MORRISON HERSHFIELD

Feasibility Study on Compost Processing and Seasonal Yard and Garden Waste Collection in Member Municipalities

Presented to:

Laura Zapotichny

Regional District of Fraser-Fort George

Report No. 220308800
July 26, 2023

Morrison Hershfield Limited | Suite 310, 4321 Still Creek Drive, Burnaby, BC V5C 6S7, Canada | Tel 604 454 0402 | morrisonhershfield.com

GLOSSARY OF TERMS

Acronym / Term	Meaning
BGM	Biosolids growing medium
C&D	Construction and demolition waste, also known as “Demolition, Land Clearing and Construction Waste,” means waste that may include scrap metal, asphalt, asphalt shingles, clean wood waste, painted and/or treated wood waste, masonry and/or rubble, stumps and/or large branches, but does not include Prohibited Waste, Controlled Waste, Recyclable Materials or Hazardous Waste.
Compost	A product which is: ▪ a stabilized earthy matter having the properties and structure of humus, ▪ beneficial to plant growth when used as a soil amendment, ▪ produced by composting, and ▪ only derived from organic matter
Composting	The controlled biological oxidation and decomposition of organic matter in accordance with the time and temperature requirements specified in Schedule 1 of the Organic Matter Recycling Regulation
Composting facility	A facility that processes organic matter to produce compost
EPR	Extended Producer Responsibility
EMA	Environmental Management Act
FBRL	Foothills Boulevard Regional Landfill
ICI	Industrial, commercial and institutional (does not include heavy industry)
LAP	Land Application Plan
MFABC	Municipal Finance Authority of BC

MSW	Municipal solid waste
MoE	Ministry of Environment
Organic Waste	Includes kitchen scraps, food waste, yard and garden waste
OMRR	Organic Matter Recycling Regulation
Processing	Organic waste managed at compost facilities (either at FBRL Compost Facility or municipalities) to produce stabilized organic matter for a number of uses, depending on the quality. Processing may include grinding, mixing, and the active compost process.
RDFFG	Regional District of Fraser-Fort George
RSWMP	Regional Solid Waste Management Plan
Y&G waste	Yard and garden waste means organic, source separated waste that includes, grass, lawn clippings, hedge clips, flowers, leaves, processed yard and garden material that has been chipped to less than 55 millimetres in any dimension and shrub and tree branches less than 75 millimetres in diameter.

EXECUTIVE SUMMARY

The Regional District of Fraser-Fort George (RDFFG) updated its Regional Solid Waste Management Plan (RSWMP) in 2015 which included a 50% waste diversion target by 2020. Yard and garden waste composting was identified as a key waste diversion initiative taking place at the Foothills Boulevard Regional Landfill (FBRL), the Mackenzie Transfer Station and the Valemount Transfer Station. The RSWMP identified new initiatives to increase the diversion of organic waste including undertaking a compost market study, updating the composting feasibility study, and implementing seasonal yard and garden waste collection in Prince George once capacity at Foothills is available.

Currently, over 6,000 tonnes of yard and garden waste is being diverted in the region through public drop-off depots in the City of Prince George, the District of Mackenzie and the Village of Valemount. Yard and garden waste is collected at public drop-off facilities owned and operated by the RDFFG. Self-hauled yard and garden waste is accepted at five drop-off locations within Prince George, as well as at the Mackenzie and Valemount Regional Transfer Stations. Yard and garden waste is currently not collected in the Village of McBride. In Prince George, approximately 6,000 tonnes of yard and garden waste is currently collected and diverted at the three drop-off locations per year from residential and commercial sources. Just over half of the self-hauled yard and garden waste is from residential sources. The quantity of self-hauled yard and garden waste is not currently tracked in Mackenzie and Valemount.

The latest waste composition audit completed in 2018 indicates that waste from single family residential sources contains approximately 24% yard and garden waste, which is currently being landfilled. Implementing seasonal curbside collection of yard and garden waste in member municipalities has the potential to divert additional yard and garden waste from the landfill.

The objectives of this feasibility study are:

- To assess the seasonal collection of yard and garden waste in the member municipalities of the City of Prince George, the District of Mackenzie, the Village of Valemount and the Village of McBride, including the associated operational and capital costs of implementation.
- To assess local processing options to create desirable end products in the member municipalities with undeveloped compost operations, specifically Mackenzie, Valemount and McBride, with consideration to costs and space availability.
- To assess the operational and cost impacts that the introduction of seasonal yard and garden waste collection will have on the current Regional District's operations, including the compost operations at the Foothills Boulevard Regional Landfill and yard and garden waste drop off locations (Vanway, Quinn Street, Foothills).
- To assess the potential cost impacts to the RDFFG and member municipalities, and potential cost recovery mechanisms.

Seasonal collection and local processing options were reviewed, including the relevant capital and operating costs as well as impacts to current operations in member municipalities including the City of Prince George, District of Mackenzie, Village of Valemount, and Village of McBride.

The potential additional yard and garden waste quantities collected from a seasonal curbside collection program were estimated based on the RDFFG's most recent 2018 waste audit data as well as using typical yard and garden waste capture rates reported from other communities in BC. The communities used as a reference are reported in Section 3.1.2. The summary table below shows the potential additional yard and garden waste diversion in tonnes from each municipality.

Table 1: Potential Additional Yard and Garden Waste Diversion in Tonnes

Municipality	Potential Additional Yard and Garden Waste Diversion (tonnes)
City of Prince George	1,400 to 2,600
District of Mackenzie	82
Village of Valemount	28
Village of McBride	40

There is a high level of uncertainty in the estimates for Mackenzie, Valemount, and McBride as the current yard and garden waste quantities are not tracked.

Once the potential ranges of yard and garden waste quantities were estimated, a potential seasonal curbside collection program was reviewed for all municipalities based on bi-weekly yard and garden waste collection from April to October using an automated collection system. Factors that were considered in developing the seasonal yard and garden waste collection program included compatibility with the current garbage collection method, current collection frequency, and existing collection fleet (vehicles) in member municipalities.

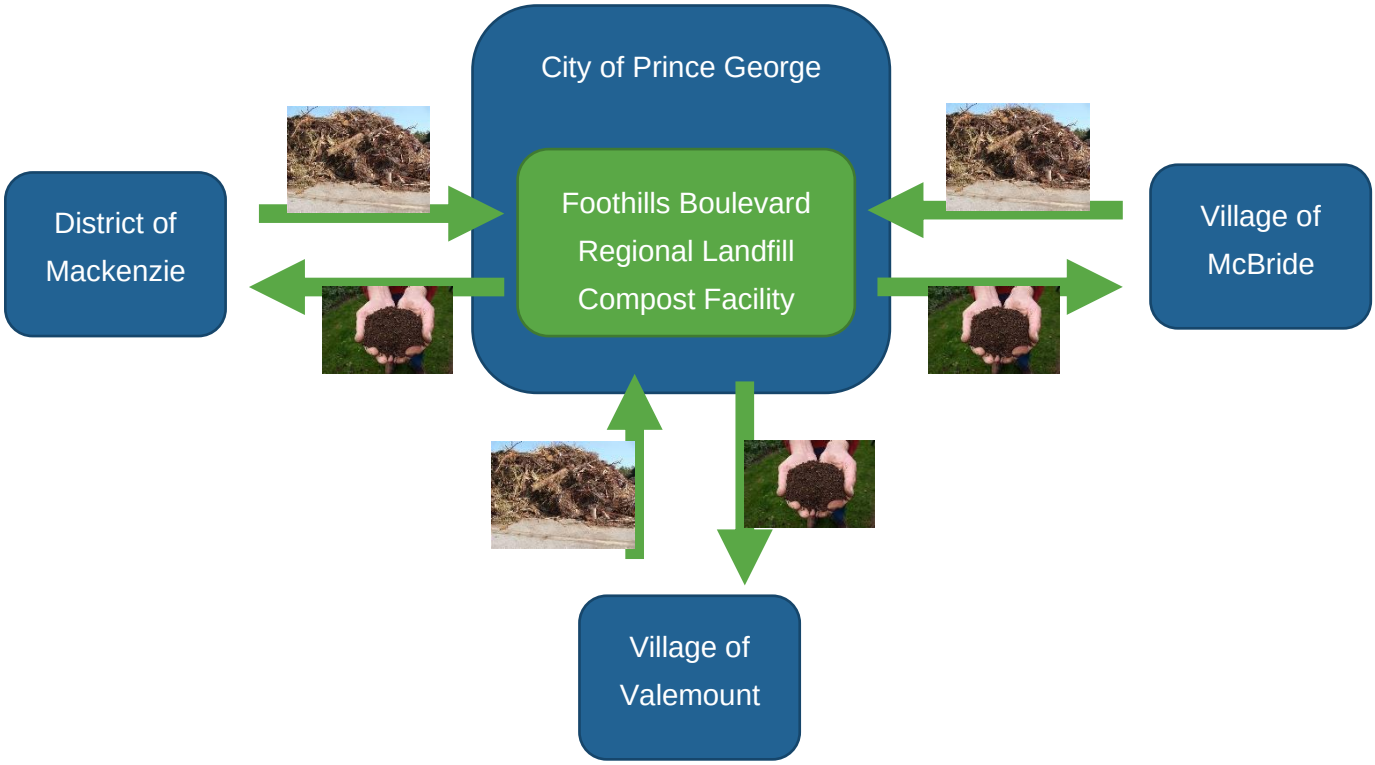
After the yard and garden waste is collected from member municipalities, it needs to be transported and processed at facilities owned and operated by the RDFFG. As shown in the flow diagram below, implementation of seasonal collection of yard and garden waste in member municipalities will impact the processing facilities owned and operated by the RDFFG. The implementation of seasonal curbside yard and garden waste collection will require coordination between member municipalities and the RDFFG to ensure the timeline to introduce the curbside collection program considers the timeline to complete upgrades at the receiving/processing facilities needed to accommodate the additional quantities of yard and garden waste.

Figure 1: Summary of Flow from Collection, Processing, and End-Use

Assuming all member municipalities implement seasonal curbside collection, two (2) yard and garden waste processing options were assessed. The two options are summarized in the figures below.

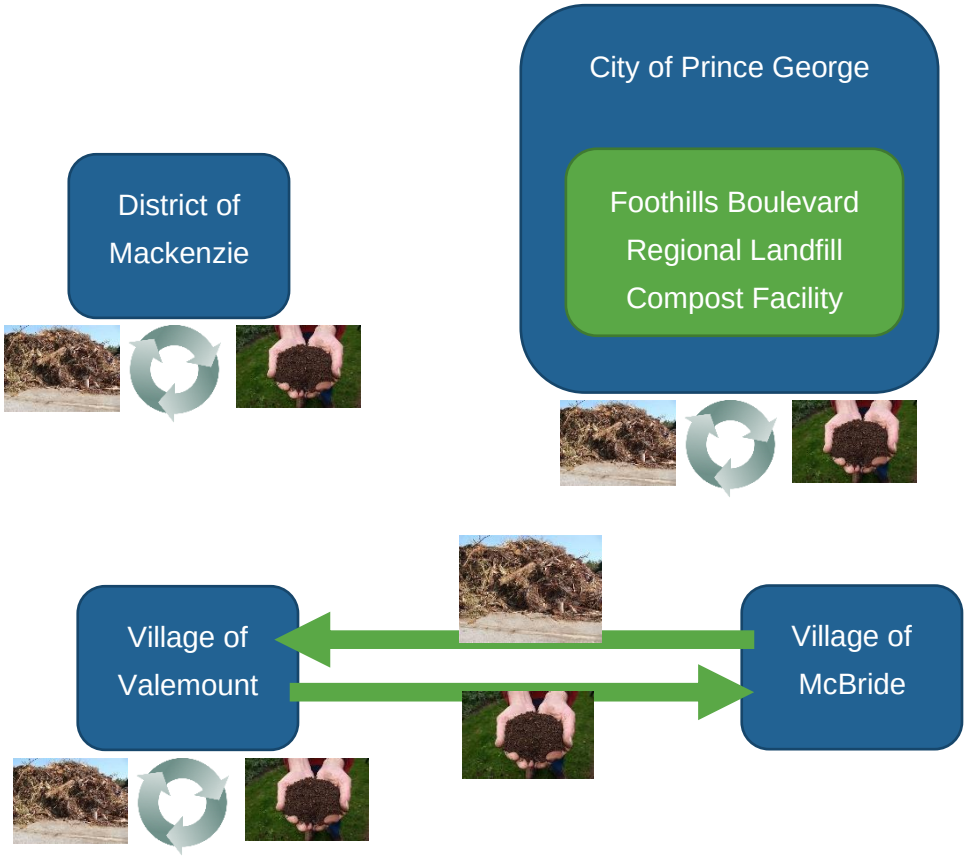
Throughout this document, the term “processing” is defined as yard and garden waste managed at compost facilities (either at FBRL Compost Facility or municipalities) to produce an organic material suitable for a number of uses, depending on the quality.

Option 1 – Centralized Processing at Foothills Boulevard Regional Landfill Compost Facility:



- This option assumes that all yard and garden waste collected from a seasonal yard and garden waste collection program in Prince George, Mackenzie, Valemount, and McBride will be processed at the FBRL Compost Facility.
- Yard and garden waste collected from curbside collection vehicles would be transferred at the Mackenzie, McBride and Valemount Regional Transfer Stations and hauled to Prince George for processing.
- Finished compost could be backhauled to the member municipalities.

Option 2 – Processing at FBRL Compost Facility, with Local Processing in Member Municipalities:



- This option assumes that yard and garden waste collected from a seasonal yard and garden waste collection program in Prince George would be processed at the FBRL Compost Facility.
- Yard and garden waste collected in Mackenzie, Valemount, and McBride would continue to be processed locally at the Mackenzie and Valemount Regional Transfer Stations (yard and garden waste collected at McBride is transferred to Valemount for processing).
- It is assumed that the current yard and garden waste processing operations would be improved to generate a higher quality end product compared to the status quo.
- The costs associated with this option will depend on the desired end-use of the processed yard and garden waste.
- A baseline cost scenario was developed assuming the current status quo process in Mackenzie and Valemount is improved to create a higher value end product which would primarily result in an increase in operational costs.

Both Options 1 and 2 achieve the same level of yard and garden waste diversion, however Option 1 produces a high quality end product (Class A compost from FBRL compost facility) with all collected

yard and garden waste whereas Option 2 produces the same high-quality end product with the majority of the collected yard and garden waste (Class A compost from FBRL compost facility) but also produces a lower quality end-product with more limited uses (in member municipalities). Under both options, the FBRL Compost Facility will need to be expanded or modified to accept a potential additional 2,000 tonnes of yard and garden waste feedstock (slightly more under Option 1).

A summary of the capital and operating costs associated with curbside collection is presented below. The curbside collection costs are the same for both Options 1 and 2. It is assumed that these costs will be the responsibility of the member municipalities as the Regional District does not provide curbside collection. The initial public engagement and education costs associated with the program implementation are included in the total capital costs. It is assumed that these costs will be shared equally between the municipalities and RDFFG. Further detailed cost breakdowns are included in Section 5 of this report.

