767	511,214	511,663	512,115	512,568	513,024	513,483	93,943	94,406	94,871	95,338	95,808	96,280	96,754	97,231	97,710	98,191	98,675	99,161	99,649	100,140	100,634
Greater Vernon RDF	3,774,755	3,740,057	5,446,234	3,906,459	4,946,348	4,039,798	4,092,176	4,145,233	4,198,978	4,249,200	4,300,023	4,351,454	4,403,500	4,451,743	4,500,515	4,549,821	4,599,668	4,645,438	4,691,663	4,738,349	4,780,737	4,823,505	4,866,655	4,910,191	4,954,117
Armstrong/Spallumcheen & Lumby	2,063,388	1,673,271	1,964,674	1,749,379	1,786,763	2,551,473	1,833,396	1,857,166	1,881,246	1,903,746	1,968,738	1,949,559	1,972,876	1,994,491	2,016,342	2,038,432	6,844,122	2,081,270	2,101,981	2,122,897	2,141,888	2,161,049	2,180,381	2,199,887	2,219,566
Transfer Stations	159,783	160,570	161,361	162,156	162,955	163,758	164,564	165,375	166,190	167,008	167,831	168,658	169,489	170,324	171,163	172,006	172,853	173,705	174,560	175,420	176,284	177,153	178,025	178,902	179,784
	6,507,365	**6,083,778**	**8,082,591**	**6,328,761**	**7,407,279**	**7,266,692**	**6,602,251**	**6,680,343**	**6,759,438**	**6,833,438**	**6,530,536**	**6,564,077**	**6,640,736**	**6,711,896**	**6,783,828**	**6,856,539**	**11,713,397**	**6,997,644**	**7,065,914**	**7,134,857**	**7,197,585**	**7,260,868**	**7,324,711**	**7,389,120**	**7,454,101**
Expenses																									
Administration	2,404,679	2,300,029	2,362,590	2,426,577	2,573,102	2,510,730	2,530,540	2,550,544	2,570,744	2,674,206	2,609,785	2,629,572	2,649,540	2,668,676	2,774,092	2,707,432	2,727,055	2,745,784	2,764,659	2,871,941	2,801,757	2,819,962	2,838,296	2,856,760	2,965,813
Greater Vernon RDF	2,266,108	1,752,136	3,567,202	2,136,587	3,108,321	2,163,645	2,177,332	2,191,126	2,205,027	2,218,644	2,232,360	2,246,178	2,260,098	2,273,707	2,287,411	2,301,209	2,315,104	2,328,663	2,342,311	2,356,048	2,369,430	2,382,895	2,396,441	2,410,071	2,423,783
Armstrong/Spallumcheen & Lumby	1,551,103	1,129,547	1,388,824	1,140,703	1,146,322	1,893,514	1,157,644	1,163,346	1,169,077	1,174,836	1,222,845	1,186,439	1,192,284	1,198,157	1,204,059	1,209,991	5,999,309	884,171	889,777	895,424	900,855	906,322	911,826	917,366	922,942
Transfer Stations	231,635	232,777	233,923	235,076	236,234	237,397	238,567	239,742	240,923	242,110	243,302	244,501	245,705	246,916	248,132	249,354	250,583	251,817	253,058	254,304	255,557	256,816	258,081	259,352	260,630
	6,453,526	**5,414,488**	**7,552,539**	**5,938,942**	**7,063,978**	**6,805,286**	**6,104,082**	**6,144,758**	**6,185,771**	**6,309,795**	**6,308,293**	**6,306,691**	**6,347,627**	**6,387,456**	**6,513,694**	**6,467,986**	**11,292,050**	**6,210,436**	**6,249,805**	**6,377,717**	**6,327,599**	**6,365,995**	**6,404,644**	**6,443,549**	**6,573,169**
Revenue Over Expenses																									
Administration	-1,895,241	-1,790,150	-1,852,268	-1,915,810	-2,061,888	-1,999,067	-2,018,425	-2,037,976	-2,057,720	-2,160,723	-2,515,842	-2,535,166	-2,554,669	-2,573,337	-2,678,284	-2,611,152	-2,630,301	-2,648,554	-2,666,949	-2,773,750	-2,703,082	-2,720,801	-2,738,647	-2,756,620	-2,865,179
Greater Vernon RDF	1,508,647	1,987,922	1,879,032	1,769,872	1,838,027	1,876,153	1,914,844	1,954,107	1,993,951	2,030,557	2,067,663	2,105,276	2,143,403	2,178,036	2,213,105	2,248,612	2,284,564	2,316,774	2,349,352	2,382,301	2,411,307	2,440,610	2,470,214	2,500,121	2,530,333
Armstrong/Spallumcheen & Lumby	512,285	543,724	575,851	608,676	640,441	657,960	675,752	693,820	712,168	728,910	745,893	763,119	780,593	796,333	812,282	828,441	844,813	1,197,099	1,212,203	1,227,473	1,241,033	1,254,726	1,268,555	1,282,521	1,296,624
Transfer Stations	-71,852	-72,206	-72,562	-72,919	-73,279	-73,639	-74,002	-74,367	-74,733	-75,101	-75,471	-75,843	-76,217	-76,592	-76,969	-77,349	-77,730	-78,112	-78,497	-78,884	-79,273	-79,663	-80,055	-80,450	-80,846
	53,838	**669,290**	**530,053**	**389,819**	**343,301**	**461,407**	**498,168**	**535,585**	**573,667**	**523,643**	**222,243**	**257,386**	**293,110**	**324,440**	**270,133**	**388,553**	**421,347**	**787,208**	**816,109**	**757,140**	**869,985**	**894,873**	**920,067**	**945,571**	**880,932**

NPV - Alternative 4 (ICI Ban + Residential, RDNO Owned) (3,110,126)

Status Quo	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Revenue																									
Administration	509,438	509,879	510,322	510,767	511,214	511,663	512,115	512,568	513,024	513,483	93,943	94,406	94,871	95,338	95,808	96,280	96,754	97,231	97,710	98,191	98,675	99,161	99,649	100,140	100,634
Greater Vernon RDF	3,774,755	3,740,057	7,881,877	3,906,459	4,946,348	4,039,798	4,092,176	4,145,233	4,198,978	4,249,200	4,300,023	4,351,454	4,403,500	4,451,743	4,500,515	4,549,821	4,599,668	4,645,438	4,691,663	4,738,349	4,780,737	4,823,505	4,866,655	4,910,191	4,954,117
Armstrong/Spallumcheen & Lumby	2,063,388	1,673,271	2,066,160	1,749,379	1,786,763	2,551,473	1,833,396	1,857,166	1,881,246	1,903,746	1,968,738	1,949,559	1,972,876	1,994,491	2,016,342	2,038,432	2,060,764	6,888,192	2,101,981	2,122,897	2,141,888	2,161,049	2,180,381	2,199,887	2,219,566
Transfer Stations	159,783	160,570	161,361	162,156	162,955	163,758	164,564	165,375	166,190	167,008	167,831	168,658	169,489	170,324	171,163	172,006	172,853	173,705	174,560	175,420	176,284	177,153	178,025	178,902	179,784
	6,507,365	**6,083,778**	**10,619,719**	**6,328,761**	**7,407,279**	**7,266,692**	**6,602,251**	**6,680,343**	**6,759,438**	**6,833,438**	**6,530,536**	**6,564,077**	**6,640,736**	**6,711,896**	**6,783,828**	**6,856,539**	**6,930,040**	**11,804,565**	**7,065,914**	**7,134,857**	**7,197,585**	**7,260,868**	**7,324,711**	**7,389,120**	**7,454,101**
Expenses																									
Administration	2,404,679	2,300,029	2,362,590	2,426,577	2,573,102	2,510,730	2,530,540	2,550,544	2,570,744	2,674,206	2,609,785	2,629,572	2,649,540	2,668,676	2,774,092	2,707,432	2,727,055	2,745,784	2,764,659	2,871,941	2,801,757	2,819,962	2,838,296	2,856,760	2,965,813
Greater Vernon RDF	2,266,108	1,752,136	6,002,845	2,549,626	3,661,753	2,724,253	2,745,208	2,766,365	2,787,724	2,808,311	2,829,080	2,850,035	2,871,177	2,891,481	2,911,953	2,932,594	2,953,405	2,973,316	2,993,379	3,013,595	3,032,859	3,052,258	3,071,793	3,091,464	3,111,272
Armstrong/Spallumcheen & Lumby	1,551,103	1,129,547	1,490,309	1,265,991	1,272,228	2,020,040	1,284,793	1,291,122	1,297,482	1,303,874	1,352,518	1,316,751	1,323,238	1,329,756	1,336,307	1,342,890	1,349,505	6,163,074	1,024,650	1,030,961	1,037,060	1,043,198	1,049,376	1,055,593	1,061,851
Transfer Stations	231,635	232,777	233,923	235,076	236,234	237,397	238,567	239,742	240,923	242,110	243,302	244,501	245,705	246,916	248,132	249,354	250,583	251,817	253,058	254,304	255,557	256,816	258,081	259,352	260,630
	6,453,526	**5,414,488**	**10,089,667**	**6,477,270**	**7,743,316**	**7,492,419**	**6,799,108**	**6,847,773**	**6,896,874**	**7,028,500**	**7,034,686**	**7,040,859**	**7,089,660**	**7,136,829**	**7,270,484**	**7,232,269**	**7,280,548**	**12,133,992**	**7,035,746**	**7,170,801**	**7,127,233**	**7,172,234**	**7,217,546**	**7,263,170**	**7,399,566**
Revenue Over Expenses																									
Administration	-1,895,241	-1,790,150	-1,852,268	-1,915,810	-2,061,888	-1,999,067	-2,018,425	-2,037,976	-2,057,720	-2,160,723	-2,515,842	-2,535,166	-2,554,669	-2,573,337	-2,678,284	-2,611,152	-2,630,301	-2,648,554	-2,666,949	-2,773,750	-2,703,082	-2,720,801	-2,738,647	-2,756,620	-2,865,179
Greater Vernon RDF	1,508,647	1,987,922	1,879,032	1,356,833	1,284,594	1,315,545	1,346,968	1,378,868	1,411,254	1,440,890	1,470,943	1,501,419	1,532,323	1,560,262	1,588,562	1,617,228	1,646,263	1,672,121	1,698,284	1,724,754	1,747,878	1,771,247	1,794,862	1,818,727	1,842,845
Armstrong/Spallumcheen & Lumby	512,285	543,724	575,851	483,387	514,535	531,434	548,603	566,044	583,763	599,873	616,220	632,807	649,639	664,734	680,035	695,542	711,260	725,118	1,077,331	1,091,936	1,104,828	1,117,851	1,131,006	1,144,293	1,157,716
Transfer Stations	-71,852	-72,206	-72,562	-72,919	-73,279	-73,639	-74,002	-74,367	-74,733	-75,101	-75,471	-75,843	-76,217	-76,592	-76,969	-77,349	-77,730	-78,112	-78,497	-78,884	-79,273	-79,663	-80,055	-80,450	-80,846
	53,838	**669,290**	**530,053**	**-148,509**	**-336,037**	**-225,727**	**-196,857**	**-167,430**	**-137,436**	**-195,062**	**-504,150**	**-476,783**	**-448,923**	**-424,933**	**-486,656**	**-375,730**	**-350,508**	**-329,427**	**30,168**	**-35,944**	**70,352**	**88,633**	**107,165**	**125,951**	**54,535**

Table 4 Status Quo - Waste Reduction and Administration

Interest Rate on Reserve	1.75%
NPV	-$59,761,598.99

Reference Figures	
General Inflation	2.0%
Discount Rate	1.5%
Real Discounted Interest Rate	-0.49%

Waste Tonnages		**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
Greater Vernon		29,199	29,462	29,727	29,995	30,235	30,477	30,720	30,966	31,214	31,432	31,652	31,874	32,097	32,290	32,483	32,678	32,874	33,039	33,204	33,370	33,504	33,638	33,772	33,907	34,043
Arsmstrong/Spallumcheen		11,932	12,039	12,147	12,257	12,355	12,454	12,553	12,654	12,755	12,844	12,934	13,025	13,116	13,195	13,274	13,353	13,433	13,501	13,568	13,636	13,691	13,745	13,800	13,855	13,911
Lumby		1,925	1,942	1,959	1,977	1,993	2,009	2,025	2,041	2,057	2,072	2,086	2,101	2,116	2,128	2,141	2,154	2,167	2,178	2,189	2,200	2,208	2,217	2,226	2,235	2,244
Total		**43,056**	**43,443**	**43,834**	**44,229**	**44,583**	**44,939**	**45,299**	**45,661**	**46,026**	**46,349**	**46,673**	**47,000**	**47,329**	**47,613**	**47,898**	**48,186**	**48,475**	**48,717**	**48,961**	**49,206**	**49,402**	**49,600**	**49,798**	**49,998**	**50,198**
Inflation Factor		**102.00%**	**104.04%**	**106.12%**	**108.24%**	**110.41%**	**112.62%**	**114.87%**	**117.17%**	**119.51%**	**121.90%**	**124.34%**	**126.82%**	**129.36%**	**131.95%**	**134.59%**	**137.28%**	**140.02%**	**142.82%**	**145.68%**	**148.59%**	**151.57%**	**154.60%**	**157.69%**	**160.84%**	**164.06%**
Present Value Discount		**98.52%**	**97.07%**	**95.63%**	**94.22%**	**92.83%**	**91.45%**	**90.10%**	**88.77%**	**87.46%**	**86.17%**	**84.89%**	**83.64%**	**82.40%**	**81.18%**	**79.99%**	**78.80%**	**77.64%**	**76.49%**	**75.36%**	**74.25%**	**73.15%**	**72.07%**	**71.00%**	**69.95%**	**68.92%**
		100.49%	**100.99%**	**101.49%**	**101.99%**	**102.49%**	**102.99%**	**103.50%**	**104.01%**	**104.52%**	**105.04%**	**105.55%**	**106.07%**	**106.60%**	**107.12%**	**107.65%**	**108.18%**	**108.71%**	**109.25%**	**109.79%**	**110.33%**	**110.87%**	**111.42%**	**111.97%**	**112.52%**	**113.07%**

Revenue		**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
Property Taxes	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000															
Recycling Revenue	77,500	77,882	78,265	78,651	79,038	79,428	79,819	80,212	80,607	81,004	81,403	81,804	82,207	82,612	83,019	83,428	83,839	84,252	84,667	85,084	85,504	85,925	86,348	86,773	87,201	87,630
Other Revenue (Royalties, Rental, Grants, Sundry)	11,500	11,557	11,614	11,671	11,728	11,786	11,844	11,902	11,961	12,020	12,079	12,139	12,199	12,259	12,319	12,380	12,441	12,502	12,564	12,625	12,688	12,750	12,813	12,876	12,939	13,003
Transfer from Operating Reserves																										
Transfer from Closure Reserves																										
Total Revenue	**509,000**	**509,438**	**509,879**	**510,322**	**510,767**	**511,214**	**511,663**	**512,115**	**512,568**	**513,024**	**513,483**	**93,943**	**94,406**	**94,871**	**95,338**	**95,808**	**96,280**	**96,754**	**97,231**	**97,710**	**98,191**	**98,675**	**99,161**	**99,649**	**100,140**	**100,634**
Expenses																										
Waste Reduction/Recycling																										
Composting Facility Operations	150,000	150,739	151,481	152,228	152,978	153,731	154,488	155,249	156,014	156,783	157,555	158,331	159,111	159,895	160,683	161,474	162,270	163,069	163,872	164,680	165,491	166,306	167,125	167,949	168,776	169,607
Drop-Bin Service Contract	150,000	150,739	151,481	152,228	152,978	153,731	154,488	155,249	156,014	156,783	157,555	158,331	159,111	159,895	160,683	161,474	162,270	163,069	163,872	164,680	165,491	166,306	167,125	167,949	168,776	169,607
Other Programs	40,000	40,197	40,395	40,594	40,794	40,995	41,197	41,400	41,604	41,809	42,015	42,222	42,430	42,639	42,849	43,060	43,272	43,485	43,699	43,915	44,131	44,348	44,567	44,786	45,007	45,229
	340,000	**341,675**	**343,358**	**345,049**	**346,749**	**348,457**	**350,174**	**351,899**	**353,632**	**355,374**	**357,125**	**358,884**	**360,652**	**362,429**	**364,214**	**366,008**	**367,811**	**369,623**	**371,444**	**373,274**	**375,112**	**376,960**	**378,817**	**380,683**	**382,559**	**384,443**
Administration																										
Salaries & Benefits	380,000	381,872	383,753	385,643	387,543	389,452	391,371	393,299	395,236	397,183	399,140	401,106	403,082	405,067	407,063	409,068	411,083	413,108	415,143	417,188	419,243	421,309	423,384	425,470	427,566	429,672
Environmental Monitoring	40,000	40,197	40,395	40,594	40,794	40,995	41,197	41,400	41,604	41,809	42,015	42,222	42,430	42,639	42,849	43,060	43,272	43,485	43,699	43,915	44,131	44,348	44,567	44,786	45,007	45,229
Eco Depot	100,000	100,493	100,988	101,485	101,985	102,487	102,992	103,500	104,010	104,522	105,037	105,554	106,074	106,597	107,122	107,649	108,180	108,713	109,248	109,786	110,327	110,871	111,417	111,966	112,517	113,072
Overhead	300,000	301,478	302,963	304,455	305,955	307,462	308,977	310,499	312,029	313,566	315,110	316,663	318,222	319,790	321,365	322,948	324,539	326,138	327,745	329,359	330,982	332,612	334,251	335,897	337,552	339,215
Public Information	35,000	35,172	35,346	35,520	35,695	35,871	36,047	36,225	36,403	36,583	36,763	36,944	37,126	37,309	37,493	37,677	37,863	38,049	38,237	38,425	38,615	38,805	38,996	39,188	39,381	39,575
Fees (Moneris, Professional)	35,000	35,172	35,346	35,520	35,695	35,871	36,047	36,225	36,403	36,583	36,763	36,944	37,126	37,309	37,493	37,677	37,863	38,049	38,237	38,425	38,615	38,805	38,996	39,188	39,381	39,575
Reserve - Operating	225,000	226,108	227,222	228,342	229,466	230,597	231,733	232,874	234,021	235,174	236,333	237,497	238,667	239,843	241,024	242,211	243,404	244,604	245,808	247,019	248,236	249,459	250,688	251,923	253,164	254,411
Reserve - Closure		692,285	745,829	800,733	857,027	913,830	925,678	937,680	949,838	962,153	973,661	985,306	997,091	1,009,017	1,020,071	1,031,247	1,042,545	1,053,967	1,064,454	1,075,047	1,085,744	1,095,457	1,105,257	1,115,144	1,125,120	1,135,185
Volume Surveys	14,000	14,069	14,138	14,208	14,278	14,348	14,419	14,490	14,561	14,633	14,705	14,778	14,850	14,924	14,997	15,071	15,145	15,220	15,295	15,370	15,446	15,522	15,598	15,675	15,752	15,830
Other	70,000	70,345	70,691	71,040	71,390	153,731	72,095	72,450	72,807	73,165	157,555	73,888	74,252	74,618	74,985	161,474	75,726	76,099	76,474	76,850	165,491	77,609	77,992	78,376	78,762	169,607
Solid Waste Management Plan Update		95,468																								
Capital - Operating		70,345																								
	1,199,000	**2,063,004**	**1,956,671**	**2,017,540**	**2,079,827**	**2,224,644**	**2,160,556**	**2,178,641**	**2,196,912**	**2,215,370**	**2,317,081**	**2,250,901**	**2,268,920**	**2,287,111**	**2,304,462**	**2,408,084**	**2,339,620**	**2,357,432**	**2,374,341**	**2,391,385**	**2,496,829**	**2,424,796**	**2,441,145**	**2,457,613**	**2,474,202**	**2,581,370**
Total Expenditures	**1,539,000**	**2,404,679**	**2,300,029**	**2,362,590**	**2,426,577**	**2,573,102**	**2,510,730**	**2,530,540**	**2,550,544**	**2,570,744**	**2,674,206**	**2,609,785**	**2,629,572**	**2,649,540**	**2,668,676**	**2,774,092**	**2,707,432**	**2,727,055**	**2,745,784**	**2,764,659**	**2,871,941**	**2,801,757**	**2,819,962**	**2,838,296**	**2,856,760**	**2,965,813**
Revenue over Expenditures	(1,030,000)	(1,895,241)	(1,790,150)	(1,852,268)	(1,915,810)	(2,061,888)	(1,999,067)	(2,018,425)	(2,037,976)	(2,057,720)	(2,160,723)	(2,515,842)	(2,535,166)	(2,554,669)	(2,573,337)	(2,678,284)	(2,611,152)	(2,630,301)	(2,648,554)	(2,666,949)	(2,773,750)	(2,703,082)	(2,720,801)	(2,738,647)	(2,756,620)	(2,865,179)
Closure Reserve - Transfer In	3,636,000	692,285	745,829	800,733	857,027	913,830	925,678	937,680	949,838	962,153	973,661	985,306	997,091	1,009,017	1,020,071	1,031,247	1,042,545	1,053,967	1,064,454	1,075,047	1,085,744	1,095,457	1,105,257	1,115,144	1,125,120	1,135,185
Closure Reserve - Transfer from Operating				315,841	316,967	-	-	-	-	-	171,687	324,997	326,167	327,343	328,524	329,711	330,905	-	-	-	-	100,638	338,188	339,423	340,664	341,911
Closure Reserve - Transfer to Revenue		50,246	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,261,380	-	-	-	-	-	-	-	-
Interest on Reserve		63,630	75,979	90,361	111,482	133,978	152,315	171,180	190,585	210,542	231,064	255,151	282,547	310,648	339,471	369,012	399,287	430,310	399,210	424,824	451,072	477,966	507,262	541,400	576,329	612,066
Closure Reserve	3,636,000	4,341,669	5,163,476	6,370,412	7,655,888	8,703,696	9,781,689	10,890,548	12,030,971	13,203,666	14,580,078	16,145,532	17,751,337	19,398,346	21,086,412	22,816,382	24,589,119	22,812,015	24,275,680	25,775,551	27,312,367	28,986,428	30,937,135	32,933,102	34,975,216	37,064,378
Operating Reserve - Transfer In	5,000,000	226,108	227,222	228,342	229,466	230,597	231,733	232,874	234,021	235,174	236,333	237,497	238,667	239,843	241,024	242,211	243,404	244,604	245,808	247,019	248,236	249,459	250,688	251,923	253,164	254,411
Operating Reserve - Transfer to Closure Reserve			132,788	315,841	316,967						171,687	324,997	326,167	327,343	328,524	329,711	330,905					100,638	338,188	339,423	340,664	341,911
Operating Reserve - Transfer to Revenue		492,414	-	-	-	958,258	741,545	-	-	-	-	-	-	-	-	-	-	1,521,978	-	-	-	-	-	-	-	-
Interest of Reserve		87,500	84,371	87,500	87,500	87,500	76,297	68,711	73,988	79,379	84,883	87,500	87,500	87,500	87,500	87,500	87,500	87,500	66,677	72,146	77,731	83,436	87,500	87,500	87,500	87,500
Operating Reserve	5,000,000	4,821,195	5,000,000	5,000,000	5,000,000	4,359,839	3,926,324	4,227,909	4,535,919	4,850,471	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	3,810,126	4,122,611	4,441,776	4,767,744	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000

Table 5 Status Quo - GVRDF

Vernon Landfill Volume, 2016	2,435,800 m^3
Vernon Waste Density	0.55
NPV	**$62,736,693.16**

only to 2041.

Reference Figures	
General Inflation	2.0%
Discount Rate	1.5%
Real Discounted Interest Rate	-0.49%

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Waste Tonnages																										
Greater Vernon		29,199	29,462	29,727	29,995	30,235	30,477	30,720	30,966	31,214	31,432	31,652	31,874	32,097	32,290	32,483	32,678	32,874	33,039	33,204	33,370	33,504	33,638	33,772	33,907	34,043
Transfer from Armstrong/Spallumcheen																			13,501	13,568	13,636	13,691	13,745	13,800	13,855	13,911
Annual Consumption of Volume (m3)		53,090	53,567	54,050	54,536	54,972	55,412	55,855	56,302	56,753	57,150	57,550	57,953	58,359	58,709	59,061	59,415	59,772	84,617	85,040	85,466	85,807	86,151	86,495	86,841	87,189
Total Waste Landfilled (tonnes)		29,199	58,661	88,389	118,384	148,618	179,095	209,815	240,782	271,996	303,428	335,081	366,955	399,052	431,342	463,825	496,503	529,378	575,917	622,690	669,696	716,890	764,273	811,845	859,608	907,561
Total Volume Consumed (m3)		53,090	106,657	160,707	215,243	270,215	325,627	381,483	437,785	494,538	551,687	609,237	667,190	725,549	784,257	843,318	902,734	962,505	1,047,123	1,132,163	1,217,628	1,303,436	1,389,586	1,476,082	1,562,923	1,650,112
Inflation Factor		**102.00%**	**104.04%**	**106.12%**	**108.24%**	**110.41%**	**112.62%**	**114.87%**	**117.17%**	**119.51%**	**121.90%**	**124.34%**	**126.82%**	**129.36%**	**131.95%**	**134.59%**	**137.28%**	**140.02%**	**142.82%**	**145.68%**	**148.59%**	**151.57%**	**154.60%**	**157.69%**	**160.84%**	**164.06%**
Present Value Discount		**98.52%**	**97.07%**	**95.63%**	**94.22%**	**92.83%**	**91.45%**	**90.10%**	**88.77%**	**87.46%**	**86.17%**	**84.89%**	**83.64%**	**82.40%**	**81.18%**	**79.99%**	**78.80%**	**77.64%**	**76.49%**	**75.36%**	**74.25%**	**73.15%**	**72.07%**	**71.00%**	**69.95%**	**68.92%**
		100.49%	**100.99%**	**101.49%**	**101.99%**	**102.49%**	**102.99%**	**103.50%**	**104.01%**	**104.52%**	**105.04%**	**105.55%**	**106.07%**	**106.60%**	**107.12%**	**107.65%**	**108.18%**	**108.71%**	**109.25%**	**109.79%**	**110.33%**	**110.87%**	**111.42%**	**111.97%**	**112.52%**	**113.07%**
Revenue		**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
Tipping Fees - Landfilled		3,108,972	3,182,154	3,256,774	3,332,858	3,407,052	3,451,226	3,495,973	3,541,300	3,587,215	3,630,120	3,673,539	3,717,477	3,761,940	3,803,154	3,844,820	3,886,943	3,929,527	3,968,629	4,008,120	4,048,003	4,084,216	4,120,753	4,157,616	4,194,809	4,232,335
Tipping Fees - Diverted		550,217	557,904	565,698	573,601	581,038	588,571	596,203	603,933	611,763	619,080	626,485	633,978	641,560	648,589	655,695	662,878	670,141	676,809	683,544	690,346	696,521	702,752	709,039	715,382	721,782
Transfer from Operating Reserves		115,567				958,258																				
Transfer from Closure Reserves																										
Total Revenue		**3,774,755**	**3,740,057**	**3,822,472**	**3,906,459**	**4,946,348**	**4,039,798**	**4,092,176**	**4,145,233**	**4,198,978**	**4,249,200**	**4,300,023**	**4,351,454**	**4,403,500**	**4,451,743**	**4,500,515**	**4,549,821**	**4,599,668**	**4,645,438**	**4,691,663**	**4,738,349**	**4,780,737**	**4,823,505**	**4,866,655**	**4,910,191**	**4,954,117**
Expenses																										
Greater Vernon RDF																										
Salaries & Benefits	190,000	190,936	191,877	192,822	193,772	194,726	195,685	196,649	197,618	198,592	199,570	200,553	201,541	202,534	203,531	204,534	205,542	206,554	207,572	208,594	209,622	210,654	211,692	212,735	213,783	214,836
Contract Services	605,000	607,980	610,975	613,985	617,010	620,049	623,103	626,173	629,258	632,357	635,472	638,603	641,749	644,910	648,087	651,279	654,488	657,712	660,952	664,208	667,480	670,768	674,072	677,392	680,729	684,083
Operation & Maintenance	200,000	200,985	201,975	202,970	203,970	204,975	205,985	206,999	208,019	209,044	210,074	211,108	212,148	213,193	214,244	215,299	216,360	217,425	218,496	219,573	220,654	221,741	222,834	223,931	225,034	226,143
Gypsum Recyling Program	200,000	200,985	201,975	202,970	203,970	204,975	205,985	206,999	208,019	209,044	210,074	211,108	212,148	213,193	214,244	215,299	216,360	217,425	218,496	219,573	220,654	221,741	222,834	223,931	225,034	226,143
Asphalt Roof Recyling	100,000	100,493	100,988	101,485	101,985	102,487	102,992	103,500	104,010	104,522	105,037	105,554	106,074	106,597	107,122	107,649	108,180	108,713	109,248	109,786	110,327	110,871	111,417	111,966	112,517	113,072
Organic Waste Program	350,000	351,724	353,457	355,198	356,948	358,706	360,473	362,249	364,033	365,827	367,629	369,440	371,260	373,088	374,926	376,773	378,629	380,494	382,369	384,252	386,145	388,047	389,959	391,880	393,810	395,750
Landfill Gas Plant	15,000	15,074	15,148	15,223	15,298	15,373	15,449	15,525	15,601	15,678	15,756	15,833	15,911	15,990	16,068	16,147	16,227	16,307	16,387	16,468	16,549	16,631	16,713	16,795	16,878	16,961
Contractor Metal	25,000	25,123	25,247	25,371	25,496	25,622	25,748	25,875	26,002	26,130	26,259	26,389	26,519	26,649	26,780	26,912	27,045	27,178	27,312	27,447	27,582	27,718	27,854	27,991	28,129	28,268
Other	50,000	50,246	50,494	50,743	50,993	51,244	51,496	51,750	52,005	52,261	52,518	52,777	53,037	53,298	53,561	53,825	54,090	54,356	54,624	54,893	55,164	55,435	55,708	55,983	56,259	56,536
Capital - Operating		522,562	-	-	-	958,258	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Capital - Closure																										
	1,735,000	**2,266,108**	**1,752,136**	**1,760,767**	**1,769,441**	**2,736,415**	**1,786,916**	**1,795,719**	**1,804,565**	**1,813,454**	**1,822,388**	**1,831,365**	**1,840,386**	**1,849,452**	**1,858,563**	**1,867,719**	**1,876,919**	**1,886,165**	**1,895,456**	**1,904,794**	**1,914,177**	**1,923,606**	**1,933,082**	**1,942,605**	**1,952,174**	**1,961,791**
Total Expenditures	**1,735,000**	**2,266,108**	**1,752,136**	**1,760,767**	**1,769,441**	**2,736,415**	**1,786,916**	**1,795,719**	**1,804,565**	**1,813,454**	**1,822,388**	**1,831,365**	**1,840,386**	**1,849,452**	**1,858,563**	**1,867,719**	**1,876,919**	**1,886,165**	**1,895,456**	**1,904,794**	**1,914,177**	**1,923,606**	**1,933,082**	**1,942,605**	**1,952,174**	**1,961,791**
Revenue over Expenditures	(1,735,000)	1,508,647	1,987,922	2,061,705	2,137,018	2,209,933	2,252,881	2,296,457	2,340,668	2,385,524	2,426,813	2,468,658	2,511,068	2,554,048	2,593,180	2,632,797	2,672,902	2,713,503	2,749,981	2,786,870	2,824,172	2,857,131	2,890,423	2,924,050	2,958,017	2,992,326

Table 6 Status Quo - ASRDF and LRDF

Armstrong Landfill Volume, 2016	328,626	m^3
Lumby Landfill Volume, 2016	379,703	m^3
Armstrong Waste Density	0.65	
Lumby Waster Density	0.50	
Hauling from Armstrong to Vernon	35	km
Hauling Rate	16.88	tonne
NPV	**$21,901,296.63**	

Reference Figures	
General Inflation	2.0%
Discount Rate	1.5%
Real Discounted Interest Rate	-0.49%

