Comox Strathcona Waste Management

Staff Report

DATE: April 4, 2019

FILE: 5380-03

TO: Chair and Directors
Comox Strathcona Waste Management Board

FROM: Russell Dyson
Chief Administrative Officer

Supported by Russell Dyson
Chief Administrative Officer

R. Dyson

RE: Regional Organics Compost Project – April 2019 Update

Purpose
To provide an update on the Regional Organics Composting project related to backhauling, facility size, site use and timeline.

Recommendation from the Chief Administrative Officer:
For information and discussion purposes only.

Executive Summary
This update summarizes the results of the organics backhauling technical memorandum, and provides details regarding the facility size, and the progress made to secure Block J as an alternative location for the organics processing facility. A separate staff report is presented to the Comox Strathcona Waste Management (CSWM) Board (Board) for the analysis of processing technologies (anaerobic digestion) for the organics compost project.

Results from the backhauling analysis:

- A 53 foot leak resistant walking floor trailer is recommended to haul comingled food and yard waste.
- Potential garbage and organics hauling savings range from $71,000 to $107,000 per year, if backhauling is implemented.

Design capacity:

- Initial organics processing capacity is 14,500 tonnes per year, of which 11,145 tonnes per year is allocated to residential and 3,360 tonnes per year to institutional commercial industrial (ICI).
- Design capacity has been established based on experience from comparable communities.
- If excess capacity is available, ICI waste will be processed.

Processing facility sitting analysis

- Campbell River Waste Management Centre (CRWMC) Block J: An application for non-farm use on agricultural land reserve (ALR) land was submitted on March 19, 2019. The application is currently being reviewed by the City of Campbell River. An answer from the Agricultural Land Commission (ALC) is expected within two months upon receipt from the City of Campbell River (July 2019). We continue to evaluate alternative layouts based on director input.

- Norm Wood Environmental Centre (NWEC): An investigation is in process in conjunction with the City of Campbell River to determine the availability of additional land for ancillary services (scale, scale house, access road, admin/maintenance building, storm water system and pond). At this time, it is not known if the required area will be available.

Timeline
Construction completion date has been delayed from March 2020 to May 2021 due to the difficulties in locating the organics processing facility at the NWEC.

Prepared by:	Concurrence:	Concurrence:
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Background/Current Situation
Backhauling
The report prepared by our consultant (attached as Appendix A) shows:

- Backhauling organic waste is possible. This will involve backhauling organic waste from the organic transfer station to be built at the Comox Valley Waste Management Centre (CVWMC) to the compost facility to be built at either the NWEC or CRWMC Block J.
- Considering that municipal solid waste will be hauled from the CRWMC to the CVWMC starting in the year 2023, a 53 foot leak resistant walking floor trailer with a minimum capacity of 25 tonnes is recommended to haul comingled food and yard waste. Before the year 2023, a 28 foot tub-style end dump trailer could be used to haul comingled food and yard waste.
- Overall garbage and organics hauling savings considering backhauling organic waste range from $71,000 per year in the year 2023 to $107,000 per year in the year 2028.
- The possibility of using a walking floor trailer towing a tub-style trailer was determined not feasible due to the total vehicle length. A vehicle of this length would be extremely challenging to maneuver at the transfer station and at the compost facility. This vehicle would also require a permit with an exemption from the BC Commercial Transportation Regulation.
- A test will be required to confirm the suitability of using the existing two 53 foot un-modified walking floor trailers, currently used at the CRWMC for solid waste, to haul organics due to the fact that they are not leak resistant.

Design capacity
The initial capacity of 14,500 tonnes per year for the organics processing facility has been determined based on technical memorandums prepared by our consultant in March 2018 attached as Appendices B and C.

This capacity has been established based on information from other existing organic programs and the expertise from our consultant.

If the amount of residential waste available is higher than expected, the operation of the compost facility will be adjusted to process less ICI waste.

The composting facility will initially be sized to accommodate single family residential co-mingled organics as well as a portion of the institutional/commercial/industrial sector from the four member municipalities. Table 1 provides the amounts of organic waste expected from the different participants and the resulting design capacity:

Table 1. Organic waste diverted and design capacity

Sources	Phase 1
Campbell River	4,724
Courtenay	3,720
Comox	2,099
Cumberland	602
ICI	3,360
Total	14,505
Design capacity	14,500

The following considerations have been factored into the expected feedstock from the four municipalities at phase 1 of the regional organics program:

- Food waste diversion rate: 125 kg per household per year, based on existing programs in other jurisdictions;
- Yard waste generation rate: 210 kg per single family household per year, based on the City of Courtenay collection program;
- Peaking factor for food waste: 1.15, based on data from the Regional District of Nanaimo;
- Peaking factor range for yard waste: 1.5 to 1.7, based on the City of Courtenay collection program;
- Municipal-specific annual growth rates range between 1.5 per cent and 3.5 per cent.

The amount of residential organic waste to be processed is influenced by the curbside pickup frequency and it is higher if organic pickup on a weekly basis and garbage on a biweekly basis. The pilot project in the CSWM has seen two different approaches to curbside pickup frequency. The Village of Cumberland (Cumberland) picks up organics weekly and garbage every second week. The waste audit completed in 2017 saw a high participation rate from Cumberland when it comes to diverting organics. On the other hand, the Town of Comox (Comox) has a weekly garbage and a weekly organic pickup. The waste audit saw that the performance of Comox was not as effective as was Cumberland.

Processing facility sitting analysis

- CRWMC Block J: An application for non-farm use on ALR land has been submitted on March 19, 2019. A response from the ALC is expected within two months upon receipt from the City of Campbell River (July 2019). A drawing with the total area required to implement the organics processing facility is attached as Appendix D of this staff report. We continue to evaluate alternative layouts based on director input.
- NWEC: An investigation is in process in conjunction with the City of Campbell River to determine the availability of additional land for ancillary services (scale, scale house, access road, admin/maintenance building, storm water system and pond). A drawing with the total area required to implement the organics processing facility is attached as Appendix E.

Timeline

Construction completion date has been delayed from March 2020 to May 2021. Initial construction completion date was based on locating the organics processing facility at the NWEC. The revised date for construction completion is based on receiving approval from the ALC in July 2019.

Timeline for the rest of the project is as follows:

1. Processing facility site analysis: February to July 2019
2. Processing facility site Board approval: September 2019
3. Agreement with host community: August to September 2019
4. First Nations and neighbors consultation: April to May 2019
5. Processing facility and transfer station preliminary design and cost: April to May 2019
6. Agreements with feedstock municipal suppliers: August to September 2019
7. Agreement on procurement approach: June 20, 2019
8. Procurement processes: September to December 2019
9. Design, construction and operation Board approval: February 2020
10. Design completion: May 2020
11. Regulatory approval timeframe: February 2020 to June 2020
12. Construction completion: May 2021

Attachments: Appendix A – "MH Technical Memo CSWM Regional Compost Facility – Organics Transfer Station Hauling Options"
Appendix B – "Jacobs Technical Memo Residential Organic Waste Quantities & Characteristics"
Appendix C – "Jacobs Technical Memo ICI Organic Waste Quantities & Characteristics"
Appendix D – "Jacobs CRWMC Conceptual Site Layout"
Appendix E – "Jacobs NWEC Conceptual Site Layout"

MEMORANDUM

MORRISON HERSHFIELD

TO:	Andrew McGifford, CPA, CGA Cole Makinson, EIT Gabriel Bau, P.Eng, PMP®, MBA Marc Rutten, P. Eng.	**FROM:**	Todd Baker, P. Eng. Curtis Jung, EIT
		CC:	John Berry, P.Eng. Veronica Hansen, M.Sc., P.Eng.
		PROJECT No.:	170074200
RE:	CSWM Regional Compost Facility – Organics Transfer Station Hauling Options	**DATE:**	3/19/2019

\\MH.LOCAL\DATA\PROJ\2017\170074200-COMOX STRATHCONA WASTE MANAGEMENT\08. WORKING\ORGANICS HAULING OPTIONS MEMO\MEMO WITH BACKHAUL ANALYSIS\MEM-2019-03-19-CSWM ORGANICS HAULING OPTIONS-170074200.DOCX

1. Introduction

Jacobs and Morrison Hershfield (MH) are assisting the Comox Valley Regional District (CVRD) and its member municipalities with the planning and procurement of a new organic waste transfer station and a regional composting facility. This memo provides an overview of the hauling options from the transfer station to the composting facility, including backhaul considerations. The scope of this memo covers transfer trailer and backhauling options only and does not include the overall design of the transfer station, which will be detailed under separate cover.

2. Executive Summary

The trailer styles that are reviewed in this memo include walking floor, push out / ejection, tub-style, and tandem roll-off trailers. The available size and length of each trailer is provided, as well as the advantages and disadvantages associated with each trailer type for hauling an organic waste stream.

A primary concern associated with hauling organics is odours and leaks originating from the trailer. Considerations related to odours and leaks are reviewed in this memo, recognizing that this is an important criteria when selecting an appropriate trailer type.

The following three scenarios were assessed as part of the backhaul analysis:

- ***Scenario 1*** (no backhaul) – MSW and organics transfer using separate hauling vehicles. A 53' walking floor trailer would be used to transfer MSW and a 28' tub-style would be used to transfer organics.
- ***Scenario 2*** (organics backhaul) – MSW transfer using a 53' walking floor trailer with organics backhaul. It is estimated that for every three MSW loads there will be one load of organics backhauled. The other two of three trips will be dedicated MSW loads with an empty trailer on the return trip, assuming another backhaul material is not identified.
- ***Scenario 3*** – MSW transfer using a 53' walking floor trailer towing an empty tub-style trailer. Backhaul of organics in an empty 53' walking floor trailer towing a tub-style trailer loaded with organics. This scenario has been analyzed in this memo and it has been determined not feasible, primarily due to a trailer length that would not be feasible to haul and maneuver at the compost facility and transfer station. Under the BC Commercial Transportation Regulation, a special permit is required for trailers exceeding 23 m in length. A 53 foot walking floor trailer

towing a tub-style trailer is estimated to be 33 m. Detailed analysis was not conducted for Scenario 3.

The potential annual savings on the total garbage and organics hauling costs with organics backhaul ranges from $71,000 to $107,000. Over the 10-year projection period, the net present value (NPV) savings is estimated at $419,000.