Table 2: Summary of Capital and Operating Costs for Curbside Collection

Curbside Collection Costs (Same for Options 1 & 2)	Prince George	Mackenzie	Valemount	McBride
Households	25,000	1,515	513	266
Tonnes Collected (Assuming 150 kg/HH)	3750	227	77	40
Total Capital Cost, Incl. 20% Contingency	$4,940,400	$219,960	$85,440	$53,160
Total Operating Cost, Incl. 15% Contingency	$442,750	$22,321	$25,737	$11,592
Total Operating Cost per Tonne Yard and Garden Waste Collected	**$118**	**$98**	**$336**	**$292**

A summary of the capital and operating costs associated with hauling, processing, and facility upgrades is presented below. It is assumed that these costs will be the responsibility of the RDFFG as they manage the collected materials and operate the facilities that produce the end-products.

Table 3: Summary of Capital and Operating Costs for Hauling, Processing, and Facility Upgrades

Operating Cost Item	Option 1 – FBRL Central Processing	Option 2 - Local Processing
Facility Upgrades, Incl. 40% Contingency	$826,000	$845,600
Additional Hauling	$53,900	$6,700
Additional Processing	$117,800	$151,400
Total Additional Operating Costs, Incl. 20% Contingency	$206,040	$189,720
Total Operating Cost per Tonne Additional Yard and Garden Waste Managed	$88	$81

Impacts to current operations due to a seasonal yard and garden waste collection program as well as cost recovery mechanisms for the RDFFG and member municipalities were reviewed as part of this Study.

In Prince George, there will be a significant reduction in yard and garden waste received at the three existing self-haul drop-off locations (FBRL public drop-off area, Vanway and Quinn Street Regional Transfer Stations). The quantity of yard and garden waste received at these facilities is estimated to decrease by approximately 2,400 tonnes due to the material being captured in the curbside collection program. The estimated annual savings due to reduced hauling requirements is $26,500 per year. In addition, with the reduction of yard and garden waste collected at the Quinn Street Regional Transfer Station, it may not be viable or efficient to continue operating the Quinn Street Regional Transfer Station as this facility mainly collects yard and garden waste during gardening seasons within the City of Prince George. The closure of the Quinn Street facility would result in much higher potential savings (compared to cost savings related to reduced hauling only). In Mackenzie and Valemount, the impacts to current tonnages received at the transfer stations and associated management costs are expected to be minor, since the material is currently self-hauled directly to the transfer station where it is processed.

Implementing seasonal yard and garden waste collection will result in a reduction in municipal solid waste (MSW) tipping fee revenue for the RDFFG due to increased yard and garden waste diversion. Based on low and high estimates of yard and garden waste diversion based on two collection rates, the potential reduction in MSW tonnage entering FBRL is estimated between 1,500 to 2,900 tonnes per year, which also represents the amount of yard and garden waste collected for FBRL Compost Facility. Additional compost production will partially offset the decrease in MSW tipping fee revenue, assuming the additional compost can be sold. At the current compost price, it is estimated that the additional revenue from the sale of compost will be approximately $38,000 per year.

The RDFFG and member municipalities will need to generate additional revenue streams to cover the program costs and reductions in revenue summarized above. Implementing a tipping fee for yard and garden waste (by the RDFFG) and utilities fees (by member municipalities) were the primary cost recovery approaches reviewed as part of this Study. A summary of the additional costs and revenue decreases and additional revenues and cost savings is provided in Figure 2.

Figure 2: Summary of Additional Costs, Revenue Decreases, Additional Revenues, and Cost Savings

For the RDFFG, a break-even tipping fee on yard and garden waste of $46 per tonne was estimated as the minimum yard and garden waste tipping fee required to fully cover the costs of the additional hauling and processing costs. Including debt financing with capital costs amortized over 10 years, the minimum break-even yard and garden waste tipping fee is estimated at $58 per tonne to cover the additional hauling, processing, and annual debt servicing costs. The break-even tipping fee is similar for both options, as the net operating and capital costs for both options are similar.

For member municipalities, an additional utility fee was estimated to cover the costs of the curbside collection program. The minimum utility fee required to cover operating costs was estimated as well as a utility fee assuming capital costs are funded through debt financing amortized over a 10-year period.

The estimated break-even tipping fee (RDFFG) and additional utility fees (municipalities) are summarized in Table 4 below. The utility fees shown in Table 4 were estimated assuming that a yard and garden waste tipping fee of $46 per tonne is introduced by the RDFFG.

Table 4: Estimated Break-Even Yard and Garden Waste Tipping Fee and Additional Utility Fees

Member Municipality / RDFFG	Additional Yard and Garden Waste Utility Fee (Operating Costs + Tipping Fees) ($ per Household per Year)	Additional Yard and Garden Waste Utility Fee (Operating + Capital Costs + Tipping Fees) ($ per Household per Year)	Break Even Yard and Garden Waste Tipping Fee – Operating Cost ($/tonne)	Break Even Yard and Garden Waste Tipping Fee – Ops + Capital Costs ($/tonne)
RDFFG	-	-	$46 per tonne	$58 per tonne
City of Prince George	$24	$48	-	-
District of Mackenzie	$23	$39	-	-
Village of Valemount	$58	$78	-	-
Village of McBride	$52	$75	-	-

Key uncertainties and recommended next steps are summarized below:

- **Facility Upgrade Requirements at the FBRL Compost Facility:** Upgrades at the FBRL Compost Facility (to increase processing capacity) is by far the highest potential capital cost for the RDFFG. For this Study, expansion costs were estimated assuming the existing composting facility and public drop-off area would remain in its current location. This expansion is considered the minimum required to increase the processing capacity at the facility while maintaining current operations. It is understood that the FBRL entrance will be redesigned and relocated in the near future, which will also include the redesign and relocation of the compost area. Costs associated with the entrance relocation project were not considered in this Study however it should be noted that the costs to relocate the compost facility would be significantly higher than the minimum expansion costs presented in this Study.
- **Facility Upgrade Requirements in Mackenzie, Valemount, and McBride:** Once a preferred processing option is selected, additional analysis should be completed to refine the capital costs to upgrade the Mackenzie, Valemount, and McBride transfer stations to allow for transfer and/or processing of yard and garden waste. Limited information was available as part of this study on actual site conditions which will impact the upgrade costs. The capital costs for upgrades in Mackenzie, Valemount, and McBride are considered conservative and should be refined once a preferred processing option is selected.
- **Collection Vehicle Modifications in Mackenzie, Valemount, McBride:** Because they are not fully utilized (currently only used for residential garbage collection 1-2 times per week), it is assumed that the existing collection vehicles in Mackenzie, Valemount, and McBride can be used for yard and garden waste collection. Allowances have been included in the capital

cost estimates for potential modifications required as well as for additional cleaning requirements throughout the year. However, the capability of the existing collection vehicles to be used for yard and garden waste collection should be reviewed with each member municipality. The capital cost estimates would increase significantly if it is not feasible to use the existing collection vehicles in Mackenzie, Valemount, and McBride.

- **Future Plans for Quinn Street and Vanway Regional Transfer Stations:** Yard and garden waste quantities are expected to significantly decrease at these facilities once seasonal yard and garden waste collection is implemented. It is assumed the Quinn Street and Vanway Regional Transfer Stations will continue to operate and accept self-hauled yard and garden waste at reduced quantities. Capital costs and the potential savings have not been considered for the potential closure, expansion or relocation of these facilities. With the reduced yard and garden waste self-hauled within Prince George, continuing to operate the Quinn Street facility in particular may not be viable and closing the facility would need to be considered.
- **Yard and Garden Waste Tipping Fee:** A yard and garden waste tipping fee is the primary cost recovery mechanism (for the RDFFG) that was assessed in this Study. Once a preferred processing option is selected and the preferred cost recovery approach is identified, the costs presented in this Study may need to be updated. Operating costs and the required municipal utility fee would increase with the introduction of a yard and garden waste tipping fee by the RDFFG.
- **End-Use and Markets for Compost in Mackenzie, Valemount, and McBride:** The required capital upgrades in Mackenzie, Valemount, and McBride and operational processing costs will depend on the desired end-use of the finished product. As a region, it is understood that there is currently a surplus of compost in the RDFFG. The end-use options and markets for compost in Mackenzie, Valemount, and McBride should be reviewed as this will impact the level of processing needed and associated costs.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. BACKGROUND AND SCOPE OF WORK

1.1 Background

The Regional District of Fraser-Fort George (RDFFG) updated its Regional Solid Waste Management Plan (RSWMP) in 2015. Since 1997, the region has improved its diversion rate from 8% to 26% (2014), while the disposal rate has gone down slightly and generation has remained fairly constant. A 2018 Waste Characterization Study (TRI Environmental Consulting Inc.) indicated that waste collected from single-family residential households is approximately 46.4% compostable organics, with approximately half of that (23.6%), consisting of yard and garden (Y&G) waste.

In the 2015 RSWMP, the Regional District set a target of 50% diversion by 2020 based on a per capita disposal target of 570 kg per year. Yard and garden waste composting was identified as a key waste diversion initiative taking place at the Foothills Boulevard Regional Landfill (FBRL), the Mackenzie Regional Transfer Station and the Valemount Regional Transfer Station. The RSWMP identified new initiatives to increase the diversion of organic waste including undertaking a compost market study, updating the composting feasibility study, and implementing seasonal yard and garden waste collection in Prince George once capacity at Foothills is available.

The compost facility located at the FBRL has been in operation since 1997. It uses a turned windrow composting process combining chipped yard and garden waste and manure as feedstock to produce a Class A compost sold to residential and commercial customers. The current compost facility is currently operating close to its maximum capacity.

1.2 Objectives and Scope

The RDFFG is investigating the feasibility of collecting yard and garden waste seasonally in the member municipalities with the goal of eliminating the landfilling of yard and garden waste (that is currently being deposited in curbside garbage bins). This feasibility study summarizes a review of seasonal collection and local processing options, including the evaluation of relevant costs, in member municipalities including the City of Prince George, District of Mackenzie, Village of Valemount, and Village of McBride.

The objectives of this feasibility study are:

- To assess the seasonal collection of yard and garden waste in the member municipalities of the City of Prince George, the District of Mackenzie, the Village of Valemount and the Village of McBride, including the associated operational and capital costs of implementation.
- To assess local processing options to create desirable end products in the member municipalities with undeveloped compost operations, specifically Mackenzie, Valemount and McBride, with consideration to costs and space availability.

- To assess the operational and cost impacts that the introduction of seasonal yard and garden waste collection will have on the current Regional District's operations, including the compost operations at the Foothills Boulevard Regional Landfill and yard and garden waste drop off locations (Vanway, Quinn Street, Foothills).
- To assess the potential cost impacts to the RDFFG and member municipalities, and potential cost recovery mechanisms.

2. CURRENT COLLECTION AND PROCESSING SYSTEM

This section summarizes the current curbside collection programs in member municipalities, the current transfer stations and drop-off depots accepting yard and garden waste managed by the RDFFG, and current organics processing facilities managed by the RDFFG.

2.1 Current Curbside Collection Program in Member Municipalities

Table 5 summarizes the current curbside collection programs in the member municipalities of Prince George, Mackenzie, Valemount, and McBride. All member municipalities currently offer weekly collection of garbage to residents using an automated collection system with standard wheeled carts. The City of Prince George and the Village of Valemount offer three cart sizes (135 L, 240 L, 360 L) at different annual utility fees. The District of Mackenzie and the Village of McBride offer one standard 240 L cart. The District of Mackenzie also offers the option for residents to change from weekly to bi-weekly garbage collection.

Annual utility fees charged to residents for the curbside garbage collection service range between $160.51 to $208 for the most common 240 L cart option and weekly collection. All member municipalities deliver the curbside garbage collection service using municipal collection crews.

Bi-weekly curbside recycling collection is provided in the City of Prince George by Recycle BC. Curbside recycling collection is not provided in the other member municipalities.

Curbside organics collection (yard and garden waste and/or food waste) is not provided in any member municipalities.

Table 5: Summary of the Current Curbside Collection Programs in Member Municipalities

Member Municipality	Population	No. of Households Serviced	Waste Stream Collected	Automated or Manual	Collection Frequency	Container Type & Sizes	Truck Model and Quantity	Service Delivery Model
City of Prince George	74,004	25,000	Garbage	Automated	Weekly	Small 135 L cart Medium 240 L cart Large 360 L cart	Active Fleet Size: 6 2014 Peterbilt Garbage Truck X 3 2015 Peterbilt Garbage Truck X 2 2021 Mack Labrie G/Packer	In-House Municipal
			Recycling[2]	Manual	Bi-weekly	Boxes (Blue and Grey Boxes)	Contracted	Recycle BC Contracted
District of Mackenzie	3,281	1,515	Garbage	Automated	Weekly, with Option to Change Service to Bi-Weekly	240 L cart	Active Fleet Size: 2 2020 International (Residential) 2007 International (Commercial)	In-House Municipal
Village of Valemount	1,052	513	Garbage	Automated	Weekly	Small 135 L cart Medium 240 L cart Large 360 L cart	Active Fleet Size: 1 (With 1 Backup) 2013 M1600 Haul All One Backup Truck to be Replaced in October 2022	In-House Municipal
Village of McBride	588	266	Garbage	Automated	Weekly	240 L cart	Active Fleet Size: 1 (Total 2 in Fleet) Rollins Machinery Freightliner	In-House Municipal

2.2 Current Yard and Garden Waste Drop-Off Locations

All yard and garden waste is currently collected at public drop-off facilities owned and operated by the RDFFG.

In Prince George, self-hauled yard and garden waste is accepted at the Quinn Street Regional Recycling Depot, the Vanway Regional Transfer Station, and the public drop-off area at the Foothills Boulevard Regional Landfill. Yard and garden waste received at these three facilities is transferred by the RDFFG to the Compost Facility at the FBRL. A summary of the yard and garden waste tonnages received at the three drop-off facilities in Prince George between 2017 to 2021 is provided in Table 6 below. It is estimated that 70% of the total yard and garden waste received at the Quinn Street Regional Recycling Depot and the Vanway Transfer Station is from residential users. The other 30% is received from commercial customers. At the public drop-off area at the FBRL, it is estimated that 46% of the total yard and garden waste is received from residential users and 54% is from commercial customers. It should be noted that customer data from Quinn Street and Vanway are considered estimates only whereas the customer data from FBRL is considered more accurate because user type is tracked at the scales.

Table 6: Yard and Garden Waste Quantities (Tonnes) Received from 2017 to 2021 at Drop-Off Locations in Prince George

Yard and Garden Waste Received From	2017	2018	2019	2020	2021
Vanway Transfer Station	825	743	875	935	956
Quinn St Recycling Depot	1,260	1,210	1,312	1,525	1,444
Foothills Landfill Self-Haul	3,387	3,156	3,723	3,919	3,573
Total Material Received for Processing	5,472	5,109	5,910	6,379	5,972

In Mackenzie and Valemount, yard and garden waste is accepted at the Mackenzie Regional Transfer Station and Valemount Regional Transfer Station. Once a large enough quantity of yard and garden waste has accumulated, it is periodically chipped (once every few years) and placed in piles. It is understood that additional organic material is not currently mixed with the chipped yard and garden waste and no systems are in placed to actively aerate the piles. The chipped yard and garden waste is used as erosion control media for landfill closure projects. Yard and garden waste self hauled in Mackenzie and Valemount is currently not tracked, however is conservatively estimated in Table 7, based on data from the collection sites in Prince George.

Yard and garden waste is not currently accepted at the McBride Regional Transfer Station.