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Capacity																										
Annual Waste - Armstrong/Spallumcheen		**11,932**	**12,039**	**12,147**	**12,257**	**12,355**	**12,454**	**12,553**	**12,654**	**12,755**	**12,844**	**12,934**	**13,025**	**13,116**	**13,195**	**13,274**	**13,353**	**13,433**	**13,501**	**13,568**	**13,636**	**13,691**	**13,745**	**13,800**	**13,855**	**13,911**
Annual Consumption of Volume (m3)		18,356	18,522	18,688	18,857	19,007	19,159	19,313	19,467	19,623	19,760	19,899	20,038	20,178	20,299	20,421	20,544	20,667								
Total Waste Landfilled (tonnes)		11,932	23,971	36,118	48,375	60,730	73,183	85,737	98,391	111,145	123,990	136,924	149,949	163,064	176,259	189,533	202,886	216,319								
Total Volume Consumed (m3)		18,356	36,878	55,567	74,423	93,431	112,590	131,903	151,370	170,993	190,753	210,652	230,690	250,868	271,168	291,589	312,132	332,799								
Annual Waste - Lumby		**1,925**	**1,942**	**1,959**	**1,977**	**1,993**	**2,009**	**2,025**	**2,041**	**2,057**	**2,072**	**2,086**	**2,101**	**2,116**	**2,128**	**2,141**	**2,154**	**2,167**	**2,178**	**2,189**	**2,200**	**2,208**	**2,217**	**2,226**	**2,235**	**2,244**
Annual Consumption of Volume (m3)		3,849	3,884	3,919	3,954	3,986	4,018	4,050	4,082	4,115	4,144	4,173	4,202	4,231	4,257	4,282	4,308	4,334	4,356	4,377	4,399	4,417	4,434	4,452	4,470	4,488
Total Waste Landfilled (tonnes)		1,925	3,867	5,826	7,803	9,796	11,805	13,830	15,871	17,929	20,001	22,087	24,188	26,304	28,432	30,573	32,727	34,894	37,072	39,261	41,460	43,668	45,886	48,112	50,347	52,591
Total Volume Consumed (m3)		3,849	7,733	11,652	15,607	19,592	23,610	27,660	31,742	35,857	40,001	44,174	48,376	52,607	56,864	61,146	65,454	69,788	74,144	78,521	82,920	87,337	91,771	96,224	100,694	105,182
Inflation Factor		**102.00%**	**104.04%**	**106.12%**	**108.24%**	**110.41%**	**112.62%**	**114.87%**	**117.17%**	**119.51%**	**121.90%**	**124.34%**	**126.82%**	**129.36%**	**131.95%**	**134.59%**	**137.28%**	**140.02%**	**142.82%**	**145.68%**	**148.59%**	**151.57%**	**154.60%**	**157.69%**	**160.84%**	**164.06%**
Present Value Discount		**98.52%**	**97.07%**	**95.63%**	**94.22%**	**92.83%**	**91.45%**	**90.10%**	**88.77%**	**87.46%**	**86.17%**	**84.89%**	**83.64%**	**82.40%**	**81.18%**	**79.99%**	**78.80%**	**77.64%**	**76.49%**	**75.36%**	**74.25%**	**73.15%**	**72.07%**	**71.00%**	**69.95%**	**68.92%**
		100.49%	**100.99%**	**101.49%**	**101.99%**	**102.49%**	**102.99%**	**103.50%**	**104.01%**	**104.52%**	**105.04%**	**105.55%**	**106.07%**	**106.60%**	**107.12%**	**107.65%**	**108.18%**	**108.71%**	**109.25%**	**109.79%**	**110.33%**	**110.87%**	**111.42%**	**111.97%**	**112.52%**	**113.07%**
Revenue		**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
Tipping Fees - Landfilled (Arsmstrong/Spallumcheen)		1,265,976	1,295,818	1,326,248	1,357,275	1,387,533	1,405,523	1,423,747	1,442,206	1,460,905	1,478,378	1,496,061	1,513,955	1,532,062	1,548,847	1,565,816	1,582,970	1,600,313	1,616,237	1,632,320	1,648,563	1,663,310	1,678,190	1,693,203	1,708,350	1,723,632
Tipping Fees - Diverted (Arsmstrong/Spallumcheen)		137,286	139,204	141,148	143,120	144,976	146,855	148,760	150,688	152,642	154,468	156,315	158,185	160,077	161,831	163,604	165,396	167,208	168,872	170,552	172,249	173,790	175,345	176,914	178,496	180,093
Tipping Fees - Landfilled (Lumby)		204,909	209,732	214,650	219,664	224,554	227,465	230,414	233,402	236,428	239,256	242,118	245,013	247,944	250,660	253,406	256,183	258,989	261,567	264,169	266,798	269,185	271,593	274,022	276,474	278,947
Tipping Fees - Diverted (Lumby)		28,124	28,517	28,916	29,320	29,700	30,085	30,475	30,870	31,270	31,644	32,023	32,406	32,793	33,153	33,516	33,883	34,254	34,595	34,939	35,287	35,603	35,921	36,243	36,567	36,894
Transfer from Operating Reserves		376,847		253,713			741,545					42,222						1,521,978								
Transfer from Closure Reserves		50,246																3,261,380								
Total Revenue		**2,063,388**	**1,673,271**	**1,964,674**	**1,749,379**	**1,786,763**	**2,551,473**	**1,833,396**	**1,857,166**	**1,881,246**	**1,903,746**	**1,968,738**	**1,949,559**	**1,972,876**	**1,994,491**	**2,016,342**	**2,038,432**	**6,844,122**	**2,081,270**	**2,101,981**	**2,122,897**	**2,141,888**	**2,161,049**	**2,180,381**	**2,199,887**	**2,219,566**
Expenses																										
Armstrong/Spallumcheen RDF																										
Salaries & Benefits	155,000	155,764	156,531	157,302	158,077	158,856	159,638	160,424	161,215	162,009	162,807	163,609	164,415	165,225	166,039	166,857	167,679	168,505	169,335	170,169	171,007	171,850	172,696	173,547	174,402	175,261
Contract Services	465,000	467,291	469,593	471,906	474,230	476,567	478,914	481,273	483,644	486,027	488,421	490,827	493,245	495,675	498,116	500,570	503,036	505,514								
Operation & Maintenance - Landfill	115,000	115,567	116,136	116,708	117,283	117,861	118,441	119,025	119,611	120,200	120,792	121,387	121,985	122,586	123,190	123,797	124,407	125,020								
Operation & Maintenance - Transfer Station	50,000																		54,624	54,893	55,164	55,435	55,708	55,983	56,259	56,536
Cover Provision	7,000	7,034	7,069	7,104	7,139	7,174	7,209	7,245	7,281	7,317	7,353	7,389	7,425	7,462	7,499	7,535	7,573	7,610								
Organic Program	85,000	85,419	85,840	86,262	86,687	87,114	87,543	87,975	88,408	88,844	89,281	89,721	90,163	90,607	91,054	91,502	91,953	92,406	92,861	93,318	93,778	94,240	94,704	95,171	95,640	96,111
Poplar Tree Program	35,000	35,172	35,346	35,520	35,695	35,871	36,047	36,225	36,403	36,583	36,763	36,944	37,126	37,309	37,493	37,677	37,863	38,049	38,237	38,425	38,615	38,805	38,996	39,188	39,381	39,575
Contractor Metal	10,000	10,049	10,099	10,149	10,199	10,249	10,299	10,350	10,401	10,452	10,504	10,555	10,607	10,660	10,712	10,765	10,818	10,871	10,925	10,979	11,033	11,087	11,142	11,197	11,252	11,307
Other	20,000	20,099	20,198	20,297	20,397	20,497	20,598	20,700	20,802	20,904	21,007	21,111	21,215	21,319	21,424	21,530	21,636	21,743	21,850	21,957	22,065	22,174	22,283	22,393	22,503	22,614
Capital - Operating		376,847	-	-	-	-	741,545	-	-	-	-	-	-	-	-	-	-	1,521,978								
Capital - Closure		50,246																3,261,380								
Hauling to Greater Vernon RDF																			248,893	251,370	253,871	256,142	258,433	260,745	263,078	265,431
		942,000	**1,323,488**	**900,810**	**905,247**	**909,707**	**914,188**	**1,660,236**	**923,217**	**927,765**	**932,335**	**936,928**	**941,543**	**946,181**	**950,842**	**955,526**	**960,233**	**964,964**	**5,753,075**	**636,724**	**641,111**	**645,533**	**649,733**	**653,963**	**658,224**	**662,514**	**666,835**
Lumby RDF																										
Salaries & Benefits	44,000	44,217	44,435	44,653	44,873	45,094	45,317	45,540	45,764	45,990	46,216	46,444	46,673	46,903	47,134	47,366	47,599	47,834	48,069	48,306	48,544	48,783	49,023	49,265	49,508	49,751
Contract Services	120,000	120,591	121,185	121,782	122,382	122,985	123,591	124,200	124,811	125,426	126,044	126,665	127,289	127,916	128,546	129,179	129,816	130,455	131,098	131,744	132,393	133,045	133,700	134,359	135,021	135,686
Operation & Maintenance	25,000	25,123	25,247	25,371	25,496	25,622	25,748	25,875	26,002	26,130	26,259	26,389	26,519	26,649	26,780	26,912	27,045	27,178	27,312	27,447	27,582	27,718	27,854	27,991	28,129	28,268
Cover Provision	5,000	5,025	5,049	5,074	5,099	5,124	5,150	5,175	5,200	5,226	5,252	5,278	5,304	5,330	5,356	5,382	5,409	5,436	5,462	5,489	5,516	5,544	5,571	5,598	5,626	5,654
Organic Program	30,000	30,148	30,296	30,446	30,596	30,746	30,898	31,050	31,203	31,357	31,511	31,666	31,822	31,979	32,137	32,295	32,454	32,614	32,774	32,936	33,098	33,261	33,425	33,590	33,755	33,921
Contractor Metal	1,500	1,507	1,515	1,522	1,530	1,537	1,545	1,552	1,560	1,568	1,576	1,583	1,591	1,599	1,607	1,615	1,623	1,631	1,639	1,647	1,655	1,663	1,671	1,679	1,688	1,696
Other	1,000	1,005	1,010	1,015	1,020	1,025	1,030	1,035	1,040	1,045	1,050	1,056	1,061	1,066	1,071	1,076	1,082	1,087	1,092	1,098	1,103	1,109	1,114	1,120	1,125	1,131
Capital - Operating		-	-	253,713	-	-	-	-	-	-	-	42,222	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Capital - Closure																										
		226,500	**227,616**	**228,737**	**483,577**	**230,996**	**232,134**	**233,278**	**234,427**	**235,582**	**236,742**	**237,908**	**281,302**	**240,258**	**241,441**	**242,631**	**243,826**	**245,027**	**246,234**	**247,447**	**248,666**	**249,891**	**251,122**	**252,359**	**253,602**	**254,852**	**256,107**
Total Expenditures		**1,168,500**	**1,551,103**	**1,129,547**	**1,388,824**	**1,140,703**	**1,146,322**	**1,893,514**	**1,157,644**	**1,163,346**	**1,169,077**	**1,174,836**	**1,222,845**	**1,186,439**	**1,192,284**	**1,198,157**	**1,204,059**	**1,209,991**	**5,999,309**	**884,171**	**889,777**	**895,424**	**900,855**	**906,322**	**911,826**	**917,366**	**922,942**
Revenue over Expenditures	(1,168,500)	512,285	543,724	575,851	608,676	640,441	657,960	675,752	693,820	712,168	728,910	745,893	763,119	780,593	796,333	812,282	828,441	844,813	1,197,099	1,212,203	1,227,473	1,241,033	1,254,726	1,268,555	1,282,521	1,296,624

Table 7 Status Quo - Cherryville, Kingfisher, Silver Star

NPV	-$1,906,612.19

Reference Figures	
General Inflation	2.0%
Discount Rate	1.5%
Real Discounted Interest Rate	-0.49%

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Inflation Factor		102.00%	104.04%	106.12%	108.24%	110.41%	112.62%	114.87%	117.17%	119.51%	121.90%	124.34%	126.82%	129.36%	131.95%	134.59%	137.28%	140.02%	142.82%	145.68%	148.59%	151.57%	154.60%	157.69%	160.84%	164.06%
Present Value Discount		98.52%	97.07%	95.63%	94.22%	92.83%	91.45%	90.10%	88.77%	87.46%	86.17%	84.89%	83.64%	82.40%	81.18%	79.99%	78.80%	77.64%	76.49%	75.36%	74.25%	73.15%	72.07%	71.00%	69.95%	68.92%
		100.49%	100.99%	101.49%	101.99%	102.49%	102.99%	103.50%	104.01%	104.52%	105.04%	105.55%	106.07%	106.60%	107.12%	107.65%	108.18%	108.71%	109.25%	109.79%	110.33%	110.87%	111.42%	111.97%	112.52%	113.07%
Revenue																										
Tipping Fees - Cherryville	30,000	30,148	30,296	30,446	30,596	30,746	30,898	31,050	31,203	31,357	31,511	31,666	31,822	31,979	32,137	32,295	32,454	32,614	32,774	32,936	33,098	33,261	33,425	33,590	33,755	33,921
Tipping Fees - Kingfisher	14,000	14,069	14,138	14,208	14,278	14,348	14,419	14,490	14,561	14,633	14,705	14,778	14,850	14,924	14,997	15,071	15,145	15,220	15,295	15,370	15,446	15,522	15,598	15,675	15,752	15,830
Silver Star RDF	115,000	115,567	116,136	116,708	117,283	117,861	118,441	119,025	119,611	120,200	120,792	121,387	121,985	122,586	123,190	123,797	124,407	125,020	125,635	126,254	126,876	127,501	128,129	128,761	129,395	130,032
Total Revenue	**159,000**	**159,783**	**160,570**	**161,361**	**162,156**	**162,955**	**163,758**	**164,564**	**165,375**	**166,190**	**167,008**	**167,831**	**168,658**	**169,489**	**170,324**	**171,163**	**172,006**	**172,853**	**173,705**	**174,560**	**175,420**	**176,284**	**177,153**	**178,025**	**178,902**	**179,784**
Expenses																										
Cherryville																										
Contract Services	33,000	33,163	33,326	33,490	33,655	33,821	33,987	34,155	34,323	34,492	34,662	34,833	35,004	35,177	35,350	35,524	35,699	35,875	36,052	36,230	36,408	36,587	36,768	36,949	37,131	37,314
Operation & Maintenance	32,000	32,158	32,316	32,475	32,635	32,796	32,958	33,120	33,283	33,447	33,612	33,777	33,944	34,111	34,279	34,448	34,618	34,788	34,959	35,132	35,305	35,479	35,653	35,829	36,006	36,183
Contractor Metal	1,500	1,507	1,515	1,522	1,530	1,537	1,545	1,552	1,560	1,568	1,576	1,583	1,591	1,599	1,607	1,615	1,623	1,631	1,639	1,647	1,655	1,663	1,671	1,679	1,688	1,696
Other	1,500	1,507	1,515	1,522	1,530	1,537	1,545	1,552	1,560	1,568	1,576	1,583	1,591	1,599	1,607	1,615	1,623	1,631	1,639	1,647	1,655	1,663	1,671	1,679	1,688	1,696
	68,000	**68,335**	**68,672**	**69,010**	**69,350**	**69,691**	**70,035**	**70,380**	**70,726**	**71,075**	**71,425**	**71,777**	**72,130**	**72,486**	**72,843**	**73,202**	**73,562**	**73,925**	**74,289**	**74,655**	**75,022**	**75,392**	**75,763**	**76,137**	**76,512**	**76,889**
Kingfisher																										
Contract Services	25,000	25,123	25,247	25,371	25,496	25,622	25,748	25,875	26,002	26,130	26,259	26,389	26,519	26,649	26,780	26,912	27,045	27,178	27,312	27,447	27,582	27,718	27,854	27,991	28,129	28,268
Operation & Maintenance	20,000	20,099	20,198	20,297	20,397	20,497	20,598	20,700	20,802	20,904	21,007	21,111	21,215	21,319	21,424	21,530	21,636	21,743	21,850	21,957	22,065	22,174	22,283	22,393	22,503	22,614
Contractor Metal	1,000	1,005	1,010	1,015	1,020	1,025	1,030	1,035	1,040	1,045	1,050	1,056	1,061	1,066	1,071	1,076	1,082	1,087	1,092	1,098	1,103	1,109	1,114	1,120	1,125	1,131
Other	1,500	1,507	1,515	1,522	1,530	1,537	1,545	1,552	1,560	1,568	1,576	1,583	1,591	1,599	1,607	1,615	1,623	1,631	1,639	1,647	1,655	1,663	1,671	1,679	1,688	1,696
	47,500	**47,734**	**47,969**	**48,205**	**48,443**	**48,682**	**48,921**	**49,162**	**49,405**	**49,648**	**49,892**	**50,138**	**50,385**	**50,633**	**50,883**	**51,134**	**51,385**	**51,639**	**51,893**	**52,149**	**52,405**	**52,664**	**52,923**	**53,184**	**53,446**	**53,709**
Silver Star																										
Contract Services	36,000	36,177	36,356	36,535	36,715	36,895	37,077	37,260	37,443	37,628	37,813	38,000	38,187	38,375	38,564	38,754	38,945	39,137	39,329	39,523	39,718	39,913	40,110	40,308	40,506	40,706
Hauling Services	16,000	16,079	16,158	16,238	16,318	16,398	16,479	16,560	16,642	16,723	16,806	16,889	16,972	17,055	17,139	17,224	17,309	17,394	17,480	17,566	17,652	17,739	17,827	17,915	18,003	18,091
Operation & Maintenance	6,500	6,532	6,564	6,597	6,629	6,662	6,694	6,727	6,761	6,794	6,827	6,861	6,895	6,929	6,963	6,997	7,032	7,066	7,101	7,136	7,171	7,207	7,242	7,278	7,314	7,350
Utilities	3,500	3,517	3,535	3,552	3,569	3,587	3,605	3,622	3,640	3,658	3,676	3,694	3,713	3,731	3,749	3,768	3,786	3,805	3,824	3,843	3,861	3,880	3,900	3,919	3,938	3,958
Other	53,000	53,261	53,523	53,787	54,052	54,318	54,586	54,855	55,125	55,397	55,669	55,944	56,219	56,496	56,775	57,054	57,335	57,618	57,902	58,187	58,473	58,761	59,051	59,342	59,634	59,928
	115,000	**115,567**	**116,136**	**116,708**	**117,283**	**117,861**	**118,441**	**119,025**	**119,611**	**120,200**	**120,792**	**121,387**	**121,985**	**122,586**	**123,190**	**123,797**	**124,407**	**125,020**	**125,635**	**126,254**	**126,876**	**127,501**	**128,129**	**128,761**	**129,395**	**130,032**
Total Expenditures	**230,500**	**231,635**	**232,777**	**233,923**	**235,076**	**236,234**	**237,397**	**238,567**	**239,742**	**240,923**	**242,110**	**243,302**	**244,501**	**245,705**	**246,916**	**248,132**	**249,354**	**250,583**	**251,817**	**253,058**	**254,304**	**255,557**	**256,816**	**258,081**	**259,352**	**260,630**
Revenue over Expenditures	(71,500)	(71,852)	(72,206)	(72,562)	(72,919)	(73,279)	(73,639)	(74,002)	(74,367)	(74,733)	(75,101)	(75,471)	(75,843)	(76,217)	(76,592)	(76,969)	(77,349)	(77,730)	(78,112)	(78,497)	(78,884)	(79,273)	(79,663)	(80,055)	(80,450)	(80,846)

Table 8 Alternative 1 (ICI Ban + Vernon, Spa Hills) - Waste Reduction and Administration

Interest Rate on Reserve	1.75%
NPV	-$59,761,598.99

Reference Figures	
General Inflation	2.0%
Discount Rate	1.5%
Real Discounted Interest Rate	-0.49%

Waste Tonnages		**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
Greater Vernon		29,199	29,462	29,727	29,995	30,235	30,477	30,720	30,966	31,214	31,432	31,652	31,874	32,097	32,290	32,483	32,678	32,874	33,039	33,204	33,370	33,504	33,638	33,772	33,907	34,043
Arsmstrong/Spallumcheen		11,932	12,039	12,147	12,257	12,355	12,454	12,553	12,654	12,755	12,844	12,934	13,025	13,116	13,195	13,274	13,353	13,433	13,501	13,568	13,636	13,691	13,745	13,800	13,855	13,911
Lumby		1,925	1,942	1,959	1,977	1,993	2,009	2,025	2,041	2,057	2,072	2,086	2,101	2,116	2,128	2,141	2,154	2,167	2,178	2,189	2,200	2,208	2,217	2,226	2,235	2,244
Total		**43,056**	**43,443**	**43,834**	**44,229**	**44,583**	**44,939**	**45,299**	**45,661**	**46,026**	**46,349**	**46,673**	**47,000**	**47,329**	**47,613**	**47,898**	**48,186**	**48,475**	**48,717**	**48,961**	**49,206**	**49,402**	**49,600**	**49,798**	**49,998**	**50,198**
Inflation Factor		**102.00%**	**104.04%**	**106.12%**	**108.24%**	**110.41%**	**112.62%**	**114.87%**	**117.17%**	**119.51%**	**121.90%**	**124.34%**	**126.82%**	**129.36%**	**131.95%**	**134.59%**	**137.28%**	**140.02%**	**142.82%**	**145.68%**	**148.59%**	**151.57%**	**154.60%**	**157.69%**	**160.84%**	**164.06%**
Present Value Discount		**98.52%**	**97.07%**	**95.63%**	**94.22%**	**92.83%**	**91.45%**	**90.10%**	**88.77%**	**87.46%**	**86.17%**	**84.89%**	**83.64%**	**82.40%**	**81.18%**	**79.99%**	**78.80%**	**77.64%**	**76.49%**	**75.36%**	**74.25%**	**73.15%**	**72.07%**	**71.00%**	**69.95%**	**68.92%**
		100.49%	**100.99%**	**101.49%**	**101.99%**	**102.49%**	**102.99%**	**103.50%**	**104.01%**	**104.52%**	**105.04%**	**105.55%**	**106.07%**	**106.60%**	**107.12%**	**107.65%**	**108.18%**	**108.71%**	**109.25%**	**109.79%**	**110.33%**	**110.87%**	**111.42%**	**111.97%**	**112.52%**	**113.07%**

Revenue		**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
Property Taxes	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000															
Recycling Revenue	77,500	77,882	78,265	78,651	79,038	79,428	79,819	80,212	80,607	81,004	81,403	81,804	82,207	82,612	83,019	83,428	83,839	84,252	84,667	85,084	85,504	85,925	86,348	86,773	87,201	87,630
Other Revenue (Royalties, Rental, Grants, Sundry)	11,500	11,557	11,614	11,671	11,728	11,786	11,844	11,902	11,961	12,020	12,079	12,139	12,199	12,259	12,319	12,380	12,441	12,502	12,564	12,625	12,688	12,750	12,813	12,876	12,939	13,003
Transfer from Operating Reserves																										
Transfer from Closure Reserves																										
Total Revenue	**509,000**	**509,438**	**509,879**	**510,322**	**510,767**	**511,214**	**511,663**	**512,115**	**512,568**	**513,024**	**513,483**	**93,943**	**94,406**	**94,871**	**95,338**	**95,808**	**96,280**	**96,754**	**97,231**	**97,710**	**98,191**	**98,675**	**99,161**	**99,649**	**100,140**	**100,634**
Expenses																										
Waste Reduction/Recycling																										
Composting Facility Operations	150,000	150,739	151,481	152,228	152,978	153,731	154,488	155,249	156,014	156,783	157,555	158,331	159,111	159,895	160,683	161,474	162,270	163,069	163,872	164,680	165,491	166,306	167,125	167,949	168,776	169,607
Drop-Bin Service Contract	150,000	150,739	151,481	152,228	152,978	153,731	154,488	155,249	156,014	156,783	157,555	158,331	159,111	159,895	160,683	161,474	162,270	163,069	163,872	164,680	165,491	166,306	167,125	167,949	168,776	169,607
Other Programs	40,000	40,197	40,395	40,594	40,794	40,995	41,197	41,400	41,604	41,809	42,015	42,222	42,430	42,639	42,849	43,060	43,272	43,485	43,699	43,915	44,131	44,348	44,567	44,786	45,007	45,229
	340,000	**341,675**	**343,358**	**345,049**	**346,749**	**348,457**	**350,174**	**351,899**	**353,632**	**355,374**	**357,125**	**358,884**	**360,652**	**362,429**	**364,214**	**366,008**	**367,811**	**369,623**	**371,444**	**373,274**	**375,112**	**376,960**	**378,817**	**380,683**	**382,559**	**384,443**
Administration																										
Salaries & Benefits	380,000	381,872	383,753	385,643	387,543	389,452	391,371	393,299	395,236	397,183	399,140	401,106	403,082	405,067	407,063	409,068	411,083	413,108	415,143	417,188	419,243	421,309	423,384	425,470	427,566	429,672
Environmental Monitoring	40,000	40,197	40,395	40,594	40,794	40,995	41,197	41,400	41,604	41,809	42,015	42,222	42,430	42,639	42,849	43,060	43,272	43,485	43,699	43,915	44,131	44,348	44,567	44,786	45,007	45,229
Eco Depot	100,000	100,493	100,988	101,485	101,985	102,487	102,992	103,500	104,010	104,522	105,037	105,554	106,074	106,597	107,122	107,649	108,180	108,713	109,248	109,786	110,327	110,871	111,417	111,966	112,517	113,072
Overhead	300,000	301,478	302,963	304,455	305,955	307,462	308,977	310,499	312,029	313,566	315,110	316,663	318,222	319,790	321,365	322,948	324,539	326,138	327,745	329,359	330,982	332,612	334,251	335,897	337,552	339,215
Public Information	35,000	35,172	35,346	35,520	35,695	35,871	36,047	36,225	36,403	36,583	36,763	36,944	37,126	37,309	37,493	37,677	37,863	38,049	38,237	38,425	38,615	38,805	38,996	39,188	39,381	39,575
Fees (Moneris, Professional)	35,000	35,172	35,346	35,520	35,695	35,871	36,047	36,225	36,403	36,583	36,763	36,944	37,126	37,309	37,493	37,677	37,863	38,049	38,237	38,425	38,615	38,805	38,996	39,188	39,381	39,575
Reserve - Operating	225,000	226,108	227,222	228,342	229,466	230,597	231,733	232,874	234,021	235,174	236,333	237,497	238,667	239,843	241,024	242,211	243,404	244,604	245,808	247,019	248,236	249,459	250,688	251,923	253,164	254,411
Reserve - Closure		692,285	745,829	800,733	857,027	913,830	925,678	937,680	949,838	962,153	973,661	985,306	997,091	1,009,017	1,020,071	1,031,247	1,042,545	1,053,967	1,064,454	1,075,047	1,085,744	1,095,457	1,105,257	1,115,144	1,125,120	1,135,185
Volume Surveys	14,000	14,069	14,138	14,208	14,278	14,348	14,419	14,490	14,561	14,633	14,705	14,778	14,850	14,924	14,997	15,071	15,145	15,220	15,295	15,370	15,446	15,522	15,598	15,675	15,752	15,830
Other	70,000	70,345	70,691	71,040	71,390	153,731	72,095	72,450	72,807	73,165	157,555	73,888	74,252	74,618	74,985	161,474	75,726	76,099	76,474	76,850	165,491	77,609	77,992	78,376	78,762	169,607
Solid Waste Management Plan Update		95,468																								
Capital - Operating		70,345																								
	1,199,000	**2,063,004**	**1,956,671**	**2,017,540**	**2,079,827**	**2,224,644**	**2,160,556**	**2,178,641**	**2,196,912**	**2,215,370**	**2,317,081**	**2,250,901**	**2,268,920**	**2,287,111**	**2,304,462**	**2,408,084**	**2,339,620**	**2,357,432**	**2,374,341**	**2,391,385**	**2,496,829**	**2,424,796**	**2,441,145**	**2,457,613**	**2,474,202**	**2,581,370**
Total Expenditures	**1,539,000**	**2,404,679**	**2,300,029**	**2,362,590**	**2,426,577**	**2,573,102**	**2,510,730**	**2,530,540**	**2,550,544**	**2,570,744**	**2,674,206**	**2,609,785**	**2,629,572**	**2,649,540**	**2,668,676**	**2,774,092**	**2,707,432**	**2,727,055**	**2,745,784**	**2,764,659**	**2,871,941**	**2,801,757**	**2,819,962**	**2,838,296**	**2,856,760**	**2,965,813**
Revenue over Expenditures	(1,030,000)	(1,895,241)	(1,790,150)	(1,852,268)	(1,915,810)	(2,061,888)	(1,999,067)	(2,018,425)	(2,037,976)	(2,057,720)	(2,160,723)	(2,515,842)	(2,535,166)	(2,554,669)	(2,573,337)	(2,678,284)	(2,611,152)	(2,630,301)	(2,648,554)	(2,666,949)	(2,773,750)	(2,703,082)	(2,720,801)	(2,738,647)	(2,756,620)	(2,865,179)

Closure Reserve - Transfer In	3,636,000	692,285	745,829	800,733	857,027	913,830	925,678	937,680	949,838	962,153	973,661	985,306	997,091	1,009,017	1,020,071	1,031,247	1,042,545	1,053,967	1,064,454	1,075,047	1,085,744	1,095,457	1,105,257	1,115,144	1,125,120	1,135,185
Closure Reserve - Transfer from Operating		-	-	-	-	-	-	-	-	-	-	-	42,076	327,343	328,524	329,711	330,905	-	-	-	-	100,638	338,188	339,423	340,664	341,911
Closure Reserve - Transfer to Revenue		50,246	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,261,380	-	-	-	-	-	-	-	-
Interest on Reserve		63,630	75,979	90,361	105,955	122,807	140,948	159,614	178,817	198,568	218,881	239,750	261,189	283,945	312,301	341,366	371,157	401,688	370,087	395,192	420,921	447,288	476,047	509,638	544,012	579,183
Closure Reserve	3,636,000	4,341,669	5,163,476	6,054,571	7,017,553	8,054,190	9,120,816	10,218,111	11,346,765	12,507,487	13,700,028	14,925,085	16,225,441	17,845,747	19,506,643	21,208,967	22,953,574	21,147,848	22,582,389	24,052,628	25,559,293	27,202,676	29,122,167	31,086,372	33,096,168	35,152,447
Operating Reserve - Transfer In	5,000,000	226,108	227,222	228,342	229,466	230,597	231,733	232,874	234,021	235,174	236,333	237,497	238,667	239,843	241,024	242,211	243,404	244,604	245,808	247,019	248,236	249,459	250,688	251,923	253,164	254,411
Operating Reserve - Transfer to Closure Reserve		132788											42,076	327,343	328,524	329,711	330,905					100,638	338,188	339,423	340,664	341,911
Operating Reserve - Transfer to Revenue		492,414	-	1,268,564	-	958,258	741,545	-	-	-	-	42,222	-	-	-	-	-	1,521,978	-	-	-	-	-	-	-	-
Interest on Reserve		87,500	84,371	87,500	70,827	76,082	64,680	56,890	61,961	67,141	72,431	77,835	82,614	87,500	87,500	87,500	87,500	87,500	66,677	72,146	77,731	83,436	87,500	87,500	87,500	87,500
Operating Reserve	5,000,000	4,821,195	5,000,000	4,047,277	4,347,571	3,695,993	3,250,861	3,540,625	3,836,607	4,138,922	4,447,686	4,720,796	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	3,810,126	4,122,611	4,441,776	4,767,744	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000

Table 9 Alternative 1 (ICI Ban + Vernon, Spa Hills) - Greater Vernon RDF

Vernon Landfill Volume, 2016	2,435,800	m^3
Vernon Waste Density	0.55	
Organic Diversion - ICI	2000	tonnes
Organic Diversion - City of Vernon	2000	tonnes
Organic Tipping Fee - Spa Hills	110	per tonne
Assume 5 load per week to Spa Hills	260	loads
Hauling Cost to Spa Hills	250	per load
NPV	**$48,752,646.37**	

Reference Figures	
General Inflation	2.0%
Discount Rate	1.5%
Real Discounted Interest Rate	-0.49%

Waste Tonnages	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Greater Vernon	29,199	29,462	29,727	29,995	30,235	30,477	30,720	30,966	31,214	31,432	31,652	31,874	32,097	32,290	32,483	32,678	32,874	33,039	33,204	33,370	33,504	33,638	33,772	33,907	34,043
Organic Diversion - ICI			1,000	2,000	2,016	2,032	2,048	2,065	2,081	2,096	2,111	2,125	2,140	2,153	2,166	2,179	2,192	2,203	2,214	2,225	2,234	2,243	2,252	2,261	2,270
Organic Diversion - Vernon				1,500	2,000	2,016	2,032	2,048	2,065	2,079	2,094	2,108	2,123	2,136	2,149	2,162	2,175	2,185	2,196	2,207	2,216	2,225	2,234	2,243	2,252
Transfer from Armstrong/Spallumcheen																		13,501	13,568	13,636	13,691	13,745	13,800	13,855	13,911
Annual Consumption of Volume (m3)	53,090	53,567	52,231	48,172	47,671	48,052	48,436	48,824	49,214	49,559	49,906	50,255	50,607	50,911	51,216	51,523	51,832	76,638	77,021	77,407	77,716	78,027	78,339	78,652	78,967
Total Waste Landfilled (tonnes)	29,199	58,661	87,389	113,884	140,102	166,531	193,171	220,024	247,092	274,349	301,797	329,438	357,271	385,272	413,441	441,779	470,287	512,438	554,800	597,373	640,117	683,032	726,118	769,377	812,809
Total Volume Consumed (m3)	53,090	106,657	158,889	207,061	254,731	302,783	351,220	400,043	449,258	498,817	548,722	598,978	649,584	700,495	751,711	803,234	855,067	931,705	1,008,726	1,086,133	1,163,849	1,241,876	1,320,215	1,398,868	1,477,835
Inflation Factor	**102.00%**	**104.04%**	**106.12%**	**108.24%**	**110.41%**	**112.62%**	**114.87%**	**117.17%**	**119.51%**	**121.90%**	**124.34%**	**126.82%**	**129.36%**	**131.95%**	**134.59%**	**137.28%**	**140.02%**	**142.82%**	**145.68%**	**148.59%**	**151.57%**	**154.60%**	**157.69%**	**160.84%**	**164.06%**
Present Value Discount	**98.52%**	**97.07%**	**95.63%**	**94.22%**	**92.83%**	**91.45%**	**90.10%**	**88.77%**	**87.46%**	**86.17%**	**84.89%**	**83.64%**	**82.40%**	**81.18%**	**79.99%**	**78.80%**	**77.64%**	**76.49%**	**75.36%**	**74.25%**	**73.15%**	**72.07%**	**71.00%**	**69.95%**	**68.92%**
	100.49%	**100.99%**	**101.49%**	**101.99%**	**102.49%**	**102.99%**	**103.50%**	**104.01%**	**104.52%**	**105.04%**	**105.55%**	**106.07%**	**106.60%**	**107.12%**	**107.65%**	**108.18%**	**108.71%**	**109.25%**	**109.79%**	**110.33%**	**110.87%**	**111.42%**	**111.97%**	**112.52%**	**113.07%**