3. Background

The analysis presented in this memo assumes that organics will be backhauled northbound from the organics transfer station at the Comox Valley Waste Management Centre (CVWMC) in Cumberland to the compost facility at either the Norm Wood Environmental Centre (NWEC) or Block J (at the Campbell River Waste Management Centre) in Campbell River. An alternate backhaul analysis would assume that the waste stream being backhauled is garbage, and in this case, the direction of the backhaul is south from Campbell River to the CVWMC. The results of the backhaul analysis, and potential cost savings, will likely be similar for either backhaul scenario. However, this is an important distinction when discussing the implementation of backhauling waste with the various involved parties.

For the purpose of this memo, the term “municipal solid waste (MSW)” is used interchangeably with the term “garbage” and refers to the portion of the waste stream that is disposed in landfill irrespective of the actual waste composition. The term “organics” refers to food and yard waste generated and collected from the residential and ICI sectors.

The estimated amount of organics (food and yard waste) and MSW to be hauled between facilities and the estimated annual trips is provided in Table 1 below. The data is presented for each year in a 10-year projection period from 2019 to 2028.

Table 1: MSW and Organics Waste Projections and Estimated Trips

Year	MSW (Southbound)			Organics (Northbound)			
	Tonnes per year	Tonnes per day	Trips per day (walking floor)[1]	Tonnes per year	Tonnes per day	Trips per day (tub-style)[2]	Trips per day (walking floor)[1]
2019	0	0	0.0	5,587	22	1.2	0.9
2020	0	0	0.0	5,681	22	1.2	0.9
2021	0	0	0.0	5,776	23	1.3	0.9
2022	0	0	0.0	5,868	23	1.3	0.9
2023	22,930	89	3.6	5,961	23	1.3	0.9
2024	21,759	84	3.4	7,794	30	1.7	1.2
2025	21,880	85	3.4	7,902	31	1.7	1.2
2026	21,983	85	3.4	8,011	31	1.7	1.2
2027	22,062	85	3.4	8,122	32	1.8	1.3
2028	22,143	86	3.4	8,235	32	1.8	1.3

Notes: 1) Assume a 53’ walking floor trailer with average payload of 25 tonnes
2) Assume a 28’ tub-style trailer with an average payload of 18 tonnes
3) Assume hauling occurs 5 days a week, 52 weeks a year

By the year 2023, it is estimated that approximately three times the amount of MSW will be hauled south compared to organics hauled north (on a per-tonne basis).

The information presented in Table 1 is presented on an annual basis and is an average over all months. However, organic hauling needs are expected to fluctuate during the year. Based on other similar sized transfer stations in BC, a peak in yard waste can be expected in the spring (April-June) and the lowest monthly tonnages in the winter months (December-February). The amount of food waste received at the transfer station is expected to remain relatively constant throughout the year.

As a comparison to other municipally-owned, mid-sized organics transfer stations in BC, the Church Road Transfer Station (CRTS) in the Regional District of Nanaimo accepted a total of 5,800 tonnes of organics in 2018 (3,900 tonnes of source-separated food waste and 1,900 tonnes of source-separated yard waste). A 53' walking floor trailer is used to haul the yard waste and a tub-style end-dump trailer is used to haul the food waste. The material is transferred to a private composting facility for processing. The City of Chilliwack operates an organics transfer station that accepted 8,900 tonnes of residential organics in 2018 (7,900 tonnes of commingled organics and 1,000 tonnes of yard waste). The facility has only accepted residential waste so far; however, it was designed to accept up to 20,000 tonnes of organic waste from both residential and ICI sources.

4. Hauling and Trailer Options

The purpose of the transfer trailer is to transport organic waste from the transfer station located at the Comox Valley Waste Management Centre (CVWMC) in Courtenay to the Regional Organics Compost Facility located at the Norm Wood Environmental Centre (NWEC) in Campbell River. The NWEC is located approximately 62 km northwest of the CVWMC by road. A round trip between the two facilities will take approximately three to five hours, depending on the transfer trailer selected and whether garbage (MSW) backhaul from Campbell River to Cumberland is included in the round trip.

There are a number of trailer options available, and the trailer should be appropriate for the type of organic waste being hauled (separate food waste and yard waste, or commingled) and the load-out configuration of the transfer station. Other considerations for selecting an appropriate trailer include:

- Expected waste quantities
- Cleaning requirements
- Local hauling capabilities

A key factor in selecting the most appropriate transfer trailer is the type of organic waste being hauled. At this point, the working group has decided that commingled food and yard waste is the most cost-effective option, and members are seeking commitments from their municipality for this collection model. As such, this memorandum assumes that the majority of residential waste received at the transfer station will be a commingled organic waste stream. It is understood that ICI organic waste will also be accepted at the transfer station, and it is expected that Phase 1 will have a limited amount of ICI organic waste. The transfer of organic waste should be reviewed once the ICI volumes increase.

Table 2 below summarizes the primary transfer trailer options for hauling organic waste and includes the pros and cons associated with each.

Table 2: Summary of Transfer Trailer Options

Trailer Option	Available Length and Capacity	Truck and Pony Configuration Available? (Y/N)	Appropriate Organic Waste Stream[1]	Load-Out and Unloading Requirements	Pros	Cons
Walking Floor	12.1-16.2 m long (40-53 ft) 15-28 tonnes/trailer	No	Yard waste or commingled	▪ Top load ▪ No tipping required	▪ No requirement to tip trailer during unloading minimizes safety risk ▪ Current garbage hauling contractor may be most familiar with this trailer type	▪ Greater cleaning requirements due to mechanical walking floor system ▪ High maintenance ▪ Highest potential for leaking ▪ Limited experience with hauling food and yard waste
Push Out/ Ejection Trailer	9.1-13.7 m long (30-45 ft) 15-25 tonnes/trailer	Yes (but less common)	All organics	▪ Top load ▪ No tipping required	▪ No requirement to tip trailer during unloading minimizes safety risk	▪ Higher maintenance requirements ▪ More complex hydraulic system and specialized contractor required for repairs ▪ Difficult to clean
Tub Style	7.9-16.2 m long (26 – 53 ft) 5-25 tonnes/trailer	Yes	All organics	▪ Top load ▪ Tipping required to unload	▪ Most proven trailer type for hauling all types of organics ▪ Easiest to clean	▪ Smaller capacity than other trailer types. May require additional trips to haul same amount of waste
Tandem Roll-off	6.7 m long (22 ft) 15, 23, 31, 46 m^3 volume (20, 30, 40, 60 yd^3) 2-8 tonnes/container	Yes	All organics	▪ Top load ▪ Container must be loaded onto the transfer vehicle ▪ Tipping required to unload	▪ Modular system allows for use of various container sizes, depending on quantities received ▪ Can be used for temporary storage of organics ▪ Proven waste hauling system	▪ Highest safety risks with loading and unloading ▪ Additional space required to store bins at transfer station. ▪ May not be compatible with transfer station loading bay ▪ Smaller capacity than other trailer types ▪ In the tandem configuration, it takes longer to load and unload containers ▪ Risk of damaging bins during loading and unloading

[1]All of the above trailers are suitable for hauling MSW.

4.1 Walking Floor Trailer

Walking floor trailers are typically used for transporting municipal solid waste from large transfer stations. There is limited experience using walking floor trailers for transfer of residential food and yard waste in Canada. A few vendors in Canada supply walking floor trailers specially designed for hauling organic waste. These trailers are essentially the same design as the traditional trailers for hauling municipal solid waste; however, they have been modified with leak-resistant walking floors and a modified tailgate to provide a watertight seal. Examples of vendors who supply these modified walking floor trailers include Trout River Inc. based in PEI, Titan Trailers Inc. and Walker Brothers based in Ontario, and TYCROP Specialty Trailers based in BC.

Walking floor trailers are open-topped or “top-load” trailers designed specifically for handling solid waste. They typically range from 40 feet to 53 feet long, are based on a tandem or tri-axle design, and in many cases, they are indistinguishable from other semi-trailers. These trailers are designed with stronger frames that resist twisting when driven over rough ground, sidewalls that resist puncturing, and a “live-floor” (chain drive or slat system) that allows waste to be unloaded without having to tip the trailer. Typical payloads for top-load trailers containing MSW range from 15 to 28 tonnes, depending on trailer size and waste type/density.

There are examples of walking floor trailers being used to transfer residential food and yard waste; however, the majority of these cases either involve contained/bagged waste or a commingled organic waste stream. Based on discussions with trailer vendors and interviews with municipalities currently using walking floor trailers to transfer organics, a walking floor trailer can be used for loose yard waste and a commingled organic waste stream (food and yard waste). However, a walking floor trailer is not appropriate for hauling food waste only, due to the high water content of the waste stream.

Walking floor trailers are both heavier and more expensive than tub-style trailers and are able to carry heavier payloads. An advantage of this trailer type is that tipping would not be required at the compost facility.

A quote for a new 53 foot leak-resistant walking floor trailer provided by TYCROP for hauling organics is provided as Attachment 1.

Figure 1 below is an example of a walking floor trailer used to transfer MSW.

Figure 1: Double Axle Walking Floor Trailer (http://www.mactrailer.com/)

4.2 Push-Out / Ejection Trailer

Push-out trailers, also known as ejection trailers, are trailers that have a body design similar to a walking floor trailer, but rely on a hydraulic ram system built into the body of the trailer to push the contents of the trailer out the rear doors. Push-out trailers are manufactured in open or closed-top configurations and are available in aluminum and steel construction. The body of the trailer is a solid weld design, and the rear doors and bulkhead can be fitted with a rubber seal to establish watertight containment. Payloads for pushout trailers range from 15 to 25 tonnes.

Push-out trailers have been used in small communities as a small, fully contained transfer station unit.

Push-out trailers often come equipped with one or two-piece hydraulic tarp systems that cover the top of the trailer during hauling.

The ejection rate can be as fast as 5 minutes, but varies depending on the hydraulic system and trailer length.

Cleaning may be an issue, as will likely be the corrosive (low pH) nature of the organics, particularly if hauling food waste only. An advantage of this trailer type is that tipping would not be required at the compost facility.