2.3 Y&G Waste Processing at the FBRL Compost Facility

The compost facility located at the FBRL has been in operation since 1997. It uses a turned windrow composting process combining chipped yard and garden waste and manure as feedstock to produce a Class A compost sold to residential and commercial customers. The compost operations are currently located on a 1.8 hectare (ha) asphalt pad with an additional 2 ha area for storage of the finished compost. The current compost facility is currently operating close to its maximum capacity. A summary of the total tonnages of yard and garden waste and manure received at the FBRL compost facility and compost produced is provided in Table 7 below. The tonnages are based on 2021 data for City of Prince George municipality and 2021 census population data for District of Mackenzie, Village of Valemount and Village of McBride.

This facility operates in compliance with BC Ministry of Environment's Organic Matter Recycling Regulation (OMRR). Further explanation and overview of the OMRR can be found in Section 4.1 or found in Appendix A for review.

Operations at this facility include accepting Y&G wastes from users, chipping the Y&G waste, and processing the chipped Y&G waste combined with manure collected at the facility. After going through the grinder, yard and garden waste material is batch processed in an open windrow system. The windrows are constructed by loader and turned 6 to 8 times per windrow as part of the process. Windrows are approximately 3 meters high and 6 meters wide, with lengths varying from 35 to 50 meters. The windrows are turned by front-end loader.

The final product is then screened once or twice. Finally, before putting the product up for sale, the batch undergoes suitable pathogen and vector attraction reduction testing to confirm it meets the quality criteria under OMRR for Class A compost.

Table 7: Summary of Current Yard Waste Collection Locations in Member Municipalities and Organics Processing Facilities

Facility Name	Facility Location	Yard and Garden Waste Collection and/or Processing	Organics Processing	Products and Markets	Quantity Received or Processed in 2021 (Tonnes)
Compost Facility at Foothills Boulevard Regional Landfill	Prince George	Yard and Garden Waste Collection at Public Drop-off Area and Processing at Compost Facility	Turned Windrow Composting	Class A Compost (Norgrow) Sold to Residential and Commercial Customers	Y&G Waste = 3,572.70 Manure = 1,068.10
Vanway Transfer Station	Prince George	Yard and Garden Waste Collection	N/A	N/A	Y&G Waste = 955.70
Quinn Street Recycling Depot	Prince George	Yard and Garden Waste Collection	N/A	N/A	Y&G Waste = 1,443.90
Mackenzie Regional Transfer Station	Mackenzie	Yard and Garden Waste Collection	Periodic Chipping	Chipped Yard Waste Used as Erosion Control Media	No data
Valemount Regional Transfer Station	Valemount	Yard and Garden Waste Collection	Periodic Chipping	Chipped Yard Waste Used as Erosion Control Media	No data
McBride Regional Transfer Station	McBride	None	N/A	N/A	N/A

The District of Mackenzie residential and commercial users currently bring their yard and garden waste to the Mackenzie Regional Transfer Station. The Y&G waste is collected at the west side of the landfill, where it is chipped periodically when the Y&G waste collection area runs out of space. The chipped wood is currently left on site, next to the unchipped Y&G waste. The quantity of Y&G waste (tonnage) collected at District of Mackenzie is currently not tracked. Since the Makenzie Regional Transfer Station was recently constructed and has a weigh scale, RDFFG has the ability to track the amount of yard and garden waste collected. This data would be useful to understand the status quo tonnages of yard and garden waste received.

The Village of Valemount residential and commercial users bring their Y&G waste to the Valemount Transfer Station. The Y&G waste is collected at the east end around the corner of the site, where it is chipped periodically when the Y&G waste collection area runs out of space. The chipped wood is currently left on site. The Valemount Transfer Station does not have a scale on site.

The Village of McBride currently collects MSW at the McBride Regional Transfer Station but does not collect any Y&G waste.

2.4 Current Waste Composition

The RDFFG has completed a number of waste composition studies, namely in 2007, 2013 and 2018. The 2018 study, titled "*2018 Waste Characterization Study Regional District of Fraser-Fort George*," completed by TRI Environmental Consulting Inc., covers the composition of waste generated by residential, commercial, industrial and institutional sources. The study was completed at the FBRL in the City of Prince George, BC.

The waste composition from Single Family Residential curbside sources is summarized in Figure 3.

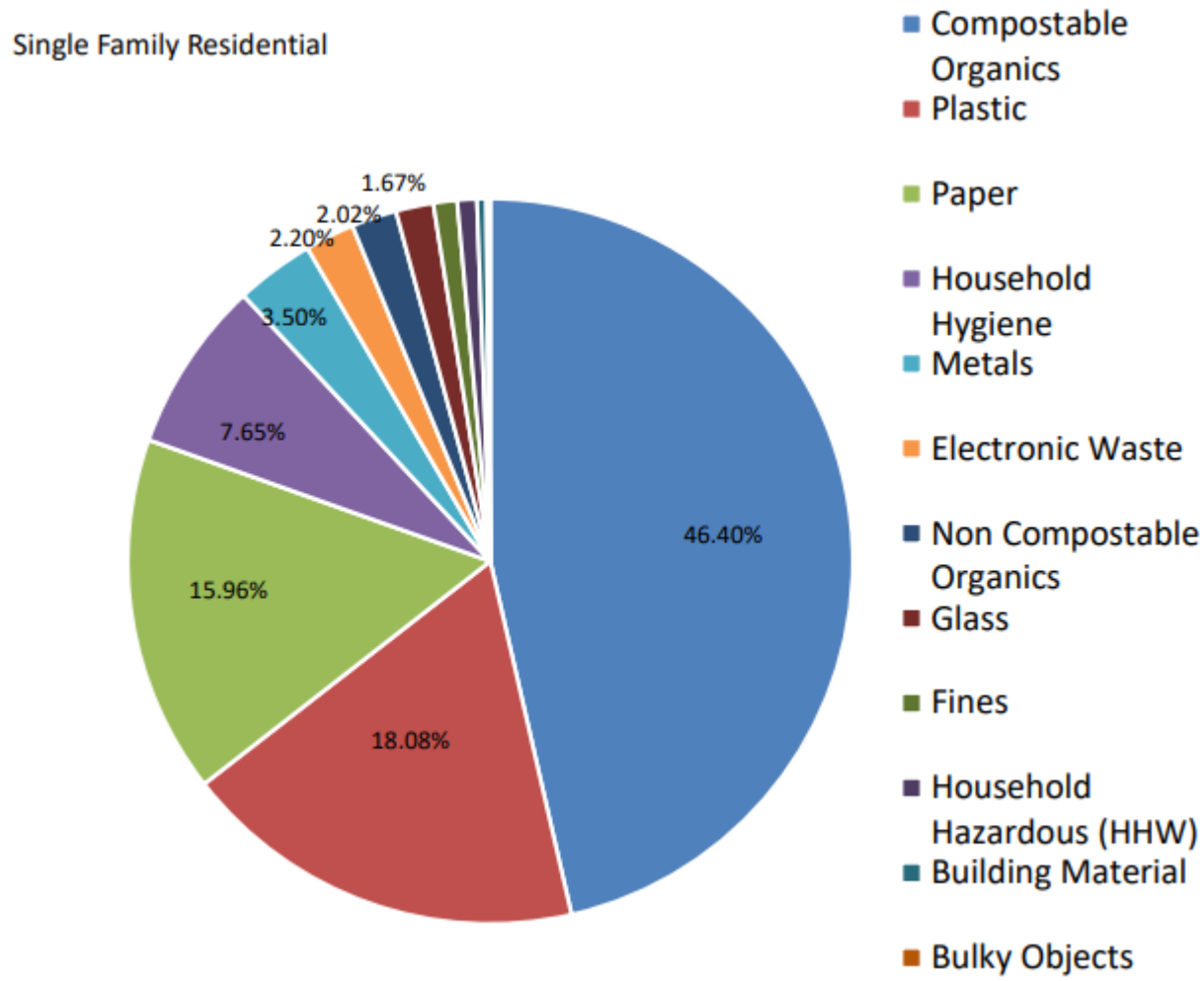


Figure 3: Mean Primary Waste Category Composition of Single Family Residential Sector

The mean primary waste is the average waste documented and averaged for the 20 samples collected by TRI Environmental from the Single Family Residential sector waste source. As shown above, 46.40% of the total waste collected from single family residential sources is compostable organics. The compostable organics fraction is made up of 50.83% Y&G waste, 49.09% food waste, and 0.07% clean wood waste.

Taking the percent of single family residential compostable organics (46.40%) and percent of Y&G waste (50.83%), this brings the composition of Y&G waste from single family residential households to approximately 24% for potential capture in a Y&G curbside collection program.

2.5 Current Costs for Yard and Garden Waste Management and Curbside Collection

2.5.1 Regional District of Fraser-Fort George – Yard and Garden Waste Management Costs

The RDFFG is responsible for processing yard and garden waste at the FBRL Compost Facility, operating the three yard and garden waste drop-off locations within Prince George including transferring yard and garden waste to the FBRL Compost Facility, and operating the Mackenzie and Valemount Regional Transfer Stations, including receiving and chipping self-hauled yard and garden waste on site.

The FBRL Compost Facility annual processing costs between 2017-2021 are summarized in Table 3 below. The average processing cost over the past 5 years has been about $340,000 per year or $50 per tonne material received for processing (includes both yard and garden waste and manure).

Table 8: FBRL Compost Facility Annual Processing Cost

Year	Quantity of Material Received for Processing (YW + manure) (tonnes)	Annual Processing Cost	$/Tonne	Average Processing Cost 2017-2021 ($/Tonne)
2017	6897.9	$355,274	$51.50	$49.50
2018	6154.5	$368,103	$59.81	
2019	7083.5	$313,949	$44.32	
2020	7477.6	$356,033	$47.61	
2021	7040.4	$311,440	$44.24	

The RDFFG sells the finished Class A compost branded as NorGrow. Yearly sales of compost have grown in the past 5 years, as shown in Table 4 below. The compost is sold between $12-15 per m^3, depending on if the material is self-loaded or loaded by RDFFG staff. The sale of NorGrow only partially covers the total costs of producing the compost. Historically, the RDFFG has been challenged with excess compost production where compost production exceeds the demand.

Table 9: NorGrow Volumes Sold by the RDFFG and associated Revenue

Year	Volume Sold (m^3)*	Revenue from Compost Sales
2017	5,868	$78,031.00
2018	5,425	$73,093.00
2019	5,242	$70,889.00
2020	7,363	$98,987.00
2021	7,187	$100,218.00

** Volume discount applied to large amounts purchased (15% to 35% discount)*

The RDFFG contracts out the transportation of yard and garden waste from the three transfer stations located within Prince George to the FBRL composting facility. Yard and garden waste is collected and transported in 30 cubic yard bins. The table below summarizes the yard and garden waste hauling costs for each facility for the past 5 years. In 2021, the RDFFG paid about $60,000 for yard and garden waste hauling within Prince George, with the majority of the hauling costs associated with Vanway and Quinn Street locations.

Table 10: Yard and Garden Waste Hauling Costs from Vanway Regional Transfer Station, Quinn Street Recycling Depot, and FBRL public drop-off area

Transfer Station Facility	Year	Yard and Garden Waste Transported (Tonnes)	Number of Hauls	Total Hauling Cost in Year	Cost Per Haul ($/haul)	Approximate Distance to Compost Facility (FBRL) (km)
Vanway	2017	824.9	261	$24,795	$95	21.0
	2018	742.6	217	$20,615		
	2019	874.6	251	$23,845		
	2020	934.9	287	$27,265		
	2021	955.7	326	$30,970		
Quinn St	2017	1260.4	360	$19,800	$55	12.5
	2018	1210.4	360	$19,800		
	2019	1312.2	346	$19,030		
	2020	1524.6	386	$21,230		
	2021	1443.9	402	$22,110		
Foothills Public Drop-off Area	2017	3386.7	242	$7,502	$31	0.5
	2018	3155.5	242	$7,502		
	2019	3723.0	229	$7,099		
	2020	3919.4	225	$6,975		
	2021	3572.7	223	$6,913		

Costs to manage yard and garden waste at the Mackenzie and Valemount Regional Transfer Stations are primarily associated with the periodic chipping and stockpiling of the material (roughly every three to five years). In Mackenzie, the yard and garden waste chipping costs were $18,342 in June 2019. In Valemount, the yard and garden waste chipping costs were $7,360 and $13,030 in June 2016 and October 2020, respectively.

There is currently no tipping fee applied to Y&G waste accepted at the facilities in the RDFFG.

2.5.2 City of Prince George – Curbside Garbage Collection Costs

The City currently provides curbside garbage collection services to approximately 25,000 households in the City of Prince George using a fleet of six collection vehicles. From 2017 to 2021, the average annual cost to operate the collection vehicles was approximately $613,000 per year. The annual operating costs reported above are direct costs associated with operating the collection fleet including staff labour, maintenance, fuels, and insurance. Administration and supervisory salaries are not included in the annual costs summarized above.

The City added the sixth truck in August 2020 which costed approximately $460,000. It is a single packer truck with a capacity of approximately 30 cubic yards and is equipped with an automated lifting arm.

The City of Prince George also pays tipping fees applicable to the garbage collected from residents. As of January 1, 2022, the tipping fee for disposal at the FBRL was $94 per tonne.

2.5.3 District of Mackenzie – Curbside Garbage Collection Costs

The District of Mackenzie currently uses curbside collection trucks, where one is used for collecting garbage from approximately 1,515 residential households and the other is used for collecting garbage from commercial customers. The annual average operational costs of operating the fleet from 2017 to 2021 was approximately $42,100 per year, not including staffing costs. Actual staff labour costs were not available as part of this Study however it is assumed that staff labour costs would approximately double the annual costs reported above. The truck used for residential curbside collection truck was replaced in 2019.

The District of Mackenzie also pays tipping fees applicable to the garbage collected from residents. As of January 1, 2022, the tipping fee for disposal at the FBRL was $94 per tonne.

2.5.4 Village of McBride – Curbside Garbage Collection Costs

The Village of McBride currently owns two automated curbside collection trucks used for garbage collection. However, only one truck is active for service at any given time. Garbage is picked up 3 times weekly, two out of the three days are for commercial bin pick up and one of the days is for residential pick up at approximately 265 households. The average annual curbside collection cost in McBride over the past 5 years was approximately $19,000 which includes staff labour, truck maintenance, and fuel.

The purchase of a new truck in 2019 cost the Village of McBride approximately $237,000. The capacity of this truck is assumed to be in the 15-20 cubic yard range.

The Village of McBride also pays tipping fees applicable to the garbage collected from residents. As of January 1, 2022, the tipping fee for disposal at the FBRL was $94 per tonne.

2.5.5 Village of Valemount – Curbside Garbage Collection Costs

The Village of Valemount currently owns two automated curbside collection trucks, where only one truck collects garbage, servicing approximately 510 residential households and commercial spaces. The yearly average operational costs of the trucks from 2017 to 2021 was approximately $18,000 per year, not including collection staff wages. Actual staff labour costs were not available as part of this Study however it is assumed that staff labour costs would at least double the annual costs reported above.

A new truck was recently ordered by the Village of Valemount with a cost of approximately $150,000 and capacity of approximately 16 cubic yards.

The Village of Valemount also pays tipping fees applicable to the garbage collected from residents. As of January 1, 2022, the tipping fee for disposal at the FBRL was $94 per tonne.

3. SEASONAL CURBSIDE COLLECTION OF YARD AND GARDEN WASTE

3.1 Potential Yard and Garden Waste Collection Quantities

The potential yard and garden waste quantities that can be expected from a seasonal curbside yard and garden waste collection service were estimated using two methods: 1) based on the 2018 residential waste audit data from Prince George and 2) based on typical yard and garden collection rates reported from other communities in BC providing curbside yard and garden waste collection services.