Revenue	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Tipping Fees - Landfilled	3,108,972	3,182,154	3,256,774	3,332,858	3,407,052	3,451,226	3,495,973	3,541,300	3,587,215	3,630,120	3,673,539	3,717,477	3,761,940	3,803,154	3,844,820	3,886,943	3,929,527	3,968,629	4,008,120	4,048,003	4,084,216	4,120,753	4,157,616	4,194,809	4,232,335
Tipping Fees - Diverted	550,217	557,904	565,698	573,601	581,038	588,571	596,203	603,933	611,763	619,080	626,485	633,978	641,560	648,589	655,695	662,878	670,141	676,809	683,544	690,346	696,521	702,752	709,039	715,382	721,782
Transfer from Operating Reserves	115,567		1,014,851		958,258																				
Transfer from Closure Reserves																									
Total Revenue	**3,774,755**	**3,740,057**	**4,837,323**	**3,906,459**	**4,946,348**	**4,039,798**	**4,092,176**	**4,145,233**	**4,198,978**	**4,249,200**	**4,300,023**	**4,351,454**	**4,403,500**	**4,451,743**	**4,500,515**	**4,549,821**	**4,599,668**	**4,645,438**	**4,691,663**	**4,738,349**	**4,780,737**	**4,823,505**	**4,866,655**	**4,910,191**	**4,954,117**
Expenses																									
Greater Vernon RDF																									
Salaries & Benefits	190,000	190,936	191,877	192,822	193,772	194,726	195,685	196,649	197,618	198,592	199,570	200,553	201,541	202,534	203,531	204,534	205,542	206,554	207,572	208,594	209,622	210,654	211,692	212,735	213,783	214,836
Contract Services	605,000	607,980	610,975	613,985	617,010	620,049	623,103	626,173	629,258	632,357	635,472	638,603	641,749	644,910	648,087	651,279	654,488	657,712	660,952	664,208	667,480	670,768	674,072	677,392	680,729	684,083
Operation & Maintenance	200,000	200,985	201,975	202,970	203,970	204,975	205,985	206,999	208,019	209,044	210,074	211,108	212,148	213,193	214,244	215,299	216,360	217,425	218,496	219,573	220,654	221,741	222,834	223,931	225,034	226,143
Gypsum Recyling Program	200,000	200,985	201,975	202,970	203,970	204,975	205,985	206,999	208,019	209,044	210,074	211,108	212,148	213,193	214,244	215,299	216,360	217,425	218,496	219,573	220,654	221,741	222,834	223,931	225,034	226,143
Asphalt Roof Recyling	100,000	100,493	100,988	101,485	101,985	102,487	102,992	103,500	104,010	104,522	105,037	105,554	106,074	106,597	107,122	107,649	108,180	108,713	109,248	109,786	110,327	110,871	111,417	111,966	112,517	113,072
Organic Waste Program	350,000	351,724	353,457	355,198	356,948	358,706	360,473	362,249	364,033	365,827	367,629	369,440	371,260	373,088	374,926	376,773	378,629	380,494	382,369	384,252	386,145	388,047	389,959	391,880	393,810	395,750
Landfill Gas Plant	15,000	15,074	15,148	15,223	15,298	15,373	15,449	15,525	15,601	15,678	15,756	15,833	15,911	15,990	16,068	16,147	16,227	16,307	16,387	16,468	16,549	16,631	16,713	16,795	16,878	16,961
Contractor Metal	25,000	25,123	25,247	25,371	25,496	25,622	25,748	25,875	26,002	26,130	26,259	26,389	26,519	26,649	26,780	26,912	27,045	27,178	27,312	27,447	27,582	27,718	27,854	27,991	28,129	28,268
Other	50,000	50,246	50,494	50,743	50,993	51,244	51,496	51,750	52,005	52,261	52,518	52,777	53,037	53,298	53,561	53,825	54,090	54,356	54,624	54,893	55,164	55,435	55,708	55,983	56,259	56,536
Capital - Operating		522,562	-	-	-	958,258	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Capital - Closure																									
Organic Diversion - Capital				1,014,851																					
Organic Diversion - Operation				25,371	50,993	51,244	51,496	51,750	52,005	52,261	52,518	52,777	53,037	53,298	53,561	53,825	54,090	54,356	54,624	54,893	55,164	55,435	55,708	55,983	56,259	56,536
Organic Diversion - Tipping Fee/Hauling to Spa Hill				144,616	458,933	519,365	525,564	531,840	538,194	544,629	550,665	556,771	562,948	569,196	575,014	580,894	586,836	592,841	598,385	603,983	609,634	614,800	620,010	625,265	630,566	635,913
	1,735,000	**2,266,108**	**1,752,136**	**2,945,606**	**2,279,366**	**3,307,024**	**2,363,976**	**2,379,309**	**2,394,764**	**2,410,344**	**2,425,571**	**2,440,913**	**2,456,371**	**2,471,947**	**2,487,138**	**2,502,437**	**2,517,845**	**2,533,363**	**2,548,466**	**2,563,670**	**2,578,975**	**2,593,842**	**2,608,801**	**2,623,853**	**2,638,999**	**2,654,240**
Total Expenditures	**1,735,000**	**2,266,108**	**1,752,136**	**2,945,606**	**2,279,366**	**3,307,024**	**2,363,976**	**2,379,309**	**2,394,764**	**2,410,344**	**2,425,571**	**2,440,913**	**2,456,371**	**2,471,947**	**2,487,138**	**2,502,437**	**2,517,845**	**2,533,363**	**2,548,466**	**2,563,670**	**2,578,975**	**2,593,842**	**2,608,801**	**2,623,853**	**2,638,999**	**2,654,240**
Revenue over Expenditures	(1,735,000)	1,508,647	1,987,922	1,891,717	1,627,093	1,639,324	1,675,822	1,712,867	1,750,469	1,788,634	1,823,629	1,859,110	1,895,083	1,931,554	1,964,606	1,998,078	2,031,976	2,066,305	2,096,972	2,127,994	2,159,374	2,186,896	2,214,704	2,242,802	2,271,192	2,299,877

Table 10 Alternative 1 (ICI Ban + Vernon, Spa Hills) - Armstrong/Spallumcheen and Lumby RDFs

Armstrong Landfill Volume, 2016	328,626	m^3
Lumby Landfill Volume, 2016	379,703	m^3
Armstrong Waste Density	0.65	
Lumby Waster Density	0.50	
Hauling from Armstrong to Vernon	35	km
Hauling Rate	16.88	tonne
NPV	**$21,901,296.63**	

Reference Figures	
General Inflation	2.0%
Discount Rate	1.5%
Real Discounted Interest Rate	-0.49%

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Capacity																										
Annual Waste - Armstrong/Spallumcheen		**11,932**	**12,039**	**12,147**	**12,257**	**12,355**	**12,454**	**12,553**	**12,654**	**12,755**	**12,844**	**12,934**	**13,025**	**13,116**	**13,195**	**13,274**	**13,353**	**13,433**	**13,501**	**13,568**	**13,636**	**13,691**	**13,745**	**13,800**	**13,855**	**13,911**
Annual Consumption of Volume (m3)		18,356	18,522	18,688	18,857	19,007	19,159	19,313	19,467	19,623	19,760	19,899	20,038	20,178	20,299	20,421	20,544	20,667								
Total Waste Landfilled (tonnes)		11,932	23,971	36,118	48,375	60,730	73,183	85,737	98,391	111,145	123,990	136,924	149,949	163,064	176,259	189,533	202,886	216,319								
Total Volume Consumed (m3)		18,356	36,878	55,567	74,423	93,431	112,590	131,903	151,370	170,993	190,753	210,652	230,690	250,868	271,168	291,589	312,132	332,799								
Annual Waste - Lumby		**1,925**	**1,942**	**1,959**	**1,977**	**1,993**	**2,009**	**2,025**	**2,041**	**2,057**	**2,072**	**2,086**	**2,101**	**2,116**	**2,128**	**2,141**	**2,154**	**2,167**	**2,178**	**2,189**	**2,200**	**2,208**	**2,217**	**2,226**	**2,235**	**2,244**
Annual Consumption of Volume (m3)		3,849	3,884	3,919	3,954	3,986	4,018	4,050	4,082	4,115	4,144	4,173	4,202	4,231	4,257	4,282	4,308	4,334	4,356	4,377	4,399	4,417	4,434	4,452	4,470	4,488
Total Waste Landfilled (tonnes)		1,925	3,867	5,826	7,803	9,796	11,805	13,830	15,871	17,929	20,001	22,087	24,188	26,304	28,432	30,573	32,727	34,894	37,072	39,261	41,460	43,668	45,886	48,112	50,347	52,591
Total Volume Consumed (m3)		3,849	7,733	11,652	15,607	19,592	23,610	27,660	31,742	35,857	40,001	44,174	48,376	52,607	56,864	61,146	65,454	69,788	74,144	78,521	82,920	87,337	91,771	96,224	100,694	105,182
Inflation Factor		**102.00%**	**104.04%**	**106.12%**	**108.24%**	**110.41%**	**112.62%**	**114.87%**	**117.17%**	**119.51%**	**121.90%**	**124.34%**	**126.82%**	**129.36%**	**131.95%**	**134.59%**	**137.28%**	**140.02%**	**142.82%**	**145.68%**	**148.59%**	**151.57%**	**154.60%**	**157.69%**	**160.84%**	**164.06%**
Present Value Discount		**98.52%**	**97.07%**	**95.63%**	**94.22%**	**92.83%**	**91.45%**	**90.10%**	**88.77%**	**87.46%**	**86.17%**	**84.89%**	**83.64%**	**82.40%**	**81.18%**	**79.99%**	**78.80%**	**77.64%**	**76.49%**	**75.36%**	**74.25%**	**73.15%**	**72.07%**	**71.00%**	**69.95%**	**68.92%**
		100.49%	**100.99%**	**101.49%**	**101.99%**	**102.49%**	**102.99%**	**103.50%**	**104.01%**	**104.52%**	**105.04%**	**105.55%**	**106.07%**	**106.60%**	**107.12%**	**107.65%**	**108.18%**	**108.71%**	**109.25%**	**109.79%**	**110.33%**	**110.87%**	**111.42%**	**111.97%**	**112.52%**	**113.07%**

Revenue		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Tipping Fees - Landfilled (Arsmstrong/Spallumcheen)		1,265,976	1,295,818	1,326,248	1,357,275	1,387,533	1,405,523	1,423,747	1,442,206	1,460,905	1,478,378	1,496,061	1,513,955	1,532,062	1,548,847	1,565,816	1,582,970	1,600,313	1,616,237	1,632,320	1,648,563	1,663,310	1,678,190	1,693,203	1,708,350	1,723,632
Tipping Fees - Diverted (Arsmstrong/Spallumcheen)		137,286	139,204	141,148	143,120	144,976	146,855	148,760	150,688	152,642	154,468	156,315	158,185	160,077	161,831	163,604	165,396	167,208	168,872	170,552	172,249	173,790	175,345	176,914	178,496	180,093
Tipping Fees - Landfilled (Lumby)		204,909	209,732	214,650	219,664	224,554	227,465	230,414	233,402	236,428	239,256	242,118	245,013	247,944	250,660	253,406	256,183	258,989	261,567	264,169	266,798	269,185	271,593	274,022	276,474	278,947
Tipping Fees - Diverted (Lumby)		28,124	28,517	28,916	29,320	29,700	30,085	30,475	30,870	31,270	31,644	32,023	32,406	32,793	33,153	33,516	33,883	34,254	34,595	34,939	35,287	35,603	35,921	36,243	36,567	36,894
Transfer from Operating Reserves		376,847		253,713			741,545					42,222						1,521,978								
Transfer from Closure Reserves		50,246																3,261,380								
Total Revenue		**2,063,388**	**1,673,271**	**1,964,674**	**1,749,379**	**1,786,763**	**2,551,473**	**1,833,396**	**1,857,166**	**1,881,246**	**1,903,746**	**1,968,738**	**1,949,559**	**1,972,876**	**1,994,491**	**2,016,342**	**2,038,432**	**6,844,122**	**2,081,270**	**2,101,981**	**2,122,897**	**2,141,888**	**2,161,049**	**2,180,381**	**2,199,887**	**2,219,566**
Expenses																										
Armstrong/Spallumcheen RDF																										
Salaries & Benefits	155,000	155,764	156,531	157,302	158,077	158,856	159,638	160,424	161,215	162,009	162,807	163,609	164,415	165,225	166,039	166,857	167,679	168,505	169,335	170,169	171,007	171,850	172,696	173,547	174,402	175,261
Contract Services	465,000	467,291	469,593	471,906	474,230	476,567	478,914	481,273	483,644	486,027	488,421	490,827	493,245	495,675	498,116	500,570	503,036	505,514								
Operation & Maintenance - Landfill	115,000	115,567	116,136	116,708	117,283	117,861	118,441	119,025	119,611	120,200	120,792	121,387	121,985	122,586	123,190	123,797	124,407	125,020								
Operation & Maintenance - Transfer Station	50,000																		54,624	54,893	55,164	55,435	55,708	55,983	56,259	56,536
Cover Provision	7,000	7,034	7,069	7,104	7,139	7,174	7,209	7,245	7,281	7,317	7,353	7,389	7,425	7,462	7,499	7,535	7,573	7,610								
Organic Program	85,000	85,419	85,840	86,262	86,687	87,114	87,543	87,975	88,408	88,844	89,281	89,721	90,163	90,607	91,054	91,502	91,953	92,406	92,861	93,318	93,778	94,240	94,704	95,171	95,640	96,111
Poplar Tree Program	35,000	35,172	35,346	35,520	35,695	35,871	36,047	36,225	36,403	36,583	36,763	36,944	37,126	37,309	37,493	37,677	37,863	38,049	38,237	38,425	38,615	38,805	38,996	39,188	39,381	39,575
Contractor Metal	10,000	10,049	10,099	10,149	10,199	10,249	10,299	10,350	10,401	10,452	10,504	10,555	10,607	10,660	10,712	10,765	10,818	10,871	10,925	10,979	11,033	11,087	11,142	11,197	11,252	11,307
Other	20,000	20,099	20,198	20,297	20,397	20,497	20,598	20,700	20,802	20,904	21,007	21,111	21,215	21,319	21,424	21,530	21,636	21,743	21,850	21,957	22,065	22,174	22,283	22,393	22,503	22,614
Capital - Operating		376,847	-	-	-	-	741,545	-	-	-	-	-	-	-	-	-	-	1,521,978								
Capital - Closure		50,246																3,261,380								
Hauling to Greater Vernon RDF																			248,893	251,370	253,871	256,142	258,433	260,745	263,078	265,431
		942,000	**1,323,488**	**900,810**	**905,247**	**909,707**	**914,188**	**1,660,236**	**923,217**	**927,765**	**932,335**	**936,928**	**941,543**	**946,181**	**950,842**	**955,526**	**960,233**	**964,964**	**5,753,075**	**636,724**	**641,111**	**645,533**	**649,733**	**653,963**	**658,224**	**662,514**	**666,835**
Lumby RDF																										
Salaries & Benefits	44,000	44,217	44,435	44,653	44,873	45,094	45,317	45,540	45,764	45,990	46,216	46,444	46,673	46,903	47,134	47,366	47,599	47,834	48,069	48,306	48,544	48,783	49,023	49,265	49,508	49,751
Contract Services	120,000	120,591	121,185	121,782	122,382	122,985	123,591	124,200	124,811	125,426	126,044	126,665	127,289	127,916	128,546	129,179	129,816	130,455	131,098	131,744	132,393	133,045	133,700	134,359	135,021	135,686
Operation & Maintenance	25,000	25,123	25,247	25,371	25,496	25,622	25,748	25,875	26,002	26,130	26,259	26,389	26,519	26,649	26,780	26,912	27,045	27,178	27,312	27,447	27,582	27,718	27,854	27,991	28,129	28,268
Cover Provision	5,000	5,025	5,049	5,074	5,099	5,124	5,150	5,175	5,200	5,226	5,252	5,278	5,304	5,330	5,356	5,382	5,409	5,436	5,462	5,489	5,516	5,544	5,571	5,598	5,626	5,654
Organic Program	30,000	30,148	30,296	30,446	30,596	30,746	30,898	31,050	31,203	31,357	31,511	31,666	31,822	31,979	32,137	32,295	32,454	32,614	32,774	32,936	33,098	33,261	33,425	33,590	33,755	33,921
Contractor Metal	1,500	1,507	1,515	1,522	1,530	1,537	1,545	1,552	1,560	1,568	1,576	1,583	1,591	1,599	1,607	1,615	1,623	1,631	1,639	1,647	1,655	1,663	1,671	1,679	1,688	1,696
Other	1,000	1,005	1,010	1,015	1,020	1,025	1,030	1,035	1,040	1,045	1,050	1,056	1,061	1,066	1,071	1,076	1,082	1,087	1,092	1,098	1,103	1,109	1,114	1,120	1,125	1,131
Capital - Operating		-	-	253,713	-	-	-	-	-	-	-	42,222	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Capital - Closure																										
		226,500	**227,616**	**228,737**	**483,577**	**230,996**	**232,134**	**233,278**	**234,427**	**235,582**	**236,742**	**237,908**	**281,302**	**240,258**	**241,441**	**242,631**	**243,826**	**245,027**	**246,234**	**247,447**	**248,666**	**249,891**	**251,122**	**252,359**	**253,602**	**254,852**	**256,107**
Total Expenditures		**1,168,500**	**1,551,103**	**1,129,547**	**1,388,824**	**1,140,703**	**1,146,322**	**1,893,514**	**1,157,644**	**1,163,346**	**1,169,077**	**1,174,836**	**1,222,845**	**1,186,439**	**1,192,284**	**1,198,157**	**1,204,059**	**1,209,991**	**5,999,309**	**884,171**	**889,777**	**895,424**	**900,855**	**906,322**	**911,826**	**917,366**	**922,942**
Revenue over Expenditures	(1,168,500)	512,285	543,724	575,851	608,676	640,441	657,960	675,752	693,820	712,168	728,910	745,893	763,119	780,593	796,333	812,282	828,441	844,813	1,197,099	1,212,203	1,227,473	1,241,033	1,254,726	1,268,555	1,282,521	1,296,624

Table 11 Alternative 1 (ICI Ban + Vernon, Spa Hills) - Cherryville, Kingfisher, Silver Star RDFs

NPV	**-$1,906,612.19**

Reference Figures	
General Inflation	2.0%
Discount Rate	1.5%
Real Discounted Interest Rate	-0.49%

Inflation Factor		**102.00%**	**104.04%**	**106.12%**	**108.24%**	**110.41%**	**112.62%**	**114.87%**	**117.17%**	**119.51%**	**121.90%**	**124.34%**	**126.82%**	**129.36%**	**131.95%**	**134.59%**	**137.28%**	**140.02%**	**142.82%**	**145.68%**	**148.59%**	**151.57%**	**154.60%**	**157.69%**	**160.84%**	**164.06%**
Present Value Discount		**98.52%**	**97.07%**	**95.63%**	**94.22%**	**92.83%**	**91.45%**	**90.10%**	**88.77%**	**87.46%**	**86.17%**	**84.89%**	**83.64%**	**82.40%**	**81.18%**	**79.99%**	**78.80%**	**77.64%**	**76.49%**	**75.36%**	**74.25%**	**73.15%**	**72.07%**	**71.00%**	**69.95%**	**68.92%**
		100.49%	**100.99%**	**101.49%**	**101.99%**	**102.49%**	**102.99%**	**103.50%**	**104.01%**	**104.52%**	**105.04%**	**105.55%**	**106.07%**	**106.60%**	**107.12%**	**107.65%**	**108.18%**	**108.71%**	**109.25%**	**109.79%**	**110.33%**	**110.87%**	**111.42%**	**111.97%**	**112.52%**	**113.07%**
Revenue		**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
Tipping Fees - Cherryville	30,000	30,148	30,296	30,446	30,596	30,746	30,898	31,050	31,203	31,357	31,511	31,666	31,822	31,979	32,137	32,295	32,454	32,614	32,774	32,936	33,098	33,261	33,425	33,590	33,755	33,921
Tipping Fees - Kingfisher	14,000	14,069	14,138	14,208	14,278	14,348	14,419	14,490	14,561	14,633	14,705	14,778	14,850	14,924	14,997	15,071	15,145	15,220	15,295	15,370	15,446	15,522	15,598	15,675	15,752	15,830
Silver Star RDF	115,000	115,567	116,136	116,708	117,283	117,861	118,441	119,025	119,611	120,200	120,792	121,387	121,985	122,586	123,190	123,797	124,407	125,020	125,635	126,254	126,876	127,501	128,129	128,761	129,395	130,032
Total Revenue	**159,000**	**159,783**	**160,570**	**161,361**	**162,156**	**162,955**	**163,758**	**164,564**	**165,375**	**166,190**	**167,008**	**167,831**	**168,658**	**169,489**	**170,324**	**171,163**	**172,006**	**172,853**	**173,705**	**174,560**	**175,420**	**176,284**	**177,153**	**178,025**	**178,902**	**179,784**
Expenses																										
Cherryville RDF																										
Contract Services	33,000	33,163	33,326	33,490	33,655	33,821	33,987	34,155	34,323	34,492	34,662	34,833	35,004	35,177	35,350	35,524	35,699	35,875	36,052	36,230	36,408	36,587	36,768	36,949	37,131	37,314
Operation & Maintenance	32,000	32,158	32,316	32,475	32,635	32,796	32,958	33,120	33,283	33,447	33,612	33,777	33,944	34,111	34,279	34,448	34,618	34,788	34,959	35,132	35,305	35,479	35,653	35,829	36,006	36,183
Contractor Metal	1,500	1,507	1,515	1,522	1,530	1,537	1,545	1,552	1,560	1,568	1,576	1,583	1,591	1,599	1,607	1,615	1,623	1,631	1,639	1,647	1,655	1,663	1,671	1,679	1,688	1,696
Other	1,500	1,507	1,515	1,522	1,530	1,537	1,545	1,552	1,560	1,568	1,576	1,583	1,591	1,599	1,607	1,615	1,623	1,631	1,639	1,647	1,655	1,663	1,671	1,679	1,688	1,696
	68,000	**68,335**	**68,672**	**69,010**	**69,350**	**69,691**	**70,035**	**70,380**	**70,726**	**71,075**	**71,425**	**71,777**	**72,130**	**72,486**	**72,843**	**73,202**	**73,562**	**73,925**	**74,289**	**74,655**	**75,022**	**75,392**	**75,763**	**76,137**	**76,512**	**76,889**
Kingfisher RDF																										
Contract Services	25,000	25,123	25,247	25,371	25,496	25,622	25,748	25,875	26,002	26,130	26,259	26,389	26,519	26,649	26,780	26,912	27,045	27,178	27,312	27,447	27,582	27,718	27,854	27,991	28,129	28,268
Operation & Maintenance	20,000	20,099	20,198	20,297	20,397	20,497	20,598	20,700	20,802	20,904	21,007	21,111	21,215	21,319	21,424	21,530	21,636	21,743	21,850	21,957	22,065	22,174	22,283	22,393	22,503	22,614
Contractor Metal	1,000	1,005	1,010	1,015	1,020	1,025	1,030	1,035	1,040	1,045	1,050	1,056	1,061	1,066	1,071	1,076	1,082	1,087	1,092	1,098	1,103	1,109	1,114	1,120	1,125	1,131
Other	1,500	1,507	1,515	1,522	1,530	1,537	1,545	1,552	1,560	1,568	1,576	1,583	1,591	1,599	1,607	1,615	1,623	1,631	1,639	1,647	1,655	1,663	1,671	1,679	1,688	1,696
	47,500	**47,734**	**47,969**	**48,205**	**48,443**	**48,682**	**48,921**	**49,162**	**49,405**	**49,648**	**49,892**	**50,138**	**50,385**	**50,633**	**50,883**	**51,134**	**51,385**	**51,639**	**51,893**	**52,149**	**52,405**	**52,664**	**52,923**	**53,184**	**53,446**	**53,709**
Silver Star RDF																										
Contract Services	36,000	36,177	36,356	36,535	36,715	36,895	37,077	37,260	37,443	37,628	37,813	38,000	38,187	38,375	38,564	38,754	38,945	39,137	39,329	39,523	39,718	39,913	40,110	40,308	40,506	40,706
Hauling Services	16,000	16,079	16,158	16,238	16,318	16,398	16,479	16,560	16,642	16,723	16,806	16,889	16,972	17,055	17,139	17,224	17,309	17,394	17,480	17,566	17,652	17,739	17,827	17,915	18,003	18,091
Operation & Maintenance	6,500	6,532	6,564	6,597	6,629	6,662	6,694	6,727	6,761	6,794	6,827	6,861	6,895	6,929	6,963	6,997	7,032	7,066	7,101	7,136	7,171	7,207	7,242	7,278	7,314	7,350
Utilities	3,500	3,517	3,535	3,552	3,569	3,587	3,605	3,622	3,640	3,658	3,676	3,694	3,713	3,731	3,749	3,768	3,786	3,805	3,824	3,843	3,861	3,880	3,900	3,919	3,938	3,958
Other	53,000	53,261	53,523	53,787	54,052	54,318	54,586	54,855	55,125	55,397	55,669	55,944	56,219	56,496	56,775	57,054	57,335	57,618	57,902	58,187	58,473	58,761	59,051	59,342	59,634	59,928
	115,000	**115,567**	**116,136**	**116,708**	**117,283**	**117,861**	**118,441**	**119,025**	**119,611**	**120,200**	**120,792**	**121,387**	**121,985**	**122,586**	**123,190**	**123,797**	**124,407**	**125,020**	**125,635**	**126,254**	**126,876**	**127,501**	**128,129**	**128,761**	**129,395**	**130,032**
Total Expenditures	**230,500**	**231,635**	**232,777**	**233,923**	**235,076**	**236,234**	**237,397**	**238,567**	**239,742**	**240,923**	**242,110**	**243,302**	**244,501**	**245,705**	**246,916**	**248,132**	**249,354**	**250,583**	**251,817**	**253,058**	**254,304**	**255,557**	**256,816**	**258,081**	**259,352**	**260,630**
Revenue over Expenditures	(71,500)	(71,852)	(72,206)	(72,562)	(72,919)	(73,279)	(73,639)	(74,002)	(74,367)	(74,733)	(75,101)	(75,471)	(75,843)	(76,217)	(76,592)	(76,969)	(77,349)	(77,730)	(78,112)	(78,497)	(78,884)	(79,273)	(79,663)	(80,055)	(80,450)	(80,846)

Table 12 Alternative 2 (ICI Ban + Residential, Spa Hills) - Waste Reduction and Administration

Interest Rate on Reserve	1.75%
NPV	-$59,761,598.99

Reference Figures	
General Inflation	2.0%
Discount Rate	1.5%
Real Discounted Interest Rate	-0.49%

Waste Tonnages		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Greater Vernon		29,199	29,462	29,727	29,995	30,235	30,477	30,720	30,966	31,214	31,432	31,652	31,874	32,097	32,290	32,483	32,678	32,874	33,039	33,204	33,370	33,504	33,638	33,772	33,907	34,043
Arsmstrong/Spallumcheen		11,932	12,039	12,147	12,257	12,355	12,454	12,553	12,654	12,755	12,844	12,934	13,025	13,116	13,195	13,274	13,353	13,433	13,501	13,568	13,636	13,691	13,745	13,800	13,855	13,911
Lumby		1,925	1,942	1,959	1,977	1,993	2,009	2,025	2,041	2,057	2,072	2,086	2,101	2,116	2,128	2,141	2,154	2,167	2,178	2,189	2,200	2,208	2,217	2,226	2,235	2,244
Total		**43,056**	**43,443**	**43,834**	**44,229**	**44,583**	**44,939**	**45,299**	**45,661**	**46,026**	**46,349**	**46,673**	**47,000**	**47,329**	**47,613**	**47,898**	**48,186**	**48,475**	**48,717**	**48,961**	**49,206**	**49,402**	**49,600**	**49,798**	**49,998**	**50,198**
Inflation Factor		**102.00%**	**104.04%**	**106.12%**	**108.24%**	**110.41%**	**112.62%**	**114.87%**	**117.17%**	**119.51%**	**121.90%**	**124.34%**	**126.82%**	**129.36%**	**131.95%**	**134.59%**	**137.28%**	**140.02%**	**142.82%**	**145.68%**	**148.59%**	**151.57%**	**154.60%**	**157.69%**	**160.84%**	**164.06%**
Present Value Discount		**98.52%**	**97.07%**	**95.63%**	**94.22%**	**92.83%**	**91.45%**	**90.10%**	**88.77%**	**87.46%**	**86.17%**	**84.89%**	**83.64%**	**82.40%**	**81.18%**	**79.99%**	**78.80%**	**77.64%**	**76.49%**	**75.36%**	**74.25%**	**73.15%**	**72.07%**	**71.00%**	**69.95%**	**68.92%**
		100.49%	**100.99%**	**101.49%**	**101.99%**	**102.49%**	**102.99%**	**103.50%**	**104.01%**	**104.52%**	**105.04%**	**105.55%**	**106.07%**	**106.60%**	**107.12%**	**107.65%**	**108.18%**	**108.71%**	**109.25%**	**109.79%**	**110.33%**	**110.87%**	**111.42%**	**111.97%**	**112.52%**	**113.07%**

Revenue		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Property Taxes	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000															
Recycling Revenue	77,500	77,882	78,265	78,651	79,038	79,428	79,819	80,212	80,607	81,004	81,403	81,804	82,207	82,612	83,019	83,428	83,839	84,252	84,667	85,084	85,504	85,925	86,348	86,773	87,201	87,630
Other Revenue (Royalties, Rental, Grants, Sundry)	11,500	11,557	11,614	11,671	11,728	11,786	11,844	11,902	11,961	12,020	12,079	12,139	12,199	12,259	12,319	12,380	12,441	12,502	12,564	12,625	12,688	12,750	12,813	12,876	12,939	13,003
Transfer from Operating Reserves																										
Transfer from Closure Reserves																										
Total Revenue	**509,000**	**509,438**	**509,879**	**510,322**	**510,767**	**511,214**	**511,663**	**512,115**	**512,568**	**513,024**	**513,483**	**93,943**	**94,406**	**94,871**	**95,338**	**95,808**	**96,280**	**96,754**	**97,231**	**97,710**	**98,191**	**98,675**	**99,161**	**99,649**	**100,140**	**100,634**
Expenses																										
Waste Reduction/Recycling																										
Composting Facility Operations	150,000	150,739	151,481	152,228	152,978	153,731	154,488	155,249	156,014	156,783	157,555	158,331	159,111	159,895	160,683	161,474	162,270	163,069	163,872	164,680	165,491	166,306	167,125	167,949	168,776	169,607
Drop-Bin Service Contract	150,000	150,739	151,481	152,228	152,978	153,731	154,488	155,249	156,014	156,783	157,555	158,331	159,111	159,895	160,683	161,474	162,270	163,069	163,872	164,680	165,491	166,306	167,125	167,949	168,776	169,607
Other Programs	40,000	40,197	40,395	40,594	40,794	40,995	41,197	41,400	41,604	41,809	42,015	42,222	42,430	42,639	42,849	43,060	43,272	43,485	43,699	43,915	44,131	44,348	44,567	44,786	45,007	45,229
	340,000	**341,675**	**343,358**	**345,049**	**346,749**	**348,457**	**350,174**	**351,899**	**353,632**	**355,374**	**357,125**	**358,884**	**360,652**	**362,429**	**364,214**	**366,008**	**367,811**	**369,623**	**371,444**	**373,274**	**375,112**	**376,960**	**378,817**	**380,683**	**382,559**	**384,443**
Administration																										
Salaries & Benefits	380,000	381,872	383,753	385,643	387,543	389,452	391,371	393,299	395,236	397,183	399,140	401,106	403,082	405,067	407,063	409,068	411,083	413,108	415,143	417,188	419,243	421,309	423,384	425,470	427,566	429,672
Environmental Monitoring	40,000	40,197	40,395	40,594	40,794	40,995	41,197	41,400	41,604	41,809	42,015	42,222	42,430	42,639	42,849	43,060	43,272	43,485	43,699	43,915	44,131	44,348	44,567	44,786	45,007	45,229
Eco Depot	100,000	100,493	100,988	101,485	101,985	102,487	102,992	103,500	104,010	104,522	105,037	105,554	106,074	106,597	107,122	107,649	108,180	108,713	109,248	109,786	110,327	110,871	111,417	111,966	112,517	113,072
Overhead	300,000	301,478	302,963	304,455	305,955	307,462	308,977	310,499	312,029	313,566	315,110	316,663	318,222	319,790	321,365	322,948	324,539	326,138	327,745	329,359	330,982	332,612	334,251	335,897	337,552	339,215
Public Information	35,000	35,172	35,346	35,520	35,695	35,871	36,047	36,225	36,403	36,583	36,763	36,944	37,126	37,309	37,493	37,677	37,863	38,049	38,237	38,425	38,615	38,805	38,996	39,188	39,381	39,575
Fees (Moneris, Professional)	35,000	35,172	35,346	35,520	35,695	35,871	36,047	36,225	36,403	36,583	36,763	36,944	37,126	37,309	37,493	37,677	37,863	38,049	38,237	38,425	38,615	38,805	38,996	39,188	39,381	39,575
Reserve - Operating	225,000	226,108	227,222	228,342	229,466	230,597	231,733	232,874	234,021	235,174	236,333	237,497	238,667	239,843	241,024	242,211	243,404	244,604	245,808	247,019	248,236	249,459	250,688	251,923	253,164	254,411
Reserve - Closure		692,285	745,829	800,733	857,027	913,830	925,678	937,680	949,838	962,153	973,661	985,306	997,091	1,009,017	1,020,071	1,031,247	1,042,545	1,053,967	1,064,454	1,075,047	1,085,744	1,095,457	1,105,257	1,115,144	1,125,120	1,135,185
Volume Surveys	14,000	14,069	14,138	14,208	14,278	14,348	14,419	14,490	14,561	14,633	14,705	14,778	14,850	14,924	14,997	15,071	15,145	15,220	15,295	15,370	15,446	15,522	15,598	15,675	15,752	15,830
Other	70,000	70,345	70,691	71,040	71,390	153,731	72,095	72,450	72,807	73,165	157,555	73,888	74,252	74,618	74,985	161,474	75,726	76,099	76,474	76,850	165,491	77,609	77,992	78,376	78,762	169,607
Solid Waste Management Plan Update		95,468																								
Capital - Operating		70,345																								
	1,199,000	**2,063,004**	**1,956,671**	**2,017,540**	**2,079,827**	**2,224,644**	**2,160,556**	**2,178,641**	**2,196,912**	**2,215,370**	**2,317,081**	**2,250,901**	**2,268,920**	**2,287,111**	**2,304,462**	**2,408,084**	**2,339,620**	**2,357,432**	**2,374,341**	**2,391,385**	**2,496,829**	**2,424,796**	**2,441,145**	**2,457,613**	**2,474,202**	**2,581,370**
Total Expenditures	**1,539,000**	**2,404,679**	**2,300,029**	**2,362,590**	**2,426,577**	**2,573,102**	**2,510,730**	**2,530,540**	**2,550,544**	**2,570,744**	**2,674,206**	**2,609,785**	**2,629,572**	**2,649,540**	**2,668,676**	**2,774,092**	**2,707,432**	**2,727,055**	**2,745,784**	**2,764,659**	**2,871,941**	**2,801,757**	**2,819,962**	**2,838,296**	**2,856,760**	**2,965,813**
Revenue over Expenditures	(1,030,000)	(1,895,241)	(1,790,150)	(1,852,268)	(1,915,810)	(2,061,888)	(1,999,067)	(2,018,425)	(2,037,976)	(2,057,720)	(2,160,723)	(2,515,842)	(2,535,166)	(2,554,669)	(2,573,337)	(2,678,284)	(2,611,152)	(2,630,301)	(2,648,554)	(2,666,949)	(2,773,750)	(2,703,082)	(2,720,801)	(2,738,647)	(2,756,620)	(2,865,179)