Figure 2 below is an example of a pushout trailer

Figure 2: Push-out Trailer (http://www.larringtontrailers.com/)

4.3 Tub-Style Trailer

The majority of the experience in Canada transporting residential food and yard waste is with tub-style dump trailers, as this form of transport is the simplest to unload and keep clean and provides the best opportunity for maintaining watertight seals. As larger trailers have larger payloads, the tub-style trailers make it easier to meet Transport Canada payload requirements. Smaller tub-style trailers (i.e. 26-28') are used at the Church Road Transfer Station in Nanaimo.

The trailers generally consist of an aluminum or steel-framed body in the shape of a tub, with a supporting I-beam along the side of the tub and an internal hoist for unloading the organics. Tub-style trailers are available in several lengths, ranging from 26 to 53 ft. There are two and three-axle configurations available, and the payload for this type of trailer can range from 5 to 25 tonnes. Depending on the quantity of organic material requiring transport, the trailers can be used as a single-trailer unit (attached to the truck body), or as a dual truck-and-pony configuration. Tub-style trailers are generally lighter and less expensive than push-out/ejection trailers and walking floor trailers, but generally have a lower payload capacity.

The trailers are loaded from the top and unloaded from the rear using the internal hoist via a dump-style method. The rear doors will have a rubber seal to maintain a watertight seal during transport. Tub-style trailers are appropriate for hauling all types of organic loads, including separate food and yard waste and commingled waste.

Automated side-rolling tarp systems are common with this type of trailer to cover the load during transport. Other operational features available with this type of trailer include mud flaps, fenders,

lighting, top rails, and air-operated latches. Examples of tub-style trailer vendors are Ocean Trailers based in Ontario and Fort Gary Industries with locations across Canada.

Figure 3 below is a tub-style transfer trailer with a four-axle pony trailer configuration.

Figure 3: Tub-style transfer trailer with four-axle pony configuration (https://www.klinetrailers.com/)

4.4 Roll-Off Trailer

Roll-off trailers are open-topped bin systems with a separate container that can be disconnected from the main trailer body during loading. The containers are commonly available in 20, 30, and 40 cubic yard sizes. 60 cubic yard containers are also available, but are much less common due to the specialized truck required to haul them. “Truck-and-pup” configurations that allow for two containers to be hauled in a single trip are possible, but less common. Payloads for roll-off containers with mixed garbage typically range from 2 to 8 tonnes per container.

Roll-off bins are common at smaller transfer stations for garbage because they allow residential and commercial customers to load waste directly into the containers. Full bins are loaded onto the collection vehicle using a hydraulic hoist system that hooks onto the base of the bin and pulls the bin onto the body of the transfer vehicle.

Figure 4 below is an example of a roll-off trailer system in a truck-and-pony configuration.

Figure 4: Roll-off Trailer in Truck-and-pony Configuration (http://www.durabac.net/)

4.5 Examples of Communities using Transfer Trailers to Haul Organics

Two communities in BC currently using transfer trailers to haul organics from a transfer facility to a processing site are summarized in Table 3 below.

The purpose of Table 3 is to highlight two communities in BC that are currently managing organics (both separate and commingled loads) and summarize the issues they have encountered. For updated information, specifically related to operational issues, the communities listed below should be contacted directly.

Table 3: Examples of Communities using Transfer Trailers to Haul Organics

Community	Trailer Type	Approximate annual tonnages	Approximate 2017 hauling cost	Reported Issues
Regional District of Nanaimo (RDN)	▪ One 53 foot walking floor trailer for yard/ garden waste ▪ One 26-28 foot tub-style trailer for food waste	▪ 1,922 tonnes yard waste (2017) ▪ 3,526 tonnes food waste (2017)	▪ $350,000 (includes transfer of 17,670 of MSW)	▪ Excessive spillage during loading at the transfer station due to the gap between the tipping floor and top of trailer ▪ Additional time required to clean floors due to the spillage, and frequent floor washing required due to a high concentration of fats, oils and greases (FOG) in the food waste ▪ Height restrictions at the regional compost facility do not allow the trailer to fully raise its box to full height during unloading/dumping ▪ Safety concerns due to the above spillage (may not be directly related to the type of trailer being used)

Community	Trailer Type	Approximate annual tonnages	Approximate 2017 hauling cost	Reported Issues
City of Vancouver (CoV)	▪ One unmodified 53 foot walking floor trailer for commingled organics (food and yard) and yard waste only	▪ 48,100 tonnes mixed curbside yard and food waste (2015) ▪ 37,500 tonnes yard waste (2017) (Vancouver South Transfer Station only)	▪ Not available	▪ Occasional leaking from the trailer floor, which is minimized by loading the trailer prior to transfer and not using the trailer for storage of commingled organics
City of Chilliwack	▪ 48 foot unmodified walking floor trailers to haul commingled organics and yard waste from residential collection	▪ 7,900 tonnes co-mingled organics (2018) ▪ 1,000 tonnes yard waste (2018)	▪ Not available	▪ No issues associated with hauling reported

The City of Vancouver is currently using unmodified walking floor trailers to haul yard waste and commingled food and yard waste from their transfer station to the organics processing facility. They estimate approximately 7-8 loads are hauled per day over a distance of approximately 20 km. They report minimal issues with this hauling model as a result of using operational practices such as only loading trailers prior to transfer and not using trailers to store commingled organics overnight. It should be noted that the loads are estimated to contain a relatively high quantity of yard waste compared to food waste, due to the collection area. However, a similar organics composition can be expected in the CSWM service area.

With respect to contamination of organics loads with garbage, the City of Vancouver reports minimal issues as a result of operational best practices. After unloading, the walking floor is run until the majority the MSW is removed. The City will place a small quantity of organics in the front of the trailer should there be any residual MSW remaining in the trailer. This is an effective process to clean out the trailer. The downside with this approach is that the organics become contaminated. The City also has a standard operating procedure for cleaning and sweeping out the trailer by hand after each load to reduce contamination of organics.

The City of Chilliwack has been transferring residential organics from the Bailey Landfill Organic Waste Transfer Station located in Chilliwack to the Net Zero Waste (NZW) compost facility in Abbotsford since the transfer station began accepting organic waste in May 2017. The distance between the facilities is approximately 50 km. In 2018, a total of 430 trips were made to haul organics between the transfer station and compost facility. Monthly trips ranged from 40 to 54 trips in the summer months (June-September) and 17 to 22 trips in the winter months (December-March). A total of 8,900 tonnes of organic waste from residential sources was accepted in 2018. All of the accepted waste was

transferred to the compost facility, with the exception of December 2018. Starting in December 2018, the City started grinding and using the yard waste onsite due to a forecasted shortage of cover material at the landfill. Since the change was made, the number of trips to the compost facility has decreased.

4.6 Considerations for Trailer Selection

- **Cleaning.** This will be an issue for all trailer types. The corrosive (low pH) nature of the organics may impact the life of the trailer body, particularly if hauling food waste only.
- **Trailer Material.** Trailers are typically available in both aluminum and steel. Aluminum trailers are generally lighter than steel trailers and are generally more rust and corrosion-resistant. The lower weight of aluminum translates to a higher payload capacity, and greater rust/corrosion resistance can translate to lower maintenance requirements. On the other hand, steel trailers have a reputation for being stronger than comparable aluminum trailers and more resistant to stresses associated with hauling. However, some manufacturers claim that their aluminum trailers have the same yield strength as steel. Steel is generally less expensive to repair than aluminum. In addition, steel trailers generally cost less than aluminum trailers to purchase.
- **Trailer Material Type.** Many manufacturers claim that aluminum trailers are lower maintenance because they are more rust and corrosion-resistant than steel. The type of trailer selected will likely have a greater impact on the maintenance requirements (walking floor trailer vs. tub-style trailer).
- **Trailer Life and Replacement.** The operating procedures of the hauling contractor will have a significant impact on the service life of the trailer. If trailers are routinely cleaned after each load and only loaded prior to hauling, trailer lifespan will be maximized. However, if the trailers are not regularly cleaned and maintained, the lifespan can be significantly reduced from the manufacturer's rated lifespan. For the purpose of this memo, the following are assumed with regards to trailer life expectancy. It should be noted that capital replacement costs and maintenance costs are assumed to be included in the hauling rate (cost per trip) paid by the CVRD to the hauling contractor. We understand this is consistent with the current MSW hauling contract.
  - 15 years for the trailer
  - 7 years for the floor
  - 10 years for the tractor
- **Contamination with Backhaul.** If garbage is backhauled with organics loads, there is the risk of garbage contaminating the organics load if the same trailer is used. Proper unloading and cleaning prior to loading organics can prevent significant contamination from occurring.
- **ICI Organic Waste.** It is expected that the transfer station will accept organic waste from residential collection, residential self-haul and ICI self-haul. ICI organic waste can be expected to have a higher moisture content than commingled residential waste. For high-moisture organic loads (e.g. fish waste and food waste with high concentration of fats, oils and greases (FOG)), a tub-style trailer is likely the only suitable hauling option. An option to discourage certain types of ICI organic loads is to introduce variable tipping fees to encourage ICI customers to haul directly to the compost facility.