3.1.1 Based on Waste Audit Data

The 2018 Waste Characterization Study involved assessing samples taken between June 11 and 22, 2018. Based on the 2018 waste audit of single family residential waste in Prince George, it is estimated that yard and garden waste makes up 24% of the residential waste stream (as summarized in Section 2.4). Based on an assumed 685 kg/household MSW curbside collection rate ("A Feasibility Study on Enhancing Waste Diversion from the Residential Curbside Solid Waste Stream in the City of Prince George" study, RDFFG), a 75% yard and garden waste capture rate (a realistic set-out rate based on MH's experience with other similarly sized municipalities), and the number of households presented in Table 11, the potential annual yard and garden waste collection from a seasonal collection service is summarized in Table 11 below. Since both Mackenzie and Valemount offer a self-haul collection service for yard and garden waste (existing yard and garden waste diversion in place), applying the City of Prince George's waste audit data for estimating potential yard and garden waste quantities available in the current waste stream is considered reasonable. Since McBride currently does not offer any yard and garden waste diversion services, applying Prince George's waste composition data may be underestimating the actual quantity of yard and garden waste available for diversion.

Table 11: Potential Annual Y&G Waste Collection Estimated with Waste Audit Data

Municipality	Number of Households	MSW Generation Rate (Kg/Household of MSW)	Total Yard and Garden Waste in Residential Waste Stream Assuming 24% Composition	Total Potential Collection Assuming 75% Capture Rate (Tonnes)
City of Prince George	25,000	685	4,110.00	3,080
District of Mackenzie	1,515		249.07	190
Village of Valemount	510		83.84	63
Village of McBride	265		43.57	33
			Total	**3,366**

3.1.2 Based on Typical Yard and Garden Waste Capture Rates from Comparable BC Communities

MH reviewed the curbside collection rates from other communities in BC currently providing seasonal yard and garden waste collection services or comingled food and yard and garden waste collection services. The communities that were reviewed included the Regional District of Central Okanagan, the City of Terrace, the District of Saanich, the City of Port Coquitlam, and the District of Kitimat. The estimated yard and garden waste collection rates range from approximately 130 kg/household/year to 260 kg/household/year. On the lower end of the spectrum, the District of Kitimat's seasonal yard and garden waste collection rate is estimated to be 130 kg/household/year, adjusted based on the number of households participating in the seasonal collection service. Communities on the higher end of the spectrum, such as the City of Port Coquitlam, have well established comingled organics collection programs and are generally located in southern BC in areas with longer growing seasons and where the collection program is offered throughout the entire year. It should be noted that the 260 kg/household/year reported above is the assumed portion of the co-mingled organics stream that is yard and garden waste. In addition, typical organics capture rate exceeding 250 kg per household per year is reported in a study by the Ministry of Environment and Climate and Change (Best Management Practices for Curbside Collection of Residential Organic Waste).

The actual yard and garden waste collection rate depends on a number of factors including the maturity of the program, participation rates, and the collection period (seasonal vs. throughout the entire year). For the purposes of this Study, a yard and garden waste collection rate of 150 kg per household per year was used[1]. This aligns with the District of Kitimat's reported seasonal yard and garden waste collection rate which is considered the most comparable community to the RDFFG member municipalities (of the communities reviewed) due to the location in northern BC and the seasonal yard and garden waste collection service. The District of Kitimat only recently implemented a seasonal bi-weekly yard and garden waste collection service and weekly curbside food waste collection service, and the reported yard and garden waste collection rate is based on one year of data only.

The potential annual yard and garden waste collection quantities from a seasonal collection service, based on a 150 kg per household per year collection rate and number of households in each community, is summarized in Table 12 below.

[1] A collection rate of 200 kg per household was also considered as part of a sensitivity analysis on operating costs and impacts to current MSW tipping fee revenue.

Table 12: Potential Annual Y&G Waste Collection with 150 kg/HH Yard and Garden Waste Capture Rates

Municipality	Number of Households	Capture Rate (kg/household)	Total Capture (tonnes)
City of Prince George	25,000	150	3,750
District of Mackenzie	1,515		228
Village of Valemount	510		77
Village of McBride	265		40
		Total	**4,095**

3.1.3 Summary of Potential Yard and Garden Waste Collection Tonnages

The estimates above indicate that the total potential yard and garden waste collection ranges from approximately 3,400 to 4,100 tonnes per year[2].

The yard and garden waste estimates are annual average tonnages. However, yard and garden waste generation rates vary significantly over the course of the year. Figure 4 shows the magnitude of this variation, which generally shows that the highest yard and garden waste generation occurs in the spring and summer months. Yard and garden waste quantities can also vary from year to year within the same area. These fluctuations can be attributed primarily to climactic changes that affect grass and tree growth rates, including variations in temperature, hours of sunlight, and precipitation.

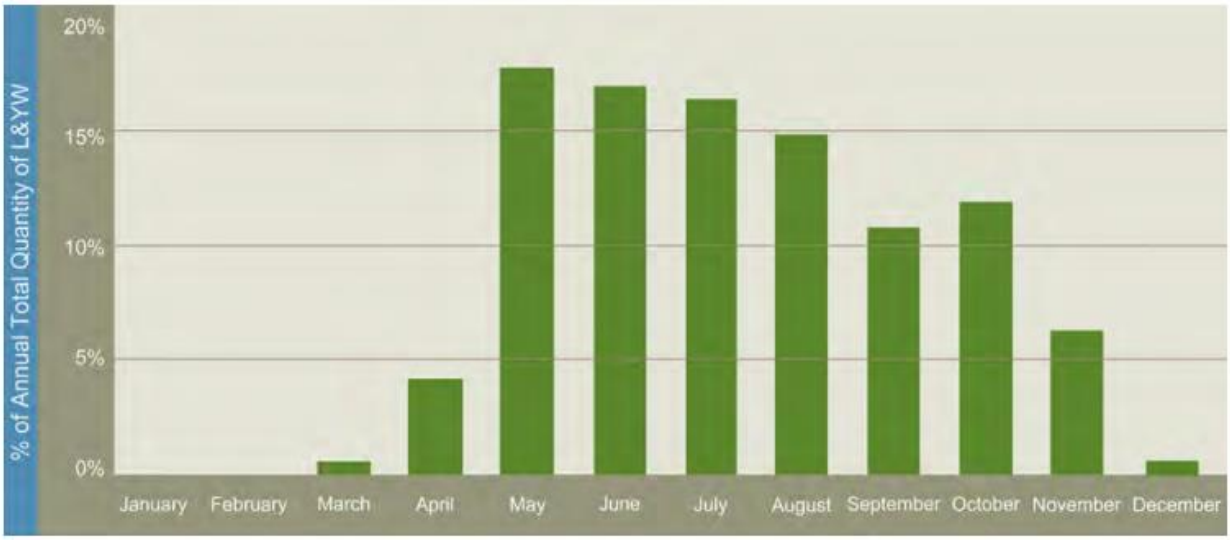


Figure 4: Typical Monthly Variation in Y&G Waste Quantities, Environment Canada

[2] Note a collection rate of 200 kg per household was also considered as part of a sensitivity analysis on operating costs and impacts to current MSW tipping fee revenue.

Green wood can be generated from gardening and landscaping, tree care, and overhead utility line clearing. Tree diseases and insect infestations (e.g., Dutch elm disease and pine bark beetle) can also affect the quantity of greenwood waste generated and requiring processing.

When designing a curbside organics collection and processing program, the monthly variations in tonnages and peaking factors must be considered.

3.1.4 Impacts to Tonnages at Existing Drop-Off Facilities

With the implementation of seasonal curbside yard and garden waste collection, the quantity of self-hauled yard and garden waste received at existing drop off facilities from residents can be expected to decrease. Table 13 summarizes the estimated change in yard and garden waste tonnages received at existing drop off facilities in Prince George. A transition period can be expected as residents become familiar with the new curbside collection program and participation increases. This estimate assumes that 70% of the yard and garden waste received at the Quinn Street Regional Recycling Depot and Vanway Regional Transfer Station is from residents and 46% of the yard and garden waste received at the FBRL public drop-off area is from residents, as explained in Section 2.2 above. In addition, it is assumed that 75% of the total residential yard and garden waste (currently received at the drop-off facilities) will be diverted to the seasonal curbside collection program, and the remaining 25% will continue to be received at the facilities. This 75% capture rate is used to account for the portion of residents who continue to self-haul yard and garden waste to the drop-off facilities even after the implementation of a seasonal curbside collection program. To develop these estimates, we have assumed that the Quinn Street Regional Recycling Depot and Vanway Regional Transfer Station will continue to accept yard and garden waste. However, it is understood that the long-term plans for these facilities, particularly the Quinn Street Regional Recycling Depot, have not been determined. The option to stop accepting yard and garden waste at these drop-off locations with the implementation of seasonal curbside collection is discussed in Section 4.3.1.

Table 13: Estimated Change in Yard and Garden Waste Quantities received at Foothills, Vanway and Quinn St Transfer Stations with the Implementation of Curbside Collection

Facility	Current Residential Yard and Garden Waste Received in 2021 (tonnes)	Quantity Captured in Curbside Collection Program (tonnes)	Remaining Quantity Collected at Facilities (tonnes)
Vanway	669	502	167
Quinn St	1,011	758	253
Foothills	1,643	1,233	411

As shown in Table 13 above, it is estimated that the quantity of yard and garden waste accepted at existing drop off facilities within Prince George could decrease by approximately 2,500 tonnes per year. Consequently, with more material captured through a curbside collection program, there will be a decrease in the number of hauls from the transfer stations. Table 14 below shows the estimated decrease in the number of yard and garden waste hauls from the transfer stations. Costs associated with the decreased number of hauls are discussed in Section 5.2.

Table 14: Decreased Number of Hauls from Transfer Stations in the Prince George Region

Facility	Decrease in Yard and Garden Waste Received (tonnes)	Decrease in Number of Hauls
Vanway	502	154
Quinn St	758	208
Foothills	1,233	80

It is difficult to predict the impacts to the current self-hauled yard and garden waste tonnages in Mackenzie and Valemount since there is no reliable data on existing tonnages, however the overall self-hauled tonnages can generally be expected to decrease with the implementation of a seasonal yard and garden waste collection program.

3.1.5 Impacts to Landfill Tonnages

With the implementation of seasonal yard and garden waste collection and additional yard and garden waste diversion from landfill, the quantity of MSW landfilled can be expected to decrease proportional to the quantity of additional yard and garden waste diverted.

For these estimates, it is assumed that the RDFFG will not introduce a tipping fee for Y&G waste as a cost recovery mechanism (refer to Section 5.4.1). However, with the RDFFG planning on updating the regional solid waste management plan (RSWMP) in the coming years, the introduction of a tipping fee on Y&G should be considered. Several other regional districts in BC have implemented yard and garden waste tipping fees as discussed in Section 5.4.1. A tipping fee applied to Y&G waste may have an impact on the additional yard and garden waste diversion and impact to MSW landfilled – these potential impacts were not considered in the quantities presented in this section.

Table 15 below shows the potential reduced MSW tonnage entering the landfill with higher Y&G waste collection. The potential MSW landfill reduction is shown in the last column in the table.

Table 15: Potential Reduced Landfill Quantities

Municipality	Total MSW Generated (Tonnes/ Household)	Total Yard and Garden Waste in Residential Waste Stream Assuming 24% Composition (Tonnes)	Total Additional Yard and Garden Waste Diversion Assuming 75% Capture Rate/ Reduced MSW Landfill Quantity (Tonnes)
City of Prince George	17,125	4,110	3,083
District of Mackenzie	1,038	249	187
Village of Valemount	349	84	63
Village of McBride	182	44	33

The financial impacts due to the decreased landfill tonnages are further discussed in Section 5.4.1.

3.2 Curbside Collection Infrastructure Requirements

As summarized in Section 2.3, all member municipalities currently offer curbside collection of garbage. This section presents the required infrastructure to support a seasonal yard and garden waste collection program, considering the current curbside collection program provided in each municipality.

The following assumptions were made in developing the seasonal yard and garden waste collection options:

- Seasonal yard and garden waste collection will be offered to all residential households currently offered garbage collection services (number of households summarized in Table 12 above). Some communities in Canada offer a subscription based curbside organics collection program. Other communities have implemented curbside organics programs in a phased approach, with an initial pilot phase. For this Study, it was assumed that the program would be fully implemented and offered to all single-family residential households.
- Seasonal yard and garden waste collection will occur between April and October on a bi-weekly collection frequency. In Prince George, half of the households would receive the yard and garden waste collection service in the first week and the other half would receive the collection service in the second week. In Mackenzie, Valemount, and McBride, bi-weekly collection of all households would occur in the same week.
- It is assumed that a seasonal yard and garden waste collection service would be delivered by in-house staff in each member municipality, similar to the current garbage collection service. There are operational efficiencies that can likely be realized with having the same collection crew and equipment responsible for both garbage and yard and garden waste collection.

3.2.1 Collection Trucks

As summarized in Section 2.1, all member municipalities currently have their own fleet of collection vehicles used for curbside garbage collection. The City of Prince George has an active fleet of six trucks, the District of Mackenzie has an active fleet of two trucks, and the Village of Valemount and McBride both have an active fleet of one truck. Automated garbage collection has been implemented in all member municipalities.

In general, the type of collection truck is determined by the collection method (automated vs. manual) as well as the capacity required. The number of collection trucks can be estimated based on the capacity of the trucks and the overall productivity of the collection staff considering the duration of each collection stop and the overall households serviced by one truck in one day. There are several variables which impact the number of households that can be serviced in a day including the collection method, the complexity of the collection route (distance between

collection points and access to collection points), staff productivity, and the location of the final transfer location.

The current garbage collection schedule in the member municipalities was reviewed to assess the collection productivity and determine the number of trucks required for a seasonal yard and garden waste collection program. The following assumptions were made:

- **Prince George**
  - Collection Method: Automated
  - Current Truck Capacity: 22 m^3/9.5 tonnes (smaller trucks with 5.5 tonne capacity)
  - Current Active Fleet Size: 6 trucks
    - 2014 Peterbilt Garbage Truck x 3
    - 2015 Peterbilt Garbage Truck x 2
    - 2021 Mack Labrie G/Packer
  - Collection Schedule/Frequency and Productivity:
    - Weekly pick up for all households over 5 days
    - 830 households per day per truck
- **Mackenzie**
  - Collection method: Automated
  - Current Truck Capacity: 12-14 m^3
  - Current Active Fleet Size: 2 trucks
    - 2020 International (Residential)
    - 2007 International (Commercial)
  - Collection Schedule/Frequency and Productivity:
    - Weekly pick up for all households over 2 days
    - 750 households per day per truck (for residential)
- **Valemount**
  - Collection Method: Automated
  - Current Truck Capacity: 12 m^3
  - Current Active Fleet Size: 1 truck
    - 2013 M1600 Haul All (Note: One backup truck to be replaced in October 2022)
  - Collection Schedule/Frequency and Productivity
    - Weekly pick up for all households over 1 day
    - 513 households per day per truck (for residential)
- **McBride**
  - Collection method: Automated
  - Current truck capacity: 12-14 m^3
  - Current Active Fleet Size: 1 truck
    - Rollins Machinery Freightliner (Note: One backup truck)

- Collection Schedule/Frequency and Productivity
  - Weekly pick up for all households over 1 day
  - 266 households per day per truck (for residential)

Based on the data above, the current collection fleet appears to be fully utilized in Prince George whereas in Mackenzie, Valemount, and McBride, the active fleet only operates one to two days per week. For Prince George, additional collection trucks will be required. However, in Mackenzie, Valemount, and McBride it is assumed that the existing trucks could be used to collect yard and garden waste since they are currently only used one to two times per week. In addition, these three municipalities have a backup truck in their current fleet which could potentially be used for curbside yard and garden waste collection.