Closure Reserve - Transfer In	3,636,000	692,285	745,829	800,733	857,027	913,830	925,678	937,680	949,838	962,153	973,661	985,306	997,091	1,009,017	1,020,071	1,031,247	1,042,545	1,053,967	1,064,454	1,075,047	1,085,744	1,095,457	1,105,257	1,115,144	1,125,120	1,135,185
Closure Reserve - Transfer from Operating		-	-	-	-	-	-	-	-	-	-	-	-	249,444	328,524	329,712	330,904	332,104	-	-	-	-	98,902	339,423	340,664	341,910
Closure Reserve - Transfer to Revenue		50,246	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,277,446	-	-	-	-	-	-	-
Interest of Reserve		63,630	75,979	90,361	105,955	122,807	140,948	159,614	178,817	198,568	218,881	239,750	261,189	283,209	310,188	339,217	368,970	399,462	430,709	399,519	425,324	451,768	478,844	508,297	542,647	577,794
Closure Reserve	3,636,000	4,341,669	5,163,476	6,054,571	7,017,553	8,054,190	9,120,816	10,218,111	11,346,765	12,507,487	13,700,028	14,925,085	16,183,365	17,725,035	19,383,819	21,083,995	22,826,413	24,611,946	22,829,664	24,304,229	25,815,298	27,362,522	29,045,525	31,008,389	33,016,820	35,071,709
Operating Reserve - Transfer In	5,000,000	226,108	227,222	228,342	229,466	230,597	231,733	232,874	234,021	235,174	236,333	237,497	238,667	239,843	241,024	242,211	243,404	244,604	245,808	247,019	248,236	249,459	250,688	251,923	253,164	254,411
Operating Reserve - Transfer to Closure Reserve		132788												249,444	328,524	329,712	330,904	332,104					98,902	339,423	340,664	341,910
Operating Reserve - Transfer to Revenue		492,414	-	1,370,049	-	958,258	741,545	-	-	-	-	42,222	-	-	-	-	-	-	1,529,475	-	-	-	-	-	-	-
Interest on Reserve		87,500	84,371	87,500	69,051	74,275	62,841	55,019	60,057	65,204	70,460	75,829	80,574	86,160	87,500	87,500	87,500	87,500	87,500	66,567	72,055	77,660	83,385	87,500	87,500	87,500
Operating Reserve	5,000,000	4,821,195	5,000,000	3,945,792	4,244,310	3,590,924	3,143,954	3,431,847	3,725,926	4,026,304	4,333,097	4,604,201	4,923,441	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	3,803,833	4,117,420	4,437,711	4,764,830	5,000,000	5,000,000	5,000,000	5,000,000

Table 13 Alternative 2 (ICI Ban + Residential, Spa Hills) - Greater Vernon RDF

Vernon Landfill Volume, 2016	2,435,800	m^3
Vernon Waste Density	0.55	
Organic Diversion - ICI	2000	tonnes
Organic Diversion - City of Vernon	2110	tonnes
Organic Tipping Fee - Spa Hills	110	per tonne
Assume 5 load per week to Spa Hills	260	loads
Hauling Cost to Spa Hills	250	load per year
NPV	**$46,003,357.34**	

Reference Figures	
General Inflation	2.0%
Discount Rate	1.5%
Real Discounted Interest Rate	-0.49%

Waste Tonnages	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Greater Vernon	29,199	29,462	29,727	29,995	30,235	30,477	30,720	30,966	31,214	31,432	31,652	31,874	32,097	32,290	32,483	32,678	32,874	33,039	33,204	33,370	33,504	33,638	33,772	33,907	34,043
Organic Diversion - ICI			1,000	2,000	2,016	2,032	2,048	2,065	2,081	2,096	2,111	2,125	2,140	2,153	2,166	2,179	2,192	2,203	2,214	2,225	2,234	2,243	2,252	2,261	2,270
Organic Diversion - Greater Vernon				1,583	2,110	2,127	2,144	2,161	2,178	2,194	2,209	2,224	2,240	2,253	2,267	2,281	2,294	2,306	2,317	2,329	2,338	2,347	2,357	2,366	2,376
Orgnaic Diversion - Armstrong/Spallumcheen/Lumby				668	890	897	904	912	919	925	932	938	945	950	956	962	968	973	977	982	986	990	994	998	1,002
Transfer from Armstrong/Spallumcheen																			13,568	13,636	13,691	13,745	13,800	13,855	13,911
Annual Consumption of Volume (m3)	53,090	53,567	52,231	48,022	47,471	47,850	48,233	48,619	49,008	49,351	49,696	50,044	50,395	50,697	51,001	51,307	51,615	51,873	76,802	77,186	77,495	77,805	78,116	78,428	78,742
Total Waste Landfilled (tonnes)	29,199	58,661	87,389	113,801	139,910	166,227	192,756	219,496	246,450	273,593	300,926	328,451	356,168	384,051	412,102	440,321	468,709	497,239	539,480	581,932	624,554	667,347	710,310	753,446	796,754
Total Volume Consumed (m3)	53,090	106,657	158,889	206,911	254,381	302,232	350,465	399,084	448,092	497,443	547,139	597,183	647,578	698,275	749,276	800,583	852,198	904,071	980,873	1,058,059	1,135,553	1,213,358	1,291,474	1,369,902	1,448,644
Inflation Factor	**102.00%**	**104.04%**	**106.12%**	**108.24%**	**110.41%**	**112.62%**	**114.87%**	**117.17%**	**119.51%**	**121.90%**	**124.34%**	**126.82%**	**129.36%**	**131.95%**	**134.59%**	**137.28%**	**140.02%**	**142.82%**	**145.68%**	**148.59%**	**151.57%**	**154.60%**	**157.69%**	**160.84%**	**164.06%**
Present Value Discount	**98.52%**	**97.07%**	**95.63%**	**94.22%**	**92.83%**	**91.45%**	**90.10%**	**88.77%**	**87.46%**	**86.17%**	**84.89%**	**83.64%**	**82.40%**	**81.18%**	**79.99%**	**78.80%**	**77.64%**	**76.49%**	**75.36%**	**74.25%**	**73.15%**	**72.07%**	**71.00%**	**69.95%**	**68.92%**
	100.49%	**100.99%**	**101.49%**	**101.99%**	**102.49%**	**102.99%**	**103.50%**	**104.01%**	**104.52%**	**105.04%**	**105.55%**	**106.07%**	**106.60%**	**107.12%**	**107.65%**	**108.18%**	**108.71%**	**109.25%**	**109.79%**	**110.33%**	**110.87%**	**111.42%**	**111.97%**	**112.52%**	**113.07%**

Revenue	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Tipping Fees - Landfilled	3,108,972	3,182,154	3,256,774	3,332,858	3,407,052	3,451,226	3,495,973	3,541,300	3,587,215	3,630,120	3,673,539	3,717,477	3,761,940	3,803,154	3,844,820	3,886,943	3,929,527	3,968,629	4,008,120	4,048,003	4,084,216	4,120,753	4,157,616	4,194,809	4,232,335
Tipping Fees - Diverted	550,217	557,904	565,698	573,601	581,038	588,571	596,203	603,933	611,763	619,080	626,485	633,978	641,560	648,589	655,695	662,878	670,141	676,809	683,544	690,346	696,521	702,752	709,039	715,382	721,782
Transfer from Operating Reserves	115,567		1,014,851		958,258																				
Transfer from Closure Reserves																									
Total Revenue	**3,774,755**	**3,740,057**	**4,837,323**	**3,906,459**	**4,946,348**	**4,039,798**	**4,092,176**	**4,145,233**	**4,198,978**	**4,249,200**	**4,300,023**	**4,351,454**	**4,403,500**	**4,451,743**	**4,500,515**	**4,549,821**	**4,599,668**	**4,645,438**	**4,691,663**	**4,738,349**	**4,780,737**	**4,823,505**	**4,866,655**	**4,910,191**	**4,954,117**
Expenses																									
Greater Vernon RDF																									
Salaries & Benefits	190,000	190,936	191,877	192,822	193,772	194,726	195,685	196,649	197,618	198,592	199,570	200,553	201,541	202,534	203,531	204,534	205,542	206,554	207,572	208,594	209,622	210,654	211,692	212,735	213,783	214,836
Contract Services	605,000	607,980	610,975	613,985	617,010	620,049	623,103	626,173	629,258	632,357	635,472	638,603	641,749	644,910	648,087	651,279	654,488	657,712	660,952	664,208	667,480	670,768	674,072	677,392	680,729	684,083
Operation & Maintenance	200,000	200,985	201,975	202,970	203,970	204,975	205,985	206,999	208,019	209,044	210,074	211,108	212,148	213,193	214,244	215,299	216,360	217,425	218,496	219,573	220,654	221,741	222,834	223,931	225,034	226,143
Gypsum Recyling Program	200,000	200,985	201,975	202,970	203,970	204,975	205,985	206,999	208,019	209,044	210,074	211,108	212,148	213,193	214,244	215,299	216,360	217,425	218,496	219,573	220,654	221,741	222,834	223,931	225,034	226,143
Asphalt Roof Recyling	100,000	100,493	100,988	101,485	101,985	102,487	102,992	103,500	104,010	104,522	105,037	105,554	106,074	106,597	107,122	107,649	108,180	108,713	109,248	109,786	110,327	110,871	111,417	111,966	112,517	113,072
Organic Waste Program	350,000	351,724	353,457	355,198	356,948	358,706	360,473	362,249	364,033	365,827	367,629	369,440	371,260	373,088	374,926	376,773	378,629	380,494	382,369	384,252	386,145	388,047	389,959	391,880	393,810	395,750
Landfill Gas Plant	15,000	15,074	15,148	15,223	15,298	15,373	15,449	15,525	15,601	15,678	15,756	15,833	15,911	15,990	16,068	16,147	16,227	16,307	16,387	16,468	16,549	16,631	16,713	16,795	16,878	16,961
Contractor Metal	25,000	25,123	25,247	25,371	25,496	25,622	25,748	25,875	26,002	26,130	26,259	26,389	26,519	26,649	26,780	26,912	27,045	27,178	27,312	27,447	27,582	27,718	27,854	27,991	28,129	28,268
Other	50,000	50,246	50,494	50,743	50,993	51,244	51,496	51,750	52,005	52,261	52,518	52,777	53,037	53,298	53,561	53,825	54,090	54,356	54,624	54,893	55,164	55,435	55,708	55,983	56,259	56,536
Capital - Operating		522,562	-	-	-	958,258	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Capital - Closure																										
Organic Diversion - Capital				1,014,851																						
Organic Diversion - Operation				25,371	50,993	51,244	51,496	51,750	52,005	52,261	52,518	52,777	53,037	53,298	53,561	53,825	54,090	54,356	54,624	54,893	55,164	55,435	55,708	55,983	56,259	56,536
Organic Diversion - Tipping Fee/Hauling to Spa Hill				144,616	543,070	632,102	639,762	647,518	655,373	663,326	670,782	678,325	685,956	693,675	700,857	708,115	715,451	722,866	729,704	736,608	743,579	749,943	756,362	762,837	769,369	775,957
Total Expenditures	**1,735,000**	**2,266,108**	**1,752,136**	**2,945,606**	**2,363,504**	**3,419,760**	**2,478,174**	**2,494,987**	**2,511,942**	**2,529,042**	**2,545,688**	**2,562,467**	**2,579,379**	**2,596,426**	**2,612,981**	**2,629,659**	**2,646,460**	**2,663,387**	**2,679,784**	**2,696,295**	**2,712,920**	**2,728,984**	**2,745,153**	**2,761,425**	**2,777,802**	**2,794,284**
Revenue over Expenditures	(1,735,000)	1,508,647	1,987,922	1,891,717	1,542,955	1,526,588	1,561,624	1,597,189	1,633,291	1,669,936	1,703,512	1,737,556	1,772,075	1,807,074	1,838,763	1,870,857	1,903,361	1,936,281	1,965,654	1,995,369	2,025,429	2,051,753	2,078,352	2,105,230	2,132,390	2,159,833

Table 14 Alternative 2 (ICI Ban + Residential, Spa Hills) - Armstrong/Spallumcheen and Lumby RDFs

Armstrong Landfill Volume, 2016	328,626	m^3
Lumby Landfill Volume, 2016	379,703	m^3
Armstrong Waste Density	0.65	
Lumby Waste Density	0.50	
Hauling from Armstrong to Vernon	35	km
Hauling Rate	16.88	tonne
Organic Diversion - Armstrong	700	tonnes
Organic Diversion - Lumby	190	tonnes
Hauling from Armstrong to Vernon - Organic	270.00	per load
Hauling from Lumby to Vernon - Organic	202.50	per load
Assume 5 loads per week to GVRDF	260	load per year
NPV	**$18,659,813.31**	

Reference Figures	
General Inflation	2.0%
Discount Rate	1.5%
Real Discounted Interest Rate	-0.49%

Capacity	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Annual Waste - Armstrong/Spallumcheen	**11,932**	**12,039**	**12,147**	**12,257**	**12,355**	**12,454**	**12,553**	**12,654**	**12,755**	**12,844**	**12,934**	**13,025**	**13,116**	**13,195**	**13,274**	**13,353**	**13,433**	**13,501**	**13,568**	**13,636**	**13,691**	**13,745**	**13,800**	**13,855**	**13,911**
Organic Diversion				**525**	**700**	**706**	**711**	**717**	**723**	**728**	**733**	**738**	**743**	**748**	**752**	**757**	**761**	**765**	**769**	**773**	**776**	**779**	**782**	**785**	**788**
Annual Consumption of Volume (m3)	18,356	18,522	18,688	18,049	17,930	18,074	18,219	18,364	18,511	18,641	18,771	18,903	19,035	19,149	19,264	19,380	19,496	19,593							
Total Waste Landfilled (tonnes)	11,932	23,971	36,118	47,850	59,505	71,253	83,095	95,032	107,064	119,181	131,382	143,669	156,041	168,488	181,010	193,607	206,279	219,015							
Total Volume Consumed (m3)	18,356	36,878	55,567	73,615	91,546	109,620	127,838	146,203	164,714	183,355	202,126	221,029	240,064	259,213	278,477	297,856	317,352	336,946							
Annual Waste - Lumby	**1,925**	**1,942**	**1,959**	**1,977**	**1,993**	**2,009**	**2,025**	**2,041**	**2,057**	**2,072**	**2,086**	**2,101**	**2,116**	**2,128**	**2,141**	**2,154**	**2,167**	**2,178**	**2,189**	**2,200**	**2,208**	**2,217**	**2,226**	**2,235**	**2,244**
Organic Diversion				**143**	**190**	**192**	**193**	**195**	**196**	**198**	**199**	**200**	**202**	**203**	**204**	**205**	**207**	**208**	**209**	**210**	**211**	**211**	**212**	**213**	**214**
Annual Consumption of Volume (m3)	3,849	3,884	3,919	3,669	3,606	3,635	3,664	3,693	3,723	3,749	3,775	3,801	3,828	3,851	3,874	3,897	3,921	3,940	3,960	3,980	3,996	4,012	4,028	4,044	4,060
Total Waste Landfilled (tonnes)	1,925	3,867	5,826	7,661	9,464	11,281	13,113	14,960	16,821	18,695	20,583	22,483	24,397	26,323	28,260	30,208	32,169	34,139	36,119	38,109	40,107	42,113	44,126	46,148	48,178
Total Volume Consumed (m3)	3,849	7,733	11,652	15,322	18,927	22,562	26,226	29,919	33,642	37,390	41,165	44,967	48,795	52,646	56,520	60,417	64,338	68,278	72,238	76,218	80,213	84,225	88,253	92,297	96,357
Inflation Factor	**102.00%**	**104.04%**	**106.12%**	**108.24%**	**110.41%**	**112.62%**	**114.87%**	**117.17%**	**119.51%**	**121.90%**	**124.34%**	**126.82%**	**129.36%**	**131.95%**	**134.59%**	**137.28%**	**140.02%**	**142.82%**	**145.68%**	**148.59%**	**151.57%**	**154.60%**	**157.69%**	**160.84%**	**164.06%**
Present Value Discount	**98.52%**	**97.07%**	**95.63%**	**94.22%**	**92.83%**	**91.45%**	**90.10%**	**88.77%**	**87.46%**	**86.17%**	**84.89%**	**83.64%**	**82.40%**	**81.18%**	**79.99%**	**78.80%**	**77.64%**	**76.49%**	**75.36%**	**74.25%**	**73.15%**	**72.07%**	**71.00%**	**69.95%**	**68.92%**
	100.49%	**100.99%**	**101.49%**	**101.99%**	**102.49%**	**102.99%**	**103.50%**	**104.01%**	**104.52%**	**105.04%**	**105.55%**	**106.07%**	**106.60%**	**107.12%**	**107.65%**	**108.18%**	**108.71%**	**109.25%**	**109.79%**	**110.33%**	**110.87%**	**111.42%**	**111.97%**	**112.52%**	**113.07%**

Revenue	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Tipping Fees - Landfilled (Arsmstrong/Spallumcheen)	1,265,976	1,295,818	1,326,248	1,357,275	1,387,533	1,405,523	1,423,747	1,442,206	1,460,905	1,478,378	1,496,061	1,513,955	1,532,062	1,548,847	1,565,816	1,582,970	1,600,313	1,616,237	1,632,320	1,648,563	1,663,310	1,678,190	1,693,203	1,708,350	1,723,632
Tipping Fees - Diverted (Arsmstrong/Spallumcheen)	137,286	139,204	141,148	143,120	144,976	146,855	148,760	150,688	152,642	154,468	156,315	158,185	160,077	161,831	163,604	165,396	167,208	168,872	170,552	172,249	173,790	175,345	176,914	178,496	180,093
Tipping Fees - Landfilled (Lumby)	204,909	209,732	214,650	219,664	224,554	227,465	230,414	233,402	236,428	239,256	242,118	245,013	247,944	250,660	253,406	256,183	258,989	261,567	264,169	266,798	269,185	271,593	274,022	276,474	278,947
Tipping Fees - Diverted (Lumby)	28,124	28,517	28,916	29,320	29,700	30,085	30,475	30,870	31,270	31,644	32,023	32,406	32,793	33,153	33,516	33,883	34,254	34,595	34,939	35,287	35,603	35,921	36,243	36,567	36,894
Transfer from Operating Reserves	376,847	-	355,198	-	-	741,545	-	-	-	-	42,222	-	-	-	-	-	-	1,529,475	-	-	-	-	-	-	-
Transfer from Closure Reserves	50,246	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,277,446	-	-	-	-	-	-	-
Total Revenue	**2,063,388**	**1,673,271**	**2,066,160**	**1,749,379**	**1,786,763**	**2,551,473**	**1,833,396**	**1,857,166**	**1,881,246**	**1,903,746**	**1,968,738**	**1,949,559**	**1,972,876**	**1,994,491**	**2,016,342**	**2,038,432**	**2,060,764**	**6,888,192**	**2,101,981**	**2,122,897**	**2,141,888**	**2,161,049**	**2,180,381**	**2,199,887**	**2,219,566**

Expenses																									
Armstrong/Spallumcheen RDF																									
Salaries & Benefits	155,000	155,764	156,531	157,302	158,077	158,856	159,638	160,424	161,215	162,009	162,807	163,609	164,415	165,225	166,039	166,857	167,679	168,505	169,335	170,169	171,007	171,850	172,696	173,547	174,402	175,261
Contract Services	465,000	467,291	469,593	471,906	474,230	476,567	478,914	481,273	483,644	486,027	488,421	490,827	493,245	495,675	498,116	500,570	503,036	505,514	508,004						
Operation & Maintenance - Landfill	115,000	115,567	116,136	116,708	117,283	117,861	118,441	119,025	119,611	120,200	120,792	121,387	121,985	122,586	123,190	123,797	124,407	125,020	125,635						
Operation & Maintenance - Transfer Station	50,000																			54,893	55,164	55,435	55,708	55,983	56,259	56,536
Cover Provision	7,000	7,034	7,069	7,104	7,139	7,174	7,209	7,245	7,281	7,317	7,353	7,389	7,425	7,462	7,499	7,535	7,573	7,610	7,647						
Organic Program	85,000	85,419	85,840	86,262	86,687	87,114	87,543	87,975	88,408	88,844	89,281	89,721	90,163	90,607	91,054	91,502	91,953	92,406	92,861	93,318	93,778	94,240	94,704	95,171	95,640	96,111
Poplar Tree Program	35,000	35,172	35,346	35,520	35,695	35,871	36,047	36,225	36,403	36,583	36,763	36,944	37,126	37,309	37,493	37,677	37,863	38,049	38,237	38,425	38,615	38,805	38,996	39,188	39,381	39,575
Contractor Metal	10,000	10,049	10,099	10,149	10,199	10,249	10,299	10,350	10,401	10,452	10,504	10,555	10,607	10,660	10,712	10,765	10,818	10,871	10,925	10,979	11,033	11,087	11,142	11,197	11,252	11,307
Other	20,000	20,099	20,198	20,297	20,397	20,497	20,598	20,700	20,802	20,904	21,007	21,111	21,215	21,319	21,424	21,530	21,636	21,743	21,850	21,957	22,065	22,174	22,283	22,393	22,503	22,614
Capital - Operating		376,847	-	-	-	-	741,545	-	-	-	-	-	-	-	-	-	-	-	1,529,475							
Capital - Closure		50,246																	3,277,446							
Organic Diversion - Capital				50,743																						
Organic Diversion - Hauling to Greater Vernon RDF					71,594	71,946	72,301	72,657	73,015	73,374	73,736	74,099	74,464	74,831	75,199	75,570	75,942	76,316	76,692	77,070	77,450	77,831	78,215	78,600	78,987	79,376
Hauling to Greater Vernon RDF																				251,370	253,871	256,142	258,433	260,745	263,078	265,431
	942,000	**1,323,488**	**900,810**	**955,990**	**981,300**	**986,134**	**1,732,537**	**995,874**	**1,000,779**	**1,005,709**	**1,010,664**	**1,015,642**	**1,020,645**	**1,025,673**	**1,030,726**	**1,035,803**	**1,040,906**	**1,046,033**	**5,858,108**	**718,181**	**722,982**	**727,564**	**732,178**	**736,823**	**741,501**	**746,211**
Lumby RDF																									
Salaries & Benefits	44,000	44,217	44,435	44,653	44,873	45,094	45,317	45,540	45,764	45,990	46,216	46,444	46,673	46,903	47,134	47,366	47,599	47,834	48,069	48,306	48,544	48,783	49,023	49,265	49,508	49,751
Contract Services	120,000	120,591	121,185	121,782	122,382	122,985	123,591	124,200	124,811	125,426	126,044	126,665	127,289	127,916	128,546	129,179	129,816	130,455	131,098	131,744	132,393	133,045	133,700	134,359	135,021	135,686
Operation & Maintenance	25,000	25,123	25,247	25,371	25,496	25,622	25,748	25,875	26,002	26,130	26,259	26,389	26,519	26,649	26,780	26,912	27,045	27,178	27,312	27,447	27,582	27,718	27,854	27,991	28,129	28,268
Cover Provision	5,000	5,025	5,049	5,074	5,099	5,124	5,150	5,175	5,200	5,226	5,252	5,278	5,304	5,330	5,356	5,382	5,409	5,436	5,462	5,489	5,516	5,544	5,571	5,598	5,626	5,654
Organic Program	30,000	30,148	30,296	30,446	30,596	30,746	30,898	31,050	31,203	31,357	31,511	31,666	31,822	31,979	32,137	32,295	32,454	32,614	32,774	32,936	33,098	33,261	33,425	33,590	33,755	33,921
Contractor Metal	1,500	1,507	1,515	1,522	1,530	1,537	1,545	1,552	1,560	1,568	1,576	1,583	1,591	1,599	1,607	1,615	1,623	1,631	1,639	1,647	1,655	1,663	1,671	1,679	1,688	1,696
Other	1,000	1,005	1,010	1,015	1,020	1,025	1,030	1,035	1,040	1,045	1,050	1,056	1,061	1,066	1,071	1,076	1,082	1,087	1,092	1,098	1,103	1,109	1,114	1,120	1,125	1,131
Capital - Operating		-	-	253,713	-	-	-	-	-	-	-	42,222	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Capital - Closure																										
Organic Diversion - Capital				50,743																						
Organic Diversion - Hauling to Greater Vernon RDF					53,695	53,960	54,225	54,493	54,761	55,031	55,302	55,574	55,848	56,123	56,400	56,677	56,957	57,237	57,519	57,803	58,087	58,373	58,661	58,950	59,240	59,532
	226,500	**227,616**	**228,737**	**534,319**	**284,691**	**286,094**	**287,503**	**288,919**	**290,343**	**291,773**	**293,210**	**336,876**	**296,106**	**297,565**	**299,030**	**300,504**	**301,984**	**303,471**	**304,966**	**306,469**	**307,978**	**309,496**	**311,020**	**312,552**	**314,092**	**315,639**
Total Expenditures	**1,168,500**	**1,551,103**	**1,129,547**	**1,490,309**	**1,265,991**	**1,272,228**	**2,020,040**	**1,284,793**	**1,291,122**	**1,297,482**	**1,303,874**	**1,352,518**	**1,316,751**	**1,323,238**	**1,329,756**	**1,336,307**	**1,342,890**	**1,349,505**	**6,163,074**	**1,024,650**	**1,030,961**	**1,037,060**	**1,043,198**	**1,049,376**	**1,055,593**	**1,061,851**
Revenue over Expenditures	(1,168,500)	512,285	543,724	575,851	483,387	514,535	531,434	548,603	566,044	583,763	599,873	616,220	632,807	649,639	664,734	680,035	695,542	711,260	725,118	1,077,331	1,091,936	1,104,828	1,117,851	1,131,006	1,144,293	1,157,716

Table 15 Alternative 2 (ICI Ban + Residential, Spa Hills) - Cherryville, Kingfisher, Silver Star RDFs

NPV	-$1,906,612.19

Reference Figures	
General Inflation	2.0%
Discount Rate	1.5%
Real Discounted Interest Rate	-0.49%

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Inflation Factor		102.00%	104.04%	106.12%	108.24%	110.41%	112.62%	114.87%	117.17%	119.51%	121.90%	124.34%	126.82%	129.36%	131.95%	134.59%	137.28%	140.02%	142.82%	145.68%	148.59%	151.57%	154.60%	157.69%	160.84%	164.06%
Present Value Discount		98.52%	97.07%	95.63%	94.22%	92.83%	91.45%	90.10%	88.77%	87.46%	86.17%	84.89%	83.64%	82.40%	81.18%	79.99%	78.80%	77.64%	76.49%	75.36%	74.25%	73.15%	72.07%	71.00%	69.95%	68.92%
		100.49%	100.99%	101.49%	101.99%	102.49%	102.99%	103.50%	104.01%	104.52%	105.04%	105.55%	106.07%	106.60%	107.12%	107.65%	108.18%	108.71%	109.25%	109.79%	110.33%	110.87%	111.42%	111.97%	112.52%	113.07%
Revenue																										
Tipping Fees - Cherryville	30,000	30,148	30,296	30,446	30,596	30,746	30,898	31,050	31,203	31,357	31,511	31,666	31,822	31,979	32,137	32,295	32,454	32,614	32,774	32,936	33,098	33,261	33,425	33,590	33,755	33,921
Tipping Fees - Kingfisher	14,000	14,069	14,138	14,208	14,278	14,348	14,419	14,490	14,561	14,633	14,705	14,778	14,850	14,924	14,997	15,071	15,145	15,220	15,295	15,370	15,446	15,522	15,598	15,675	15,752	15,830
Silver Star RDF	115,000	115,567	116,136	116,708	117,283	117,861	118,441	119,025	119,611	120,200	120,792	121,387	121,985	122,586	123,190	123,797	124,407	125,020	125,635	126,254	126,876	127,501	128,129	128,761	129,395	130,032
Total Revenue	**159,000**	**159,783**	**160,570**	**161,361**	**162,156**	**162,955**	**163,758**	**164,564**	**165,375**	**166,190**	**167,008**	**167,831**	**168,658**	**169,489**	**170,324**	**171,163**	**172,006**	**172,853**	**173,705**	**174,560**	**175,420**	**176,284**	**177,153**	**178,025**	**178,902**	**179,784**
Expenses																										
Cherryville RDF																										
Contract Services	33,000	33,163	33,326	33,490	33,655	33,821	33,987	34,155	34,323	34,492	34,662	34,833	35,004	35,177	35,350	35,524	35,699	35,875	36,052	36,230	36,408	36,587	36,768	36,949	37,131	37,314
Operation & Maintenance	32,000	32,158	32,316	32,475	32,635	32,796	32,958	33,120	33,283	33,447	33,612	33,777	33,944	34,111	34,279	34,448	34,618	34,788	34,959	35,132	35,305	35,479	35,653	35,829	36,006	36,183
Contractor Metal	1,500	1,507	1,515	1,522	1,530	1,537	1,545	1,552	1,560	1,568	1,576	1,583	1,591	1,599	1,607	1,615	1,623	1,631	1,639	1,647	1,655	1,663	1,671	1,679	1,688	1,696
Other	1,500	1,507	1,515	1,522	1,530	1,537	1,545	1,552	1,560	1,568	1,576	1,583	1,591	1,599	1,607	1,615	1,623	1,631	1,639	1,647	1,655	1,663	1,671	1,679	1,688	1,696
	68,000	**68,335**	**68,672**	**69,010**	**69,350**	**69,691**	**70,035**	**70,380**	**70,726**	**71,075**	**71,425**	**71,777**	**72,130**	**72,486**	**72,843**	**73,202**	**73,562**	**73,925**	**74,289**	**74,655**	**75,022**	**75,392**	**75,763**	**76,137**	**76,512**	**76,889**
Kingfisher RDF																										
Contract Services	25,000	25,123	25,247	25,371	25,496	25,622	25,748	25,875	26,002	26,130	26,259	26,389	26,519	26,649	26,780	26,912	27,045	27,178	27,312	27,447	27,582	27,718	27,854	27,991	28,129	28,268
Operation & Maintenance	20,000	20,099	20,198	20,297	20,397	20,497	20,598	20,700	20,802	20,904	21,007	21,111	21,215	21,319	21,424	21,530	21,636	21,743	21,850	21,957	22,065	22,174	22,283	22,393	22,503	22,614
Contractor Metal	1,000	1,005	1,010	1,015	1,020	1,025	1,030	1,035	1,040	1,045	1,050	1,056	1,061	1,066	1,071	1,076	1,082	1,087	1,092	1,098	1,103	1,109	1,114	1,120	1,125	1,131
Other	1,500	1,507	1,515	1,522	1,530	1,537	1,545	1,552	1,560	1,568	1,576	1,583	1,591	1,599	1,607	1,615	1,623	1,631	1,639	1,647	1,655	1,663	1,671	1,679	1,688	1,696
	47,500	**47,734**	**47,969**	**48,205**	**48,443**	**48,682**	**48,921**	**49,162**	**49,405**	**49,648**	**49,892**	**50,138**	**50,385**	**50,633**	**50,883**	**51,134**	**51,385**	**51,639**	**51,893**	**52,149**	**52,405**	**52,664**	**52,923**	**53,184**	**53,446**	**53,709**
Silver Star RDF																										
Contract Services	36,000	36,177	36,356	36,535	36,715	36,895	37,077	37,260	37,443	37,628	37,813	38,000	38,187	38,375	38,564	38,754	38,945	39,137	39,329	39,523	39,718	39,913	40,110	40,308	40,506	40,706
Hauling Services	16,000	16,079	16,158	16,238	16,318	16,398	16,479	16,560	16,642	16,723	16,806	16,889	16,972	17,055	17,139	17,224	17,309	17,394	17,480	17,566	17,652	17,739	17,827	17,915	18,003	18,091
Operation & Maintenance	6,500	6,532	6,564	6,597	6,629	6,662	6,694	6,727	6,761	6,794	6,827	6,861	6,895	6,929	6,963	6,997	7,032	7,066	7,101	7,136	7,171	7,207	7,242	7,278	7,314	7,350
Utilities	3,500	3,517	3,535	3,552	3,569	3,587	3,605	3,622	3,640	3,658	3,676	3,694	3,713	3,731	3,749	3,768	3,786	3,805	3,824	3,843	3,861	3,880	3,900	3,919	3,938	3,958
Other	53,000	53,261	53,523	53,787	54,052	54,318	54,586	54,855	55,125	55,397	55,669	55,944	56,219	56,496	56,775	57,054	57,335	57,618	57,902	58,187	58,473	58,761	59,051	59,342	59,634	59,928
	115,000	**115,567**	**116,136**	**116,708**	**117,283**	**117,861**	**118,441**	**119,025**	**119,611**	**120,200**	**120,792**	**121,387**	**121,985**	**122,586**	**123,190**	**123,797**	**124,407**	**125,020**	**125,635**	**126,254**	**126,876**	**127,501**	**128,129**	**128,761**	**129,395**	**130,032**
Total Expenditures	**230,500**	**231,635**	**232,777**	**233,923**	**235,076**	**236,234**	**237,397**	**238,567**	**239,742**	**240,923**	**242,110**	**243,302**	**244,501**	**245,705**	**246,916**	**248,132**	**249,354**	**250,583**	**251,817**	**253,058**	**254,304**	**255,557**	**256,816**	**258,081**	**259,352**	**260,630**
Revenue over Expenditures	(71,500)	(71,852)	(72,206)	(72,562)	(72,919)	(73,279)	(73,639)	(74,002)	(74,367)	(74,733)	(75,101)	(75,471)	(75,843)	(76,217)	(76,592)	(76,969)	(77,349)	(77,730)	(78,112)	(78,497)	(78,884)	(79,273)	(79,663)	(80,055)	(80,450)	(80,846)

Table 16 Alternative 3 (ICI Ban, RDNO Owned) - Waste Reduction and Administration

Interest Rate on Reserve	1.75%
NPV	-$59,761,598.99

Reference Figures	
General Inflation	2.0%
Discount Rate	1.5%
Real Discounted Interest Rate	-0.49%