- **Odour during Transport.** Odours during transport can be a public nuisance and a source of public complaint. Odour during transport can be managed through the following practices:
  - Implementing best practices at the transfer station, including minimizing organics storage times (maximum 1-2 days).
  - Not using trailers for organics storage overnight, and loading trailers only before transport.
  - Washing trailers after each load or on an as-needed basis. If trailers are not washed and organics accumulate in the trailer over an extended period of time, additional odours may be generated.
  - Trailer equipment:
    - Use of water-sealed, watertight doors
    - Use of a tarp system to cover the entire trailer box
- **Scale Considerations.** There are currently two scales at the CVWMC long enough to weigh a 53 foot trailer. If the compost facility is located at the NWEC, the scales should be large enough to accommodate the longest transfer vehicle. We understand there are currently scales at the CRWMC; however, they are not long enough to accommodate the expected transfer vehicles.
- **Hauling Contractor vs. CVRD Responsibilities.** At this point in the planning stage, it is important to define the anticipated responsibilities of the hauling contractor and the CVRD with the hauling scenarios described in this memo. All costs associated with contractor responsibilities will be covered in the rate charged to the CVRD. We understand the CVRD currently pays per round trip with an annual minimum to the MSW hauling contractor. Another contract arrangement is payment per hour as opposed to per trip, with an annual minimum guaranteed loads. To minimize the risk to the CVRD, MH suggests the following with regards to the hauling contract:
  - Responsibilities of Hauling Contractor
    - All labour associated with hauling.
    - Supply, maintenance, and replacement of all hauling equipment, including truck and trailers.
    - All capital investment to maintain and replace hauling equipment during contract term.
    - Cleaning trailers at the CVWMC and NWEC or Block J. The cleaning and maintenance of the trailers will be incorporated into the contract rate of the hauler. CVRD operations staff may need to provide organic waste or similar to help the hauler clean the trailer.
  - Responsibilities of CVRD:
    - Operation of the organics transfer station at the CVWMC.
    - Loading trailers with organics at the CVWMC.
    - Securing minimum feedstock for hauling.
- **Transfer Station Design Considerations.** The scope of this memo is limited to the type of trailer used to transport organics between the transfer station and the compost facility. This memo does not discuss the transfer station design, which will be covered under a separate deliverable as part of future planning phases. The preliminary design of the transfer station should assume a hauling vehicle and trailer, because the type of hauling vehicle selected will

have an impact on the factors listed below. It is possible to design for a range of vehicles and containers; however, this can result in operational challenges.

- Transfer station load-out configuration (top load, at-grade load, etc.).
- Required turning radius and space allocation at the transfer station (in building and around building).
- Storage requirements.
- Potential scale upgrades.

- **Trailer Assumptions for Preliminary Design.** The analysis presented in this memo indicates that separate organics and MSW transfer trailers will be required in the 10-year projection period from 2019-2028 for both hauling scenarios (Scenario 1 with no backhaul and Scenario 2 with organics backhaul). At this point in the design process, MH recommends the preliminary design of the transfer station and compost facility be developed assuming that both a 53' top-load walking floor trailer and a 28' end-dump, top-load tub-style trailer will be used to haul organics.
- **Organics Storage at Transfer Station.** A smaller trailer will require more frequent trips, while a larger trailer will result in longer storage. As a best practice, organics should not be stored at the transfer station for longer than 2-3 days. The analysis presented in this memo assumes that organics will be hauled out of the transfer station on a daily basis, with minimal overnight storage of organics at the transfer station.
- **Trailer Storage Requirements.** The number of trailers used will be determined by the hauling contractor. At a minimum, it is expected that one tub-style trailer will be required to haul organics originating from the CVWMC and two walking floor trailers will be required to haul MSW originating from the CRWMC. It is assumed that the tractor and two existing 53' walking floor trailers are currently stored at the CRWMC at the end of each day. When a tub-style trailer is required in 2020, it is assumed that the trailer will be stored at the transfer station at the CVWMC at the end of each day.

4.7 Regulatory Considerations

The BC Ministry of Transportation, under the Commercial Transport Act and Commercial Transport Regulations, has the following maximum legal sizes and weights related to the commercial transfer vehicles described above:

Table 4: Summary of Applicable BC MoT Size and Weight Limits

Commercial Vehicle Type	Width	Height	Overall Length	Max Pony Trailer /Trailer Length	Wheelbase - min	Wheelbase - max	Weight
Straight Truck	2.6 m	4.15 m	12.5 m	-	4.4 m	10 m	Gross vehicle: 34 tonnes (4 axles)
Straight Truck and Pony Trailer	2.6 m	4.15 m	23 m	12.5 m	5.5 m (single and tandem axle) 6.25 m (tridem axle)	-	Pony trailer: 21 tonnes Gross vehicle: 60.2 tonnes
Straight Truck and Full Trailer	2.6 m	4.15 m	23 m	12.5 m	4.4 m (single axle dolly and tandem trailer) 6.25 m (all other axle combinations)	-	-

Axle weight limits are summarized below. The maximum allowable spacing for tandem axles in BC is 1.85 m unless the first and/or last is a steering axle or one that articulates in the manner of a steering axle.

Table 5: Summary of BC MoT Axle Weight Limits

Distance between the centres of the first axle and last axle	Maximum gross weight of axle group
Less than 1.00 m	9,100 kg
1.00 m up to but not including 1.20 m	16,500 kg
2.60 m up to but not including 3.00 m	20,000 kg
4.60 m up to but not including 5.00 m	25,000 kg
6.50 m up to but not including 6.90 m	30,000 kg
8.00 m	34,000 kg

The gross axle weight is determined by the axle spacing and the number of axles. With the appropriate number of axles and spacing for the expected trailer weights shown in Table 4, all trailer types can meet the axle weight limits for the transfer of organic loads. A fully loaded 16.2 m walking floor trailer has the largest capacity of all trailer types and therefore has the greatest risk of exceeding the axle weight limits. The density of food waste can be over three times the density of un-compacted mixed residential garbage loads. If a trailer is used for garbage backhaul, in particular a walking floor trailer, the trailer axle configuration should be suitable for hauling both garbage and organics loads.

There does not appear to be any specific commercial vehicle gross weight or axle weight limits on Highway BC-19 between Courtenay and Campbell River at the time this memo was prepared.

5. Organics Back Haul Analysis

Municipal Solid Waste (MSW) is planned to be hauled from the Campbell River Waste Management Centre (CRWMC) to the CVWMC for final landfill disposal beginning in 2023. The CVRD is interested in using the same trailer used to haul MSW from the CRWMC to the CVWMC to backhaul organics on the return trip from the CVWMC. The trailers that are currently available from the hauling contractor are two 53 foot TYCROP walking floor trailers. These trailers are currently not being used to transport MSW to the CVWMC however they are being used in other aspects of operations. Starting in 2023, they will be used to transfer MSW from the CRWMC to the CVWMC.

As noted above, unmodified walking floor trailers are likely not suitable for hauling dedicated loads of food waste due to the relatively high water content, which requires a trailer with a watertight seal to prevent material from leaking out of the trailer during transport.

There are a few vendors in Canada that manufacture leak-resistant walking floor trailers. These trailers have been used with varying success to haul organic waste loads. Using a standard walking floor trailer to haul commingled organics or yard waste has been successful in some municipalities. The City of Vancouver has been using a standard, unmodified walking floor trailer to haul commingled organics from their transfer station to the landfill site. The primary issue reported is material leaking from the trailer as it is not a sealed unit. To mitigate this issue, loading is conducted just prior to hauling and the trailer is never used for organics storage.

An analysis has been completed to assess the potential cost savings that may be realized by back hauling organics from the CVWMC to the compost facility located in Campbell River. The analysis considered the following three scenarios:

- **Scenario 1** (no backhaul) – MSW and organics transfer using separate hauling vehicles. A 53’ walking floor trailer would be used to transfer MSW and a 28’ tub-style would be used to transfer organics. Under this scenario, an additional 28’ tub-style trailer would be required.
- **Scenario 2** (organics backhaul) – MSW transfer using a 53’ walking floor trailer with organics backhaul. It is estimated that one in three MSW loads will be required to backhaul organics. The other two of three trips will be dedicated MSW loads with an empty trailer on the return trip, assuming another backhaul material is not identified. Under this scenario, an additional 28’ tub-style trailer and an additional 53’ leak-resistant trailer would be required.
- **Scenario 3** – MSW transfer using a 53’ walking floor trailer towing an empty tub-style trailer. Backhaul of organics in an empty 53’ walking floor trailer towing a tub-style trailer loaded with

organics. This scenario was determined to be not feasible, primarily due to a trailer length that would not be feasible to haul and maneuver at the compost facility and transfer station. Detailed analysis was not conducted for Scenario 3.

Scenario 1

Scenario 1 assumes that a tub-style trailer will be used to transfer organics from the CVWMC in Cumberland to the NWEC in Campbell River, and the trailer will head straight back from the NWEC to the CVWMC empty. Garbage will continue to be hauled under a separate hauling contract. It is assumed that separate haul vehicles will be used over the 10-year projection period.

Another option is to use the existing walking floor trailers to transfer organics in the short-term. An advantage of this option is that the hauler does not have to purchase new trailers. A tub-style trailer can be purchased in the future when more ICI waste is accepted at the transfer station.

The haul route for Scenario 1 is provided in Table 6 and Figure 5 below.

Table 6: Summary of Scenario 1 Haul Route

Section	Start	End	Distance (km)	Trailer Content
1	CVWMC	NWEC	62	Organics
2	NWEC	CVWMC	62	Empty
Total Round Trip Haul Distance			**123**	

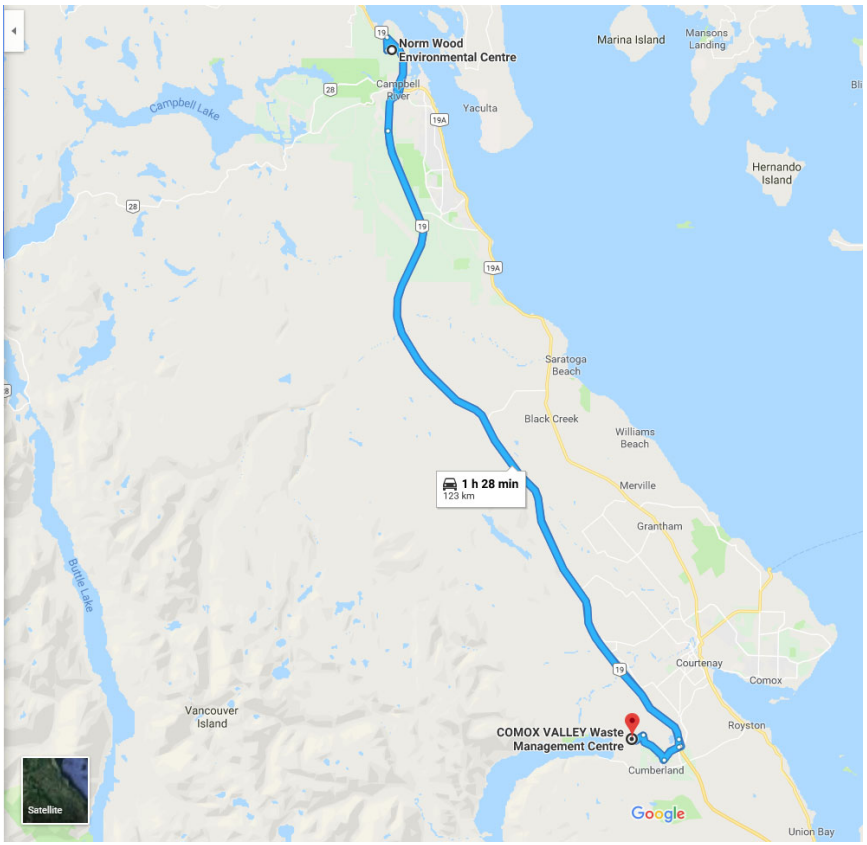


Figure 5: Summary of Scenario 1 Haul Route

Scenario 2

Scenario 2 assumes that organics will be backhauled from the CVWMC under the same contract as MSW transfer from the CRWMC to the CVWMC using a walking floor trailer. Organics transfer under Scenario 2 is summarized as follows:

1. Load MSW at the CRWMC.
2. Haul MSW from transfer station at CRWMC to landfill at CVWMC.
3. Unload MSW at the CVWMC.
4. Load organics at the CVWMC.
5. Haul organics from transfer station located at CVWMC to NWEC.
6. Unload organics at the NWEC.
7. Empty haul from NWEC to CRWMC.