For a bi-weekly collection service, it is estimated that the City of Prince George will require a minimum of three additional trucks (with similar capacity of current vehicles), based on the current number of households and assumed collection productivity (summarized above). Half of the households would be serviced in the first week, and the other half of the households would be serviced in the second week. Mackenzie, Valemount, and McBride will not require additional collection trucks and it is assumed the current collection fleet can be used for yard and garden waste collection (collected on a bi-weekly basis). Minor modifications to the existing trucks may be required to accommodate new yard and garden waste carts.

The number of trucks required in Prince George was primarily determined based on the constraint of collection time per household and the available collection time per day (based on existing information on current garbage collection). Payload constraints specific to yard and garden waste were also considered in the analysis. MH recommends a detailed analysis of resource requirements be completed as part of implementation planning, with consideration to the future population growth and development in Prince George. The City of Prince George will need to validate the collection time per household with further operational field data and also consider the need for a backup (spare) truck to ensure service flexibility and coverage in the event of breakdowns.

3.2.2 Staffing Requirements

With the new yard and garden waste collection service delivered using in-house collection crews, there will be an increase in staff hours.

The City of Prince George will require the largest increase in staff resources, with three additional trucks requiring three new operators. It is assumed that the current garbage collection staff are fully utilized as garbage is currently being collected five days a week, every week. With a seasonal yard and garden waste collection service operating on a bi-weekly basis, it is estimated that three additional seasonal staff (temporary or full time) will be required to provide the bi-weekly collection service over approximately seven months from April to October.

The District of Mackenzie will require staff to collect yard and garden waste over two days, on a bi-weekly basis. Currently, garbage is collected over two days on a weekly basis. Therefore, it is assumed that the same collection staff are not fully utilized and could be used for the bi-weekly yard and garden waste collection service.

The Village of Valemount and Village and McBride will need to increase the staffing hours to include one additional day for collecting Y&G waste from residents on a bi-weekly basis.

For Mackenzie, Valemount and McBride, it is assumed that the existing collection vehicles can be used for yard and garden waste collection however it can be expected that some additional cleaning will be required after MSW curbside collection days.

3.2.3 Collection Method

All member municipalities are currently collecting garbage using an automated method with standard cart sizes. For the potential new collection options, it is assumed that yard and garden waste will also be collected using an automated method with standard cart sizes. This section presents some operational and financial considerations associated with manual and semi-automated collection methods.

Manual Collection

In a manual collection system, the collector leaves the truck's cab to lift and empty the containers into the truck hopper. Curbside collection containers tend to be smaller and less expensive and are often available at local retail stores. For residential yard and garden waste, best practice is to use Kraft bags or 80-120 litre containers (likely similar in size to the maximum garbage container size). Manual collection has the lowest upfront capital costs compared to an automated cart-based system, however operating costs may be higher due to additional staff time during collection.

Cart-Based Automated Collection

Many local governments and private sector collectors have switched recently to automated cart-based collection. For automated collection, the operator stays in the cab and has no direct contact with the cart or its contents. A mechanical arm on the side of the collection vehicle reaches out, grasps, lifts, and empties the collection cart. This switch from manual to automated collection is often precipitated by a desire to reduce worker injuries, retain an aging workforce, increase the size of labour pool for waste collection and create opportunities to diversify the workforce. Other benefits of automated collection include lower operating costs per household (due to shorter collection time), improved data gathering through RFID tags, and simpler containers for collection staff to manage. Some of the key barriers with automated collection are the upfront capital costs of the containers (approximately $100 for a 240 L cart), the space required for maintenance and storage of the carts, and the training and staff resources required for implementing a cart-based collection system.

Semi-Automated Collection

With semi-automated collection, the truck does not have a mechanical lift arm. Though the carts are the same as those used in an automated program, the collector needs to exit the truck cab and manually position the cart at the tipper mechanism to be lifted and emptied. The collector then replaces the cart and re-enters the truck.

3.2.4 Containers and Carts

Automated collection carts range in size and capacity from 80 to 360 litres. Automated collection programs taking yard and garden waste typically use larger sized carts. Based on the estimated collection quantities and the container sizes currently used by member municipalities, it is assumed that a single-size 240 L cart will be used for seasonal yard and garden waste collection. In order to differentiate between the MSW and Y&G carts, a different colour theme for Y&G waste can be used (usually green in most municipalities).

Carts would be owned by the member municipality and loaned to participating households, assuming the yard and garden waste collection service is delivered in-house. Some municipalities use RFID and GPS technology to assign a cart to a specific property.

Figure 5: MSW Carts in Prince George

3.2.5 Other Supporting Infrastructure and Public Education Considerations

Additional space will be required to store the new collection vehicles (for Prince George only). The new collection carts will also need to be temporarily stored before implementation of the collection program.

Education will be an important service for all municipalities to provide to residents who are participating in the Y&G curbside collection services. A large part of education is helping residents understand what is acceptable and what is considered contamination when placing material in the Y&G bins. Contamination would include food waste in the Y&G bin (e.g., fruits and leftover foods). Any contamination will impact the composting process and may result in material having to be disposed in the landfill, defeating the purpose of collecting and processing Y&G waste. Education will require continual efforts from all municipalities before and during the Y&G waste curbside collection program implementation.

In addition to the ongoing education efforts from member municipalities, enforcement (which may include load checking) will be the responsibility of the collectors (member municipalities). Education is often most effective when enforcement is happening concurrently. The Regional

District would have limited ability to check the loads entering the facilities for any contamination and determine the source of the contamination. Thus, enforcement efforts are considered to be most effective at the front end when the Y&G waste is collected.

4. PROCESSING OPTIONS

4.1 Ministry of Environment and Climate Change Strategy & Organic Matter Recycling Regulation (OMRR)

The Organic Matter Recycling Regulation (OMRR) was enacted in 2002 under the authority of Environmental Management Act (EMA) and the Health Act.

The following two activities are regulated in BC by the OMRR guidelines:

- The production, distribution, sale storage, use and land application of biosolids and compost.
- The construction and operation of composting facilities.

Residuals regulated under the OMRR are classified according to quality and process criteria as follows:

- Class A biosolids
- Class B biosolids
- Class A compost
- Class B compost
- Biosolids growing medium (BGM)

Class A biosolids, Class B biosolids and Class B compost are considered as managed organic matter. Class A compost and BGM are considered retail grade organic matter.

Class A compost, as outlined in the OMRR guidelines, is divided in two categories:

- Compost produced solely from untreated and unprocessed wood waste and yard and garden waste
- Compost produced from another feedstock, such as farm animal manure

The FBRL compost facility accepts both Y&G waste and animal manure, following the requirements of pathogen reduction processes, pathogen reduction limits and quality criteria as set in OMRR guideline.

For the case of the compost operations at the FBRL, the compost facility follows the OMRR guidelines to manage specific requirements. The Foothills Boulevard Regional Landfill's compost facility produces Class A compost, enabling the compost produced at the facility to be sold as retail grade organic matter. Class A compost may be distributed without restriction and without a Land Application Plan (LAP).

The compost facility at the FBRL is designed and operated to process Y&G waste and animal manure feedstocks. Introducing a curbside collection program that collects Y&G waste only would be consistent with the material currently being collected and would be compatible with the existing composting technology at the FBRL compost facility. Collecting additional organic materials such as food waste would require a change to the composting technology and overall process – this was not considered as part of this Study.

4.2 Desired End-Product Use and Quality Requirements

Figure 6 below is a simplified diagram that shows three primary considerations of producing compost with potential end uses.

Figure 6: Process, Quality and End-Use Compost Flow Chart

The desired end-use of the compost may vary from municipality to municipality. Some potential end-uses of the compost includes, but is not limited to, gardening, landscaping, erosion control media, farming uses or for landfill closure/reclamation/biocover.

Once the desired end-use is determined, the compost quality requirements can be confirmed.

Class A compost requires the most amount of operational resources and capital to meet the process and quality requirements, such as adhering to sampling, analysis, record-keeping requirements, and meeting pathogen reduction limits established under OMRR. Class A compost may be distributed without restriction.

Class B compost would require similar protocols to what is outlined for Class A but may not achieve as high quality due to less stringent quality criteria including metals and pathogen reduction limits. Class B compost has restrictions around distribution and has more limited uses. Class B compost is often associated with a compost process including biosolids as a feedstock.

The production of Class A and B compost must follow guidelines and requirements set out under OMRR related to grinding, mixing, blending, and screening before performing any routine monitoring, mixing and quality sampling. This is required to demonstrate that the quality meets OMRR standards.

Generally, the higher the quality, the higher the operational and initial capital costs required to have an operation that can produce such quality. For example, Class A compost would likely cost more to produce than Class B. Whereas, chipped wood would be considered the lowest

quality with the least amount of potential end-uses and markets, but would also cost the least to produce.

Therefore, identifying the end-use is a crucial first step for each municipality to determine the required compost quality and processing requirements.

4.3 Summary of Processing Options

The following yard and garden waste processing options were considered:

1. Yard and garden waste collected from all member municipalities will be processed at the FBRL Compost Facility
2. Yard and garden waste collected in Prince George will be processed at the FBRL Compost Facility and local processing operations in Mackenzie and Valemount will be improved.

In Option 1, yard and garden waste collected in all member municipalities would be processed at the FBRL Compost Facility. In Prince George, yard and garden waste collected as part of a seasonal curbside collection program would be directly hauled to the FBRL Compost Facility by the curbside collection vehicles. In Mackenzie, Valemount, and McBride, the collected yard and garden waste would be transferred into roll-off bins at the transfer station in each community, then hauled to the FBRL Compost Facility for processing.

In Option 2, yard and garden waste collected in Prince George would be processed at the FBRL Compost Facility and yard and garden waste collected in Mackenzie and Valemount would be processed within the community, with some improvements to the current operations. This option is similar to the status quo, with improvements to the current processing operations in Mackenzie and Valemount to improve the quality of the end product.

These two options are discussed in the following sections.

4.3.1 Option 1 – All Processing at FBRL Compost Facility

As summarized in Section 2.3, the FBRL Compost Facility is a well-established operation that has the infrastructure and procedures in place to produce a Class A compost. This option takes advantage of the economies of scale associated with processing all yard and garden waste at a centralized location. Yard and garden waste received from curbside collection vehicles from Prince George, and from bins hauled from Mackenzie, Valemount, and McBride, would be chipped and combined with the manure and composted using the current turned windrow composting process. Based on the additional tonnages presented in Section 2.5, it is likely that at least one additional windrow will be required in an expanded area.

The 2010 memorandum "*Compost Marketing Survey and Operations Review*" identifies adding one to three windrows as options to increase the processing capacity by 35 to 90%, however these options will require the brush stockpile at the eastern entrance to be removed or reduced in size and would also reduce the maneuvering room for equipment. The paved area is constrained by the landfill to the south, a buffer between Foothills Boulevard to the north, and

surface water detention ponds to the west. There is currently an overflow storage area being used off the pad at the northwest side of the facility to store piles of mature screened product only. This area is currently unpaved and may need to be expanded with the additional facility input. This area should be assessed for suitability and expanded to ensure an impermeable surface and adequate collection and storage of leachate/runoff from the finished compost as well as curbs or berms to prevent contact with clean surface runoff. The estimated expansion costs are $500,000 which includes minor regrading, paving (asphalt and subbase), and storm water management upgrades required to expand the process in an area of approximately 7,500 m^2. Section 5 includes a cost estimate for a 7,500 m^2 expansion of this finished compost storage area to provide additional processing capacity.

With all processing completed at FBRL compost facility, there is opportunity to backhaul Class A compost to member municipalities in the roll-off bins used to haul Y&G waste. This will increase access to Class A Compost available for use by residential and commercial gardeners in member municipalities.

Assuming the Y&G waste is collected in 50 cubic yard roll-off bins in Mackenzie, McBride and Valemount, the estimated number of hauls are provided in the table below, based on a capture rate of 150 kg per household per year.

Table 16: Number of Annual Hauls from Municipalities

Municipality	Approximate Annual Quantity (Tonnes) (Based on 150 kg/hh Capture Rate)	Number of Hauls per Year	Cost of Annual Hauling Borne by RDFFG
Mackenzie	227	29	$33,000
McBride	40	5	$0*
Valemount	77	10	$20,900**

*All McBride hauls are transported to Valemount.
**Cost of hauling for Valemount includes McBride's

4.3.2 Option 2 – Improvements to Local Yard and Garden Waste Processing

Under Option 2, yard waste collected in Prince George would be processed at the FBRL compost facility as summarized in Option 1. However, yard waste collected in Mackenzie, Valemount, and McBride would be processed locally. It is assumed that any yard waste collected in McBride would be transferred to Valemount for processing.

As summarized in Section 2.3, yard and garden waste currently received in Mackenzie and Valemount is currently stockpiled and chipped on the landfill and placed in a static pile. The material is eventually used as erosion control media for landfill closure projects. While the finished material has a beneficial end-use, it would not be considered compost under OMRR. OMRR defines compost as:

- A stabilized earthy matter having the properties and structure of humus,

- Beneficial to plant growth when used as a soil amendment,
- Produced by composting, and
- Only derived from organic matter.

Furthermore, to be considered composting, specific time and temperature requirements must be met, as outlined in Schedule 1 of OMRR.

This option focuses on identifying operational measures that could be implemented to improve the quality of the end product, considering the desired end use of the material. It is recognized that any significant modifications or upgrades to the current process would be cost prohibitive therefore this section focuses on operational measures that can be taken at the facilities using the existing infrastructure.

4.3.3 Summary of Processing Considerations

In general, increasing the quality of the finished material requires more staff time and resources which increases the cost per tonne. Therefore, it is important to identify the desired end use of the material before investing resources into producing the material. Currently the processed material is used as erosion control media for landfill closure projects and the level of processing is sufficient for that purpose. However, there may be an incentive to improve the quality of the finished material if higher end uses are identified, such as use as topsoil or as part of a biocover for landfill closure projects. The financial viability of organic waste processing may improve if other organic materials are identified that can be co-processed with the yard and garden waste, such as biosolids or septage. Another key consideration when looking at local small scale composting is the overall supply of compost in the region. Historically, the RDFFG has produced excess compost material produced at the FBRL compost facility. The costs of hauling the finished compost to the member municipalities should be weighed against the costs to establish local organics processing capacity.

It is estimated that approximately 200 tonnes per year of yard and garden waste could be available in the District of Mackenzie and 70 tonnes per year of yard and garden waste could be available in the Village of Valemount through a seasonal curbside collection program. It is important to recognize the potential scale of the local processing and/or composting as many composting technologies are not economically feasible at quantities below 1,000 tonnes per year. For reference, the compost facility at the FBRL uses a turned windrow composting process and processes approximately 6,000 tonnes of yard and garden waste per year.