Waste Tonnages		**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
Greater Vernon		29,199	29,462	29,727	29,995	30,235	30,477	30,720	30,966	31,214	31,432	31,652	31,874	32,097	32,290	32,483	32,678	32,874	33,039	33,204	33,370	33,504	33,638	33,772	33,907	34,043
Arsmstrong/Spallumcheen		11,932	12,039	12,147	12,257	12,355	12,454	12,553	12,654	12,755	12,844	12,934	13,025	13,116	13,195	13,274	13,353	13,433	13,501	13,568	13,636	13,691	13,745	13,800	13,855	13,911
Lumby		1,925	1,942	1,959	1,977	1,993	2,009	2,025	2,041	2,057	2,072	2,086	2,101	2,116	2,128	2,141	2,154	2,167	2,178	2,189	2,200	2,208	2,217	2,226	2,235	2,244
Total		**43,056**	**43,443**	**43,834**	**44,229**	**44,583**	**44,939**	**45,299**	**45,661**	**46,026**	**46,349**	**46,673**	**47,000**	**47,329**	**47,613**	**47,898**	**48,186**	**48,475**	**48,717**	**48,961**	**49,206**	**49,402**	**49,600**	**49,798**	**49,998**	**50,198**
Inflation Factor		**102.00%**	**104.04%**	**106.12%**	**108.24%**	**110.41%**	**112.62%**	**114.87%**	**117.17%**	**119.51%**	**121.90%**	**124.34%**	**126.82%**	**129.36%**	**131.95%**	**134.59%**	**137.28%**	**140.02%**	**142.82%**	**145.68%**	**148.59%**	**151.57%**	**154.60%**	**157.69%**	**160.84%**	**164.06%**
Present Value Discount		**98.52%**	**97.07%**	**95.63%**	**94.22%**	**92.83%**	**91.45%**	**90.10%**	**88.77%**	**87.46%**	**86.17%**	**84.89%**	**83.64%**	**82.40%**	**81.18%**	**79.99%**	**78.80%**	**77.64%**	**76.49%**	**75.36%**	**74.25%**	**73.15%**	**72.07%**	**71.00%**	**69.95%**	**68.92%**
		100.49%	**100.99%**	**101.49%**	**101.99%**	**102.49%**	**102.99%**	**103.50%**	**104.01%**	**104.52%**	**105.04%**	**105.55%**	**106.07%**	**106.60%**	**107.12%**	**107.65%**	**108.18%**	**108.71%**	**109.25%**	**109.79%**	**110.33%**	**110.87%**	**111.42%**	**111.97%**	**112.52%**	**113.07%**

Revenue		**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
Property Taxes	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000															
Recycling Revenue	77,500	77,882	78,265	78,651	79,038	79,428	79,819	80,212	80,607	81,004	81,403	81,804	82,207	82,612	83,019	83,428	83,839	84,252	84,667	85,084	85,504	85,925	86,348	86,773	87,201	87,630
Other Revenue (Royalties, Rental, Grants, Sundry)	11,500	11,557	11,614	11,671	11,728	11,786	11,844	11,902	11,961	12,020	12,079	12,139	12,199	12,259	12,319	12,380	12,441	12,502	12,564	12,625	12,688	12,750	12,813	12,876	12,939	13,003
Transfer from Operating Reserves																										
Transfer from Closure Reserves																										
Total Revenue	**509,000**	**509,438**	**509,879**	**510,322**	**510,767**	**511,214**	**511,663**	**512,115**	**512,568**	**513,024**	**513,483**	**93,943**	**94,406**	**94,871**	**95,338**	**95,808**	**96,280**	**96,754**	**97,231**	**97,710**	**98,191**	**98,675**	**99,161**	**99,649**	**100,140**	**100,634**
Expenses																										
Waste Reduction/Recycling																										
Composting Facility Operations	150,000	150,739	151,481	152,228	152,978	153,731	154,488	155,249	156,014	156,783	157,555	158,331	159,111	159,895	160,683	161,474	162,270	163,069	163,872	164,680	165,491	166,306	167,125	167,949	168,776	169,607
Drop-Bin Service Contract	150,000	150,739	151,481	152,228	152,978	153,731	154,488	155,249	156,014	156,783	157,555	158,331	159,111	159,895	160,683	161,474	162,270	163,069	163,872	164,680	165,491	166,306	167,125	167,949	168,776	169,607
Other Programs	40,000	40,197	40,395	40,594	40,794	40,995	41,197	41,400	41,604	41,809	42,015	42,222	42,430	42,639	42,849	43,060	43,272	43,485	43,699	43,915	44,131	44,348	44,567	44,786	45,007	45,229
	340,000	**341,675**	**343,358**	**345,049**	**346,749**	**348,457**	**350,174**	**351,899**	**353,632**	**355,374**	**357,125**	**358,884**	**360,652**	**362,429**	**364,214**	**366,008**	**367,811**	**369,623**	**371,444**	**373,274**	**375,112**	**376,960**	**378,817**	**380,683**	**382,559**	**384,443**
Administration																										
Salaries & Benefits	380,000	381,872	383,753	385,643	387,543	389,452	391,371	393,299	395,236	397,183	399,140	401,106	403,082	405,067	407,063	409,068	411,083	413,108	415,143	417,188	419,243	421,309	423,384	425,470	427,566	429,672
Environmental Monitoring	40,000	40,197	40,395	40,594	40,794	40,995	41,197	41,400	41,604	41,809	42,015	42,222	42,430	42,639	42,849	43,060	43,272	43,485	43,699	43,915	44,131	44,348	44,567	44,786	45,007	45,229
Eco Depot	100,000	100,493	100,988	101,485	101,985	102,487	102,992	103,500	104,010	104,522	105,037	105,554	106,074	106,597	107,122	107,649	108,180	108,713	109,248	109,786	110,327	110,871	111,417	111,966	112,517	113,072
Overhead	300,000	301,478	302,963	304,455	305,955	307,462	308,977	310,499	312,029	313,566	315,110	316,663	318,222	319,790	321,365	322,948	324,539	326,138	327,745	329,359	330,982	332,612	334,251	335,897	337,552	339,215
Public Information	35,000	35,172	35,346	35,520	35,695	35,871	36,047	36,225	36,403	36,583	36,763	36,944	37,126	37,309	37,493	37,677	37,863	38,049	38,237	38,425	38,615	38,805	38,996	39,188	39,381	39,575
Fees (Moneris, Professional)	35,000	35,172	35,346	35,520	35,695	35,871	36,047	36,225	36,403	36,583	36,763	36,944	37,126	37,309	37,493	37,677	37,863	38,049	38,237	38,425	38,615	38,805	38,996	39,188	39,381	39,575
Reserve - Operating	225,000	226,108	227,222	228,342	229,466	230,597	231,733	232,874	234,021	235,174	236,333	237,497	238,667	239,843	241,024	242,211	243,404	244,604	245,808	247,019	248,236	249,459	250,688	251,923	253,164	254,411
Reserve - Closure		692,285	745,829	800,733	857,027	913,830	925,678	937,680	949,838	962,153	973,661	985,306	997,091	1,009,017	1,020,071	1,031,247	1,042,545	1,053,967	1,064,454	1,075,047	1,085,744	1,095,457	1,105,257	1,115,144	1,125,120	1,135,185
Volume Surveys	14,000	14,069	14,138	14,208	14,278	14,348	14,419	14,490	14,561	14,633	14,705	14,778	14,850	14,924	14,997	15,071	15,145	15,220	15,295	15,370	15,446	15,522	15,598	15,675	15,752	15,830
Other	70,000	70,345	70,691	71,040	71,390	153,731	72,095	72,450	72,807	73,165	157,555	73,888	74,252	74,618	74,985	161,474	75,726	76,099	76,474	76,850	165,491	77,609	77,992	78,376	78,762	169,607
Solid Waste Management Plan Update		95,468																								
Capital - Operating		70,345																								
	1,199,000	**2,063,004**	**1,956,671**	**2,017,540**	**2,079,827**	**2,224,644**	**2,160,556**	**2,178,641**	**2,196,912**	**2,215,370**	**2,317,081**	**2,250,901**	**2,268,920**	**2,287,111**	**2,304,462**	**2,408,084**	**2,339,620**	**2,357,432**	**2,374,341**	**2,391,385**	**2,496,829**	**2,424,796**	**2,441,145**	**2,457,613**	**2,474,202**	**2,581,370**
Total Expenditures	**1,539,000**	**2,404,679**	**2,300,029**	**2,362,590**	**2,426,577**	**2,573,102**	**2,510,730**	**2,530,540**	**2,550,544**	**2,570,744**	**2,674,206**	**2,609,785**	**2,629,572**	**2,649,540**	**2,668,676**	**2,774,092**	**2,707,432**	**2,727,055**	**2,745,784**	**2,764,659**	**2,871,941**	**2,801,757**	**2,819,962**	**2,838,296**	**2,856,760**	**2,965,813**
Revenue over Expenditures	(1,030,000)	(1,895,241)	(1,790,150)	(1,852,268)	(1,915,810)	(2,061,888)	(1,999,067)	(2,018,425)	(2,037,976)	(2,057,720)	(2,160,723)	(2,515,842)	(2,535,166)	(2,554,669)	(2,573,337)	(2,678,284)	(2,611,152)	(2,630,301)	(2,648,554)	(2,666,949)	(2,773,750)	(2,703,082)	(2,720,801)	(2,738,647)	(2,756,620)	(2,865,179)

Closure Reserve - Transfer In	3,636,000	692,285	745,829	800,733	857,027	913,830	925,678	937,680	949,838	962,153	973,661	985,306	997,091	1,009,017	1,020,071	1,031,247	1,042,545	1,053,967	1,064,454	1,075,047	1,085,744	1,095,457	1,105,257	1,115,144	1,125,120	1,135,185
Closure Reserve - Transfer from Operating		-	-	-	-	-	-	-	-	-	-	-	-	-	-	297,372	330,904	-	-	-	-	100,639	338,188	339,423	340,663	341,911
Closure Reserve - Transfer to Revenue		50,246	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,261,380	-	-	-	-	-	-	-	-
Interest of Reserve		63,630	75,979	90,361	105,955	122,807	140,948	159,614	178,817	198,568	218,881	239,750	261,189	283,209	305,823	329,026	358,035	388,336	356,502	381,369	406,856	432,976	461,485	494,821	528,936	563,843
Closure Reserve	3,636,000	4,341,669	5,163,476	6,054,571	7,017,553	8,054,190	9,120,816	10,218,111	11,346,765	12,507,487	13,700,028	14,925,085	16,183,365	17,475,591	18,801,486	20,459,131	22,190,614	20,371,536	21,792,493	23,248,908	24,741,508	26,370,580	28,275,510	30,224,899	32,219,618	34,260,557
Operating Reserve - Transfer In	5,000,000	226,108	227,222	228,342	229,466	230,597	231,733	232,874	234,021	235,174	236,333	237,497	238,667	239,843	241,024	242,211	243,404	244,604	245,808	247,019	248,236	249,459	250,688	251,923	253,164	254,411
Operating Reserve - Transfer to Closure Reserve		132788														297,372	330,904					100,639	338,188	339,423	340,663	341,911
Operating Reserve - Transfer to Revenue		492,414	-	1,877,475	-	958,258	741,545	-	-	-	-	42,222	-	-	-	-	-	1,521,978	-	-	-	-	-	-	-	-
Interest of Reserve		87,500	84,371	87,500	60,171	65,240	53,648	45,665	50,539	55,519	60,606	65,803	70,372	75,780	81,303	86,944	87,500	87,500	66,677	72,146	77,731	83,436	87,500	87,500	87,500	87,500
Operating Reserve	5,000,000	4,821,195	5,000,000	3,438,366	3,728,004	3,065,583	2,609,419	2,887,958	3,172,519	3,463,212	3,760,151	4,021,229	4,330,267	4,645,890	4,968,217	5,000,000	5,000,000	3,810,126	4,122,612	4,441,777	4,767,744	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000

Table 17 Alternative 3 (ICI Ban, RDNO Owned) - Greater Vernon RDF

Vernon Landfill Volume, 2016	2,435,800	m^3
Vernon Waste Density	0.55	
Organic Diversion - ICI	2000	tonnes
Organic Diversion - Yard & Garden Waste	2000	tonnes
Organic Diversion - Capital Costs	400	per tonne
Organic Diversion - Operating Costs	90	per tonne
NPV	**$53,394,781.67**	

Reference Figures	
General Inflation	2.0%
Discount Rate	1.5%
Real Discounted Interest Rate	-0.49%

Waste Tonnages	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Greater Vernon	29,199	29,462	29,727	29,995	30,235	30,477	30,720	30,966	31,214	31,432	31,652	31,874	32,097	32,290	32,483	32,678	32,874	33,039	33,204	33,370	33,504	33,638	33,772	33,907	34,043
Organic Diversion - ICI			1,000	2,000	2,016	2,032	2,048	2,065	2,081	2,096	2,111	2,125	2,140	2,153	2,166	2,179	2,192	2,203	2,214	2,225	2,234	2,243	2,252	2,261	2,270
Transfer from Armstrong/Spallumcheen																		13,501	13,568	13,636	13,691	13,745	13,800	13,855	13,911
Annual Consumption of Volume (m3)	53,090	53,567	52,231	50,900	51,307	51,717	52,131	52,548	52,968	53,339	53,713	54,089	54,467	54,794	55,123	55,454	55,786	80,612	81,015	81,420	81,746	82,073	82,401	82,731	83,061
Total Waste Landfilled (tonnes)	29,199	58,661	87,389	115,384	143,602	172,047	200,719	229,620	258,753	288,090	317,632	347,380	377,337	407,474	437,792	468,291	498,974	529,809	560,800	591,945	623,214	654,609	686,129	717,775	749,548
Total Volume Consumed (m3)	53,090	106,657	158,889	209,788	261,095	312,812	364,944	417,492	470,460	523,799	577,512	631,601	686,068	740,862	795,985	851,438	907,225	987,837	1,068,851	1,150,271	1,232,017	1,314,090	1,396,491	1,479,221	1,562,283
Inflation Factor	**102.00%**	**104.04%**	**106.12%**	**108.24%**	**110.41%**	**112.62%**	**114.87%**	**117.17%**	**119.51%**	**121.90%**	**124.34%**	**126.82%**	**129.36%**	**131.95%**	**134.59%**	**137.28%**	**140.02%**	**142.82%**	**145.68%**	**148.59%**	**151.57%**	**154.60%**	**157.69%**	**160.84%**	**164.06%**
Present Value Discount	**98.52%**	**97.07%**	**95.63%**	**94.22%**	**92.83%**	**91.45%**	**90.10%**	**88.77%**	**87.46%**	**86.17%**	**84.89%**	**83.64%**	**82.40%**	**81.18%**	**79.99%**	**78.80%**	**77.64%**	**76.49%**	**75.36%**	**74.25%**	**73.15%**	**72.07%**	**71.00%**	**69.95%**	**68.92%**
	100.49%	**100.99%**	**101.49%**	**101.99%**	**102.49%**	**102.99%**	**103.50%**	**104.01%**	**104.52%**	**105.04%**	**105.55%**	**106.07%**	**106.60%**	**107.12%**	**107.65%**	**108.18%**	**108.71%**	**109.25%**	**109.79%**	**110.33%**	**110.87%**	**111.42%**	**111.97%**	**112.52%**	**113.07%**

Revenue	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Tipping Fees - Landfilled	3,108,972	3,182,154	3,256,774	3,332,858	3,407,052	3,451,226	3,495,973	3,541,300	3,587,215	3,630,120	3,673,539	3,717,477	3,761,940	3,803,154	3,844,820	3,886,943	3,929,527	3,968,629	4,008,120	4,048,003	4,084,216	4,120,753	4,157,616	4,194,809	4,232,335
Tipping Fees - Diverted	550,217	557,904	565,698	573,601	581,038	588,571	596,203	603,933	611,763	619,080	626,485	633,978	641,560	648,589	655,695	662,878	670,141	676,809	683,544	690,346	696,521	702,752	709,039	715,382	721,782
Transfer from Operating Reserves	115,567		1,623,762		958,258																				
Transfer from Closure Reserves																									
Total Revenue	**3,774,755**	**3,740,057**	**5,446,234**	**3,906,459**	**4,946,348**	**4,039,798**	**4,092,176**	**4,145,233**	**4,198,978**	**4,249,200**	**4,300,023**	**4,351,454**	**4,403,500**	**4,451,743**	**4,500,515**	**4,549,821**	**4,599,668**	**4,645,438**	**4,691,663**	**4,738,349**	**4,780,737**	**4,823,505**	**4,866,655**	**4,910,191**	**4,954,117**

Expenses																										
Greater Vernon RDF																										
Salaries & Benefits	190,000	190,936	191,877	192,822	193,772	194,726	195,685	196,649	197,618	198,592	199,570	200,553	201,541	202,534	203,531	204,534	205,542	206,554	207,572	208,594	209,622	210,654	211,692	212,735	213,783	214,836
Contract Services	605,000	607,980	610,975	613,985	617,010	620,049	623,103	626,173	629,258	632,357	635,472	638,603	641,749	644,910	648,087	651,279	654,488	657,712	660,952	664,208	667,480	670,768	674,072	677,392	680,729	684,083
Operation & Maintenance	200,000	200,985	201,975	202,970	203,970	204,975	205,985	206,999	208,019	209,044	210,074	211,108	212,148	213,193	214,244	215,299	216,360	217,425	218,496	219,573	220,654	221,741	222,834	223,931	225,034	226,143
Gypsum Recyling Program	200,000	200,985	201,975	202,970	203,970	204,975	205,985	206,999	208,019	209,044	210,074	211,108	212,148	213,193	214,244	215,299	216,360	217,425	218,496	219,573	220,654	221,741	222,834	223,931	225,034	226,143
Asphalt Roof Recyling	100,000	100,493	100,988	101,485	101,985	102,487	102,992	103,500	104,010	104,522	105,037	105,554	106,074	106,597	107,122	107,649	108,180	108,713	109,248	109,786	110,327	110,871	111,417	111,966	112,517	113,072
Organic Waste Program	350,000	351,724	353,457	355,198	356,948	358,706	360,473	362,249	364,033	365,827	367,629	369,440	371,260	373,088	374,926	376,773	378,629	380,494	382,369	384,252	386,145	388,047	389,959	391,880	393,810	395,750
Landfill Gas Plant	15,000	15,074	15,148	15,223	15,298	15,373	15,449	15,525	15,601	15,678	15,756	15,833	15,911	15,990	16,068	16,147	16,227	16,307	16,387	16,468	16,549	16,631	16,713	16,795	16,878	16,961
Contractor Metal	25,000	25,123	25,247	25,371	25,496	25,622	25,748	25,875	26,002	26,130	26,259	26,389	26,519	26,649	26,780	26,912	27,045	27,178	27,312	27,447	27,582	27,718	27,854	27,991	28,129	28,268
Other	50,000	50,246	50,494	50,743	50,993	51,244	51,496	51,750	52,005	52,261	52,518	52,777	53,037	53,298	53,561	53,825	54,090	54,356	54,624	54,893	55,164	55,435	55,708	55,983	56,259	56,536
Capital - Operating		522,562	-	-	-	958,258	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Capital - Closure																										
Organic Diversion - Capital				1,623,762																						
Organic Diversion - Operation				182,673	367,146	371,906	376,728	381,613	386,561	391,573	396,256	400,996	405,792	410,645	415,144	419,692	424,290	428,939	433,207	437,518	441,871	445,824	449,812	453,836	457,896	461,993
	1,735,000	**2,266,108**	**1,752,136**	**3,567,202**	**2,136,587**	**3,108,321**	**2,163,645**	**2,177,332**	**2,191,126**	**2,205,027**	**2,218,644**	**2,232,360**	**2,246,178**	**2,260,098**	**2,273,707**	**2,287,411**	**2,301,209**	**2,315,104**	**2,328,663**	**2,342,311**	**2,356,048**	**2,369,430**	**2,382,895**	**2,396,441**	**2,410,071**	**2,423,783**
Total Expenditures	**1,735,000**	**2,266,108**	**1,752,136**	**3,567,202**	**2,136,587**	**3,108,321**	**2,163,645**	**2,177,332**	**2,191,126**	**2,205,027**	**2,218,644**	**2,232,360**	**2,246,178**	**2,260,098**	**2,273,707**	**2,287,411**	**2,301,209**	**2,315,104**	**2,328,663**	**2,342,311**	**2,356,048**	**2,369,430**	**2,382,895**	**2,396,441**	**2,410,071**	**2,423,783**
Revenue over Expenditures	(1,735,000)	1,508,647	1,987,922	1,879,032	1,769,872	1,838,027	1,876,153	1,914,844	1,954,107	1,993,951	2,030,557	2,067,663	2,105,276	2,143,403	2,178,036	2,213,105	2,248,612	2,284,564	2,316,774	2,349,352	2,382,301	2,411,307	2,440,610	2,470,214	2,500,121	2,530,333

Table 18 Alternative 3 (ICI Ban, RDNO Owned) - Armstrong/Spallumcheen and Lumby RDFs

Armstrong Landfill Volume, 2016	328,626	m^3
Lumby Landfill Volume, 2016	379,703	m^3
Armstrong Waste Density	0.65	
Lumby Waster Density	0.50	
Hauling from Armstrong to Vernon	35	km
Hauling Rate	16.88	tonne
NPV	**$21,901,296.63**	

Reference Figures	
General Inflation	2.0%
Discount Rate	1.5%
Real Discounted Interest Rate	-0.49%

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Capacity																										
Annual Waste - Armstrong/Spallumcheen		**11,932**	**12,039**	**12,147**	**12,257**	**12,355**	**12,454**	**12,553**	**12,654**	**12,755**	**12,844**	**12,934**	**13,025**	**13,116**	**13,195**	**13,274**	**13,353**	**13,433**	**13,501**	**13,568**	**13,636**	**13,691**	**13,745**	**13,800**	**13,855**	**13,911**
Annual Consumption of Volume (m3)		18,356	18,522	18,688	18,857	19,007	19,159	19,313	19,467	19,623	19,760	19,899	20,038	20,178	20,299	20,421	20,544	20,667								
Total Waste Landfilled (tonnes)		11,932	23,971	36,118	48,375	60,730	73,183	85,737	98,391	111,145	123,990	136,924	149,949	163,064	176,259	189,533	202,886	216,319								
Total Volume Consumed (m3)		18,356	36,878	55,567	74,423	93,431	112,590	131,903	151,370	170,993	190,753	210,652	230,690	250,868	271,168	291,589	312,132	332,799								
Annual Waste - Lumby		**1,925**	**1,942**	**1,959**	**1,977**	**1,993**	**2,009**	**2,025**	**2,041**	**2,057**	**2,072**	**2,086**	**2,101**	**2,116**	**2,128**	**2,141**	**2,154**	**2,167**	**2,178**	**2,189**	**2,200**	**2,208**	**2,217**	**2,226**	**2,235**	**2,244**
Annual Consumption of Volume (m3)		3,849	3,884	3,919	3,954	3,986	4,018	4,050	4,082	4,115	4,144	4,173	4,202	4,231	4,257	4,282	4,308	4,334	4,356	4,377	4,399	4,417	4,434	4,452	4,470	4,488
Total Waste Landfilled (tonnes)		1,925	3,867	5,826	7,803	9,796	11,805	13,830	15,871	17,929	20,001	22,087	24,188	26,304	28,432	30,573	32,727	34,894	37,072	39,261	41,460	43,668	45,886	48,112	50,347	52,591
Total Volume Consumed (m3)		3,849	7,733	11,652	15,607	19,592	23,610	27,660	31,742	35,857	40,001	44,174	48,376	52,607	56,864	61,146	65,454	69,788	74,144	78,521	82,920	87,337	91,771	96,224	100,694	105,182
Inflation Factor		**102.00%**	**104.04%**	**106.12%**	**108.24%**	**110.41%**	**112.62%**	**114.87%**	**117.17%**	**119.51%**	**121.90%**	**124.34%**	**126.82%**	**129.36%**	**131.95%**	**134.59%**	**137.28%**	**140.02%**	**142.82%**	**145.68%**	**148.59%**	**151.57%**	**154.60%**	**157.69%**	**160.84%**	**164.06%**
Present Value Discount		**98.52%**	**97.07%**	**95.63%**	**94.22%**	**92.83%**	**91.45%**	**90.10%**	**88.77%**	**87.46%**	**86.17%**	**84.89%**	**83.64%**	**82.40%**	**81.18%**	**79.99%**	**78.80%**	**77.64%**	**76.49%**	**75.36%**	**74.25%**	**73.15%**	**72.07%**	**71.00%**	**69.95%**	**68.92%**
		100.49%	**100.99%**	**101.49%**	**101.99%**	**102.49%**	**102.99%**	**103.50%**	**104.01%**	**104.52%**	**105.04%**	**105.55%**	**106.07%**	**106.60%**	**107.12%**	**107.65%**	**108.18%**	**108.71%**	**109.25%**	**109.79%**	**110.33%**	**110.87%**	**111.42%**	**111.97%**	**112.52%**	**113.07%**
Revenue		**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
Tipping Fees - Landfilled (Arsmstrong/Spallumcheen)		1,265,976	1,295,818	1,326,248	1,357,275	1,387,533	1,405,523	1,423,747	1,442,206	1,460,905	1,478,378	1,496,061	1,513,955	1,532,062	1,548,847	1,565,816	1,582,970	1,600,313	1,616,237	1,632,320	1,648,563	1,663,310	1,678,190	1,693,203	1,708,350	1,723,632
Tipping Fees - Diverted (Arsmstrong/Spallumcheen)		137,286	139,204	141,148	143,120	144,976	146,855	148,760	150,688	152,642	154,468	156,315	158,185	160,077	161,831	163,604	165,396	167,208	168,872	170,552	172,249	173,790	175,345	176,914	178,496	180,093
Tipping Fees - Landfilled (Lumby)		204,909	209,732	214,650	219,664	224,554	227,465	230,414	233,402	236,428	239,256	242,118	245,013	247,944	250,660	253,406	256,183	258,989	261,567	264,169	266,798	269,185	271,593	274,022	276,474	278,947
Tipping Fees - Diverted (Lumby)		28,124	28,517	28,916	29,320	29,700	30,085	30,475	30,870	31,270	31,644	32,023	32,406	32,793	33,153	33,516	33,883	34,254	34,595	34,939	35,287	35,603	35,921	36,243	36,567	36,894
Transfer from Operating Reserves		376,847		253,713			741,545					42,222						1,521,978								
Transfer from Closure Reserves		50,246																3,261,380								
Total Revenue		**2,063,388**	**1,673,271**	**1,964,674**	**1,749,379**	**1,786,763**	**2,551,473**	**1,833,396**	**1,857,166**	**1,881,246**	**1,903,746**	**1,968,738**	**1,949,559**	**1,972,876**	**1,994,491**	**2,016,342**	**2,038,432**	**6,844,122**	**2,081,270**	**2,101,981**	**2,122,897**	**2,141,888**	**2,161,049**	**2,180,381**	**2,199,887**	**2,219,566**
Expenses																										
Armstrong/Spallumcheen RDF																										
Salaries & Benefits	155,000	155,764	156,531	157,302	158,077	158,856	159,638	160,424	161,215	162,009	162,807	163,609	164,415	165,225	166,039	166,857	167,679	168,505	169,335	170,169	171,007	171,850	172,696	173,547	174,402	175,261
Contract Services	465,000	467,291	469,593	471,906	474,230	476,567	478,914	481,273	483,644	486,027	488,421	490,827	493,245	495,675	498,116	500,570	503,036	505,514								
Operation & Maintenance - Landfill	115,000	115,567	116,136	116,708	117,283	117,861	118,441	119,025	119,611	120,200	120,792	121,387	121,985	122,586	123,190	123,797	124,407	125,020								
Operation & Maintenance - Transfer Station	50,000																		54,624	54,893	55,164	55,435	55,708	55,983	56,259	56,536
Cover Provision	7,000	7,034	7,069	7,104	7,139	7,174	7,209	7,245	7,281	7,317	7,353	7,389	7,425	7,462	7,499	7,535	7,573	7,610								
Organic Program	85,000	85,419	85,840	86,262	86,687	87,114	87,543	87,975	88,408	88,844	89,281	89,721	90,163	90,607	91,054	91,502	91,953	92,406	92,861	93,318	93,778	94,240	94,704	95,171	95,640	96,111
Poplar Tree Program	35,000	35,172	35,346	35,520	35,695	35,871	36,047	36,225	36,403	36,583	36,763	36,944	37,126	37,309	37,493	37,677	37,863	38,049	38,237	38,425	38,615	38,805	38,996	39,188	39,381	39,575
Contractor Metal	10,000	10,049	10,099	10,149	10,199	10,249	10,299	10,350	10,401	10,452	10,504	10,555	10,607	10,660	10,712	10,765	10,818	10,871	10,925	10,979	11,033	11,087	11,142	11,197	11,252	11,307
Other	20,000	20,099	20,198	20,297	20,397	20,497	20,598	20,700	20,802	20,904	21,007	21,111	21,215	21,319	21,424	21,530	21,636	21,743	21,850	21,957	22,065	22,174	22,283	22,393	22,503	22,614
Capital - Operating		376,847	-	-	-	-	741,545	-	-	-	-	-	-	-	-	-	-	1,521,978								
Capital - Closure		50,246																3,261,380								
Hauling to Greater Vernon RDF																			248,893	251,370	253,871	256,142	258,433	260,745	263,078	265,431
		942,000	**1,323,488**	**900,810**	**905,247**	**909,707**	**914,188**	**1,660,236**	**923,217**	**927,765**	**932,335**	**936,928**	**941,543**	**946,181**	**950,842**	**955,526**	**960,233**	**964,964**	**5,753,075**	**636,724**	**641,111**	**645,533**	**649,733**	**653,963**	**658,224**	**662,514**	**666,835**
Lumby RDF																										
Salaries & Benefits	44,000	44,217	44,435	44,653	44,873	45,094	45,317	45,540	45,764	45,990	46,216	46,444	46,673	46,903	47,134	47,366	47,599	47,834	48,069	48,306	48,544	48,783	49,023	49,265	49,508	49,751
Contract Services	120,000	120,591	121,185	121,782	122,382	122,985	123,591	124,200	124,811	125,426	126,044	126,665	127,289	127,916	128,546	129,179	129,816	130,455	131,098	131,744	132,393	133,045	133,700	134,359	135,021	135,686
Operation & Maintenance	25,000	25,123	25,247	25,371	25,496	25,622	25,748	25,875	26,002	26,130	26,259	26,389	26,519	26,649	26,780	26,912	27,045	27,178	27,312	27,447	27,582	27,718	27,854	27,991	28,129	28,268
Cover Provision	5,000	5,025	5,049	5,074	5,099	5,124	5,150	5,175	5,200	5,226	5,252	5,278	5,304	5,330	5,356	5,382	5,409	5,436	5,462	5,489	5,516	5,544	5,571	5,598	5,626	5,654
Organic Program	30,000	30,148	30,296	30,446	30,596	30,746	30,898	31,050	31,203	31,357	31,511	31,666	31,822	31,979	32,137	32,295	32,454	32,614	32,774	32,936	33,098	33,261	33,425	33,590	33,755	33,921
Contractor Metal	1,500	1,507	1,515	1,522	1,530	1,537	1,545	1,552	1,560	1,568	1,576	1,583	1,591	1,599	1,607	1,615	1,623	1,631	1,639	1,647	1,655	1,663	1,671	1,679	1,688	1,696
Other	1,000	1,005	1,010	1,015	1,020	1,025	1,030	1,035	1,040	1,045	1,050	1,056	1,061	1,066	1,071	1,076	1,082	1,087	1,092	1,098	1,103	1,109	1,114	1,120	1,125	1,131
Capital - Operating		-	-	253,713	-	-	-	-	-	-	-	42,222	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Capital - Closure																										
		226,500	**227,616**	**228,737**	**483,577**	**230,996**	**232,134**	**233,278**	**234,427**	**235,582**	**236,742**	**237,908**	**281,302**	**240,258**	**241,441**	**242,631**	**243,826**	**245,027**	**246,234**	**247,447**	**248,666**	**249,891**	**251,122**	**252,359**	**253,602**	**254,852**	**256,107**
Total Expenditures		**1,168,500**	**1,551,103**	**1,129,547**	**1,388,824**	**1,140,703**	**1,146,322**	**1,893,514**	**1,157,644**	**1,163,346**	**1,169,077**	**1,174,836**	**1,222,845**	**1,186,439**	**1,192,284**	**1,198,157**	**1,204,059**	**1,209,991**	**5,999,309**	**884,171**	**889,777**	**895,424**	**900,855**	**906,322**	**911,826**	**917,366**	**922,942**
Revenue over Expenditures		(1,168,500)	512,285	543,724	575,851	608,676	640,441	657,960	675,752	693,820	712,168	728,910	745,893	763,119	780,593	796,333	812,282	828,441	844,813	1,197,099	1,212,203	1,227,473	1,241,033	1,254,726	1,268,555	1,282,521	1,296,624

Table 19 Alternative 3 (ICI Ban, RDNO Owned) - Cherryville, Kingfisher, Silver Star RDFs

NPV	-$1,906,612.19

Reference Figures	
General Inflation	2.0%
Discount Rate	1.5%
Real Discounted Interest Rate	-0.49%