The trips with organics backhaul (summarized above) would be completed using a leak-resistant 53' walking floor trailer. Under Scenario 2, a trailer suitable for hauling dedicated organics loads will still be required.

A 28' tub-style trailer would be used to haul organics from 2020 to 2022, until MSW is hauled from the CRWMC to the CVWMC beginning in 2023. The existing unmodified trailers would be used to haul dedicated MSW loads.

This route is summarized in Table 7 and shown in Figure 6 below.

Table 7: Summary of Scenario 2 Haul Route

Section	Start	End	Distance (km)	Trailer Content
1	CRWMC	CVWMC	64	Garbage
2	CVWMC	NWEC	62	Organics
3	NWEC	CRWMC	12	Empty
Total Round Trip Haul Distance			**137**	

We understand the CVRD is currently assessing the feasibility of locating the compost facility at Block J, adjacent to the CRWMC. It is estimated that locating the compost facility at Block J compared to the NWEC would reduce the round trip haul time by approximately 15 minutes. The cost savings associated with the reduced haul time between the NWEC compared to Block J will be minimal and will not affect the feasibility of organics backhaul. For this reason, a separate analysis was not completed assuming the compost facility is located at Block J. The conclusions provided from Scenario 2 are valid for a facility located at the NWEC or Block J.

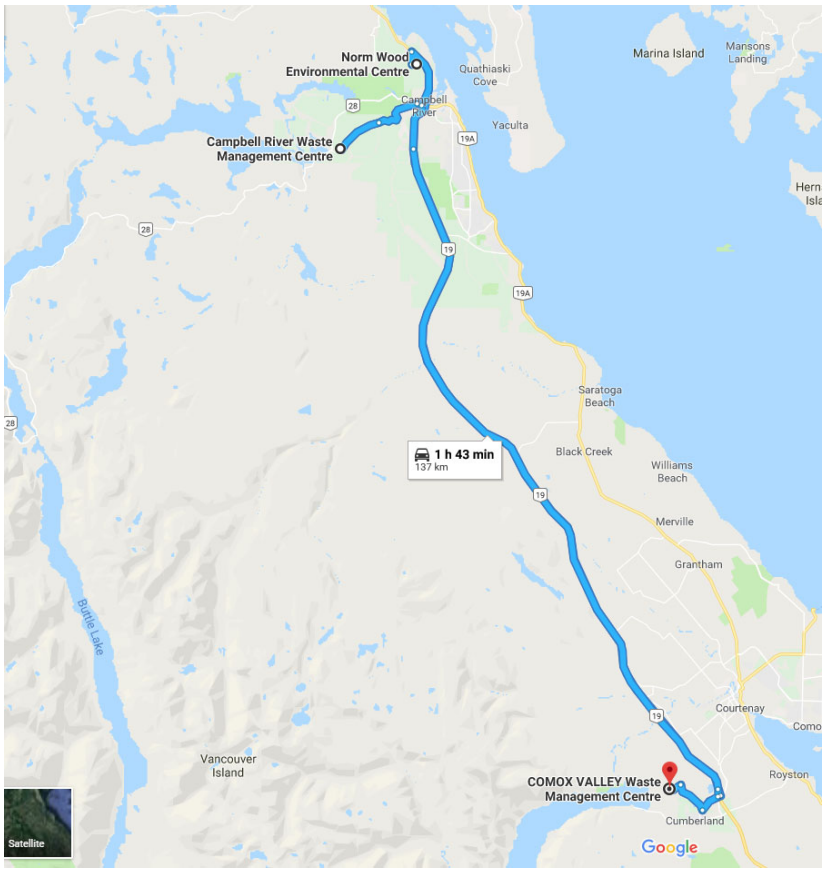


Figure 6: Summary of Scenario 2 Haul Route

Under Scenario 2, it is assumed that the trailer is weighed at CVWMC for both loads (i.e. no need to scale at NWEC). It is understood that the existing scale at the CRWMC is too short to weigh a 53 foot trailer.

Scenario 3

The CVRD requested that MH review and comment on the feasibility of a third hauling scenario as described below:

- MSW is hauled southbound from the CRWMC to the CVWMC in an existing 53' walking floor trailer towing an empty tub-style organics trailer.
- MSW is unloaded at the CVWMC and the tub-style trailer is loaded with organics.
- The empty 53' walking floor trailer towing the full tub-style trailer travels northbound back to the compost facility at the NWEC.

A 53 foot (16 m) trailer with a 23 foot (7 m) tractor will have a total vehicle length of 76 feet (23 m). Under Section 7.08 of the BC Commercial Transportation Regulation, "*A person must not, without a permit, drive or operate a combination of vehicles that contains a licensed booster axle assembly mounted to the rear of a semi-trailer lowbed and has an overall length that exceeds 23.0 m."* The regulation does not allow trailers longer than 23 m without a separate permit. The minimum length of a

tub-style trailer is expected to be 8 m or 26 ft plus an additional 2 m (7 feet) for the connection assembly.

In total, a 53 foot walking floor trailer towing a tub-style trailer is estimated to be 33 m or 108 feet. A vehicle of this length would be extremely challenging to maneuver at the transfer station and at the compost facility. Additional design considerations would be required for the transfer station to accommodate a trailer of this length. This vehicle would also require a permit with an exemption from the BC Commercial Transportation Regulation.

MH has determined that this scenario is not feasible, primarily because of excessive trailer length.

Analysis and Results

The analysis presented in this memo assumes that organics will be backhauled northbound from the organics transfer station at the Comox Valley Waste Management Centre (CVWMC) in Cumberland to the compost facility either at the NWEC or Block J in Campbell River. The waste stream being backhauled is organics, and the direction of the backhaul is north. An alternate backhaul analysis would assume that the waste stream being backhauled is garbage, and in this case, the direction of the backhaul is south from Campbell River to the CVWMC. The results of the backhaul analysis, and potential cost savings, will likely be similar for either backhaul scenario. However, this is an important distinction when discussing the implementation of backhauling waste with the various involved parties.

The following analysis is based on an estimate of annual and daily trips between the transfer station and the compost facility, based on the expected organics and MSW tonnages listed in Table 12 below.

It is understood that the contractor has two 53’ unmodified walking floor trailers available to haul MSW. To determine the cost for a round trip with organics backhaul, an assumed value of $390/round trip was converted to an hourly rate, assuming a three-hour round trip. Using $130/hour as the basis, the cost for hauling with organics backhaul was calculated to be $585/trip (assuming a 4.5 hour trip using a 53’ leak resistant walking floor trailer).

The following analysis considers hauling costs, and the potential cost savings, between Scenarios 1 and 2 in the 10 year projection period between 2019 and 2028.

The following were assumed in the financial analysis presented in this section:

- The analysis considers a 10-year projection period between 2019 and 2028.
- A 1.5% annual escalation factor was applied to the haul rate to account for inflation.
- A 5% discount rate was applied to all future cash flows for the net present value (NPV) analysis.
- Hauling will occur 5 days a week, 52 weeks per year.
- Future dollars were discounted to present value (PV) 2019 dollars using the discount rate listed above.

Additional assumptions are presented in Tables 8, 9, 10, and 11 below. Unit costs are from data from a similar-sized community on Vancouver Island that manages and hauls organic loads to a regional composting facility. Cost information was also provided by the CVRD.

Table 8: Haul Rates – Per Hour

Haul Rates - Hourly	Value	Units
53' Walking Floor Trailer Hourly Haul Rate	$ 130	$/hour
28' Tub-Style End Dump Trailer	$ 114	$/hour

Table 9: Summary of Round Trip Haul Times

Round Trip Haul Times		
MSW Haul (no backhaul) - CRWMC - CVWMC - CRWMC		
Load MSW at CRWMC	1	hours
Haul MSW from CRWMC to CVWMC	1	hours
Unload MSW at CVWMC	0.25	hours
Empty haul from CVWMC to CRWMC	0.75	hours
TOTAL ROUND TRIP TIME	3	hours
Organics Haul (no backhaul) - CVWMC – NWEC – CVWMC		
Load organics at CVWMC	0.5	hours
Haul organics from CVWMC to NWEC	1	hours
Unload organics at NWEC	0.25	hours
Clean trailer at NWEC	0.25	hours
Empty haul from NWEC to CVWMC	1	hours
TOTAL ROUND TRIP TIME	3	hours
MSW w/ Organics Backhaul - CRWMC – CVWMC – NWEC - CRWMC		
Load MSW at CRWMC	1	hours
Haul MSW from CRWMC to CVWMC	1	hours
Unload MSW at CVWMC	0.25	hours
Clean trailer at CVWMC	0.25	hours
Load organics at CVWMC	0.5	hours
Haul organics from CVWMC to NWEC	1	hours
Clean trailer at NWEC	0.25	hours
Empty haul from NWEC to CRWMC	0.25	hours
TOTAL ROUND TRIP TIME	4.5	hours

Table 10: Haul Rates - Per Trip

Haul Rate – Per Trip	Value	Units
53 ' Walking Floor Trailer – MSW (3 hours)	$ 390	$/trip
53 ' Walking Floor Trailer - MSW w/ Organics Backhaul (4.5 hours)	$ 585	$/trip
28 ' Tub-Style End Dump Trailer – Organics (3 hours)	$ 343	$/trip

Table 11: Assumed Trailer Payloads

Waste Payload		
53' Unmodified Walking Floor Trailer (28 tonne max capacity)	25	tonnes
53' Leak Resistant Walking Floor Trailer (28 tonne max capacity)	25	tonnes
28 ' Tub-Style End Dump Trailer (25 tonne max capacity)	18	tonnes

Table 12 below presents the MSW and organic waste projections provided by the CVRD. These tonnages form the basis of the analysis and were assumed to be the required quantity of waste to be transferred between facilities.