Assuming a higher end use is identified, the following operational improvements have been considered under this option to improve the current static pile process:

- Improvements to feedstock mixing by focusing on optimizing the initial carbon to nitrogen ratio and porosity of the material. This may include combining grass and wood chips and spending more time mixing the material before placing in piles.
- Weekly monitoring of the compost pile for oxygen and temperature, and additional mixing to aerate the pile as needed.

Static pile composting has typically been used to process yard and garden waste, including leaves, brush and wood residuals. This method of composting is the simplest and least

expensive option available. It is generally only appropriate when there is an abundance of space available.

An alternative to the current static pile processing method that may be suitable for the quantities of yard and garden waste in Mackenzie and Valemount is to compost yard and garden waste material contained in bunkers. This is a simple composting method well-suited to smaller feedstock quantities of yard and garden waste, however, has higher capital costs than the static pile method as a structure is required. The bunkers can be constructed from cast-in-place concrete, concrete lock-blocks, modular concrete barriers. The bunkers can be located outdoors, covered by a simple roof structure, or contained within a building. This technology is suited for garden and yard waste but not for food waste processing.

Another relatively simple composting system for processing yard and garden waste is windrow composting (currently being used at the FBRL) which involves the feedstocks being formed into long, low piles known as windrows. Windrows are typically 1.5m to 3.5 m high and 3m to 6m wide. The windrows are regularly moved or turned to re-establish porosity, break up and blend the material. Based on the quantity of feedstock that could be available in Mackenzie and Valemount, this technology is not considered feasible at this time, unless additional feedstock can be obtained to improve economies of scale.

Actively aerated composting systems which use active/forced aeration were not considered as local processing options due to the quantity of feedstock available. However, there are examples of smaller scale static containers and rotating drum technologies being used in BC.

For example, an organization on Salt Spring Island recently purchased a rotating-drum composting system which is reported to be able to produce approximately 100 tonnes of compost per year. The facility will reportedly accept organic material from the island's farmer co-operative abattoir, community gardens and food businesses such as grocers and restaurants. The organization received $170,000 in provincial funding[3] and the project is reported to be a $310,000[4] project.

Any consideration for on-site composting at either the Mackenzie Select Landfill site or the Valemount Regional Transfer Station would require further investigation to determine if the location is viable, funding models, cost projections and operational requirements.

4.4 Impacts to RDFFG Facility Operations

Either of the options mentioned above will impact the RDFFG's current facility operations due to the increase in Y&G waste collected. A summary of the cost impacts borne by the Regional District of Fraser-Fort George and schedule considerations are summarized below. Detailed dollar amounts are discussed in Section 5.

[3] https://news.gov.bc.ca/releases/2023ENV0006-000126
[4] https://www.timescolonist.com/local-news/large-scale-composting-coming-to-salt-spring-6488356

For Option 1 – All Processing at FBRL Compost Facility:

- The majority of the upgrade costs will be associated with constructing a new compost pad at the FBRL compost facility to accommodate additional tonnages of Y&G waste. The current compost pad is near full capacity and would need to be expanded.
- Expanding the FBRL compost facility to accept additional yard and garden waste quantities will require time for the RDFFG to implement. An expanded compost pad will require time for the RDFFG to procure services related to design, tender and construction. A realistic completion date for the new pad is spring or summer 2025, depending on the priorities of the RDFFG.
- Hauling costs from member municipalities will increase (except for the City of Prince since Y&G waste will be collected from curbside collection vehicles and brought directly to the FBRL). Additional Y&G waste collected at the Mackenzie, McBride and Valemount transfer stations will increase the number of hauls from those municipalities to the FBRL.

For Option 2 – Improvements to Local Yard and Garden Waste Processing:

- Upgrades will be in member municipalities at Regional District owned transfer stations and landfills, namely the Mackenzie Regional Select Waste Landfill, Valemount Regional Transfer Station, McBride Regional Transfer Station. The FBRL compost facility will still need to be expanded to accommodate additional Y&G waste quantities from Prince George. The upgrades to each site are further discussed in Section 5 below.
- Similar to Option 1, the upgrades at the RDFFG sites will require time to procure, design, and construct. This would include upgrades to the FBRL compost facility and facility improvements in Mackenzie, Valemount and McBride. A realistic completion date for the new infrastructure is spring or summer 2025, depending on the priorities of the RDFFG. Managing construction at the four sites will require a significant amount of effort and resources from the RDFFG.
- Hauling costs will likely not change substantially. Most of the costs will be related to upgrading the sites and providing additional staffing for each of the facilities in order to improve the current yard and garden waste processing method.

5. FINANCIAL CONSIDERATIONS

5.1 Summary of Options and Costs

As presented in Section 4.1, two yard and garden waste processing scenarios were assessed as part of this Study:

Option 1: All processing at FBRL compost facility

Option 2: Some processing at FBRL compost facility, with improvements to local yard and garden waste processing in member municipalities

This section provides a summary of the estimated capital and operating costs associated with implementing seasonal curbside yard and garden waste collection with the two processing options. Generally, municipalities will be responsible for curbside collection costs whereas the RDFFG will be responsible for hauling from respective Regional Transfer Stations and processing costs. A summary of the additional costs is provided in Table 17 below.

Table 17: Summary of Additional Costs for Member Municipalities and RDFFG

	Member Municipalities (curbside collection)	RDFFG (hauling and processing)
Capital Costs	▪ New or modified collection vehicles ▪ New collection containers (carts)	▪ Upgrades to the FBRL compost facility ▪ Transfer station modifications (Option 1 only)
Operating Costs	▪ Annual costs associated with curbside collection vehicles (vehicle maintenance, fuel, supplies, etc.) ▪ Staffing costs (either seasonal part-time or full time) ▪ Continued education for Y&G curbside collection	▪ Staffing costs (either seasonal part-time or full time) for all facilities affected (FBRL and transfer stations at Mackenzie, McBride and Valemount) ▪ Additional processing costs at FBRL compost facility ▪ Transfer/hauling costs of Y&G waste bins to FBRL from other member municipalities (Mackenzie, Valemount and McBride) (Option 1 only)

Capital and operating costs are presented separately based on the costs borne by member municipalities (primarily related to curbside collection) and costs borne by the RDFFG (primarily related to hauling and processing).

For both processing options, it is assumed that all municipalities will implement seasonal collection of Y&G waste.

The following assumptions were made for developing the capital and operating cost estimates presented in this section:

- All costs are presented in 2022 dollars. An inflation/escalation factor of 15% was applied to the estimated unit rates, assuming implementation in 2024.

- Capital and operating cost estimates are considered Class B and C estimates, with contingency applied based on the Class of estimate and level of uncertainty as follows:
  - Capital costs associated with processing and transfer facility expansion and upgrades – Class C estimate – 40% contingency
  - Capital costs associated with curbside collection (collection vehicles and carts) – Class B estimate – 20% contingency
  - Operating costs associated with hauling yard and garden waste from member municipalities and FBRL compost facility – Class B estimate – 20% contingency
  - Operating costs associated with curbside collection – Class B estimate – 15% contingency
- For the additional annual operating costs associated with debenture financing of capital costs, the following financial assumptions are made:
  - Interest rate – 4.19% (10-year indicative lending rate as per MFABC, reported on Nov. 13/22)
  - Loan Term – 10 years
  - Compounding annually with annual payments over loan term
- All curbside collection costs are based on a seasonal curbside collection service provided 7 months per year between April to October.

A summary of the capital and operating costs associated with curbside collection is presented in Table 18 below. The curbside collection costs will be the same for both processing Options 1 and 2. It is assumed that these costs will be the responsibility of the member municipalities.

Table 18: Summary of Curbside Collection Costs (same for Options 1 and 2)

Curbside Collection Costs	Prince George	Mackenzie	Valemount	McBride
Households	25,000	1,515	513	266
Tonnes Collected Per Year (Assuming 150 kg/HH/year)	3,750	227	77	40
Curbside Collection - Capital Costs				
Planning and Public Engagement (Assume Split 50% between Municipality and RDFFG)	$250,000	$30,300	$10,200	$5,300
Collection Vehicles	$1,590,000	$15,000	$15,000	$15,000
Carts	$2,277,000	$137,986	$46,450	$4,136
Subtotal Capital Cost	**$4,117,000**	**$183,300**	**$71,200**	**$44,300**
Total Capital Cost, Incl. 20% Contingency	**$4,940,400**	**$219,960**	**$85,440**	**$53,160**
Curbside Collection - Annual Operating Costs				
Vehicle Maintenance, Supplies, Fuel, Oil + Cleaning, Insurance	$168,000	$5,100	$11,000	$2,800
Collection Staff	$63,000	$7,840	$3,920	$3,920
Administration and Supervisory Staff (50% of Vehicle Maintenance and Collection Staff Costs)	$154,000	$6,470	$7,460	$3,360
Subtotal Operating Cost	**$385,000**	**$19,410**	**$22,380**	**$10,080**
Total Operating Cost, Incl. 15% Contingency	**$442,750**	**$22,321**	**$25,737**	**$11,592**
Total Operating Cost per Tonne Yard and Garden Waste Collected	**$118**	**$98**	**$336**	**$292**

A summary of the additional capital and operating costs associated with hauling, processing, and facility upgrades for Options 1 and 2 is presented in Table 19 below. It is assumed that these costs will be the responsibility of the RDFFG.

Table 19: Summary of Additional Hauling, Processing, and Facility Upgrades for Options 1 and 2

	Option 1 - Central Processing of All Yard and Garden Waste	Option 2 - Central Processing, with Local Processing
Facility Upgrades, incl. 40% contingency	$826,000	$845,600
Additional Hauling	$53,900	$6,700
Additional Processing	$117,800	$151,400
Subtotal Additional Operating Costs (Hauling + Processing)	$171,700	$158,100
Total Additional Operating Costs, incl. 20% contingency	$206,040	$189,720
Total Operating Cost per Tonne Additional Yard Waste Managed	$88	$81

5.2 Option 1 – Implement Curbside Collection with All Processing at FBRL Compost Facility

As discussed in Section 4.3.1, this option takes advantage of the economies of scale associated with processing all yard and garden waste at a centralized location. Yard and garden waste received from curbside collection vehicles from Prince George, and from bins hauled from Mackenzie, Valemount, and McBride, would be chipped and processed using the current turned windrow composting process at the FBRL compost facility.

The following sections summarize the estimated capital and operating costs for each member municipality and the RDFFG.

5.2.1 RDFFG

For Option 1, the capital and operating costs are summarized below:

- Capital Costs
  - Additional costs would be required to expand the FBRL Compost Facility to increase the annual capacity to accept additional yard and garden waste from member municipalities. As summarized in Section 5, it is understood that the current compost facility is operating at capacity. Capital costs have been estimated assuming an expansion in the area where finished compost is currently being stored. The estimated expansion costs are $500,000 which includes minor regrading, paving (asphalt and subbase), and storm water management upgrades required to expand the process in an area of approximately 7,500 m^2.
  - Additional costs would be required to upgrade the Mackenzie and Valemount Regional Transfer Stations to allow for yard and garden waste transfer. Capital costs are also included to upgrade the transfer depot in McBride.
- Hauling Costs

- We estimated a decrease in hauling costs within Prince George due to a decrease in yard and garden waste quantities received at the three drop-off locations in Prince George (Quinn Street and Vanway Regional Transfer Stations, public drop-off area at FBRL). The annual decrease in hauling costs is estimated at approximately $29,000 per year, based on the reduced quantities of yard and garden waste received at the three drop-off facilities. Table 20 below shows the decreased number of hauls from the three transfer stations and associated cost savings.

Table 20: Annual Cost Savings from Decreased Number of Hauls

Facility	Decreased Number of Hauls	Per Haul Cost	Cost Savings from Less Hauls
Vanway	154	$95	$14,630
Quinn St	208	$55	$11,440
Foothills	80	$31	$2,480
		Total Savings	$28,550

- There would be an increase in hauling costs from member municipalities to transport yard and garden waste to the FBRL Compost Facility and backhaul finished compost. The additional hauling costs to transport yard and garden waste from Mackenzie, Valemount and McBride are estimated at $53,900 per year.

- Facility Operating Costs
  - There would be an increase in operating costs at the FBRL Compost Facility due to an increase in yard and garden waste processed. It is assumed that the per tonne operating cost at the FBRL compost facility will remain the same with additional yard and garden waste quantities since the compost process is expected to remain unchanged. Therefore, annual operating costs will increase proportional to the quantity of additional yard and garden waste processed at the facility from member municipalities.

5.2.2 City of Prince George

The City of Prince George's costs are primarily related to implementing the curbside collection program. Capital costs include additional collection vehicles and carts. Operating costs are associated with operating the collection program including staffing costs, vehicle operation and maintenance costs.

The City of Prince George's fleet will require additional trucks since the current fleet is operating near capacity every week. As summarized in Section 4.2, a minimum of three additional collection vehicles will be required based on the assumed yard and garden waste collection frequency (bi-weekly basis), yard and garden waste volume, the current number of households, and based on data on the current collection efficiency (for garbage collection). It is estimated that the cost to purchase one truck will be approximately $530,000, or $1,590,000 for all three trucks. Capital costs are based on actual costs for an automated collection vehicle purchased in 2021 by Prince George and assumes the three new trucks are single packer trucks supplied

with automated collection arms each with a minimum capacity of 29 cubic yards or 9500 kg of waste.

Additionally, new 240 L (65 gallon) carts will be required for residents to use. The cost of one cart is estimated at $91 per 240 L cart which includes delivery and taxes. Assuming a new yard and garden waste cart will be supplied to each household, the capital costs for cart purchases is estimated at approximately $2,277,000 for 25,000 carts.

In total, the capital cost to purchase three new trucks and 25,000 new carts is $3,867,000.

Annual operating costs and staffing for running the three new trucks were estimated based on the City of Prince George's average operating costs over the past five years (2017-2021) associated with the current garbage collection fleet. The average cost for vehicle maintenance, supplies, fuel, oil, cleaning, and insurance for the current fleet is approximately $83,000 per truck per year. The average labour cost for staffing the current fleet is approximately $32,000 per truck per year. To estimate the three new trucks' annual operating cost, the current average costs were marked up by 15% to adjust for inflation (primarily for supplies and staff wages) assuming implementation in 2024 and also adjusted for the assumption that trucks will be operating 7 months of the year.

Costs associated with planning and public engagement (to obtain public input and to raise awareness among residents of the future changes) have been included. The costs associated with public engagement are assumed to be a shared cost between the City and the RDFFG. Using an approximate unit rate of $10 per household, based on average planning and public engagement costs found in the *BC MOE Best Management Practices for Curbside Collection of Residential Organic Waste*, the total cost is estimated at $250,000. Since the total cost is assumed to be a shared cost between the municipality and the RDFFG, the RDFFG and the City will incur $125,000 each for public engagement. The $10 per household unit rate for public engagement costs assumes there is in-house capacity to plan and implement public engagement and communications tasks, that there is no extensive public consultation, and that there is in-house capacity for producing engagement materials.

Table 21 below summarizes the capital and operational costs described above. The City of Prince George's annual operating costs to provide a curbside yard and garden waste collection service are estimated to be $106 per tonne yard and garden waste collected.