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Inflation Factor		102.00%	104.04%	106.12%	108.24%	110.41%	112.62%	114.87%	117.17%	119.51%	121.90%	124.34%	126.82%	129.36%	131.95%	134.59%	137.28%	140.02%	142.82%	145.68%	148.59%	151.57%	154.60%	157.69%	160.84%	164.06%
Present Value Discount		98.52%	97.07%	95.63%	94.22%	92.83%	91.45%	90.10%	88.77%	87.46%	86.17%	84.89%	83.64%	82.40%	81.18%	79.99%	78.80%	77.64%	76.49%	75.36%	74.25%	73.15%	72.07%	71.00%	69.95%	68.92%
		100.49%	100.99%	101.49%	101.99%	102.49%	102.99%	103.50%	104.01%	104.52%	105.04%	105.55%	106.07%	106.60%	107.12%	107.65%	108.18%	108.71%	109.25%	109.79%	110.33%	110.87%	111.42%	111.97%	112.52%	113.07%
Revenue																										
Tipping Fees - Cherryville	30,000	30,148	30,296	30,446	30,596	30,746	30,898	31,050	31,203	31,357	31,511	31,666	31,822	31,979	32,137	32,295	32,454	32,614	32,774	32,936	33,098	33,261	33,425	33,590	33,755	33,921
Tipping Fees - Kingfisher	14,000	14,069	14,138	14,208	14,278	14,348	14,419	14,490	14,561	14,633	14,705	14,778	14,850	14,924	14,997	15,071	15,145	15,220	15,295	15,370	15,446	15,522	15,598	15,675	15,752	15,830
Silver Star RDF	115,000	115,567	116,136	116,708	117,283	117,861	118,441	119,025	119,611	120,200	120,792	121,387	121,985	122,586	123,190	123,797	124,407	125,020	125,635	126,254	126,876	127,501	128,129	128,761	129,395	130,032
Total Revenue	**159,000**	**159,783**	**160,570**	**161,361**	**162,156**	**162,955**	**163,758**	**164,564**	**165,375**	**166,190**	**167,008**	**167,831**	**168,658**	**169,489**	**170,324**	**171,163**	**172,006**	**172,853**	**173,705**	**174,560**	**175,420**	**176,284**	**177,153**	**178,025**	**178,902**	**179,784**
Expenses																										
Cherryville RDF																										
Contract Services	33,000	33,163	33,326	33,490	33,655	33,821	33,987	34,155	34,323	34,492	34,662	34,833	35,004	35,177	35,350	35,524	35,699	35,875	36,052	36,230	36,408	36,587	36,768	36,949	37,131	37,314
Operation & Maintenance	32,000	32,158	32,316	32,475	32,635	32,796	32,958	33,120	33,283	33,447	33,612	33,777	33,944	34,111	34,279	34,448	34,618	34,788	34,959	35,132	35,305	35,479	35,653	35,829	36,006	36,183
Contractor Metal	1,500	1,507	1,515	1,522	1,530	1,537	1,545	1,552	1,560	1,568	1,576	1,583	1,591	1,599	1,607	1,615	1,623	1,631	1,639	1,647	1,655	1,663	1,671	1,679	1,688	1,696
Other	1,500	1,507	1,515	1,522	1,530	1,537	1,545	1,552	1,560	1,568	1,576	1,583	1,591	1,599	1,607	1,615	1,623	1,631	1,639	1,647	1,655	1,663	1,671	1,679	1,688	1,696
	68,000	**68,335**	**68,672**	**69,010**	**69,350**	**69,691**	**70,035**	**70,380**	**70,726**	**71,075**	**71,425**	**71,777**	**72,130**	**72,486**	**72,843**	**73,202**	**73,562**	**73,925**	**74,289**	**74,655**	**75,022**	**75,392**	**75,763**	**76,137**	**76,512**	**76,889**
Kingfisher RDF																										
Contract Services	25,000	25,123	25,247	25,371	25,496	25,622	25,748	25,875	26,002	26,130	26,259	26,389	26,519	26,649	26,780	26,912	27,045	27,178	27,312	27,447	27,582	27,718	27,854	27,991	28,129	28,268
Operation & Maintenance	20,000	20,099	20,198	20,297	20,397	20,497	20,598	20,700	20,802	20,904	21,007	21,111	21,215	21,319	21,424	21,530	21,636	21,743	21,850	21,957	22,065	22,174	22,283	22,393	22,503	22,614
Contractor Metal	1,000	1,005	1,010	1,015	1,020	1,025	1,030	1,035	1,040	1,045	1,050	1,056	1,061	1,066	1,071	1,076	1,082	1,087	1,092	1,098	1,103	1,109	1,114	1,120	1,125	1,131
Other	1,500	1,507	1,515	1,522	1,530	1,537	1,545	1,552	1,560	1,568	1,576	1,583	1,591	1,599	1,607	1,615	1,623	1,631	1,639	1,647	1,655	1,663	1,671	1,679	1,688	1,696
	47,500	**47,734**	**47,969**	**48,205**	**48,443**	**48,682**	**48,921**	**49,162**	**49,405**	**49,648**	**49,892**	**50,138**	**50,385**	**50,633**	**50,883**	**51,134**	**51,385**	**51,639**	**51,893**	**52,149**	**52,405**	**52,664**	**52,923**	**53,184**	**53,446**	**53,709**
Silver Star RDF																										
Contract Services	36,000	36,177	36,356	36,535	36,715	36,895	37,077	37,260	37,443	37,628	37,813	38,000	38,187	38,375	38,564	38,754	38,945	39,137	39,329	39,523	39,718	39,913	40,110	40,308	40,506	40,706
Hauling Services	16,000	16,079	16,158	16,238	16,318	16,398	16,479	16,560	16,642	16,723	16,806	16,889	16,972	17,055	17,139	17,224	17,309	17,394	17,480	17,566	17,652	17,739	17,827	17,915	18,003	18,091
Operation & Maintenance	6,500	6,532	6,564	6,597	6,629	6,662	6,694	6,727	6,761	6,794	6,827	6,861	6,895	6,929	6,963	6,997	7,032	7,066	7,101	7,136	7,171	7,207	7,242	7,278	7,314	7,350
Utilities	3,500	3,517	3,535	3,552	3,569	3,587	3,605	3,622	3,640	3,658	3,676	3,694	3,713	3,731	3,749	3,768	3,786	3,805	3,824	3,843	3,861	3,880	3,900	3,919	3,938	3,958
Other	53,000	53,261	53,523	53,787	54,052	54,318	54,586	54,855	55,125	55,397	55,669	55,944	56,219	56,496	56,775	57,054	57,335	57,618	57,902	58,187	58,473	58,761	59,051	59,342	59,634	59,928
	115,000	**115,567**	**116,136**	**116,708**	**117,283**	**117,861**	**118,441**	**119,025**	**119,611**	**120,200**	**120,792**	**121,387**	**121,985**	**122,586**	**123,190**	**123,797**	**124,407**	**125,020**	**125,635**	**126,254**	**126,876**	**127,501**	**128,129**	**128,761**	**129,395**	**130,032**
Total Expenditures	**230,500**	**231,635**	**232,777**	**233,923**	**235,076**	**236,234**	**237,397**	**238,567**	**239,742**	**240,923**	**242,110**	**243,302**	**244,501**	**245,705**	**246,916**	**248,132**	**249,354**	**250,583**	**251,817**	**253,058**	**254,304**	**255,557**	**256,816**	**258,081**	**259,352**	**260,630**
Revenue over Expenditures	(71,500)	(71,852)	(72,206)	(72,562)	(72,919)	(73,279)	(73,639)	(74,002)	(74,367)	(74,733)	(75,101)	(75,471)	(75,843)	(76,217)	(76,592)	(76,969)	(77,349)	(77,730)	(78,112)	(78,497)	(78,884)	(79,273)	(79,663)	(80,055)	(80,450)	(80,846)

Table 20 Alternative 4 (ICI Ban + Residential, RDNO Owned) - Waste Reduction and Administration

Interest Rate on Reserve	1.75%
NPV	-$59,761,598.99

Reference Figures	
General Inflation	2.0%
Discount Rate	1.5%
Real Discounted Interest Rate	-0.49%

Waste Tonnages		**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
Greater Vernon		29,199	29,462	29,727	29,995	30,235	30,477	30,720	30,966	31,214	31,432	31,652	31,874	32,097	32,290	32,483	32,678	32,874	33,039	33,204	33,370	33,504	33,638	33,772	33,907	34,043
Arsmstrong/Spallumcheen		11,932	12,039	12,147	12,257	12,355	12,454	12,553	12,654	12,755	12,844	12,934	13,025	13,116	13,195	13,274	13,353	13,433	13,501	13,568	13,636	13,691	13,745	13,800	13,855	13,911
Lumby		1,925	1,942	1,959	1,977	1,993	2,009	2,025	2,041	2,057	2,072	2,086	2,101	2,116	2,128	2,141	2,154	2,167	2,178	2,189	2,200	2,208	2,217	2,226	2,235	2,244
Total		**43,056**	**43,443**	**43,834**	**44,229**	**44,583**	**44,939**	**45,299**	**45,661**	**46,026**	**46,349**	**46,673**	**47,000**	**47,329**	**47,613**	**47,898**	**48,186**	**48,475**	**48,717**	**48,961**	**49,206**	**49,402**	**49,600**	**49,798**	**49,998**	**50,198**
Inflation Factor		**102.00%**	**104.04%**	**106.12%**	**108.24%**	**110.41%**	**112.62%**	**114.87%**	**117.17%**	**119.51%**	**121.90%**	**124.34%**	**126.82%**	**129.36%**	**131.95%**	**134.59%**	**137.28%**	**140.02%**	**142.82%**	**145.68%**	**148.59%**	**151.57%**	**154.60%**	**157.69%**	**160.84%**	**164.06%**
Present Value Discount		**98.52%**	**97.07%**	**95.63%**	**94.22%**	**92.83%**	**91.45%**	**90.10%**	**88.77%**	**87.46%**	**86.17%**	**84.89%**	**83.64%**	**82.40%**	**81.18%**	**79.99%**	**78.80%**	**77.64%**	**76.49%**	**75.36%**	**74.25%**	**73.15%**	**72.07%**	**71.00%**	**69.95%**	**68.92%**
		100.49%	**100.99%**	**101.49%**	**101.99%**	**102.49%**	**102.99%**	**103.50%**	**104.01%**	**104.52%**	**105.04%**	**105.55%**	**106.07%**	**106.60%**	**107.12%**	**107.65%**	**108.18%**	**108.71%**	**109.25%**	**109.79%**	**110.33%**	**110.87%**	**111.42%**	**111.97%**	**112.52%**	**113.07%**

Revenue		**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
Property Taxes	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000															
Recycling Revenue	77,500	77,882	78,265	78,651	79,038	79,428	79,819	80,212	80,607	81,004	81,403	81,804	82,207	82,612	83,019	83,428	83,839	84,252	84,667	85,084	85,504	85,925	86,348	86,773	87,201	87,630
Other Revenue (Royalties, Rental, Grants, Sundry)	11,500	11,557	11,614	11,671	11,728	11,786	11,844	11,902	11,961	12,020	12,079	12,139	12,199	12,259	12,319	12,380	12,441	12,502	12,564	12,625	12,688	12,750	12,813	12,876	12,939	13,003
Transfer from Operating Reserves																										
Transfer from Closure Reserves																										
Total Revenue	**509,000**	**509,438**	**509,879**	**510,322**	**510,767**	**511,214**	**511,663**	**512,115**	**512,568**	**513,024**	**513,483**	**93,943**	**94,406**	**94,871**	**95,338**	**95,808**	**96,280**	**96,754**	**97,231**	**97,710**	**98,191**	**98,675**	**99,161**	**99,649**	**100,140**	**100,634**
Expenses																										
Waste Reduction/Recycling																										
Composting Facility Operations	150,000	150,739	151,481	152,228	152,978	153,731	154,488	155,249	156,014	156,783	157,555	158,331	159,111	159,895	160,683	161,474	162,270	163,069	163,872	164,680	165,491	166,306	167,125	167,949	168,776	169,607
Drop-Bin Service Contract	150,000	150,739	151,481	152,228	152,978	153,731	154,488	155,249	156,014	156,783	157,555	158,331	159,111	159,895	160,683	161,474	162,270	163,069	163,872	164,680	165,491	166,306	167,125	167,949	168,776	169,607
Other Programs	40,000	40,197	40,395	40,594	40,794	40,995	41,197	41,400	41,604	41,809	42,015	42,222	42,430	42,639	42,849	43,060	43,272	43,485	43,699	43,915	44,131	44,348	44,567	44,786	45,007	45,229
	340,000	**341,675**	**343,358**	**345,049**	**346,749**	**348,457**	**350,174**	**351,899**	**353,632**	**355,374**	**357,125**	**358,884**	**360,652**	**362,429**	**364,214**	**366,008**	**367,811**	**369,623**	**371,444**	**373,274**	**375,112**	**376,960**	**378,817**	**380,683**	**382,559**	**384,443**
Administration																										
Salaries & Benefits	380,000	381,872	383,753	385,643	387,543	389,452	391,371	393,299	395,236	397,183	399,140	401,106	403,082	405,067	407,063	409,068	411,083	413,108	415,143	417,188	419,243	421,309	423,384	425,470	427,566	429,672
Environmental Monitoring	40,000	40,197	40,395	40,594	40,794	40,995	41,197	41,400	41,604	41,809	42,015	42,222	42,430	42,639	42,849	43,060	43,272	43,485	43,699	43,915	44,131	44,348	44,567	44,786	45,007	45,229
Eco Depot	100,000	100,493	100,988	101,485	101,985	102,487	102,992	103,500	104,010	104,522	105,037	105,554	106,074	106,597	107,122	107,649	108,180	108,713	109,248	109,786	110,327	110,871	111,417	111,966	112,517	113,072
Overhead	300,000	301,478	302,963	304,455	305,955	307,462	308,977	310,499	312,029	313,566	315,110	316,663	318,222	319,790	321,365	322,948	324,539	326,138	327,745	329,359	330,982	332,612	334,251	335,897	337,552	339,215
Public Information	35,000	35,172	35,346	35,520	35,695	35,871	36,047	36,225	36,403	36,583	36,763	36,944	37,126	37,309	37,493	37,677	37,863	38,049	38,237	38,425	38,615	38,805	38,996	39,188	39,381	39,575
Fees (Moneris, Professional)	35,000	35,172	35,346	35,520	35,695	35,871	36,047	36,225	36,403	36,583	36,763	36,944	37,126	37,309	37,493	37,677	37,863	38,049	38,237	38,425	38,615	38,805	38,996	39,188	39,381	39,575
Reserve - Operating	225,000	226,108	227,222	228,342	229,466	230,597	231,733	232,874	234,021	235,174	236,333	237,497	238,667	239,843	241,024	242,211	243,404	244,604	245,808	247,019	248,236	249,459	250,688	251,923	253,164	254,411
Reserve - Closure		692,285	745,829	800,733	857,027	913,830	925,678	937,680	949,838	962,153	973,661	985,306	997,091	1,009,017	1,020,071	1,031,247	1,042,545	1,053,967	1,064,454	1,075,047	1,085,744	1,095,457	1,105,257	1,115,144	1,125,120	1,135,185
Volume Surveys	14,000	14,069	14,138	14,208	14,278	14,348	14,419	14,490	14,561	14,633	14,705	14,778	14,850	14,924	14,997	15,071	15,145	15,220	15,295	15,370	15,446	15,522	15,598	15,675	15,752	15,830
Other	70,000	70,345	70,691	71,040	71,390	153,731	72,095	72,450	72,807	73,165	157,555	73,888	74,252	74,618	74,985	161,474	75,726	76,099	76,474	76,850	165,491	77,609	77,992	78,376	78,762	169,607
Solid Waste Management Plan Update		95,468																								
Capital - Operating		70,345																								
	1,199,000	**2,063,004**	**1,956,671**	**2,017,540**	**2,079,827**	**2,224,644**	**2,160,556**	**2,178,641**	**2,196,912**	**2,215,370**	**2,317,081**	**2,250,901**	**2,268,920**	**2,287,111**	**2,304,462**	**2,408,084**	**2,339,620**	**2,357,432**	**2,374,341**	**2,391,385**	**2,496,829**	**2,424,796**	**2,441,145**	**2,457,613**	**2,474,202**	**2,581,370**
Total Expenditures	**1,539,000**	**2,404,679**	**2,300,029**	**2,362,590**	**2,426,577**	**2,573,102**	**2,510,730**	**2,530,540**	**2,550,544**	**2,570,744**	**2,674,206**	**2,609,785**	**2,629,572**	**2,649,540**	**2,668,676**	**2,774,092**	**2,707,432**	**2,727,055**	**2,745,784**	**2,764,659**	**2,871,941**	**2,801,757**	**2,819,962**	**2,838,296**	**2,856,760**	**2,965,813**
Revenue over Expenditures	(1,030,000)	(1,895,241)	(1,790,150)	(1,852,268)	(1,915,810)	(2,061,888)	(1,999,067)	(2,018,425)	(2,037,976)	(2,057,720)	(2,160,723)	(2,515,842)	(2,535,166)	(2,554,669)	(2,573,337)	(2,678,284)	(2,611,152)	(2,630,301)	(2,648,554)	(2,666,949)	(2,773,750)	(2,703,082)	(2,720,801)	(2,738,647)	(2,756,620)	(2,865,179)
Closure Reserve - Transfer In	3,636,000	692,285	745,829	800,733	857,027	913,830	925,678	937,680	949,838	962,153	973,661	985,306	997,091	1,009,017	1,020,071	1,031,247	1,042,545	1,053,967	1,064,454	1,075,047	1,085,744	1,095,457	1,105,257	1,115,144	1,125,120	1,135,185
Closure Reserve - Transfer from Operating		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Closure Reserve - Transfer to Revenue		50,246	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,277,446	-	-	-	-	-	-	-
Interest of Reserve		63,630	75,979	90,361	105,955	122,807	140,948	159,614	178,817	198,568	218,881	239,750	261,189	283,209	305,823	329,026	352,831	377,250	402,296	370,609	395,908	421,837	448,389	475,578	503,416	531,915
Closure Reserve	3,636,000	4,341,669	5,163,476	6,054,571	7,017,553	8,054,190	9,120,816	10,218,111	11,346,765	12,507,487	13,700,028	14,925,085	16,183,365	17,475,591	18,801,486	20,161,759	21,557,134	22,988,351	21,177,655	22,623,311	24,104,963	25,622,257	27,175,903	28,766,625	30,395,161	32,062,262
Operating Reserve - Transfer In	5,000,000	226,108	227,222	228,342	229,466	230,597	231,733	232,874	234,021	235,174	236,333	237,497	238,667	239,843	241,024	242,211	243,404	244,604	245,808	247,019	248,236	249,459	250,688	251,923	253,164	254,411
Operating Reserve - Transfer to Closure Reserve		132,788																								
Operating Reserve - Transfer to Revenue		492,414	-	4,414,603	-	958,258	741,545	-	-	-	-	42,222	-	-	-	-	-	-	1,529,475	-	-	-	-	-	-	-
Interest of Reserve		87,500	84,371	87,500	15,772	20,063	7,680	2,968	7,116	11,356	15,690	19,382	23,898	28,514	33,230	38,051	42,976	48,009	26,385	31,169	36,059	41,056	46,161	51,377	56,707
Operating Reserve	5,000,000	4,821,195	5,000,000	901,238	1,146,476	438,879	(63,253)	169,622	406,611	648,901	896,590	1,107,555	1,365,604	1,629,345	1,898,882	2,174,324	2,455,779	2,743,359	1,507,701	1,781,106	2,060,511	2,346,029	2,637,772	2,935,856	3,240,398	3,551,515

Table 21 Alternative 4 (ICI Ban + Residential, RDNO Owned) - Greater Vernon RDF

Vernon Landfill Volume, 2016	2,435,800	m^3
Vernon Waste Density	0.55	
Organic Diversion - ICI	2000	tonnes
Organic Diversion - City of Vernon	2110	tonnes
Organic Diversion - Yard & Garden Waste	5000	tonnes
Organic Diversion - Capital Costs	400	per tonne
Organic Diversion - Operating Costs	90	per tonne
NPV	**$39,898,271.86**	

Reference Figures	
General Inflation	2.0%
Discount Rate	1.5%
Real Discounted Interest Rate	-0.49%

Waste Tonnages	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Greater Vernon	29,199	29,462	29,727	29,995	30,235	30,477	30,720	30,966	31,214	31,432	31,652	31,874	32,097	32,290	32,483	32,678	32,874	33,039	33,204	33,370	33,504	33,638	33,772	33,907	34,043
Organic Diversion - ICI			1,000	2,000	2,016	2,032	2,048	2,065	2,081	2,096	2,111	2,125	2,140	2,153	2,166	2,179	2,192	2,203	2,214	2,225	2,234	2,243	2,252	2,261	2,270
Organic Diversion - Greater Vernon				1,583	2,110	2,127	2,144	2,161	2,178	2,194	2,209	2,224	2,240	2,253	2,267	2,281	2,294	2,306	2,317	2,329	2,338	2,347	2,357	2,366	2,376
Orgnaic Diversion - Armstrong/Spallumcheen/Lumby				668	890	897	904	912	919	925	932	938	945	950	956	962	968	973	977	982	986	990	994	998	1,002
Transfer from Armstrong/Spallumcheen																			13,568	13,636	13,691	13,745	13,800	13,855	13,911
Annual Consumption of Volume (m3)	53,090	53,567	52,231	48,022	47,471	47,850	48,233	48,619	49,008	49,351	49,696	50,044	50,395	50,697	51,001	51,307	51,615	51,873	76,802	77,186	77,495	77,805	78,116	78,428	78,742
Total Waste Landfilled (tonnes)	29,199	58,661	87,389	113,801	139,910	166,227	192,756	219,496	246,450	273,593	300,926	328,451	356,168	384,051	412,102	440,321	468,709	497,239	539,480	581,932	624,554	667,347	710,310	753,446	796,754
Total Volume Consumed (m3)	53,090	106,657	158,889	206,911	254,381	302,232	350,465	399,084	448,092	497,443	547,139	597,183	647,578	698,275	749,276	800,583	852,198	904,071	980,873	1,058,059	1,135,553	1,213,358	1,291,474	1,369,902	1,448,644
Inflation Factor	**102.00%**	**104.04%**	**106.12%**	**108.24%**	**110.41%**	**112.62%**	**114.87%**	**117.17%**	**119.51%**	**121.90%**	**124.34%**	**126.82%**	**129.36%**	**131.95%**	**134.59%**	**137.28%**	**140.02%**	**142.82%**	**145.68%**	**148.59%**	**151.57%**	**154.60%**	**157.69%**	**160.84%**	**164.06%**
Present Value Discount	**98.52%**	**97.07%**	**95.63%**	**94.22%**	**92.83%**	**91.45%**	**90.10%**	**88.77%**	**87.46%**	**86.17%**	**84.89%**	**83.64%**	**82.40%**	**81.18%**	**79.99%**	**78.80%**	**77.64%**	**76.49%**	**75.36%**	**74.25%**	**73.15%**	**72.07%**	**71.00%**	**69.95%**	**68.92%**
	100.49%	**100.99%**	**101.49%**	**101.99%**	**102.49%**	**102.99%**	**103.50%**	**104.01%**	**104.52%**	**105.04%**	**105.55%**	**106.07%**	**106.60%**	**107.12%**	**107.65%**	**108.18%**	**108.71%**	**109.25%**	**109.79%**	**110.33%**	**110.87%**	**111.42%**	**111.97%**	**112.52%**	**113.07%**

Revenue	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Tipping Fees - Landfilled	3,108,972	3,182,154	3,256,774	3,332,858	3,407,052	3,451,226	3,495,973	3,541,300	3,587,215	3,630,120	3,673,539	3,717,477	3,761,940	3,803,154	3,844,820	3,886,943	3,929,527	3,968,629	4,008,120	4,048,003	4,084,216	4,120,753	4,157,616	4,194,809	4,232,335
Tipping Fees - Diverted	550,217	557,904	565,698	573,601	581,038	588,571	596,203	603,933	611,763	619,080	626,485	633,978	641,560	648,589	655,695	662,878	670,141	676,809	683,544	690,346	696,521	702,752	709,039	715,382	721,782
Transfer from Operating Reserves	115,567		4,059,405		958,258																				
Transfer from Closure Reserves																									
Total Revenue	**3,774,755**	**3,740,057**	**7,881,877**	**3,906,459**	**4,946,348**	**4,039,798**	**4,092,176**	**4,145,233**	**4,198,978**	**4,249,200**	**4,300,023**	**4,351,454**	**4,403,500**	**4,451,743**	**4,500,515**	**4,549,821**	**4,599,668**	**4,645,438**	**4,691,663**	**4,738,349**	**4,780,737**	**4,823,505**	**4,866,655**	**4,910,191**	**4,954,117**
Expenses																									
Greater Vernon RDF																									
Salaries & Benefits	190,000	190,936	191,877	192,822	193,772	194,726	195,685	196,649	197,618	198,592	199,570	200,553	201,541	202,534	203,531	204,534	205,542	206,554	207,572	208,594	209,622	210,654	211,692	212,735	213,783	214,836
Contract Services	605,000	607,980	610,975	613,985	617,010	620,049	623,103	626,173	629,258	632,357	635,472	638,603	641,749	644,910	648,087	651,279	654,488	657,712	660,952	664,208	667,480	670,768	674,072	677,392	680,729	684,083
Operation & Maintenance	200,000	200,985	201,975	202,970	203,970	204,975	205,985	206,999	208,019	209,044	210,074	211,108	212,148	213,193	214,244	215,299	216,360	217,425	218,496	219,573	220,654	221,741	222,834	223,931	225,034	226,143
Gypsum Recyling Program	200,000	200,985	201,975	202,970	203,970	204,975	205,985	206,999	208,019	209,044	210,074	211,108	212,148	213,193	214,244	215,299	216,360	217,425	218,496	219,573	220,654	221,741	222,834	223,931	225,034	226,143
Asphalt Roof Recyling	100,000	100,493	100,988	101,485	101,985	102,487	102,992	103,500	104,010	104,522	105,037	105,554	106,074	106,597	107,122	107,649	108,180	108,713	109,248	109,786	110,327	110,871	111,417	111,966	112,517	113,072
Organic Waste Program	350,000	351,724	353,457	355,198	356,948	358,706	360,473	362,249	364,033	365,827	367,629	369,440	371,260	373,088	374,926	376,773	378,629	380,494	382,369	384,252	386,145	388,047	389,959	391,880	393,810	395,750
Landfill Gas Plant	15,000	15,074	15,148	15,223	15,298	15,373	15,449	15,525	15,601	15,678	15,756	15,833	15,911	15,990	16,068	16,147	16,227	16,307	16,387	16,468	16,549	16,631	16,713	16,795	16,878	16,961
Contractor Metal	25,000	25,123	25,247	25,371	25,496	25,622	25,748	25,875	26,002	26,130	26,259	26,389	26,519	26,649	26,780	26,912	27,045	27,178	27,312	27,447	27,582	27,718	27,854	27,991	28,129	28,268
Other	50,000	50,246	50,494	50,743	50,993	51,244	51,496	51,750	52,005	52,261	52,518	52,777	53,037	53,298	53,561	53,825	54,090	54,356	54,624	54,893	55,164	55,435	55,708	55,983	56,259	56,536
Capital - Operating		522,562	-	-	-	958,258	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Capital - Closure																										
Organic Diversion - Capital				4,059,405																						
Organic Diversion - Operation				182,673	780,186	925,339	937,336	949,489	961,800	974,270	985,923	997,715	1,009,648	1,021,724	1,032,918	1,044,234	1,055,675	1,067,240	1,077,860	1,088,586	1,099,418	1,109,253	1,119,176	1,129,188	1,139,290	1,149,481
	1,735,000	**2,266,108**	**1,752,136**	**6,002,845**	**2,549,626**	**3,661,753**	**2,724,253**	**2,745,208**	**2,766,365**	**2,787,724**	**2,808,311**	**2,829,080**	**2,850,035**	**2,871,177**	**2,891,481**	**2,911,953**	**2,932,594**	**2,953,405**	**2,973,316**	**2,993,379**	**3,013,595**	**3,032,859**	**3,052,258**	**3,071,793**	**3,091,464**	**3,111,272**
Total Expenditures	**1,735,000**	**2,266,108**	**1,752,136**	**6,002,845**	**2,549,626**	**3,661,753**	**2,724,253**	**2,745,208**	**2,766,365**	**2,787,724**	**2,808,311**	**2,829,080**	**2,850,035**	**2,871,177**	**2,891,481**	**2,911,953**	**2,932,594**	**2,953,405**	**2,973,316**	**2,993,379**	**3,013,595**	**3,032,859**	**3,052,258**	**3,071,793**	**3,091,464**	**3,111,272**
Revenue over Expenditures	(1,735,000)	1,508,647	1,987,922	1,879,032	1,356,833	1,284,594	1,315,545	1,346,968	1,378,868	1,411,254	1,440,890	1,470,943	1,501,419	1,532,323	1,560,262	1,588,562	1,617,228	1,646,263	1,672,121	1,698,284	1,724,754	1,747,878	1,771,247	1,794,862	1,818,727	1,842,845

Table 22 Alternative 4 (ICI Ban + Residential, RDNO Owned) - Armstrong/Spallumcheen and Lumby RDFs

Armstrong Landfill Volume, 2016	328,626	m^3
Lumby Landfill Volume, 2016	379,703	m^3
Armstrong Waste Density	0.65	
Lumby Waster Density	0.50	
Hauling from Armstrong to Vernon	35	km
Hauling Rate	16.88	tonne
Organic Diversion - Armstrong	700	tonnes
Organic Diversion - Lumby	190	tonnes
Hauling from Armstrong to Vernon - Organic	270.00	per load
Hauling from Lumby to Vernon - Organic	202.50	per load
Assume 5 load per week	260	load
NPV	**$18,659,813.31**	

Reference Figures	
General Inflation	2.0%
Discount Rate	1.5%
Real Discounted Interest Rate	-0.49%

Capacity	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Annual Waste - Armstrong/Spallumcheen	**11,932**	**12,039**	**12,147**	**12,257**	**12,355**	**12,454**	**12,553**	**12,654**	**12,755**	**12,844**	**12,934**	**13,025**	**13,116**	**13,195**	**13,274**	**13,353**	**13,433**	**13,501**	**13,568**	**13,636**	**13,691**	**13,745**	**13,800**	**13,855**	**13,911**
Organic Diversion				**525**	**700**	**706**	**711**	**717**	**723**	**728**	**733**	**738**	**743**	**748**	**752**	**757**	**761**	**765**	**769**	**773**	**776**	**779**	**782**	**785**	**788**
Annual Consumption of Volume (m3)	18,356	18,522	18,688	18,049	17,930	18,074	18,219	18,364	18,511	18,641	18,771	18,903	19,035	19,149	19,264	19,380	19,496	19,593							
Total Waste Landfilled (tonnes)	11,932	23,971	36,118	47,850	59,505	71,253	83,095	95,032	107,064	119,181	131,382	143,669	156,041	168,488	181,010	193,607	206,279	219,015							
Total Volume Consumed (m3)	18,356	36,878	55,567	73,615	91,546	109,620	127,838	146,203	164,714	183,355	202,126	221,029	240,064	259,213	278,477	297,856	317,352	336,946							
Annual Waste - Lumby	**1,925**	**1,942**	**1,959**	**1,977**	**1,993**	**2,009**	**2,025**	**2,041**	**2,057**	**2,072**	**2,086**	**2,101**	**2,116**	**2,128**	**2,141**	**2,154**	**2,167**	**2,178**	**2,189**	**2,200**	**2,208**	**2,217**	**2,226**	**2,235**	**2,244**
Organic Diversion				**143**	**190**	**192**	**193**	**195**	**196**	**198**	**199**	**200**	**202**	**203**	**204**	**205**	**207**	**208**	**209**	**210**	**211**	**211**	**212**	**213**	**214**
Annual Consumption of Volume (m3)	3,849	3,884	3,919	3,669	3,606	3,635	3,664	3,693	3,723	3,749	3,775	3,801	3,828	3,851	3,874	3,897	3,921	3,940	3,960	3,980	3,996	4,012	4,028	4,044	4,060
Total Waste Landfilled (tonnes)	1,925	3,867	5,826	7,661	9,464	11,281	13,113	14,960	16,821	18,695	20,583	22,483	24,397	26,323	28,260	30,208	32,169	34,139	36,119	38,109	40,107	42,113	44,126	46,148	48,178
Total Volume Consumed (m3)	3,849	7,733	11,652	15,322	18,927	22,562	26,226	29,919	33,642	37,390	41,165	44,967	48,795	52,646	56,520	60,417	64,338	68,278	72,238	76,218	80,213	84,225	88,253	92,297	96,357
Inflation Factor	**102.00%**	**104.04%**	**106.12%**	**108.24%**	**110.41%**	**112.62%**	**114.87%**	**117.17%**	**119.51%**	**121.90%**	**124.34%**	**126.82%**	**129.36%**	**131.95%**	**134.59%**	**137.28%**	**140.02%**	**142.82%**	**145.68%**	**148.59%**	**151.57%**	**154.60%**	**157.69%**	**160.84%**	**164.06%**
Present Value Discount	**98.52%**	**97.07%**	**95.63%**	**94.22%**	**92.83%**	**91.45%**	**90.10%**	**88.77%**	**87.46%**	**86.17%**	**84.89%**	**83.64%**	**82.40%**	**81.18%**	**79.99%**	**78.80%**	**77.64%**	**76.49%**	**75.36%**	**74.25%**	**73.15%**	**72.07%**	**71.00%**	**69.95%**	**68.92%**
	100.49%	**100.99%**	**101.49%**	**101.99%**	**102.49%**	**102.99%**	**103.50%**	**104.01%**	**104.52%**	**105.04%**	**105.55%**	**106.07%**	**106.60%**	**107.12%**	**107.65%**	**108.18%**	**108.71%**	**109.25%**	**109.79%**	**110.33%**	**110.87%**	**111.42%**	**111.97%**	**112.52%**	**113.07%**

Revenue	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Tipping Fees - Landfilled (Arsmstrong/Spallumcheen)	1,265,976	1,295,818	1,326,248	1,357,275	1,387,533	1,405,523	1,423,747	1,442,206	1,460,905	1,478,378	1,496,061	1,513,955	1,532,062	1,548,847	1,565,816	1,582,970	1,600,313	1,616,237	1,632,320	1,648,563	1,663,310	1,678,190	1,693,203	1,708,350	1,723,632
Tipping Fees - Diverted (Arsmstrong/Spallumcheen)	137,286	139,204	141,148	143,120	144,976	146,855	148,760	150,688	152,642	154,468	156,315	158,185	160,077	161,831	163,604	165,396	167,208	168,872	170,552	172,249	173,790	175,345	176,914	178,496	180,093
Tipping Fees - Landfilled (Lumby)	204,909	209,732	214,650	219,664	224,554	227,465	230,414	233,402	236,428	239,256	242,118	245,013	247,944	250,660	253,406	256,183	258,989	261,567	264,169	266,798	269,185	271,593	274,022	276,474	278,947
Tipping Fees - Diverted (Lumby)	28,124	28,517	28,916	29,320	29,700	30,085	30,475	30,870	31,270	31,644	32,023	32,406	32,793	33,153	33,516	33,883	34,254	34,595	34,939	35,287	35,603	35,921	36,243	36,567	36,894
Transfer from Operating Reserves	376,847	-	355,198	-	-	741,545	-	-	-	-	42,222	-	-	-	-	-	-	1,529,475	-	-	-	-	-	-	-
Transfer from Closure Reserves	50,246	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,277,446	-	-	-	-	-	-	-
Total Revenue	**2,063,388**	**1,673,271**	**2,066,160**	**1,749,379**	**1,786,763**	**2,551,473**	**1,833,396**	**1,857,166**	**1,881,246**	**1,903,746**	**1,968,738**	**1,949,559**	**1,972,876**	**1,994,491**	**2,016,342**	**2,038,432**	**2,060,764**	**6,888,192**	**2,101,981**	**2,122,897**	**2,141,888**	**2,161,049**	**2,180,381**	**2,199,887**	**2,219,566**