Table 12: Annual MSW and Organics Tonnages to be Transferred

Year	MSW Tonnes (Southbound)		Organics Tonnes (Northbound)	
	Per Year	Per Day	Per Year	Per Day
2019	0	0	5,587	22
2020	0	0	5,681	22
2021	0	0	5,776	23
2022	0	0	5,868	23
2023	22,930	89	5,961	23
2024	21,759	84	7,794	30
2025	21,880	85	7,902	31
2026	21,983	85	8,011	31
2027	22,062	85	8,122	32
2028	22,143	86	8,235	32

Tables 13 and 14 summarize the estimated trips required for MSW and organics transfer under Scenarios 1 and 2.

Table 13: Annual Trips Required for Separate MSW and Organics Transfer (Scenario 1)

Year	MSW Trips (Southbound)		Organics Trips (Northbound)		Total Trips
	Per Year	Per Day	Per Year (28' tub-style trailer)	Per Day (28' tub-style trailer)	
2019	0	0.0	318	1.2	318
2020	0	0.0	318	1.2	318
2021	0	0.0	332	1.3	332
2022	0	0.0	332	1.3	332
2023	926	3.6	332	1.3	1258
2024	874	3.4	433	1.7	1307
2025	884	3.4	448	1.7	1332
2026	884	3.4	448	1.7	1332
2027	884	3.4	462	1.8	1346
2028	894	3.4	462	1.8	1357

Table 14: Summary of Annual Trips with Organics Backhaul (Scenario 2)

Year	Organics Only	MSW with Organics Backhaul (53' trailer)	MSW Only	Total Trips
2019	318	0	0	318
2020	318	0	0	318
2021	332	0	0	332
2022	332	0	0	332
2023	0	239	686	926
2024	0	312	562	874
2025	0	322	562	884
2026	0	322	562	884
2027	0	333	551	884
2028	0	333	562	894

Tables 15 and 16 present a summary of the annual hauling costs for Scenarios 1 and 2, respectively. Table 17 presents a comparison of the two scenarios and shows the estimated cost difference.

Table 15: Cost Summary - Scenario 1 (Separate MSW and Organics Haul with No Backhaul)

Year	MSW Trips (Southbound)			Organics Trips (Northbound)			Total Annual Haul Cost (Separate MSW + Organics Haul)	
	Hourly Haul Rate ($/hour)	Trip Haul Rate ($/trip)	Annual Haul Cost	Hourly Haul Rate ($/hour)	Trip Haul Rate ($/trip)	Annual Haul Cost	Future Dollars	Present Value (Discounted)
2019	$130	$390	$0	$114	$343	$109,021	$109,021	$109,021
2020	$132	$396	$0	$116	$348	$110,656	$110,656	$105,387
2021	$134	$402	$0	$118	$353	$117,421	$117,421	$106,504
2022	$136	$408	$0	$120	$359	$119,182	$119,182	$102,954
2023	$138	$414	$383,135	$121	$364	$120,970	$504,105	$414,729
2024	$140	$420	$367,035	$123	$370	$160,154	$527,189	$413,066
2025	$142	$426	$376,975	$125	$375	$167,975	$544,950	$406,650
2026	$144	$433	$382,630	$127	$381	$170,495	$553,125	$393,095
2027	$146	$439	$388,370	$129	$386	$178,634	$567,004	$383,771
2028	$149	$446	$398,833	$131	$392	$181,314	$580,146	$373,968

Table 16: Cost Summary - Scenario 2 (MSW Haul with Organics Backhaul)

Year	MSW Trips (Southbound)			Organics Trips (Northbound)			MSW with Organics Backhaul			Total Annual Haul Cost (MSW with Organics Backhaul)	
	Hourly Haul Rate ($/hour)	Trip Haul Rate ($/trip)	Annual Haul Cost	Hourly Haul Rate ($/hour)	Trip Haul Rate ($/trip)	Annual Haul Cost	Hourly Haul Rate ($/hour)	Trip Haul Rate ($/trip)	Annual Haul Cost	Future Dollars	Present Value (Discounted)
2019	$130	$390	$0	$114	$343	$109,021	$130	$585	$0	$109,021	$109,021
2020	$132	$396	$0	$116	$348	$110,656	$132	$594	$0	$110,656	$105,387
2021	$134	$402	$0	$118	$353	$117,421	$134	$603	$0	$117,421	$106,504
2022	$136	$408	$0	$120	$359	$119,182	$136	$612	$0	$119,182	$102,954
2023	$138	$414	$284,123	$121	$364	$0	$138	$621	$148,519	$432,642	$355,935
2024	$140	$420	$235,951	$123	$370	$0	$140	$630	$196,626	$432,577	$338,935
2025	$142	$426	$239,490	$125	$375	$0	$142	$640	$206,228	$445,718	$332,602
2026	$144	$433	$243,083	$127	$381	$0	$144	$649	$209,321	$452,404	$321,515
2027	$146	$439	$242,160	$129	$386	$0	$146	$659	$219,315	$461,474	$312,344
2028	$149	$446	$250,430	$131	$392	$0	$149	$669	$222,604	$473,034	$304,922

Table 17: Cost Summary – Comparison of Scenario 1 (Separate Haul) vs. Scenario 2 (Organics Backhaul) Annual Costs

Year	Scenario 1 Separate MSW + Organics Haul (No Backhaul)		Scenario 2 MSW with Organics Backhaul		Difference between Scenarios 1 and 2 Annual Haul Costs (Potential Cost Savings)	
	Future Dollars	Present Value (Discounted)	Future Dollars	Present Value (Discounted)	Future Dollars	Present Value (Discounted)
2019	$109,021	$109,021	$109,021	$109,021	$0	$0
2020	$110,656	$105,387	$110,656	$105,387	$0	$0
2021	$117,421	$106,504	$117,421	$106,504	$0	$0
2022	$119,182	$102,954	$119,182	$102,954	$0	$0
2023	$504,105	$414,729	$432,642	$355,935	$71,464	$58,794
2024	$527,189	$413,066	$432,577	$338,935	$94,612	$74,131
2025	$544,950	$406,650	$445,718	$332,602	$99,232	$74,049
2026	$553,125	$393,095	$452,404	$321,515	$100,721	$71,580
2027	$567,004	$383,771	$461,474	$312,344	$105,529	$71,426
2028	$580,146	$373,968	$473,034	$304,922	$107,112	$69,046
				TOTAL	**$578,671**	**$419,026**

In summary, the total annual hauling cost to haul organics from the transfer station to the compost facility using a separate transfer trailer while hauling garbage separately (Scenario 1) ranges from $109,000 to $119,000 from 2019 to 2022, and from $504,000 to $580,000 between 2023 and 2028.

The total annual hauling cost with organics backhaul (Scenario 2) is estimated to range from $109,000 to $119,000 from 2019 to 2022, and from $433,000 to $473,000 between 2023 and 2028.

The potential annual savings on the total garbage and organics hauling costs with organics backhaul ranges from $71,000 to $107,000. Over the 10-year projection period, the net present value (NPV) savings is estimated at $419,000.

Capital Cost Considerations

The analysis above indicates that for both Scenarios 1 and 2, a dedicated trailer to haul organics will be required. For Scenario 2, an additional leak resistant walking floor trailer will be required. It is expected that the two existing unmodified 53’ walking floor trailers will still be used for the dedicated MSW loads.

The estimated costs to purchase new transfer trailers suitable for hauling organics is provided in Table 18 below. It should be noted that all capital investments and maintenance is expected to be the responsibility of the hauling contractor, and this cost will not be the responsibility of the CVRD.

Table 18: Transfer Trailer Capital Costs

Transfer Trailer Costs	Cost
53 ' Leak Resistant Walking Floor Trailer (28 Tonne Capacity)	$ 118,000
Tub-Style Trailer (20 Tonne Capacity)	$ 90,000

Based on discussions with the CVRD, it is understood that the existing walking floor trailers cannot be upgraded to be suitable for hauling organic waste. The cost shown in Table 18 is for the purchase of a brand new leak-resistant trailer. The leak-resistant trailer would also be suitable for hauling MSW.

The cost to purchase a leak-resistant walking floor trailer is expected to be approximately 30% greater than the cost to purchase a tub-style trailer.

6. Future Considerations and Recommendations

The analysis presented in this memo indicates that there are cost savings that can be realized if organics are backhauled from the CVWMC to the NWEC or Block J in Campbell River. Backhauling organics is estimated to reduce the total annual hauling costs for garbage and organics by $71,000 to $107,000, compared to if garbage and organics are hauled separately.

Key conclusions from the analysis, based on the updated organics and MSW projections, are as follows:

- The quantity of garbage required to be hauled southbound is about three times the quantity of organics required to be hauled northbound.
- It is estimated that 3 to 4 trips per day will be required to transfer MSW, and 1 to 2 trips per day will be required to transfer organics.
- The annual cost to haul organics is estimated to account for approximately 30% of the total annual haul cost. The remaining 70% of the total cost is associated with hauling MSW.
- From 2019 to 2022, it is assumed that MSW will not be transferred; therefore, organics backhaul will not be possible. Assuming the organics processing facility and transfer station are constructed and accepting organic waste by the end of 2020, a dedicated organics hauling trailer will be required.
- From 2023 to 2028, organics backhaul will be possible. It is estimated that one in every three trips of MSW will be required to backhaul the organics received at the transfer station at the CVWMC.
- For both hauling scenarios assessed, it is assumed that the two existing 53 foot walking floor trailers will be used to haul dedicated MSW loads.
- For Scenario 1 (no organics backhaul), a trailer dedicated for hauling organics will be required. This memo assumes that a 28 foot tub-style end dump transfer trailer would be used to transfer organics, which would provide the most flexibility for hauling both residential waste (primarily commingled food and yard waste) and ICI waste (variable composition).
- For Scenario 2 (organics backhaul), a trailer dedicated for hauling organics and a leak-resistant 53 foot walking floor trailer will be required. This memo assumes that a 28 foot tub-style end dump trailer will be used to haul organics from 2019 to 2022. Beginning in 2023, organics will be backhauled using a leak resistant walking floor trailer. The tub-style trailer can continue to be used to haul select ICI loads that are not suitable for the leak-resistant walking floor trailer.