Table 21: City of Prince George - Capital & Operating Costs

No.	Item Description	Unit Rate	Unit	Quantity	Total
1	Planning and Public Engagement Costs	$5*	Household	25,000	$125,000
2	**Capital Costs**				
2.1	Collection Vehicles	$530,000	$/Truck	3	$1,590,000
2.2	Carts (Assume 240L/65 Gallon)	$91	$/Cart	25,000	$2,277,000
3	**Annual Operating Costs**				
3.1	Curbside Collection Costs - Vehicle Maintenance, Supplies, Fuel, Oil + Cleaning, Insurance	$56,000	$ Per Truck/Year	3	$168,000
3.2	Curbside Collection Costs - Staffing	$21,000	$ Per Truck/Year	3	$63,000
3.3	Administration and supervisory staff (50% of vehicle maintenance and collection staff costs)	$38,500	LS per truck/Year	3	$115,500
		Municipality Capital Costs, incl. 20% contingency			**$4,790,400**
		Municipality Annual Operating Costs, incl. 15% contingency			**$398,475**
		Municipality Operating Cost per Tonne Yard and Garden Waste Collected			**$106**

*****Note: the total unit rate for Planning & Public Engagement is $10 per household, but it is assumed that these costs will be split between the RDFFG and municipality equally; thus the $5 per household unit rate is used for this calculation.

5.2.3 District of Mackenzie

Yard and garden waste is currently collected at the Mackenzie Regional Select Waste Landfill for the District of Mackenzie. To implement a curbside collection program in Mackenzie, one of the existing collection trucks may need to be modified to handle Y&G waste. In addition, the transfer station will need to be upgraded to facilitate the transfer of Y&G waste.

The current fleet of two collection trucks in the District of Mackenzie collects MSW from all the residential households in two days out of the week. Since the trucks are underutilized, there is an opportunity use one of the trucks for both MSW and Y&G waste collection, however some modifications may be required. A lump sum of approximately $15,000 has been included for these modifications.

Additionally, new 240 L (65 gallon) carts will be required for residents to use. Assuming each household will require one new cart, the District of Mackenzie will need to spend approximately $138,000 for 1,515 carts.

In total, the capital cost to modify one truck and purchase 1,515 new carts totals $153,000.

The annual operating costs and staffing costs were estimated based on District of Mackenzie's historic operating costs. The cost for vehicle maintenance, supplies, fuel, oil, and cleaning is estimated to be $4,100 annually with an additional $1,000 per year for cleaning the trucks before and after Y&G waste collection duties, totaling $5,100 annually for the seven months of operational duties. The estimated labour cost for staffing at $35 per hour is approximately $7,840 annually. Additionally, administration and supervisory staff costs are estimated to be $6,470. The total vehicle maintenance and staffing costs are $19,410 annually.

The estimated costs associated with public engagement are assumed to be a shared cost between the District of Mackenzie and RDFFG. Using a unit rate of $20 per household, based on the average cost found in *BC MOE Best Management Practices for Curbside Collection of Residential Organic Waste*, the total cost is estimated to be $30,300. Since it is assumed that this is a shared cost between the municipality and the RDFFG, the cost is split equally. Therefore, the RDFFG and the District will incur $15,150 each for public engagement.

Table 22 below summarizes the breakdown of the capital and operating costs discussed above, including contingency in the total costs.

Table 22: District of Mackenzie - Capital & Operating Costs

No.	Item Description	Unit Rate	Unit	Quantity	Total
1	Planning And Public Engagement Costs	$10*	Household	1515	$15,150
2	**Capital Costs**				
2.1	Collection Vehicles & Modifications	$15,000	LS	1	$15,000
2.2	Carts (Assume 240L/65 Gallon)	$91	$/Cart	1515	$137,986
3	**Annual Operating Costs**				
3.1	Curbside Collection Costs - Vehicle Maintenance, Supplies, Fuel, Oil + Cleaning	$5,100	LS/Year	1	$5,100
3.2	Curbside Collection Costs - Staffing (One Staff, 2 Days @ 8 Hours/Day, bi-weekly collection in 7 months of year)	$35	$/Hour	224	$7,840
3.3	Administration and supervisory staff (50% of vehicle maintenance and collection staff costs)	$6,470	LS/Year	1	$6,470
		Municipality Capital Costs, incl. 20% contingency			**$201,763**
		Municipality Operating Costs, incl. 15% contingency			**$22,322**
		Municipality Operating Cost Per Tonne			**$98**

*****Note: the total unit rate for Planning & Public Engagement is $10 per household, but it is assumed that these costs will be split between the RDFFG and municipality equally; thus the $5 per household unit rate is used for this calculation.

5.2.4 Village of Valemount

Implementing a curbside collection program for yard and garden waste in the Village of Valemount will include costs associated with modifying a truck to be able to handle Y&G waste and modifications to the transfer station to accommodate Y&G waste collection.

The current active truck in the Village of Valemount can service all residential households in one day out of the week. With the underutilized truck, there is an opportunity to use the same truck for Y&G waste collection, with a few modifications. A lump sum of approximately $15,000 is included for these potential modifications.

Additionally, new 240 L (65 gallon) carts will be required for residents to use. Assuming each household will require one new cart, the cost for 510 carts is estimated at $46,450.

In total, the capital cost to modify one truck and purchase 510 new carts is $61,450.

The annual operating costs and staffing costs were estimated based on Village of Valemount's historic operating costs. The cost for vehicle maintenance, supplies, fuel, oil, and cleaning is estimated to be $10,000 annually with an additional $1,000 per year for cleaning the trucks before and after Y&G waste collection duties, totaling $11,000 annually for the seven months of operational duties. The estimated labour cost for staffing at $35 per hour is approximately $3,920 annually. Additionally, administration and supervisory staff costs are estimated to be $7,460. The total vehicle maintenance and staffing costs are $22,380 annually.

The costs associated with public engagement are assumed to be a shared cost between the Village and RDFFG. Assuming a unit rate of $20 per household, based on the average cost reported in the *BC MOE Best Management Practices for Curbside Collection of Residential Organic Waste*, the total cost is $10,200. Since this is assumed to be a shared cost between the municipality and RDFFG, the cost is split half. Therefore, RDFFG and the Village will incur $5,100 each for public engagement.

Table 23 below summarizes the breakdown between the overall costs for the above-mentioned capital and operational costs in implementing curbside collection, including contingency in the total costs.

Table 23: Village of Valemount - Capital & Operational Costs

No.	Item Description	Unit Rate	Unit	Quantity	Total
1	Planning and Public Engagement Costs	$10*	Household	510	$5,100
2	**Capital Costs**				
2.1	Collection Vehicles & Modifications	$15,000	LS	1	$15,000
2.2	Carts (assume 240L/65 Gallon)	$91	$/Cart	510	$46,450
3	**Annual Operating Costs**				
3.1	Curbside Collection Costs - Vehicle Maintenance, Supplies, Fuel, Oil + Cleaning	$11,000	LS/Year	1	$11,000
3.2	Curbside Collection Costs - Staffing (One Staff, 1 Day @ 8 Hours/Day, bi-weekly collection in 7 months of year)	$35	$/Hour	112	$3,920
3.3	Administration and supervisory staff (50% of vehicle maintenance and collection staff costs)	$7,460	LS/Year	1	$7,460
		Municipality Capital Costs, incl. 20% contingency			**$79,861**
		Municipality Operating Costs, incl. 15% contingency			**$25,737**
		Municipality Operating Cost per Tonne			**$336**

*****Note: the true cost of unit rate for Planning & Public Engagement is $20, but is split between the RDFFG and municipality equally; thus the $10 unit rate for this calculation.

5.2.5 Village of McBride

The Village of McBride currently does not collect Y&G waste. Costs associated with implementing a curbside collection program in McBride include modifications to the current truck used for collecting MSW and improvements to the transfer station site to accommodate Y&G waste collection.

The truck in the Village of McBride is currently servicing all residential households in one day out of the week for MSW collection. Additionally, a spare truck is available in case the primary truck is out for maintenance. With the underutilized truck only used one day out of the week, there is an opportunity to use the same truck to perform Y&G waste curbside collection, with potentially a few modifications to be able to collect Y&G waste. For the truck modifications we have assumed a lump sum of approximately $15,000.

New 240 L (65 gallon) carts will be required for residents to use. Assuming each household will require one new cart, the Village of McBride will need to spend approximately $24,000 for 265 carts.

In total, the capital cost for modifying one truck and purchasing 265 new carts is estimated to be $39,136.

The annual operating costs and staffing costs were estimated based on Village of McBride's historic operating costs. The cost for vehicle maintenance, supplies, fuel, oil, and cleaning is estimated to be $1,800 annually with an additional $1,000 per year for cleaning the trucks before and after Y&G waste collection duties, totaling $2,800 annually for the seven months of operational duties. The estimated labour cost for staffing at $35 per hour is approximately $3,920 annually. Additionally, administration and supervisory staff costs are estimated to be $3,360. The total vehicle maintenance and staffing costs are $10,080 annually.

The costs associated with public engagement are assumed to be shared between the Village of McBride and RDFFG. Assuming a unit rate of $20 per household, based on average costs found in *BC MOE Best Management Practices for Curbside Collection of Residential Organic Waste*, the total cost is $5,300 per year. Since this is assumed to be a shared cost between the municipality and RDFFG, the cost is split equally. Therefore, the RDFFG and the Village will incur $2,650 each for public engagement.

Table 24 below summarizes the breakdown between the overall costs for the above-mentioned capital and operational costs in implementing curbside collection, including contingency in the total costs.

Table 24: Village of McBride - Capital & Operational Costs

No.	Item Description	Unit Rate	Unit	Quantity	Total
1	Planning and Public Engagement Costs	$10	Household	265	$2,650
2	**Capital Costs**				
2.1	Collection Vehicles & Modifications	$15,000	LS	1	$15,000
2.2	Carts (Assume 240L/65 Gallon)	$91	$/Cart	265	$24,136
3	**Annual Operating Costs**				
3.1	Curbside Collection Costs - Vehicle Maintenance, Supplies, Fuel, Oil + Cleaning	$7,400	LS/Year	1	$2,800
3.2	Curbside Collection Costs - Staffing (One Staff, 1 Day @ 8 Hours/Day, bi-weekly collection in 7 months of year)	$35	$/Hour	112	$3,920
3.3	Administration and supervisory staff (50% of vehicle maintenance and collection staff costs)	$3,360	LS/Year	1	$3,360
				Municipality Capital Costs, incl. 20% contingency	**$50,143**
				Municipality Operating Costs, incl. 15% contingency	**$11,592**
				Municipality Operating Cost per Tonne	**$219**

*****Note: the total unit rate for Planning & Public Engagement is $10 per household, but it is assumed that these costs will be split between the RDFFG and municipality equally; thus the $5 per household unit rate is used for this calculation.

5.3 Option 2 – Improvements to Local Yard and Garden Waste Processing

Under Option 2, as discussed in Section 5.2.2, yard and garden waste collected in Prince George would be processed at the FBRL compost facility as summarized in Option 1. However, yard and garden waste collected in Mackenzie, Valemount, and McBride would be processed locally. It is assumed that any yard and garden waste collected in McBride would be transferred to Valemount for processing.

5.3.1 RDFFG

The main costs under Option 2 are as follows:

- Capital Costs
  - Construction and upgrades at the existing compost facility at FBRL (same as Option 1).
  - Upgrades (primarily related to paving) to improve organics processing at the Mackenzie Regional Transfer Station.
  - Modifications to the McBride Regional Transfer Station to enable yard and garden waste transfer between McBride and Valemount (to fit in a roll off bin for Y&G waste storage and collection).
- Operating Costs
  - Operational costs for additional yard and garden waste processing and staff training at the District of Mackenzie and Village of Valemount facilities.
  - Hauling costs associated with transferring Y&G waste from the Village of McBride to the Village of Valemount.

Table 25 below summarizes the additional capital and operating costs associated with Option 2. It is assumed that the RDFFG would be responsible for these costs.

Table 25: Option 2 - Capital and Operating Costs - RDFFG

Capital Costs	Totals
Upgrades at FBRL Compost Facility	$500,000
Upgrades at Member Municipality Transfer Stations (McBride Regional Transfer Station Upgrade)	$30,000
Upgrades at Member Municipality Yard and Garden Waste Processing Facility (Mackenzie Regional Transfer Station)	$74,000
Subtotal Capital Costs	$604,000
Total Capital Costs, Incl. 40% Contingency	$845,600
Annual Operating Costs	
Additional Yard and Garden Waste Processing Costs from All Municipalities	$151,400
Hauling Costs from Village of McBride to Village of Valemount	$6,700
Subtotal Operating Costs	$158,100
Total Additional Operating Costs, Incl. 20% Contingency	$189,720

5.3.2 Member Municipalities

Since the seasonal curbside collection programs are assumed to be the same for Options 1 and 2, the capital and operating costs for the City of Prince George, District of Mackenzie, Village of McBride, and Village of Valemount will remain unchanged from Table 21, Table 22, Table 24, and Table 25, respectively.

5.4 Cost Recovery

5.4.1 RDFFG

The RDFFG's primary revenue sources for funding solid waste services are tipping fees and tax requisition. The sale of compost also represents a smaller portion of the overall revenue stream.

The analysis presented in this section focuses on cost recovery primarily through tipping fees, as this user-pay model is considered a best practice for funding solid waste services. The principle of the user-pay model is that users are charged an amount based on how much waste is generated and managed or processed. However, the additional costs and potential revenue decrease associated with a seasonal yard and garden waste collection service could be recovered through a combination of tipping fees and tax requisition (hybrid funding approach).

The RDFFG currently does not charge a tipping fee on yard and garden waste. However, it is common in many regional districts to charge a tipping fee on yard and garden waste to partially or fully cover the cost of collecting, managing and processing yard and garden waste. For example, the Regional District of Kitimat Stikine charges a tipping fee of $99 per tonne on yard and garden waste, compared to a garbage tipping fee of $110 per tonne. Metro Vancouver's 2023 tipping fee for green waste is $107 per tonne with a minimum $10 charge, compared to a garbage tipping fee ranging from $113 to $161 per tonne, depending on the load size. Like the RDFFG, the Cariboo Regional District currently does not charge tipping fees on yard and garden waste from residential and commercial users.

The results presented below consider the potential yard and garden waste tipping fee required to cover additional costs and recover the potential decrease in revenue from MSW tipping fees. It is assumed that the yard and garden waste tipping fee would be applied to all yard and garden waste generated from both residential and commercial sources. However, considering approximately 50% of the yard and garden waste currently managed at the FBRL Compost Facility is from commercial sources (refer to Section 3), the RDFFG could consider introducing a higher tipping fee for commercial customers.

As summarized in Sections 5.2 and 5.3, the RDFFG's additional operating costs primarily relate to additional yard and garden waste hauling from member municipalities and processing at the FBRL Compost Facility. With the additional yard and garden waste diversion, revenues from MSW tipping fees are expected to decrease.

Decrease in MSW Tipping Fees due to Additional Yard and Garden Waste Diversion

As explained on Section 3.1.5, the quantity of MSW landfilled can be expected to decrease proportional to the quantity of additional yard and garden waste diverted. Table 26 below shows an estimate of the reduced tipping fee revenue based on the RDFFG's current tipping fee of $94 per tonne, based on 150 and 200 kg per household yard and garden waste collection rates.