Expenses																									
Armstrong/Spallumcheen RDF																									
Salaries & Benefits	155,000	155,764	156,531	157,302	158,077	158,856	159,638	160,424	161,215	162,009	162,807	163,609	164,415	165,225	166,039	166,857	167,679	168,505	169,335	170,169	171,007	171,850	172,696	173,547	174,402	175,261
Contract Services	465,000	467,291	469,593	471,906	474,230	476,567	478,914	481,273	483,644	486,027	488,421	490,827	493,245	495,675	498,116	500,570	503,036	505,514	508,004						
Operation & Maintenance - Landfill	115,000	115,567	116,136	116,708	117,283	117,861	118,441	119,025	119,611	120,200	120,792	121,387	121,985	122,586	123,190	123,797	124,407	125,020	125,635						
Operation & Maintenance - Transfer Station	50,000																			54,893	55,164	55,435	55,708	55,983	56,259	56,536
Cover Provision	7,000	7,034	7,069	7,104	7,139	7,174	7,209	7,245	7,281	7,317	7,353	7,389	7,425	7,462	7,499	7,535	7,573	7,610	7,647						
Organic Program	85,000	85,419	85,840	86,262	86,687	87,114	87,543	87,975	88,408	88,844	89,281	89,721	90,163	90,607	91,054	91,502	91,953	92,406	92,861	93,318	93,778	94,240	94,704	95,171	95,640	96,111
Poplar Tree Program	35,000	35,172	35,346	35,520	35,695	35,871	36,047	36,225	36,403	36,583	36,763	36,944	37,126	37,309	37,493	37,677	37,863	38,049	38,237	38,425	38,615	38,805	38,996	39,188	39,381	39,575
Contractor Metal	10,000	10,049	10,099	10,149	10,199	10,249	10,299	10,350	10,401	10,452	10,504	10,555	10,607	10,660	10,712	10,765	10,818	10,871	10,925	10,979	11,033	11,087	11,142	11,197	11,252	11,307
Other	20,000	20,099	20,198	20,297	20,397	20,497	20,598	20,700	20,802	20,904	21,007	21,111	21,215	21,319	21,424	21,530	21,636	21,743	21,850	21,957	22,065	22,174	22,283	22,393	22,503	22,614
Capital - Operating		376,847	-	-	-	-	741,545	-	-	-	-	-	-	-	-	-	-	-	1,529,475							
Capital - Closure		50,246																	3,277,446							
Organic Diversion - Capital				50,743																						
Organic Diversion - Hauling to Greater Vernon RDF					71,594	71,946	72,301	72,657	73,015	73,374	73,736	74,099	74,464	74,831	75,199	75,570	75,942	76,316	76,692	77,070	77,450	77,831	78,215	78,600	78,987	79,376
Hauling to Greater Vernon RDF																				251,370	253,871	256,142	258,433	260,745	263,078	265,431
	942,000	**1,323,488**	**900,810**	**955,990**	**981,300**	**986,134**	**1,732,537**	**995,874**	**1,000,779**	**1,005,709**	**1,010,664**	**1,015,642**	**1,020,645**	**1,025,673**	**1,030,726**	**1,035,803**	**1,040,906**	**1,046,033**	**5,858,108**	**718,181**	**722,982**	**727,564**	**732,178**	**736,823**	**741,501**	**746,211**
Lumby RDF																									
Salaries & Benefits	44,000	44,217	44,435	44,653	44,873	45,094	45,317	45,540	45,764	45,990	46,216	46,444	46,673	46,903	47,134	47,366	47,599	47,834	48,069	48,306	48,544	48,783	49,023	49,265	49,508	49,751
Contract Services	120,000	120,591	121,185	121,782	122,382	122,985	123,591	124,200	124,811	125,426	126,044	126,665	127,289	127,916	128,546	129,179	129,816	130,455	131,098	131,744	132,393	133,045	133,700	134,359	135,021	135,686
Operation & Maintenance	25,000	25,123	25,247	25,371	25,496	25,622	25,748	25,875	26,002	26,130	26,259	26,389	26,519	26,649	26,780	26,912	27,045	27,178	27,312	27,447	27,582	27,718	27,854	27,991	28,129	28,268
Cover Provision	5,000	5,025	5,049	5,074	5,099	5,124	5,150	5,175	5,200	5,226	5,252	5,278	5,304	5,330	5,356	5,382	5,409	5,436	5,462	5,489	5,516	5,544	5,571	5,598	5,626	5,654
Organic Program	30,000	30,148	30,296	30,446	30,596	30,746	30,898	31,050	31,203	31,357	31,511	31,666	31,822	31,979	32,137	32,295	32,454	32,614	32,774	32,936	33,098	33,261	33,425	33,590	33,755	33,921
Contractor Metal	1,500	1,507	1,515	1,522	1,530	1,537	1,545	1,552	1,560	1,568	1,576	1,583	1,591	1,599	1,607	1,615	1,623	1,631	1,639	1,647	1,655	1,663	1,671	1,679	1,688	1,696
Other	1,000	1,005	1,010	1,015	1,020	1,025	1,030	1,035	1,040	1,045	1,050	1,056	1,061	1,066	1,071	1,076	1,082	1,087	1,092	1,098	1,103	1,109	1,114	1,120	1,125	1,131
Capital - Operating		-	-	253,713	-	-	-	-	-	-	-	42,222	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Capital - Closure																										
Organic Diversion - Capital				50,743																						
Organic Diversion - Hauling to Greater Vernon RDF					53,695	53,960	54,225	54,493	54,761	55,031	55,302	55,574	55,848	56,123	56,400	56,677	56,957	57,237	57,519	57,803	58,087	58,373	58,661	58,950	59,240	59,532
	226,500	**227,616**	**228,737**	**534,319**	**284,691**	**286,094**	**287,503**	**288,919**	**290,343**	**291,773**	**293,210**	**336,876**	**296,106**	**297,565**	**299,030**	**300,504**	**301,984**	**303,471**	**304,966**	**306,469**	**307,978**	**309,496**	**311,020**	**312,552**	**314,092**	**315,639**
Total Expenditures	**1,168,500**	**1,551,103**	**1,129,547**	**1,490,309**	**1,265,991**	**1,272,228**	**2,020,040**	**1,284,793**	**1,291,122**	**1,297,482**	**1,303,874**	**1,352,518**	**1,316,751**	**1,323,238**	**1,329,756**	**1,336,307**	**1,342,890**	**1,349,505**	**6,163,074**	**1,024,650**	**1,030,961**	**1,037,060**	**1,043,198**	**1,049,376**	**1,055,593**	**1,061,851**
Revenue over Expenditures	(1,168,500)	512,285	543,724	575,851	483,387	514,535	531,434	548,603	566,044	583,763	599,873	616,220	632,807	649,639	664,734	680,035	695,542	711,260	725,118	1,077,331	1,091,936	1,104,828	1,117,851	1,131,006	1,144,293	1,157,716

Table 23 Alternative 4 (ICI Ban + Residential, RDNO Owned) - Cherryville, Kingfisher, Silver Star RDFs

NPV	-$1,906,612.19

Reference Figures	
General Inflation	2.0%
Discount Rate	1.5%
Real Discounted Interest Rate	-0.49%

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Inflation Factor		102.00%	104.04%	106.12%	108.24%	110.41%	112.62%	114.87%	117.17%	119.51%	121.90%	124.34%	126.82%	129.36%	131.95%	134.59%	137.28%	140.02%	142.82%	145.68%	148.59%	151.57%	154.60%	157.69%	160.84%	164.06%
Present Value Discount		98.52%	97.07%	95.63%	94.22%	92.83%	91.45%	90.10%	88.77%	87.46%	86.17%	84.89%	83.64%	82.40%	81.18%	79.99%	78.80%	77.64%	76.49%	75.36%	74.25%	73.15%	72.07%	71.00%	69.95%	68.92%
		100.49%	100.99%	101.49%	101.99%	102.49%	102.99%	103.50%	104.01%	104.52%	105.04%	105.55%	106.07%	106.60%	107.12%	107.65%	108.18%	108.71%	109.25%	109.79%	110.33%	110.87%	111.42%	111.97%	112.52%	113.07%
Revenue																										
Tipping Fees - Cherryville	30,000	30,148	30,296	30,446	30,596	30,746	30,898	31,050	31,203	31,357	31,511	31,666	31,822	31,979	32,137	32,295	32,454	32,614	32,774	32,936	33,098	33,261	33,425	33,590	33,755	33,921
Tipping Fees - Kingfisher	14,000	14,069	14,138	14,208	14,278	14,348	14,419	14,490	14,561	14,633	14,705	14,778	14,850	14,924	14,997	15,071	15,145	15,220	15,295	15,370	15,446	15,522	15,598	15,675	15,752	15,830
Silver Star RDF	115,000	115,567	116,136	116,708	117,283	117,861	118,441	119,025	119,611	120,200	120,792	121,387	121,985	122,586	123,190	123,797	124,407	125,020	125,635	126,254	126,876	127,501	128,129	128,761	129,395	130,032
Total Revenue	**159,000**	**159,783**	**160,570**	**161,361**	**162,156**	**162,955**	**163,758**	**164,564**	**165,375**	**166,190**	**167,008**	**167,831**	**168,658**	**169,489**	**170,324**	**171,163**	**172,006**	**172,853**	**173,705**	**174,560**	**175,420**	**176,284**	**177,153**	**178,025**	**178,902**	**179,784**
Expenses																										
Cherryville RDF																										
Contract Services	33,000	33,163	33,326	33,490	33,655	33,821	33,987	34,155	34,323	34,492	34,662	34,833	35,004	35,177	35,350	35,524	35,699	35,875	36,052	36,230	36,408	36,587	36,768	36,949	37,131	37,314
Operation & Maintenance	32,000	32,158	32,316	32,475	32,635	32,796	32,958	33,120	33,283	33,447	33,612	33,777	33,944	34,111	34,279	34,448	34,618	34,788	34,959	35,132	35,305	35,479	35,653	35,829	36,006	36,183
Contractor Metal	1,500	1,507	1,515	1,522	1,530	1,537	1,545	1,552	1,560	1,568	1,576	1,583	1,591	1,599	1,607	1,615	1,623	1,631	1,639	1,647	1,655	1,663	1,671	1,679	1,688	1,696
Other	1,500	1,507	1,515	1,522	1,530	1,537	1,545	1,552	1,560	1,568	1,576	1,583	1,591	1,599	1,607	1,615	1,623	1,631	1,639	1,647	1,655	1,663	1,671	1,679	1,688	1,696
	68,000	**68,335**	**68,672**	**69,010**	**69,350**	**69,691**	**70,035**	**70,380**	**70,726**	**71,075**	**71,425**	**71,777**	**72,130**	**72,486**	**72,843**	**73,202**	**73,562**	**73,925**	**74,289**	**74,655**	**75,022**	**75,392**	**75,763**	**76,137**	**76,512**	**76,889**
Kingfisher RDF																										
Contract Services	25,000	25,123	25,247	25,371	25,496	25,622	25,748	25,875	26,002	26,130	26,259	26,389	26,519	26,649	26,780	26,912	27,045	27,178	27,312	27,447	27,582	27,718	27,854	27,991	28,129	28,268
Operation & Maintenance	20,000	20,099	20,198	20,297	20,397	20,497	20,598	20,700	20,802	20,904	21,007	21,111	21,215	21,319	21,424	21,530	21,636	21,743	21,850	21,957	22,065	22,174	22,283	22,393	22,503	22,614
Contractor Metal	1,000	1,005	1,010	1,015	1,020	1,025	1,030	1,035	1,040	1,045	1,050	1,056	1,061	1,066	1,071	1,076	1,082	1,087	1,092	1,098	1,103	1,109	1,114	1,120	1,125	1,131
Other	1,500	1,507	1,515	1,522	1,530	1,537	1,545	1,552	1,560	1,568	1,576	1,583	1,591	1,599	1,607	1,615	1,623	1,631	1,639	1,647	1,655	1,663	1,671	1,679	1,688	1,696
	47,500	**47,734**	**47,969**	**48,205**	**48,443**	**48,682**	**48,921**	**49,162**	**49,405**	**49,648**	**49,892**	**50,138**	**50,385**	**50,633**	**50,883**	**51,134**	**51,385**	**51,639**	**51,893**	**52,149**	**52,405**	**52,664**	**52,923**	**53,184**	**53,446**	**53,709**
Silver Star RDF																										
Contract Services	36,000	36,177	36,356	36,535	36,715	36,895	37,077	37,260	37,443	37,628	37,813	38,000	38,187	38,375	38,564	38,754	38,945	39,137	39,329	39,523	39,718	39,913	40,110	40,308	40,506	40,706
Hauling Services	16,000	16,079	16,158	16,238	16,318	16,398	16,479	16,560	16,642	16,723	16,806	16,889	16,972	17,055	17,139	17,224	17,309	17,394	17,480	17,566	17,652	17,739	17,827	17,915	18,003	18,091
Operation & Maintenance	6,500	6,532	6,564	6,597	6,629	6,662	6,694	6,727	6,761	6,794	6,827	6,861	6,895	6,929	6,963	6,997	7,032	7,066	7,101	7,136	7,171	7,207	7,242	7,278	7,314	7,350
Utilities	3,500	3,517	3,535	3,552	3,569	3,587	3,605	3,622	3,640	3,658	3,676	3,694	3,713	3,731	3,749	3,768	3,786	3,805	3,824	3,843	3,861	3,880	3,900	3,919	3,938	3,958
Other	53,000	53,261	53,523	53,787	54,052	54,318	54,586	54,855	55,125	55,397	55,669	55,944	56,219	56,496	56,775	57,054	57,335	57,618	57,902	58,187	58,473	58,761	59,051	59,342	59,634	59,928
	115,000	**115,567**	**116,136**	**116,708**	**117,283**	**117,861**	**118,441**	**119,025**	**119,611**	**120,200**	**120,792**	**121,387**	**121,985**	**122,586**	**123,190**	**123,797**	**124,407**	**125,020**	**125,635**	**126,254**	**126,876**	**127,501**	**128,129**	**128,761**	**129,395**	**130,032**
Total Expenditures	**230,500**	**231,635**	**232,777**	**233,923**	**235,076**	**236,234**	**237,397**	**238,567**	**239,742**	**240,923**	**242,110**	**243,302**	**244,501**	**245,705**	**246,916**	**248,132**	**249,354**	**250,583**	**251,817**	**253,058**	**254,304**	**255,557**	**256,816**	**258,081**	**259,352**	**260,630**
Revenue over Expenditures	(71,500)	(71,852)	(72,206)	(72,562)	(72,919)	(73,279)	(73,639)	(74,002)	(74,367)	(74,733)	(75,101)	(75,471)	(75,843)	(76,217)	(76,592)	(76,969)	(77,349)	(77,730)	(78,112)	(78,497)	(78,884)	(79,273)	(79,663)	(80,055)	(80,450)	(80,846)

Table 24 Solid Waste Management System - Waste, Diversion, Recyling Volumes

Growth Rate 2017	Growth Rate 2018-2020	Growth Rate 2021-2025	Growth Rate 2026-2029	Growth Rate 2030-2033	Growth Rate 2034-2036	Growth Rate 2037+
1.00%	0.90%	0.80%	0.70%	0.60%	0.50%	0.40%

Projected Waste Tonnages		85340	86167	86963	87738	88509	89261	90000	90733	91447	92142	92822	93486
Vernon Landfi	**Description**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
ADD HAND	Additional handling	13	13	13	13	13	14	14	14	14	14	14	14
C&D WASTE	Construction and demolition waste	820	828	836	843	851	858	864	871	878	885	892	898
DRY-REC NON	Drywall - non recyclable	23	23	23	23	23	24	24	24	24	25	25	25
R01	Regular Refuse	25.739	25.996	26.230	26.466	26.705	26.918	27.134	27.351	27.569	27.790	27.984	28.180
R02	Controlled Waste	139	140	141	142	144	145	146	147	148	150	151	152
R03	Regulated Material	1.000	1.010	1.019	1.028	1.038	1.046	1.054	1.063	1.071	1.080	1.087	1.095
R04	Contains Drywall	21	21	21	21	22	22	22	22	22	22	23	23
R07	Controlled Waste - Out of Region	25	25	26	26	26	26	26	27	27	27	27	27
R10	Refuse - Illegally Dumped	77	77	78	79	80	80	81	81	82	83	83	84
R12	R12 Buried (60% of total R12)	1.050	1.061	1.070	1.080	1.089	1.098	1.107	1.116	1.125	1.134	1.142	1.150
STUMPS-DRTY	Logs and stumps - dirty	4	5	5	5	5	5	5	5	5	5	5	5
Total		**28.910**	**29.199**	**29.462**	**29.727**	**29.995**	**30.235**	**30.477**	**30.720**	**30.966**	**31.214**	**31.432**	**31.652**
Armstrong/Spallumcheen													
ADD HAND	Additional handling	21	21	22	22	22	22	22	22	23	23	23	23
C&D WASTE	Construction and demolition waste	173	175	177	178	180	181	183	184	186	187	188	190
DRY-REC NON	Drywall - non recyclable	1	1	1	1	1	2	2	2	2	2	2	2
R01	Regular Refuse	10.699	10.806	10.904	11.002	11.101	11.190	11.279	11.369	11.460	11.552	11.633	11.714
R03	Regulated Material	465	470	474	478	482	486	490	494	498	502	505	509
R04	Contains Drywall	54	55	55	56	56	57	57	57	58	58	59	59
R06	Regular Refuse - Out of Region	2	2	2	2	2	2	2	3	3	3	3	3
R12	R12 Buried (60% of total R12)	397	401	405	408	412	415	419	422	425	429	432	435
Total		**11.814**	**11.932**	**12.039**	**12.147**	**12.257**	**12.355**	**12.454**	**12.553**	**12.654**	**12.755**	**12.844**	**12.934**
Lumby													
ADD HAND	Additional handling	39	40	40	40	41	41	41	42	42	42	43	43
C&D WASTE	Construction and demolition waste	29	30	30	30	31	31	31	31	32	32	32	32
DRY-REC NON	Drywall - non recyclable	1	1	1	1	1	1	1	1	1	1	1	1
R01	Regular Refuse	1.728	1.745	1.761	1.777	1.793	1.807	1.821	1.836	1.851	1.866	1.879	1.892
R03	Regulated Material	48	49	49	49	50	50	51	51	52	52	52	53
R04	Contains Drywall	9	9	9	10	10	10	10	10	10	10	10	10
R06	Regular Refuse - Out of Region	1	1	1	1	1	1	1	1	1	1	1	1
R12	R12 Buried (60% of total R12)	50	51	51	51	52	52	53	53	54	54	54	55
Total		**1.906**	**1.925**	**1.942**	**1.959**	**1.977**	**1.993**	**2.009**	**2.025**	**2.041**	**2.057**	**2.072**	**2.086**
TOTAL WASTE		42.629	43.056	43.443	43.834	44.229	44.583	44.939	45.299	45.661	46.026	46.349	46.673
PER CAPITA		0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Projected Diversion Tonnages													
Vernon Landfi	**Description**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
AR-CLEAN	Asphalt roofing - clean	1.356	1.370	1.382	1.394	1.407	1.418	1.429	1.441	1.452	1.464	1.474	1.485
AR-MAJOR	Asphalt roofing - major contamination	2	2	2	2	2	2	2	2	2	2	2	2
COMPOST	Compost Sales	9	9	9	9	9	9	9	9	9	9	9	9
CRUSHABLE	Crushable material for aggregate	5.974	6.034	6.088	6.143	6.199	6.248	6.298	6.349	6.399	6.451	6.496	6.541
DRY-IN	Drywall - inbound	296	299	302	305	307	310	312	315	317	320	322	324
DRY-REC	Drywall - recyclable	1.108	1.119	1.129	1.139	1.150	1.159	1.168	1.178	1.187	1.196	1.205	1.213
MATTRESS	Mattresses/Box Springs	61	62	62	63	64	64	65	65	66	66	67	67
METAL	Scrap metal	490	495	499	504	508	512	517	521	525	529	533	537
PROP TANKS	Propane tanks	110	111	112	113	114	115	116	117	118	119	119	120
R12	Mixed Residential Waste - 40% Recyclable	701	708	714	721	727	733	739	745	751	757	762	767
REFRIG	Refrigerated appliances	23	23	24	24	24	24	24	25	25	25	25	25
SOIL-COVER	Cover material	2.223	2.245	2.265	2.286	2.306	2.325	2.343	2.362	2.381	2.400	2.417	2.434
SOIL-HYDC	Hydrocarbon contaminated soil	532	538	543	547	552	557	561	566	570	575	579	583
STUMPS-CLE	Logs and stumps - clean	558	563	568	573	578	583	588	592	597	602	606	610
WD-CHIPPED	Wood Waste - chipped	31	32	32	32	32	33	33	33	33	34	34	34
WD-CLEAN	Wood Waste - clean	4.210	4.252	4.290	4.328	4.367	4.402	4.438	4.473	4.509	4.545	4.577	4.609
WD-DIRTY	Wood Waste - dirty	792	800	807	814	821	828	835	841	848	855	861	867
YARD	Yard and Garden Waste	452	456	460	464	468	472	476	480	484	488	491	494
Total		**18.927**	**19.116**	**19.289**	**19.462**	**19.637**	**19.794**	**19.953**	**20.112**	**20.273**	**20.435**	**20.579**	**20.723**
MATTRESS	Mattresses/Box Springs	2.500	2.525	2.548	2.571	2.594	2.615	2.635	2.657	2.678	2.699	2.718	2.737
REFRIG	Refrigerated appliances	1.250	1.263	1.274	1.285	1.297	1.307	1.318	1.328	1.339	1.350	1.359	1.369
Armstrong/Spallumcheen													
AR-CLEAN	Asphalt roofing - clean	459	464	468	472	477	480	484	488	492	496	499	503
CRUSHABLE	Crushable material for aggregate	631	637	643	649	654	660	665	670	676	681	686	691
DRY-REC	Drywall - recyclable	179	181	183	184	186	188	189	191	192	194	195	196
METAL	Scrap metal	144	146	147	148	150	151	152	153	155	156	157	158
PROP TANKS	Propane tanks	7	7	7	7	7	7	7	7	7	7	7	7
R12	Mixed Residential Waste	265	268	270	272	275	277	279	282	284	286	288	290
REFRIG	Refrigerated appliances	11	11	12	12	12	12	12	12	12	12	12	12
SOIL-COVER	Cover material	24	24	25	25	25	25	26	26	26	26	26	27
STUMPS-CLE	Logs and stumps - clean	108	109	110	111	112	113	114	114	115	116	117	118
WD-CLEAN	Wood Waste - clean	1.126	1.137	1.147	1.157	1.168	1.177	1.187	1.196	1.206	1.215	1.224	1.232
WD-DIRTY	Wood Waste - dirty	772	780	787	794	801	807	814	820	827	834	839	845
YARD	Yard and Garden Waste	85	86	87	88	89	89	90	91	92	92	93	94
Total		**3.812**	**3.850**	**3.885**	**3.920**	**3.955**	**3.986**	**4.018**	**4.050**	**4.083**	**4.116**	**4.144**	**4.173**
REFRIG	Refrigerated appliances	500	505	510	514	519	523	527	531	536	540	544	547
Lumby													
BATT-AUTO	Batteries - Automotive	5	5	5	5	5	5	5	5	5	5	5	5
DRY-REC	Drywall - recyclable	48	48	49	49	50	50	51	51	51	52	52	52
MATTRESS	Mattresses/Box Springs	7	7	7	7	7	7	7	7	7	7	7	7
METAL	Scrap metal	31	31	31	32	32	32	32	33	33	33	33	34
R12	Mixed Residential Waste	33	33	34	34	34	35	35	35	35	36	36	36
SOIL-COVER	Cover material	326	329	332	335	338	341	344	347	349	352	355	357
SOIL-HYDC	Hydrocarbon contaminated soil	751	759	766	773	780	786	792	798	805	811	817	823
STUMPS-CLE	Logs and stumps - clean	8	9	9	9	9	9	9	9	9	9	9	9
WD-CLEAN	Wood Waste - clean	390	394	397	401	405	408	411	414	418	421	424	427
WD-DIRTY	Wood Waste - dirty	2	2	2	2	2	2	2	2	2	2	2	2
Total		**1.601**	**1.617**	**1.631**	**1.646**	**1.661**	**1.674**	**1.687**	**1.701**	**1.715**	**1.728**	**1.740**	**1.753**
MATTRESS	Mattresses/Box Springs	250	253	255	257	259	261	264	266	268	270	272	274

Projected Waste Tonnages		94131	94754	95363	95941	96502	97047	97556	98040	98503	98935	99350	99740
Vernon Landfi	**Description**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**
ADD HAND	Additional handling	14	14	15	15	15	15	15	15	15	15	15	15
C&D WASTE	Construction and demolition waste	904	910	916	921	927	932	937	942	946	950	954	958
DRY-REC NON	Drywall - non recyclable	25	25	25	26	26	26	26	26	26	26	26	27
R01	Regular Refuse	28.378	28.576	28.748	28.920	29.094	29.268	29.415	29.562	29.710	29.828	29.948	30.067
R02	Controlled Waste	153	154	155	156	157	158	158	159	160	161	161	162
R03	Regulated Material	1.103	1.110	1.117	1.124	1.130	1.137	1.143	1.149	1.154	1.159	1.164	1.168
R04	Contains Drywall	23	23	23	23	24	24	24	24	24	24	24	24
R07	Controlled Waste - Out of Region	28	28	28	28	28	28	29	29	29	29	29	29
R10	Refuse - Illegally Dumped	84	85	86	86	87	87	88	88	88	89	89	90
R12	R12 Buried (60% of total R12)	1.158	1.166	1.173	1.180	1.187	1.194	1.200	1.206	1.212	1.217	1.222	1.227
STUMPS-DRTY	Logs and stumps - dirty	5	5	5	5	5	5	5	5	5	5	5	5
Total		**31.874**	**32.097**	**32.290**	**32.483**	**32.678**	**32.874**	**33.039**	**33.204**	**33.370**	**33.504**	**33.638**	**33.772**
Armstrong/Spallumcheen													
ADD HAND	Additional handling	23	23	24	24	24	24	24	24	24	24	25	25
C&D WASTE	Construction and demolition waste	191	192	194	195	196	197	198	199	200	201	202	203
DRY-REC NON	Drywall - non recyclable	2	2	2	2	2	2	2	2	2	2	2	2
R01	Regular Refuse	11.796	11.879	11.950	12.022	12.094	12.166	12.227	12.288	12.350	12.399	12.449	12.499
R03	Regulated Material	513	516	519	522	525	529	531	534	537	539	541	543
R04	Contains Drywall	60	60	60	61	61	61	62	62	62	63	63	63
R06	Regular Refuse - Out of Region	3	3	3	3	3	3	3	3	3	3	3	3
R12	R12 Buried (60% of total R12)	438	441	443	446	449	451	454	456	458	460	462	464
Total		**13.025**	**13.116**	**13.195**	**13.274**	**13.353**	**13.433**	**13.501**	**13.568**	**13.636**	**13.691**	**13.745**	**13.800**
Lumby													
ADD HAND	Additional handling	43	44	44	44	44	45	45	45	45	45	46	46
C&D WASTE	Construction and demolition waste	32	33	33	33	33	33	34	34	34	34	34	34
DRY-REC NON	Drywall - non recyclable	1	1	1	1	1	1	1	1	1	1	1	1
R01	Regular Refuse	1.905	1.918	1.930	1.941	1.953	1.965	1.975	1.984	1.994	2.002	2.010	2.018
R03	Regulated Material	53	53	54	54	54	55	55	55	56	56	56	56
R04	Contains Drywall	10	10	10	10	10	11	11	11	11	11	11	11
R06	Regular Refuse - Out of Region	1	1	1	1	1	1	1	1	1	1	1	1
R12	R12 Buried (60% of total R12)	55	56	56	56	57	57	57	57	58	58	58	58
Total		**2.101**	**2.116**	**2.128**	**2.141**	**2.154**	**2.167**	**2.178**	**2.189**	**2.200**	**2.208**	**2.217**	**2.226**
TOTAL WASTE		47.000	47.329	47.613	47.898	48.186	48.475	48.717	48.961	49.206	49.402	49.600	49.798
PER CAPITA		0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Projected Diversion Tonnages													
Vernon Landfi	**Description**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**
AR-CLEAN	Asphalt roofing - clean	1.495	1.506	1.515	1.524	1.533	1.542	1.550	1.557	1.565	1.571	1.578	1.584
AR-MAJOR	Asphalt roofing - major contamination	2	2	2	2	2	2	2	2	2	2	2	2
COMPOST	Compost Sales	9	9	10	10	10	10	10	10	10	10	10	10
CRUSHABLE	Crushable material for aggregate	6.587	6.633	6.673	6.713	6.753	6.794	6.828	6.862	6.896	6.924	6.951	6.979
DRY-IN	Drywall - inbound	327	329	331	333	335	337	338	340	342	343	345	346
DRY-REC	Drywall - recyclable	1.222	1.230	1.238	1.245	1.253	1.260	1.266	1.273	1.279	1.284	1.289	1.294
MATTRESS	Mattresses/Box Springs	68	68	68	69	69	70	70	70	71	71	71	72
METAL	Scrap metal	540	544	547	551	554	557	560	563	566	568	570	572
PROP TANKS	Propane tanks	121	122	123	123	124	125	126	126	127	127	128	128
R12	Mixed Residential Waste - 40% Recyclable	773	778	783	788	792	797	801	805	809	812	816	819
REFRIG	Refrigerated appliances	26	26	26	26	26	26	26	27	27	27	27	27
SOIL-COVER	Cover material	2.451	2.468	2.483	2.498	2.513	2.528	2.540	2.553	2.566	2.576	2.587	2.597
SOIL-HYDC	Hydrocarbon contaminated soil	587	591	595	598	602	605	608	612	615	617	619	622
STUMPS-CLE	Logs and stumps - clean	615	619	623	626	630	634	637	640	644	646	649	651
WD-CHIPPED	Wood Waste - chipped	34	35	35	35	35	35	36	36	36	36	36	36
WD-CLEAN	Wood Waste - clean	4.641	4.674	4.702	4.730	4.758	4.787	4.811	4.835	4.859	4.878	4.898	4.917
WD-DIRTY	Wood Waste - dirty	873	879	884	889	895	900	905	909	914	917	921	925
YARD	Yard and Garden Waste	498	501	504	507	510	513	516	519	521	523	525	527
Total		**20.868**	**21.014**	**21.140**	**21.267**	**21.394**	**21.523**	**21.630**	**21.738**	**21.847**	**21.934**	**22.022**	**22.110**
MATTRESS	Mattresses/Box Springs	2.756	2.776	2.792	2.809	2.826	2.843	2.857	2.871	2.886	2.897	2.909	2.920
REFRIG	Refrigerated appliances	1.378	1.388	1.396	1.404	1.413	1.421	1.429	1.436	1.443	1.449	1.454	1.460
Armstrong/Spallumcheen													
AR-CLEAN	Asphalt roofing - clean	506	510	513	516	519	522	525	528	530	532	534	537
CRUSHABLE	Crushable material for aggregate	695	700	704	709	713	717	721	724	728	731	734	737
DRY-REC	Drywall - recyclable	198	199	200	202	203	204	205	206	207	208	209	210
METAL	Scrap metal	159	160	161	162	163	164	165	166	167	167	168	169
PROP TANKS	Propane tanks	7	7	8	8	8	8	8	8	8	8	8	8
R12	Mixed Residential Waste	292	294	296	298	300	301	303	304	306	307	308	310
REFRIG	Refrigerated appliances	12	13	13	13	13	13	13	13	13	13	13	13
SOIL-COVER	Cover material	27	27	27	27	27	28	28	28	28	28	28	28
STUMPS-CLE	Logs and stumps - clean	119	120	120	121	122	123	123	124	124	125	125	126
WD-CLEAN	Wood Waste - clean	1.241	1.250	1.257	1.265	1.272	1.280	1.286	1.293	1.299	1.304	1.310	1.315
WD-DIRTY	Wood Waste - dirty	851	857	862	867	873	878	882	887	891	895	898	902
YARD	Yard and Garden Waste	94	95	95	96	97	97	98	98	99	99	99	100
Total		**4.203**	**4.232**	**4.257**	**4.283**	**4.309**	**4.334**	**4.356**	**4.378**	**4.400**	**4.417**	**4.435**	**4.453**
REFRIG	Refrigerated appliances	551	555	558	562	565	569	571	574	577	579	582	584
Lumby													
BATT-AUTO	Batteries - Automotive	5	5	5	5	5	5	5	5	6	6	6	6
DRY-REC	Drywall - recyclable	53	53	54	54	54	55	55	55	55	56	56	56
MATTRESS	Mattresses/Box Springs	7	8	8	8	8	8	8	8	8	8	8	8
METAL	Scrap metal	34	34	34	34	35	35	35	35	35	36	36	36
R12	Mixed Residential Waste	36	37	37	37	37	38	38	38	38	38	38	39
SOIL-COVER	Cover material	360	362	364	367	369	371	373	375	377	378	380	381
SOIL-HYDC	Hydrocarbon contaminated soil	828	834	839	844	849	854	859	863	867	871	874	878
STUMPS-CLE	Logs and stumps - clean	9	9	9	9	10	10	10	10	10	10	10	10
WD-CLEAN	Wood Waste - clean	430	433	436	438	441	443	446	448	450	452	454	456
WD-DIRTY	Wood Waste - dirty	2	2	2	2	2	2	2	2	2	2	2	2
Total		**1.765**	**1.777**	**1.788**	**1.799**	**1.809**	**1.820**	**1.829**	**1.838**	**1.848**	**1.855**	**1.862**	**1.870**
MATTRESS	Mattresses/Box Springs	276	278	279	281	283	284	286	287	289	290	291	292