As the CVRD proceeds with the Compost Facility and Transfer Station host site selection, the following are recommended:

- There are additional risks and costs associated with hauling MSW and backhauling organics (compared to hauling MSW only). Once the indicative design of the transfer station is complete, the CVRD should start developing the terms of the organics hauling contract and identify a short list of qualified contractors. The responsibilities of the hauling contractor should also be reviewed.
- The CVRD should proceed with the design of the transfer station and compost facility with the assumption that organics will be backhauled. The indicative design of the transfer station and compost facility should assume the following trailers will be used to transfer organic waste:
  - 53 foot leak-resistant walking floor transfer trailer with a minimum capacity of 25 tonnes.
  - 28 foot tub-style end dump trailer with a minimum capacity of 18 tonnes.
- The existing 53 foot unmodified trailers should not be used to haul organics, as this presents an additional risk to the CVRD. Once the nature (water content) of the organics loads is better understood, the suitability of the unmodified trailers to haul organics should be re-assessed. In particular, the composition and quantity of ICI organic waste that will be accepted at the transfer station is unknown at this time.

TECHNICAL MEMORANDUM

Residential Organic Waste Quantities & Characteristics

PREPARED FOR: Comox Valley Regional District

PREPARED BY: CH2M

DATE: March 5, 2018

VERSION: FINAL

PROJECT NUMBER: 700041

1 Introduction

CH2M and Morrision Hershfield are assisting the Comox Valley Regional District (CVRD) and its member municipalities with the planning and procurement of a new organic waste transfer station and a regional composting facility that will service municipalities in the southern portion of the Comox Strathcona Waste Management (CSWM) service area.

As part of the facility development process, it is necessary to understand the sources, quantities, and characteristics of source-separated organic (SSO) feedstock materials that could be received at the facility.

The primary sources of SSO materials considered in this study are single-family and multi-family residences. The SSO stream from these generators consists primarily of food and food-soiled paper, and leaf and yard waste (L&YW). This memorandum discusses the quantities, characteristics and associated seasonal variability in generation rates and quality of these materials.

There are additional sources of organic waste that could be incorporated into regional diversion programs, including SSO from industrial/ commercial/ institutional (ICI) sources, and biosolids from the City of Campbell River's wastewater treatment plant (WWTP). These sources, and others identified through a waste-to-energy study being completed in parallel with this work, are discussed in a separate technical memorandum.

2 Residential Food Waste

Food waste makes up a significant proportion of the municipal solid waste stream. It is generated primarily by the residential and ICI sectors, and can be either "post-consumer" (i.e. originating in residences and commercial kitchens in restaurants, hospitals etc.), or "pre-consumer" (i.e. coming from food processors, warehouses, and supermarkets). Food wastes typically have a high moisture content and a high nutrient content.

The following are examples of specific food wastes that are typically included in diversion programs:

- fruits and vegetables
- table scraps and plate scrapings
- pasta and rice
- eggs and egg shells

- meat, chicken, fish, and bones
- dairy products
- bread and baked goods
- coffee grounds/filters and tea bags
- paper towels, napkins and tissues
- food soiled newsprint
- paper take-out trays and egg cartons

Food-soiled paper products are often included within the scope of food waste diversion programs. Food-soiled paper products (e.g. paper towels, napkins, pizza boxes, soiled or waxed cardboard, soiled newspaper, and tissues) cannot be recycled. However, these materials do not normally have any harmful or toxic characteristics and are readily degradable. Including food-soiled paper in collection programs is also beneficial from the perspective that it helps to absorb free-liquids during collection.

2.1 Residential Food and Food-Soiled Paper Waste Quantities

The amount of food waste and food-soiled paper available in the residential waste stream can be estimated using detailed data from solid waste composition studies together with waste generation data. However, estimates based on this approach can be influenced by the level of detail of the waste component categories, the time of year that the sampling was done, and the number of samples obtained. Using this approach to determine the amount of material that can be diverted through collection programs also requires that participation and capture rates be estimated.

An alternative approach for estimating quantities of food waste that could be diverted is to rely on diversion data from existing collection programs in other jurisdictions. Specifically, "per household" diversion rates (e.g. kg/household per year) from existing programs can be combined with population statistics from the subject community to arrive at diversion estimates. This approach has the advantage that participation and capture rate estimates are not required as they are accounted for in the operating data. However, the drawback to this approach is that differences in education programs, supporting policies and diversion incentives (e.g. pay-as-you-throw, disposal bans), consumer habits and climates are not factored into the estimate.

The latter approach has been used to estimate the amount of food waste that could be diverted in this assessment. Exhibit 1 provides collection statistics from programs in other locations (e.g. Ontario and Nanaimo) where a relatively small green bin (60-80 litre) is provided for food and other kitchen waste (and perhaps small quantities of yard waste). Exhibit 1 also summarizes collection statistics from programs that co-collect food waste and yard waste together in the same container.

The data shows that the Ontario average and Nanaimo green bin diversion ranged between 107 and 148 kg/single-family household (SFHH) per year. In most communities, green bin collection is offered to some, but not all multi-family households as well. Thus, the actual food waste diversion per SFHH is probably somewhere between the two range endpoints. The average total organics (food plus yard waste) reported by the Ontario communities ranges from 223 to 285 kg/SFHH per year. The Ontario communities all use user-provided bags or cans for yard waste for part of the year on a weekly or every-other-week basis.

Future changes in food waste quantities are affected by a number of factors including population demographics and growth, tourism, and changes in an area's commercial/industrial base. A detailed assessment of these factors and their impact on solid waste quantities is beyond

the scope of this assignment. Instead, a simplistic assessment of "waste growth" was completed by using the per household waste generation rates in combination with projections of population and households.

The preliminary estimates of future residential food and food-soiled paper waste quantities shown in Exhibits 2 and 3 were arrived at using the average diversion rate of the programs listed in Exhibit 1. In the absence of information on supporting educational programs and policies, the average was chosen as a reasonable indicator of program performance in CVRD.

The estimates in Exhibits 2 and 3 were also based on municipal-specific annual growth rates that range between 0.5% and 5% over the period. Detail population and household estimates used to arrive at these estimates are provided in the appendices.

EXHIBIT 1
ORGANICS COLLECTION DATA FROM OTHER COMMUNITIES

	Yard Waste, Other	Food	Total Organics
Separate Food Collection, with HH-provided YW container			
Ontario Average [1] (kg/SFHH)	137	148	285
Ontario Average [1] (kg/All HH)	107	116	223
City of Nanaimo [2]	n.a.	132	n.a.
Regional District of Nanaimo [2]	n.a.	107	n.a.
Combined Food/Yard Collection in Cart (kg/SFHH, food/YW split estimated)			
St. Albert, AB [3]	249	120	369
Port Coquitlam, BC [4]	351	138	489
Metro Vancouver, BC [5]	n.a.	n.a.	434
Seattle, WA - 2 years of food/yard [4, 6]	315	131	446
Tacoma, WA Pilot [4]	326	112	438

Notes:

1. Average of 7 largest Ontario communities in 2010. Excludes Toronto, which allows diapers. From: http://www.wdo.ca/content/?path=page82+item35931

2. Range represents City of Nanaimo and Regional District of Nanaimo data from 2012.

http://www.rdn.bc.ca/cms/wpattachments/wpID224atID5946.pdf

3. Based on time series data provided to CH2M HILL. Food assumed to be February organics collection.

4. Port Coquitlam and Seattle estimated by comparing to period prior to food waste introduction; Tacoma pilot estimated by comparing to control collection routes with yard waste only.

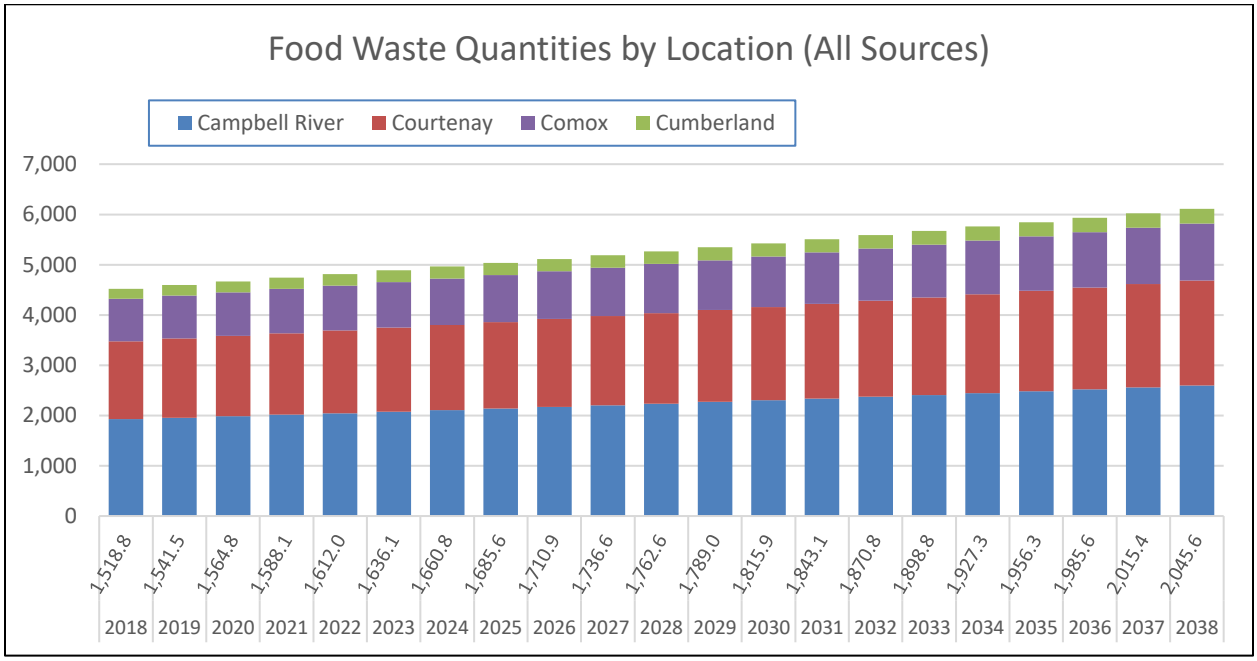
5. Email from Marcel Pitre, Metro Vancouver, May 14, 2012.