Table 26: Reduction in Tipping Fee Revenue from MSW due to Additional Yard and Garden Waste Diversion

Municipality	Number of Households	Additional YW Collection/MSW Reduction Assuming 150 Kg/HH/Year Capture Rate (Tonnes)	Additional YW Collection/MSW Reduction Assuming 200 Kg/HH/Year Capture Rate (Tonnes)	Reduced Tipping Fee Revenue @ $94/Tonne (150 Kg/HH/Year)	Reduced Tipping Fee Revenue @ $94/Tonne (200 Kg/HH/Year)
City of Prince George	25,000	1,361	2,611	$127,925	$245,425
District of Mackenzie	1,515	82	158	$7,752	$14,873
Village of Valemount	510	28	53	$2,610	$5,007
Village of McBride	265	40	53	$3,737	$4,982
		Total		**$142,024**	**$270,287**

Increase in Revenues due to Increase in Compost Sales

Due to the increased quantity of yard and garden waste accepted for processing, there will be an increase in compost available. Assuming markets can be found, the increase in compost production will result in an increase in the revenue from compost sales. Table 27 below shows the potential revenue from compost sales from the additional Y&G waste collected. The quantity of yard and garden waste received at the FBRL Compost Facility is estimated to increase by approximately 30% compared to 2021 quantities. It is assumed that the quantity of manure processed at the facility will also increase by approximately 30% to maintain optimal feedstock mixing ratios. The yard and garden waste to manure ratio received at the facility has been in the 5-6:1 ratio over the past three years and it is assumed that this ratio is driven by the compost process requirements. With an approximately 30% increase in the feedstock quantities, the amount of compost produced can also be expected to increase by 30%.

Table 27: Estimated Revenue from Additional Compost Sales

Additional Quantity of Y&G Waste (Tonnes)	Additional Volume of Compost Produced (m^3)	Additional Revenue from Compost Sales ($13.5 per m3)
2,000	2,360	$32,000

The additional volume of compost is calculated by multiplying the additional yard and garden waste and manure feedstock quantities by a 0.5 finished compost to feedstock ratio, then multiplying by an assumed finished compost density of 0.5 tonnes/m^3. The additional NorGrow sales were calculated by multiplying the additional volume by $13.5 per cubic meter (average revenue per cubic metre over the last five years), bringing the potential additional revenue from

compost sales to $32,000. This represents an approximately 30% increase in compost sales revenue over 2021 values.

Another option to increase the revenue from compost sales is to increase the price of the finished compost (higher than the current average price of $13.5 per cubic meter). However, it is understood that the RDFFG has historically had challenges selling the finished compost therefore this option was not considered further as a higher price could impact the quantity of compost sold.

Potential Yard and Garden Waste Tipping Fee to Cover Additional Costs and Decreased Revenues

A potential yard and garden waste tipping fee was assessed considering the additional costs and decreased revenues summarized in previous sections. The financial impacts considered as part of the yard and garden waste tipping fee analysis are summarized in Figure 7 below.

Figure 7: Summary of Revenues and Costs - RDFFG

Introducing a tipping fee on Y&G waste would create a significant revenue stream to assist with covering the costs of collecting, transferring, and processing the yard and garden waste and with covering the costs of marketing the finished compost.

Table 28 below summarizes the costs and revenues associated with implementation of a seasonal curbside collection program for yard and garden waste. The net cost (total costs less revenues streams) is used to estimate the tipping fee required to cover the additional costs. The break-even yard and garden waste tipping fee is calculated with and without amortized capital costs included in the net operating costs (assuming debt financing).

Table 28: Break-In Yard and Garden Waste Tipping Fee based on Net Operating Costs for Options 1 and 2

Cost and Revenue Summary - RDFFG	Option 1	Option 2
Costs/Revenue Decrease		
Operating Costs	**Annual Cost/ Revenue Decrease**	**Annual Cost/ Revenue Decrease**
Additional yard and garden waste processing costs	$117,800	$151,400
Additional hauling costs from member municipalities	$53,900	$6,700
Decrease in MSW tipping fee revenues (average between low and high range)	$206,000	$206,000
Subtotal Operating Costs	$377,700	$364,100
Total Operating Costs, incl. 20% contingency	$453,240	$436,920
Capital Costs		
Upgrades at FBRL Compost Facility	$500,000	$500,000
Upgrades at member municipality transfer stations	$90,000	$30,000
Upgrades at member municipality yard and garden waste processing facility	$0	$74,000
Subtotal Capital Costs	$590,000	$604,000
Total Capital Costs, incl. 40% contingency	$826,000	$845,600
Revenues/Cost Savings		
Additional Compost Sales	$38,000	$32,000
Reduced Yard and Garden Waste Hauling Costs within Prince George	$29,000	$29,000
Net Additional Operating Costs	**$386,240**	**$375,920**
Net Additional Operating Costs (incl. annualized capital costs)	**$489,044**	**$481,163**
Total Yard and Garden Waste Received (tonnes) (Status Quo 6,087 tonnes + Additional 2,357 tonnes)	8444	8444
Break-Even Yard and Garden Waste Tipping Fee (operating costs only)	$46	$45
Break-Even Yard and Garden Waste Tipping Fee (capital and operating costs)	$58	$57

As shown in Table 28 above, the estimated break-even yard and garden waste tipping fee to cover the additional operating costs is approximately $46 per tonne. With capital costs included (amortized over 10 years), the estimated break-even tipping fee is $58 per tonne. This is considered the minimum tipping fee required to cover the additional operating costs associated with a seasonal yard and garden waste collection program.

Tipping fee revenue can be increased by increasing the yard and garden waste tipping fee rate above the values identified above, but it is recommended to maintain the tipping fee reasonably lower than the current tipping fee for MSW to encourage yard and garden waste diversion.

5.4.2 Member Municipalities

It is assumed that the costs of a seasonal curbside yard and garden waste collection program would be covered by an additional flat utility fee.

For member municipalities, an additional utility fee was estimated to cover the costs of the curbside collection program (refer to previous sections). The minimum utility fee required to cover operating costs was estimated as well as a utility fee assuming capital costs are funded through debt financing amortized over a 10-year period. The estimated utility fees are summarized in Table 29 below.

Table 29: Estimated Yard and Garden Waste Utility Fee for Member Municipalities

Member Municipality	Utility Fee (Operating Costs Only) ($ per Household per Year)	Utility Fee (Operating + Capital Costs) ($ per Household per Year)
City of Prince George	$18	$42
District of Mackenzie	$15	$31
Village of Valemount	$50	$70
Village of McBride	$44	$67

Utility fees were also estimated assuming that a yard and garden waste tipping fee of $46 per tonne is introduced by the RDFFG. The estimated utility fees needed to cover the program costs and tipping fees are summarized in Table 30 below. To cover the costs of a $46 per tonne yard waste tipping fee, the minimum utility fee required increases by an estimated $8 per household.

Table 30: Estimated Yard and Garden Waste Utility Fee for Member Municipalities, including Tipping Fees

Member Municipality	Utility Fee (Operating Costs Only + Tipping Fees) ($ per Household per Year)	Utility Fee (Operating + Capital Costs + Tipping Fees) ($ per Household per Year)
City of Prince George	$24	$48
District of Mackenzie	$23	$39
Village of Valemount	$58	$78
Village of McBride	$52	$75

6. CONCLUSIONS

The objective of this feasibility study was to assess the seasonal collection and processing of yard and garden waste in member municipalities within the Regional District of Fraser-Fort George including the associated operational and capital costs of implementation.

Two yard and garden waste processing options were considered in this study. Option 1 is for all collected yard and garden waste to be processed at the compost facility at the Foothills Boulevard Regional Landfill (FBRL). Option 2 is similar to the current situation, with improvements to local processing in member municipalities.

Over 6,000 tonnes of yard and garden waste is currently being diverted in the region through an established network of public drop-off depots operated by the RDFFG. The majority of yard and garden waste collected in the region is processed at the compost facility located at the FBRL. The compost facility operates under a permit issued by with the Ministry of Environment and Climate Change Strategy's (MoECCS) under the Organic Matter Recycling Regulation (OMRR) and produces a high-quality Class A compost.

The Class A Compost produced, Norgrow, averages between $75,000 - $85,000 in annual sales, off-setting some, but not all costs associated with its production.

Yard and garden waste processing in the member municipalities of the District of Mackenzie and the Village of Valemount consists of basic grinding operations which produces a lower quality end-product used as part of landfill operations and is unavailable to be sold to the public.

The latest waste composition data demonstrates a significant opportunity to divert additional organic waste from landfill. Almost half of the single-family residential waste currently being landfilled consists of compostable organics. There is a large diversion opportunity by focusing on yard and garden waste as a first step in organics diversion (the focus of this study). It is estimated that up to an additional 2,600 tonnes of yard and garden waste could be diverted through a seasonal curbside collection program.

The implementation of a seasonal yard and garden waste curbside collection program in member municipalities will be a complex, multi-year process that will require significant coordination, planning, and engagement from all stakeholders involved.

For member municipalities, the financial and operational impacts to the current curbside collection operations will need to be considered in the planning process. As identified in this study, the financial impacts include the capital costs (primarily additional collection vehicles and carts) and additional operating costs (including additional staff costs to operate collection vehicles and maintain the expanded collection fleet, as well as ongoing costs associated with education and enforcement).

One of the keys to the success of a new seasonal yard and garden waste curbside collection program will be an effective public education and outreach program, supported by enforcement measures with the objective to reduce the amount of contamination in the collected material.

Education and enforcement will need to be a joint, collaborative effort between the RDFFG (responsible for processing) and member municipalities (responsible for collection).

Other operational impacts that will need to be considered by member municipalities include the capacity of the existing collection fleet and staff, modifications to existing collection routes and schedules, and training existing and new staff on how to manage a new yard and garden waste stream.

For the RDFFG, the financial and operational impacts of curbside collection within the member municipalities will be to the existing collection depots currently accepting self-hauled yard and garden waste from residents and commercial customers, as well as impacts to the compost facility at the FBRL due to the additional material collected and brought to the site.

As outlined in this report, the amount of yard and garden waste currently being collected from drop-off depots within Prince George could decrease by approximately 2,500 tonnes with the implementation of a curbside collection program. With the reduced amount of yard and garden waste received at these facilities, the RDFFG will need to assess the pros and cons of continuing to operate and/or accept yard and garden waste at these facilities.

The impact of a curbside collection program on the compost facility at the FBRL is primarily related to capacity. The Foothills site is currently operating near capacity and the facility will need to be upgraded and expanded to accommodate the additional yard and garden waste brought to site from a seasonal collection program. This represents a significant capital project and the RDFFG will need several years to plan, design, and construct the compost facility expansion. The timing of the expansion of the compost facility will need to be coordinated with the timing of the implementation of curbside collection to ensure the facility is ready to accommodate the additional material brought to the site.

As part of this study, improvements to local processing of yard and garden waste in the member municipalities of the District of Mackenzie and Village of Valemount were reviewed. Local end-use options and markets for the finished product should be assessed before investing additional capital and resources to improve the current process to produce a higher quality end product.

Additional revenue streams will be needed to cover the additional program costs and reductions in existing revenue streams. For member municipalities, the additional program costs are primarily related to the seasonal curbside collection program (capital costs for additional trucks and carts and ongoing operating costs). For the RDFFG, the primary capital cost is associated with the expansion of the compost facility at the FBRL and potential upgrades to existing transfer stations to accept and transfer yard and garden waste. The RDFFG can also expect additional operating/processing costs at the compost facility at the FBRL.

The two cost recovery approaches considered in this study were yard waste tipping fees introduced by the RDFFG and utility fees introduced by member municipalities. Revenue from compost sales currently only cover approximately 20% of the compost facility's total operating costs and will not be sufficient to cover the additional program costs. As part of this study, a minimum break-even tipping fee was estimated that would be applied to residential and commercial users (including municipalities). Member municipalities would be charged tipping

fees on the collected yard and garden waste and may recover those costs via utility fees. A minimum utility fee was estimated to cover the additional program costs.

As outlined in the 2015 Regional Solid Waste Management Plan approved by the MoECCS, a key objective of the plan is to improve waste diversion in the region by taking a stepwise approach to increasing the diversion of organic waste currently being landfilled. Seasonal collection of yard waste is a first step that the RDFFG and member municipalities can take to significantly increase the diversion of organic waste from landfill. Diverting organic waste from landfill is supported by the MoECCS and has several benefits including reducing GHG emissions from decomposing organic waste in landfills, supporting a circular economy, and reducing or deferring landfill related costs such as leachate management costs and landfill closure and expansion costs.

While the focus of this study was on seasonal collection and processing of yard and garden waste, there are other strategies that the RDFFG and member municipalities can consider to increase yard and garden waste diversion such as cart audits, enforcement mechanisms such as inspections and fines, material bans and load inspections, targeted education campaigns, and creating dedicated staff positions responsible for waste diversion initiatives and programs. All these initiatives (including seasonal yard and garden waste collection) will require support for additional staffing and dedicated staff positions to manage and oversee the programs. Currently, the RDFFG and member municipalities have limited staff capacity to manage new solid waste initiatives.

7. CLOSURE

The Regional District of Fraser-Fort George retained Morrison Hershfield to conduct the work described in this report, and this report has been prepared solely for this purpose.

This document, the information it contains, the information and basis on which it relies, and factors associated with implementation of suggestions contained in this report are subject to changes that are beyond the control of the author. The information provided by others is believed to be accurate and may not have been verified.

Morrison Hershfield does not accept responsibility for the use of this report for any purpose other than that stated above and does not accept responsibility to any third party for the use, in whole or in part, of the contents of this document. This report should be understood in its entirety, since sections taken out of context could lead to misinterpretation.

We trust the information presented in this report meets Client's requirements. If you have any questions or need addition details, please do not hesitate to contact one of the undersigned.

Morrison Hershfield Limited

Prepared by:

July 27, 2023

Curtis Jung, P.Eng.
Solid Waste Engineer
cjung@morrisonhershfield.com

Anson Hardjojo, EIT
Solid Waste Designer
ahardjojo@morrisonhershfield.com

Reviewed By:

Todd Baker, P.Eng.
Solid Waste Practice Lead
tbaker@morrisonhershfield.com

8. REFERENCES

David J.L. Forgie, et al., March 2004. Compost Facility Requirements Guideline: How to Comply with Part 5 of the Organic Matter Recycling Regulation.

Environment and Climate Change Canada. National Waste Characterization Report: The Composition of Canadian Residual Municipal Solid Waste.

Environment and Climate Change Canada. Technical Document on Municipal Solid Waste Organics Processing.

Environmental Management Act and Public Health Act, BC. Organic Matter Recycling Regulation.

Maura Walker & Associates Environmental Consultants. 2015 Regional Solid Waste Management Plan.

Metro Vancouver, September 2021. Metro Vancouver Compost Quality Study, Foreign matter content in locally available compost.

Ministry of Environment and Climate Change Strategy, BC. Best Management Practices for Curbside Collection of Residential Organic Waste.

Net Zero Waste Inc. Compost Market Study – Report.

Regional District of Fraser-Fort George, September 27, 2010. Compost Marketing Survey and Operations Review Memorandum.

Regional District of Fraser-Fort George, March 2002. A Feasibility Study on Source-Separated Organics: Opportunities to Enhance the Centralized Composting Service in the City of Prince George.

Regional District of Fraser-Fort George, June 2011. A Feasibility Study on Enhancing Waste Diversion from the Residential Curbside Solid Waste Stream in the City of Prince George.

Regional District of Fraser-Fort George, October 2021. 2021 Regional Solid Waste Management Financial Plan.

SYLVIS, March 2008. Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice.

Tri Environmental Consulting Inc., July 31, 2018. 2018 Waste Characterization Study Regional District of Fraser-Fort George.