Projected Waste Tonnages		100115	100475	100476	100477	100478	100479	100480	100481	100482	100483	100484
Vernon Landfi	**Description**	**2040**	**2041**	**2042**	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**
ADD HAND	Additional handling	15	15	15	15	15	16	16	16	16	16	16
C&D WASTE	Construction and demolition waste	962	966	969	973	977	981	985	989	993	997	1.001
DRY-REC NON	Drywall - non recyclable	27	27	27	27	27	27	27	27	28	28	28
R01	Regular Refuse	30.188	30.308	30.430	30.551	30.674	30.796	30.920	31.043	31.167	31.292	31.417
R02	Controlled Waste	162	163	164	164	165	166	166	167	168	168	169
R03	Regulated Material	1.173	1.178	1.182	1.187	1.192	1.196	1.201	1.206	1.211	1.216	1.221
R04	Contains Drywall	24	25	25	25	25	25	25	25	25	25	25
R07	Controlled Waste - Out of Region	29	30	30	30	30	30	30	30	30	30	31
R10	Refuse - Illegally Dumped	90	90	91	91	91	92	92	92	93	93	94
R12	R12 Buried (60% of total R12)	1.231	1.236	1.241	1.246	1.251	1.256	1.261	1.266	1.271	1.277	1.282
STUMPS-DRTY	Logs and stumps - dirty	5	5	5	5	5	5	5	5	5	5	5
Total		**33.907**	**34.043**	**34.179**	**34.316**	**34.453**	**34.591**	**34.729**	**34.868**	**35.008**	**35.148**	**35.288**
Armstrong/Spallumcheen												
ADD HAND	Additional handling	25	25	25	25	25	25	25	25	26	26	26
C&D WASTE	Construction and demolition waste	203	204	205	206	207	207	208	209	210	211	212
DRY-REC NON	Drywall - non recyclable	2	2	2	2	2	2	2	2	2	2	2
R01	Regular Refuse	12.549	12.599	12.649	12.700	12.751	12.802	12.853	12.904	12.956	13.008	13.060
R03	Regulated Material	545	547	550	552	554	556	558	561	563	565	567
R04	Contains Drywall	63	64	64	64	64	65	65	65	65	66	66
R06	Regular Refuse - Out of Region	3	3	3	3	3	3	3	3	3	3	3
R12	R12 Buried (60% of total R12)	466	467	469	471	473	475	477	479	481	483	485
Total		**13.855**	**13.911**	**13.967**	**14.022**	**14.078**	**14.135**	**14.191**	**14.248**	**14.305**	**14.362**	**14.420**
Lumby												
ADD HAND	Additional handling	46	46	46	47	47	47	47	47	47	48	48
C&D WASTE	Construction and demolition waste	35	35	35	35	35	35	35	36	36	36	36
DRY-REC NON	Drywall - non recyclable	1	1	1	1	1	1	1	1	1	1	1
R01	Regular Refuse	2.026	2.035	2.043	2.051	2.059	2.067	2.076	2.084	2.092	2.101	2.109
R03	Regulated Material	56	57	57	57	57	58	58	58	58	59	59
R04	Contains Drywall	11	11	11	11	11	11	11	11	11	11	11
R06	Regular Refuse - Out of Region	1	1	1	1	1	1	1	1	1	1	1
R12	R12 Buried (60% of total R12)	59	59	59	59	60	60	60	60	61	61	61
Total		**2.235**	**2.244**	**2.253**	**2.262**	**2.271**	**2.280**	**2.289**	**2.298**	**2.308**	**2.317**	**2.326**
TOTAL WASTE		49.998	50.198	50.398	50.600	50.802	51.006	51.210	51.415	51.620	51.827	52.034
PER CAPITA		0.50	0.50	0.50	0.50	0.51	0.51	0.51	0.51	0.51	0.52	0.52
Projected Diversion Tonnages												
Vernon Landfi	**Description**	**2040**	**2041**	**2042**	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**
AR-CLEAN	Asphalt roofing - clean	1.590	1.597	1.603	1.610	1.616	1.622	1.629	1.635	1.642	1.649	1.655
AR-MAJOR	Asphalt roofing - major contamination	2	2	2	2	2	2	2	2	2	2	2
COMPOST	Compost Sales	10	10	10	10	10	10	10	10	10	10	10
CRUSHABLE	Crushable material for aggregate	7.007	7.035	7.063	7.091	7.120	7.148	7.177	7.206	7.234	7.263	7.292
DRY-IN	Drywall - inbound	347	349	350	352	353	354	356	357	359	360	361
DRY-REC	Drywall - recyclable	1.300	1.305	1.310	1.315	1.321	1.326	1.331	1.336	1.342	1.347	1.353
MATTRESS	Mattresses/Box Springs	72	72	72	73	73	73	74	74	74	75	75
METAL	Scrap metal	575	577	579	582	584	586	589	591	593	596	598
PROP TANKS	Propane tanks	129	129	130	130	131	131	132	132	133	134	134
R12	Mixed Residential Waste - 40% Recyclable	822	825	829	832	835	839	842	845	849	852	856
REFRIG	Refrigerated appliances	27	27	27	28	28	28	28	28	28	28	28
SOIL-COVER	Cover material	2.607	2.618	2.628	2.639	2.649	2.660	2.670	2.681	2.692	2.703	2.713
SOIL-HYDC	Hydrocarbon contaminated soil	624	627	629	632	635	637	640	642	645	647	650
STUMPS-CLE	Logs and stumps - clean	654	656	659	662	664	667	670	672	675	678	680
WD-CHIPPED	Wood Waste - chipped	37	37	37	37	37	37	37	38	38	38	38
WD-CLEAN	Wood Waste - clean	4.937	4.957	4.977	4.997	5.017	5.037	5.057	5.077	5.097	5.118	5.138
WD-DIRTY	Wood Waste - dirty	928	932	936	940	943	947	951	955	959	962	966
YARD	Yard and Garden Waste	530	532	534	536	538	540	542	545	547	549	551
Total		**22.199**	**22.287**	**22.377**	**22.466**	**22.556**	**22.646**	**22.737**	**22.828**	**22.919**	**23.011**	**23.103**
MATTRESS	Mattresses/Box Springs	2.932	2.944	2.956	2.967	2.979	2.991	3.003	3.015	3.027	3.039	3.052
REFRIG	Refrigerated appliances	1.466	1.472	1.478	1.484	1.490	1.496	1.502	1.508	1.514	1.520	1.526
Armstrong/Spallumcheen												
AR-CLEAN	Asphalt roofing - clean	539	541	543	545	547	550	552	554	556	558	561
CRUSHABLE	Crushable material for aggregate	740	743	746	749	752	755	758	761	764	767	770
DRY-REC	Drywall - recyclable	210	211	212	213	214	215	216	216	217	218	219
METAL	Scrap metal	169	170	171	171	172	173	173	174	175	175	176
PROP TANKS	Propane tanks	8	8	8	8	8	8	8	8	8	8	8
R12	Mixed Residential Waste	311	312	313	315	316	317	318	320	321	322	323
REFRIG	Refrigerated appliances	13	13	13	13	13	14	14	14	14	14	14
SOIL-COVER	Cover material	28	29	29	29	29	29	29	29	29	29	30
STUMPS-CLE	Logs and stumps - clean	126	127	127	128	128	129	129	130	130	131	132
WD-CLEAN	Wood Waste - clean	1.320	1.325	1.331	1.336	1.341	1.347	1.352	1.357	1.363	1.368	1.374
WD-DIRTY	Wood Waste - dirty	906	909	913	916	920	924	927	931	935	939	942
YARD	Yard and Garden Waste	100	101	101	101	102	102	103	103	103	104	104
Total		**4.471**	**4.489**	**4.506**	**4.525**	**4.543**	**4.561**	**4.579**	**4.597**	**4.616**	**4.634**	**4.653**
REFRIG	Refrigerated appliances	586	589	591	593	596	598	601	603	605	608	610
Lumby												
BATT-AUTO	Batteries - Automotive	6	6	6	6	6	6	6	6	6	6	6
DRY-REC	Drywall - recyclable	56	56	57	57	57	57	58	58	58	58	59
MATTRESS	Mattresses/Box Springs	8	8	8	8	8	8	8	8	8	8	8
METAL	Scrap metal	36	36	36	36	37	37	37	37	37	37	37
R12	Mixed Residential Waste	39	39	39	39	39	39	40	40	40	40	40
SOIL-COVER	Cover material	383	384	386	387	389	390	392	393	395	397	398
SOIL-HYDC	Hydrocarbon contaminated soil	881	885	888	892	895	899	903	906	910	914	917
STUMPS-CLE	Logs and stumps - clean	10	10	10	10	10	10	10	10	10	10	10
WD-CLEAN	Wood Waste - clean	457	459	461	463	465	467	468	470	472	474	476
WD-DIRTY	Wood Waste - dirty	2	2	2	2	2	2	2	2	2	2	2
Total		**1.877**	**1.885**	**1.892**	**1.900**	**1.908**	**1.915**	**1.923**	**1.931**	**1.938**	**1.946**	**1.954**
MATTRESS	Mattresses/Box Springs	293	294	296	297	298	299	300	302	303	304	305

Table 24 Solid Waste Management System - Waste, Diversion, Recyling Volumes

Proiected Waste Tonnaqes		100485	100486	100487	100488	100489	100490	100491	100492	100493	100494	100495	100496	100497	100498	100499	100500	100501	100502	100503	100504	100505	100506	100507	100508	100509	100510	100511	100512	100513	100514
Vernon Landfi	Description	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080
ADD HAND	Additional handling	16	16	16	16	16	16	16	16	16	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	18	18	18	18	18	18
C&D WASTE	Construction and demolition waste	1.005	1.009	1.013	1.017	1.021	1.025	1.029	1.033	1.038	1.042	1.046	1.050	1.054	1.058	1.063	1.067	1.071	1.075	1.080	1.084	1.088	1.093	1.097	1.102	1.106	1.110	1.115	1.119	1.124	1.128
DRY-REC NON	Drywall - non recyclable	28	28	28	28	28	28	29	29	29	29	29	29	29	29	30	30	30	30	30	30	30	30	30	31	31	31	31	31	31	31
R01	Reqular Refuse	31.543	31.669	31.796	31.923	32.051	32.179	32.308	32.437	32.566	32.697	32.828	32.959	33.091	33.223	33.356	33.489	33.623	33.758	33.893	34.028	34.165	34.301	34.438	34.576	34.714	34.853	34.993	35.133	35.273	35.414
R02	Controlled Waste	170	170	171	172	173	173	174	175	175	176	177	177	178	179	180	180	181	182	182	183	184	185	185	186	187	188	188	189	190	191
R03	Requlated Material	1.225	1.230	1.235	1.240	1.245	1.250	1.255	1.260	1.265	1.270	1.275	1.281	1.286	1.291	1.296	1.301	1.306	1.312	1.317	1.322	1.327	1.333	1.338	1.343	1.349	1.354	1.360	1.365	1.370	1.376
R04	Contains Drywall	26	26	26	26	26	26	26	26	26	26	27	27	27	27	27	27	27	27	27	28	28	28	28	28	28	28	28	28	29	29
R07	Controlled Waste - Out of Reqion	31	31	31	31	31	31	31	32	32	32	32	32	32	32	32	33	33	33	33	33	33	33	34	34	34	34	34	34	34	34
R10	Refuse - Illegally Dumped	94	94	95	95	95	96	96	97	97	97	98	98	99	99	99	100	100	101	101	101	102	102	103	103	103	104	104	105	105	105
R12	R12 Buried (60% of total R12)	1.287	1.292	1.297	1.302	1.307	1.313	1.318	1.323	1.329	1.334	1.339	1.345	1.350	1.355	1.361	1.366	1.372	1.377	1.383	1.388	1.394	1.399	1.405	1.411	1.416	1.422	1.428	1.433	1.439	1.445
STUMPS-DRTY	Logs and stumps - dirty	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Total		**35.429**	**35.571**	**35.713**	**35.856**	**36.000**	**36.144**	**36.288**	**36.433**	**36.579**	**36.725**	**36.872**	**37.020**	**37.168**	**37.316**	**37.466**	**37.616**	**37.766**	**37.917**	**38.069**	**38.221**	**38.374**	**38.527**	**38.682**	**38.836**	**38.992**	**39.148**	**39.304**	**39.461**	**39.619**	**39.778**
Armstrong/Spallumcheen																															
ADD HAND	Additional handling	26	26	26	26	26	26	27	27	27	27	27	27	27	27	27	27	28	28	28	28	28	28	28	28	28	29	29	29	29	29
C&D WASTE	Construction and demolition waste	212	213	214	215	216	217	218	218	219	220	221	222	223	224	225	226	226	227	228	229	230	231	232	233	234	235	236	237	238	239
DRY-REC NON	Drywall - non recyclable	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
R01	Reqular Refuse	13.112	13.164	13.217	13.270	13.323	13.376	13.430	13.484	13.537	13.592	13.646	13.701	13.755	13.810	13.866	13.921	13.977	14.033	14.089	14.145	14.202	14.259	14.316	14.373	14.430	14.488	14.546	14.604	14.663	14.721
R03	Requlated Material	570	572	574	577	579	581	584	586	588	591	593	595	598	600	602	605	607	610	612	615	617	620	622	624	627	629	632	635	637	640
R04	Contains Drywall	66	67	67	67	67	68	68	68	68	69	69	69	69	70	70	70	71	71	71	71	72	72	72	73	73	73	73	74	74	74
R06	Regular Refuse - Out of Reqion	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
R12	R12 Buried (60% of total R12)	487	488	490	492	494	496	498	500	502	504	506	508	510	512	514	517	519	521	523	525	527	529	531	533	535	538	540	542	544	546
Total		**14.477**	**14.535**	**14.594**	**14.652**	**14.710**	**14.769**	**14.828**	**14.888**	**14.947**	**15.007**	**15.067**	**15.127**	**15.188**	**15.249**	**15.310**	**15.371**	**15.432**	**15.494**	**15.556**	**15.618**	**15.681**	**15.743**	**15.806**	**15.870**	**15.933**	**15.997**	**16.061**	**16.125**	**16.190**	**16.254**
Lumby																															
ADD HAND	Additional handling	48	48	48	49	49	49	49	49	50	50	50	50	50	51	51	51	51	51	52	52	52	52	52	53	53	53	53	54	54	54
C&D WASTE	Construction and demolition waste	36	36	36	37	37	37	37	37	37	37	38	38	38	38	38	38	38	39	39	39	39	39	39	40	40	40	40	40	40	41
DRY-REC NON	Drywall - non recyclable	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
R01	Reqular Refuse	2,117	2,126	2,134	2,143	2,152	2,160	2,169	2,177	2,186	2,195	2,204	2,213	2,221	2,230	2,239	2,248	2,257	2,266	2,275	2,284	2,293	2,303	2,312	2,321	2,330	2,340	2,349	2,358	2,368	2,377
R03	Requlated Material	59	59	59	60	60	60	60	61	61	61	61	62	62	62	62	63	63	63	63	64	64	64	64	65	65	65	65	66	66	66
R04	Contains Drywall	11	11	11	11	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	13	13	13	13	13
R06	Regular Refuse - Out of Reqion	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
R12	R12 Buried (60% of total R12)	61	62	62	62	62	63	63	63	63	64	64	64	64	65	65	65	66	66	66	66	67	67	67	67	68	68	68	68	69	69
Total		**2.335**	**2.345**	**2.354**	**2.363**	**2.373**	**2.382**	**2.392**	**2.402**	**2.411**	**2.421**	**2.430**	**2.440**	**2.450**	**2.460**	**2.470**	**2.479**	**2.489**	**2.499**	**2.509**	**2.519**	**2.529**	**2.540**	**2.550**	**2.560**	**2.570**	**2.580**	**2.591**	**2.601**	**2.612**	**2.622**
TOTAL WASTE		52.242	52.451	52.661	52.872	53.083	53.295	53.509	53.723	53.937	54.153	54.370	54.587	54.806	55.025	55.245	55.466	55.688	55.911	56.134	56.359	56.584	56.810	57.038	57.266	57.495	57.725	57.956	58.188	58.420	58.654
PER CAPITA		0.52	0.52	0.52	0.53	0.53	0.53	0.53	0.53	0.54	0.54	0.54	0.54	0.55	0.55	0.55	0.55	0.55	0.56	0.56	0.56	0.56	0.57	0.57	0.57	0.57	0.57	0.58	0.58	0.58	0.58

Proiected Diversion Tonnaqes																															
Vernon Landfi	Description	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080
AR-CLEAN	Asphalt roofing - clean	1,662	1,668	1,675	1,682	1,689	1,695	1,702	1,709	1,716	1,723	1,729	1,736	1,743	1,750	1,757	1,764	1,771	1,778	1,786	1,793	1,800	1,807	1,814	1,822	1,829	1,836	1,844	1,851	1,858	1,866
AR-MAJOR	Asphalt roofing - major contamination	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3
COMPOST	Compost Sales	10	10	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	12	12	12	12	12
CRUSHABLE	Crushable material for aggregate	7,322	7,351	7,380	7,410	7,439	7,469	7,499	7,529	7,559	7,589	7,620	7,650	7,681	7,712	7,742	7,773	7,805	7,836	7,867	7,899	7,930	7,962	7,994	8,026	8,058	8,090	8,122	8,155	8,188	8,220
DRY-IN	Drywall - inbound	363	364	366	367	369	370	372	373	375	376	378	379	381	382	384	385	387	388	390	392	393	395	396	398	399	401	403	404	406	407
DRY-REC	Drywall - recyclable	1,358	1,363	1,369	1,374	1,380	1,385	1,391	1,396	1,402	1,408	1,413	1,419	1,425	1,430	1,436	1,442	1,448	1,453	1,459	1,465	1,471	1,477	1,483	1,489	1,495	1,501	1,507	1,513	1,519	1,525
MATTRESS	Mattresses/Box Springs	75	75	76	76	76	76	77	77	77	78	78	78	79	79	79	80	80	80	81	81	82	82	82	82	83	83	83	84	84	84
METAL	Scrap metal	601	603	605	608	610	613	615	618	620	622	625	627	630	633	635	638	640	643	645	648	650	653	656	658	661	664	666	669	672	674
PROP TANKS	Propane tanks	135	135	136	136	137	137	138	138	139	140	140	141	141	142	142	143	143	144	145	145	146	146	147	148	148	149	149	150	151	151
R12	Mixed Residential Waste - 40% Recyclable	859	863	866	869	873	876	880	883	887	890	894	898	901	905	908	912	916	919	923	927	930	934	938	942	945	949	953	957	961	965
REFRIG	Refrigerated appliances	28	29	29	29	29	29	29	29	29	29	30	30	30	30	30	30	30	30	31	31	31	31	31	31	31	31	32	32	32	32
SOIL-COVER	Cover material	2,724	2,735	2,746	2,757	2,768	2,779	2,790	2,801	2,813	2,824	2,835	2,847	2,858	2,869	2,881	2,892	2,904	2,916	2,927	2,939	2,951	2,963	2,974	2,986	2,998	3,010	3,022	3,034	3,046	3,059
SOIL-HYDC	Hydrocarbon contaminated soil	652	655	658	660	663	666	668	671	674	676	679	682	685	687	690	693	696	698	701	704	707	710	712	715	718	721	724	727	730	733
STUMPS-CLE	Loas and stumos - clean	683	686	689	691	694	697	700	703	705	708	711	714	717	720	722	725	728	731	734	737	740	743	746	749	752	755	758	761	764	767
WD-CHIPPED	Wood Waste - chipped	38	38	39	39	39	39	39	39	39	40	40	40	40	40	40	41	41	41	41	41	42	42	42	42	42	42	42	43	43	43
WD-CLEAN	Wood Waste - clean	5,159	5,179	5,200	5,221	5,242	5,263	5,284	5,305	5,326	5,347	5,369	5,390	5,412	5,434	5,455	5,477	5,499	5,521	5,543	5,565	5,587	5,610	5,632	5,655	5,677	5,700	5,723	5,746	5,769	5,792
WD-DIRTY	Wood Waste - dirty	970	974	978	982	986	990	994	998	1,002	1,006	1,010	1,014	1,018	1,022	1,026	1,030	1,034	1,038	1,042	1,047	1,051	1,055	1,059	1,063	1,068	1,072	1,076	1,081	1,085	1,089
YARD	Yard and Garden Waste	553	556	558	560	562	565	567	569	571	574	576	578	581	583	585	588	590	592	595	597	599	602	604	607	609	611	614	616	619	621
Total		**23,195**	**23,288**	**23,381**	**23,475**	**23,569**	**23,663**	**23,757**	**23,853**	**23,948**	**24,044**	**24,140**	**24,236**	**24,333**	**24,431**	**24,528**	**24,627**	**24,725**	**24,824**	**24,923**	**25,023**	**25,123**	**25,224**	**25,324**	**25,426**	**25,527**	**25,630**	**25,732**	**25,835**	**25,938**	**26,042**
MATTRESS	Mattresses/Box Springs	306	308	309	310	311	313	314	315	316	318	319	320	321	323	324	325	327	328	329	331	332	333	334	336	337	339	340	341	343	344
REFRIG	Refrigerated appliances	1,532	1,538	1,544	1,550	1,557	1,563	1,569	1,575	1,582	1,588	1,594	1,601	1,607	1,613	1,620	1,626	1,633	1,639	1,646	1,653	1,659	1,666	1,672	1,679	1,686	1,693	1,699	1,706	1,713	1,720

Armstrong/Spallumcheen																															
AR-CLEAN	Asphalt roofing - clean	563	565	567	570	572	574	577	579	581	583	586	588	591	593	595	598	600	602	605	607	610	612	615	617	619	622	624	627	629	632
CRUSHABLE	Crushable material for aggregate	773	776	779	782	785	788	792	795	798	801	804	808	811	814	817	821	824	827	830	834	837	840	844	847	851	854	857	861	864	868
DRY-REC	Drywall - recyclable	220	221	222	223	223	224	225	226	227	228	229	230	231	232	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247
METAL	Scrap metal	177	178	178	179	180	180	181	182	183	183	184	185	186	186	187	188	189	189	190	191	192	192	193	194	195	195	196	197	198	199
PROP TANKS	Propane tanks	8	8	8	8	8	8	8	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
R12	Mixed Residential Waste	325	326	327	329	330	331	333	334	335	337	338	339	341	342	343	345	346	348	349	350	352	353	355	356	357	359	360	362	363	365
REFRIG	Refrigerated appliances	14	14	14	14	14	14	14	14	14	14	14	14	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	16
SOIL-COVER	Cover material	30	30	30	30	30	30	30	31	31	31	31	31	31	31	31	32	32	32	32	32	32	32	32	33	33	33	33	33	33	33
STUMPS-CLE	Loas and stumos - clean	132	133	133	134	134	135	135	136	136	137	137	138	139	139	140	140	141	141	142	142	143	144	144	145	145	146	146	147	148	148
WD-CLEAN	Wood Waste - clean	1,379	1,385	1,390	1,396	1,402	1,407	1,413	1,418	1,424	1,430	1,436	1,441	1,447	1,453	1,459	1,464	1,470	1,476	1,482	1,488	1,494	1,500	1,506	1,512	1,518	1,524	1,530	1,536	1,542	1,549
WD-DIRTY	Wood Waste - dirty	946	950	954	958	961	965	969	973	977	981	985	989	993	997	1,001	1,005	1,009	1,013	1,017	1,021	1,025	1,029	1,033	1,037	1,041	1,045	1,050	1,054	1,058	1,062
YARD	Yard and Garden Waste	105	105	106	106	106	107	107	108	108	109	109	110	110	111	111	111	112	112	113	113	113	114	114	115	115	116	116	117	117	118
Total		**4,671**	**4,690**	**4,709**	**4,728**	**4,747**	**4,766**	**4,785**	**4,804**	**4,823**	**4,842**	**4,862**	**4,881**	**4,901**	**4,920**	**4,940**	**4,960**	**4,979**	**4,999**	**5,019**	**5,039**	**5,060**	**5,080**	**5,100**	**5,121**	**5,141**	**5,162**	**5,182**	**5,203**	**5,224**	**5,245**
REFRIG	Refrigerated appliances	613	615	618	620	623	625	628	630	633	635	638	640	643	645	648	651	653	656	658	661	664	666	669	672	674	677	680	682	685	688

Lumby																															
BATT-AUTO	Batteries - Automotive	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	7	7
DRY-REC	Drywall - recyclable	59	59	59	59	60	60	60	60	61	61	61	61	62	62	62	62	63	63	63	63	64	64	64	64	65	65	65	65	66	66
MATTRESS	Mattresses/Box Springs	8	8	8	8	8	8	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
METAL	Scrap metal	38	38	38	38	38	38	38	39	39	39	39	39	39	40	40	40	40	40	40	41	41	41	41	41	41	42	42	42	42	42
R12	Mixed Residential Waste	40	41	41	41	41	41	41	42	42	42	42	42	42	43	43	43	43	43	43	44	44	44	44	44	45	45	45	45	45	45
SOIL-COVER	Cover material	400	401	403	405	406	408	409	411	413	414	416	418	419	421	423	424	426	428	430	431	433	435	436	438	440	442	444	445	447	449
SOIL-HYDC	Hydrocarbon contaminated soil	921	925	928	932	936	939	943	947	951	955	958	962	966	970	974	978	982	985	989	993	997	1,001	1,005	1,009	1,013	1,017	1,022	1,026	1,030	1,034
STUMPS-CLE	Loas and stumos - clean	10	10	10	10	10	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	12	12
WD-CLEAN	Wood Waste - clean	478	480	482	484	486	488	489	491	493	495	497	499	501	503	505	507	509	511	514	516	518	520	522	524	526	528	530	532	534	537
WD-DIRTY	Wood Waste - dirty	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Total		**1,962**	**1,969**	**1,977**	**1,985**	**1,993**	**2,001**	**2,009**	**2,017**	**2,025**	**2,033**	**2,042**	**2,050**	**2,058**	**2,066**	**2,074**	**2,083**	**2,091**	**2,099**	**2,108**	**2,116**	**2,125**	**2,133**	**2,142**	**2,150**	**2,159**	**2,168**	**2,176**	**2,185**	**2,194**	**2,202**

Table 25 Tipping Fee Rates

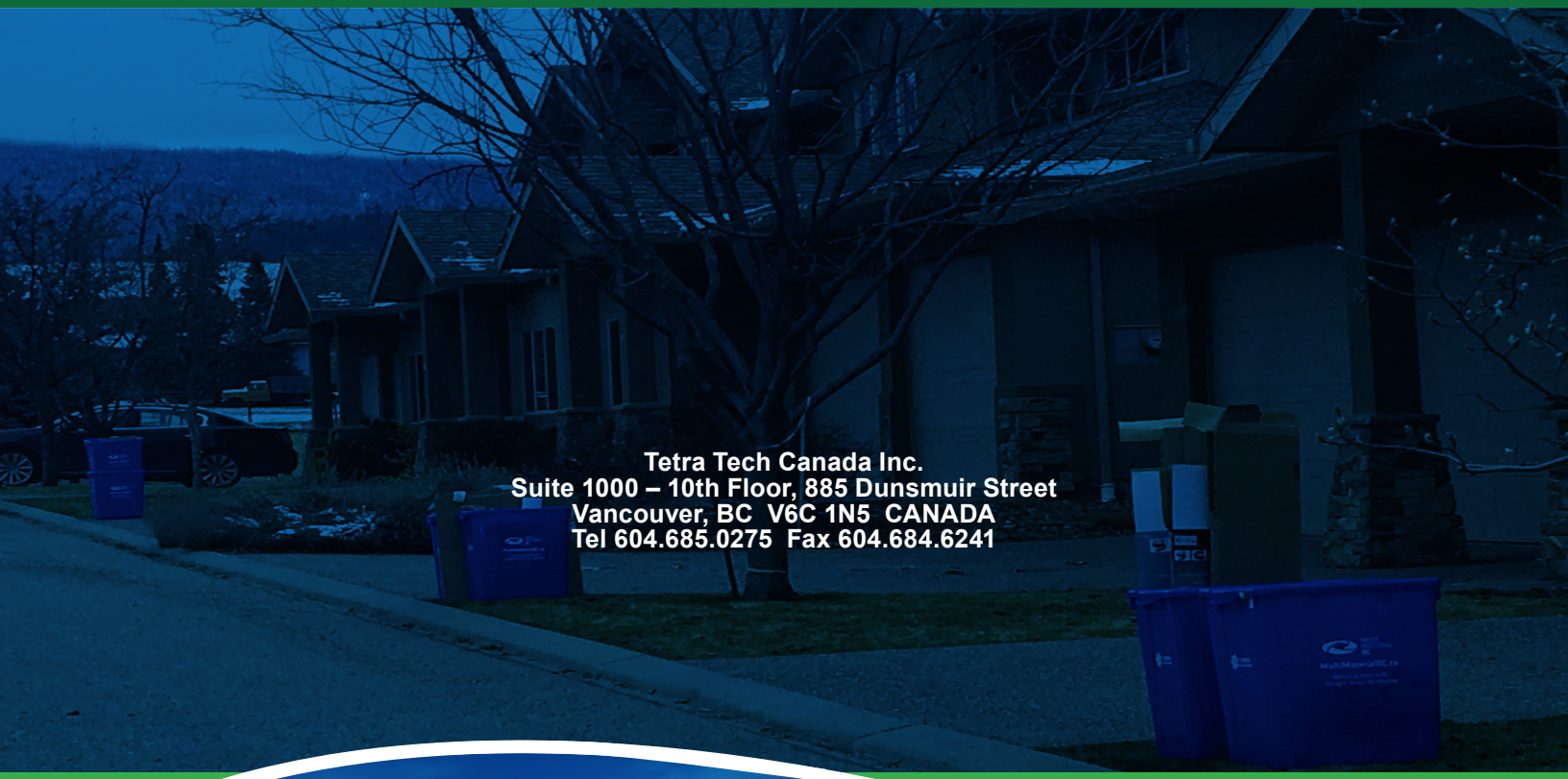
Code	Description	2017 Tipping Fee Rate	2018 Tipping Fee Rate	2019 Tipping Fee Rate	2020 Tipping Fee Rate	2021 + Tipping Fee Rate
ADD HAND	Additional handling	173	174	175	176	177
AR-CLEAN	Asphalt roofing - clean	82	82	82	82	82
AR-MAJOR	Asphalt roofing - minor contamination	110	110	110	110	110
AR-OUT	Asphalt roofing - outbound	0	0	0	0	0
BATT-AUTO	Batteries - Automotive	1	1	1	1	1
BATT-RES	Batteries - Household (< 20kg)	0.10	0.10	0.10	0.10	0.10
C&D WASTE	Construction and demolition waste	202	203	204	205	206
CRUSHABLE	Crushable material for aggregate	10	10	10	10	10
DRY-IN	Drywall - inbound	0	0	0	0	0
DRY-OUT	Drywall - outbound	0	0	0	0	0
DRY-REC	Drywall - recyclable	135	135	135	135	135
DRY-REC NON	Drywall - non recyclable	140	141	142	143	144
FLUOR BULBS	Fluorescent tubes and bulbs	0.50	0.50	0.50	0.50	0.50
MATTRESS	Mattresses/Box Springs	8	8	8	8	8
METAL	Scrap metal	10	10	10	10	10
MMBC-PPP	MMBC Container Stream	0	0	0	0	0
	MMBC Fiber Stream	0	0	0	0	0
	MMBC Comingled Stream	0	0	0	0	0
PROP TANKS	Propane tanks	0	0	0	0	0
R01	Regular Refuse	100	101	102	103	104
R02	Controlled Waste	174	175	176	177	178
R03	Regulated Material	203	204	205	206	207
R04	Contains Drywall	303	304	305	306	307
R06	Controlled Waste - Out of Region	400	401	402	403	404
R10	Refuse - Illegally Dumped	43	44	45	46	47
R12	Mixed Residential Waste	68	68	68	68	68
	R12 Burried (60% of Mixed Residential)	68	69	70	71	72
	Blue Bag Recyclables	0	0	0	0	0
	OCC Cardboard	0	0	0	0	0
REFRIG	Refrigerated appliances	15	15	15	15	15
	Blue Bag Recyclables	0	0	0	0	0
SCALE USE	Scale for movers	10	10	10	10	10
SOIL-COVER	Cover material	0	0	0	0	0
SOIL-HYDC	Hydrocarbon contaminated soil	10	10	10	10	10
STUMPS-CLE	Logs and stumps - clean	20	20	20	20	20
STUMPS-DRTY	STUMPS-DRTY	75	75	75	75	75
STYRO	Styrofoam	97	97	97	97	97
TIRES	Tires	10	10	10	10	10
WD-CHIPPED	Wood Waste - chipped	20	20	20	20	20
WD-CLEAN	Wood Waste - clean	20	20	20	20	20
WD-DIRTY	Wood Waste - dirty	20	20	20	20	20
YARD	Yard and Garden Waste	0	0	0	0	0

Table 26 RDNO Long-Term Capital Projects

Project Description		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
GVRDF - RDF Signage Project	25,000	25,000																									
GVRDF - Refurbish existing Quonset	35,000						35,000																				
GVRDF - Relocate Composting Pad	900,000						900,000																				
GVRDF - LFG Management System	0																										
GVRDF - New Haul Road	30,000	30,000																									
GVRDF - Water System	0																										
GVRDF - Leachate Pond Fence	0																										
GVRDF - Leachate Pond Pump Station	0																										
GVRDF - Expansion Preliminary Design	100,000		100,000																								
GVRDF - Closure	0																										
GVRDF - Upgrade Entrance	150,000	150,000																									
GVRDF - Blast out Knoll Beside Asbestos Disposal Area	25,000	25,000																									
ASRDF - Stage B Works	0																										
ASRDF - Leachate Pond Stabilization	100,000		100,000																								
ASRDF - New Signage	25,000	25,000																									
ASRDF - Stage G and H Works	720,000							720,000																			
ASRDF - Closure (2034)	3,000,000																		3,000,000								
ASRDF - Transfer Stn	1,400,000																		1,400,000								
LRDF - Stage A Works	0																										
LRDF - Stage B Works	250,000				250,000																						
LRDF - Signage Pilot Project	0																										
LRDF - Stage D & E Works	40,000												40,000														
LRDF - Closure (2075)	0																										
LRDF - Transfer Stn	0																										
CRDF - Concrete Pads for Containers	0																										
CRDF -Closure (2015)	0																										
PRRDF - Closure (final 2015)	0																										

RDNO

REGIONAL DISTRICT NORTH OKANAGAN



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