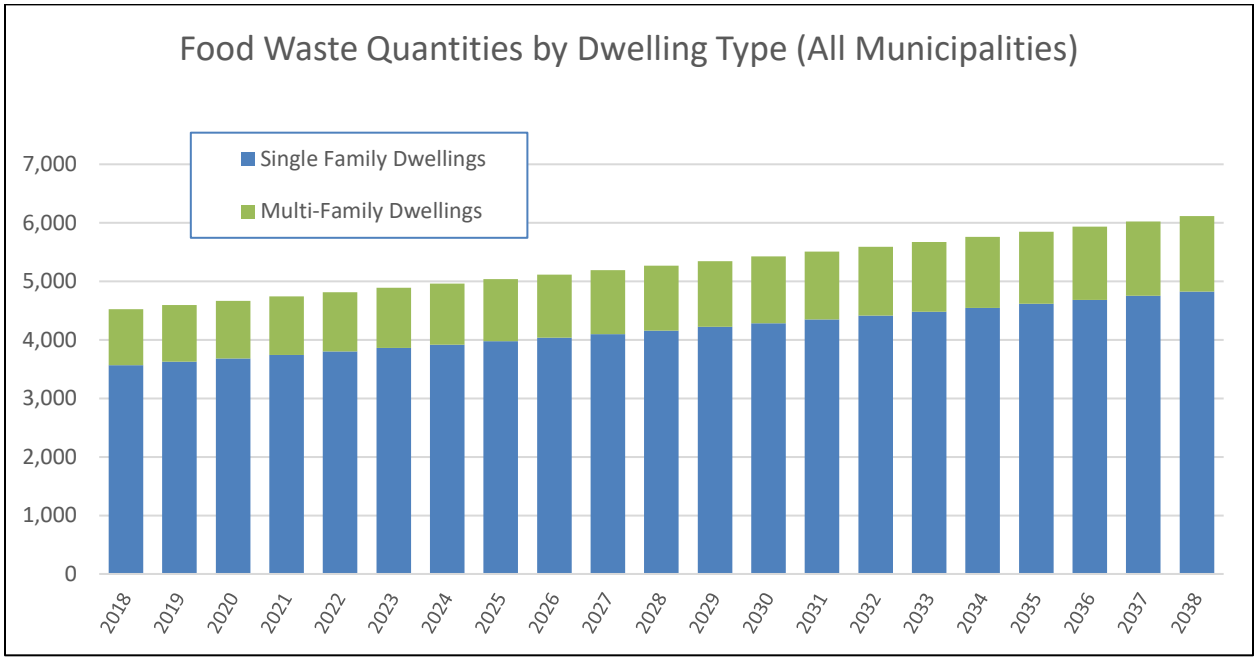
6. Various reports available at http://www.seattle.gov/util/Services/index.asp.

EXHIBIT 2
ESTIMATED DIVERTABLE FOOD WASTE QUANTITIES (TONNES) FOR STUDY AREA

		2018	2023	2028	2033	2038
Single Family Households						
Campbell River	125.0 kg/hhld/yr	1,519	1,636	1,763	1,899	2,046
Courtenay	125.0 kg/hhld/yr	1,196	1,289	1,388	1,496	1,611
Comox	125.0 kg/hhld/yr	675	727	783	844	909
Cumberland	125.0 kg/hhld/yr	179	208	225	242	261
Total		**3,569**	**3,861**	**4,159**	**4,480**	**4,827**
Multi-Family Households						
Campbell River	125.0 kg/hhld/yr	408	440	474	511	550
Courtenay	125.0 kg/hhld/yr	355	383	412	444	479
Comox	125.0 kg/hhld/yr	167	180	194	209	225
Cumberland	125.0 kg/hhld/yr	23	26	29	31	33
Total		**953**	**1,029**	**1,109**	**1,194**	**1,287**
All Household Types						
Campbell River		1,927	2,076	2,237	2,409	2,596
Courtenay		1,552	1,672	1,801	1,940	2,090
Comox		842	907	977	1,053	1,134
Cumberland		202	235	253	273	294
Total		**4,522**	**4,889**	**5,268**	**5,674**	**6,113**

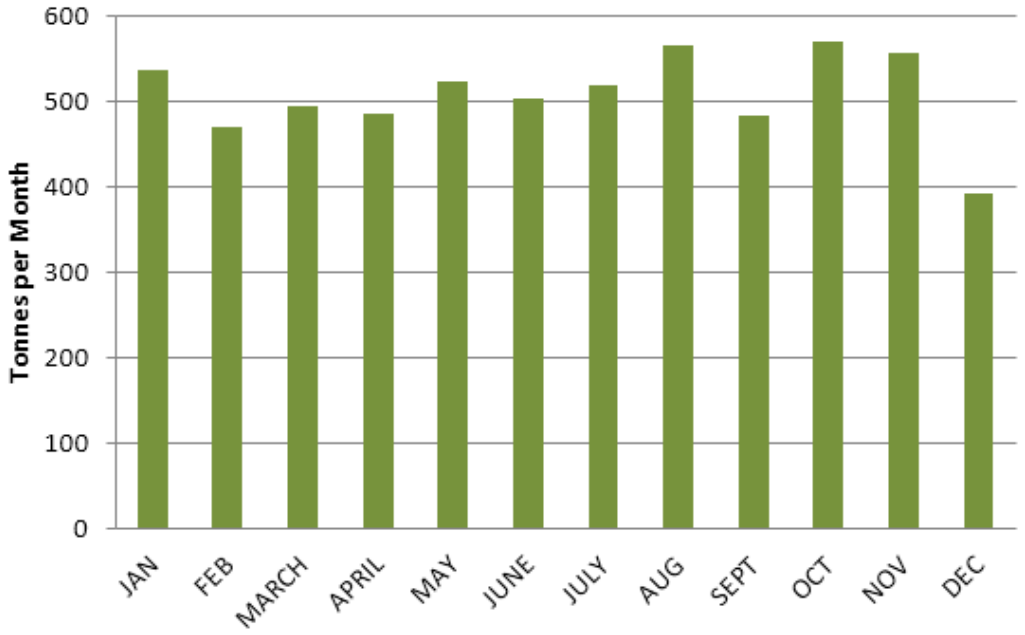
EXHIBIT 3
ESTIMATED DIVERTABLE FOOD WASTE QUANTITIES (TONNES) IN STUDY AREA BY LOCATION AND DWELLING TYPE





The food waste component of the residential food waste stream is significantly less variable than the L&YW stream. This is evident from the following graphical summary of monthly food waste quantities collected through the Regional District of Nanaimo's Green Bin program in 2012. Data from the residential food waste collection program in the Region of Peel exhibits a similar trend.

EXHIBIT 4
SEASONAL VARIATIONS IN NANAIMO FOOD WASTE QUANTITIES (2012)



Based on the data from the Regional District of Nanaimo, a conservative estimate of the peaking factor for food waste would be 1.15. This value was used in subsequent analyses completed within the scope of this study.

2.2 Anticipated Compost Quality

Compost produced from residential food waste and food soiled paper collected in the CSWM service area can be expected to be of moderate to high quality. The compost product should easily meet the provincially mandated standards contained in the Organic Matter Recycling Regulation (OMRR) as well as industry standards for pathogen levels, trace elements, and stability. It is also expected that the compost would meet the quality criteria specified by the Canadian Food Inspection Agency (CFIA) through the Fertilizer Regulation and associated trade memoranda.

The parameter that will be most difficult to meet, and which might cause the quality to be impacted, is sharps and foreign matter content. Food waste diverted through residential collection programs typically contains between 2 to 5% (by weight) of foreign matter contamination. If the feedstocks are not fully inspected upon receipt and contaminants are not removed during the pre- and post-processing stages, the sharps and foreign matter criteria contained in the Canadian Council of Ministers of the Environment's (CCME's) *Guidelines for Compost Quality* may not be met. This may impact the marketability and uses of the finished product.

3 Residential Leaf and Yard Waste

Leaf and yard waste (L&YW) is the term used to refer to a wide range of materials including grass clippings, leaves, flowers, weeds, pine needles and cones, and small prunings from bushes and trees. In some jurisdictions, Christmas trees from diversion programs operated in late December and January are also included in this category. L&YW that is collected through curbside programs is generally small enough that it does not require pre-processing (i.e. grinding) before inclusion in composting programs. L&YW collected at drop-off depot is more likely to contain larger materials (e.g. limbs, trunks) that require grinding.

3.1 Residential L&YW Quantities

Like food waste, the amount of L&YW that can reasonably be diverted can be estimated using detailed data from solid waste composition studies together with anticipated participation and capture rates. Alternatively, "per household" diversion rates from existing programs in comparable climates can be used. Preliminary estimates of L&YW quantities that could be diverted in the study area were developed using the latter method and data from City of Courtenay.

Historical quantities of L&YW diverted through the collection program in Courtenay are summarized in Exhibit 5. These quantities were used to develop a per household generation rate that was used in combination with household projections in the study area to estimate L&YW quantities that could be diverted. These estimates are summarized in Exhibit 6 and 7.

EXHIBIT 5
CITY OF COURTENAY HISTORICAL L&YW QUANTITIES (TONNES)

Month	2013	2014	2015	2016
January	68	50	84	52
February	68	36	108	86
March	118	96	120	158
April	184	160	192	250
May	218	272	264	250
June	200	206	194	234
July	226	204	194	214
August	114	186	158	205
September	158	172	174	165
October	93	238	186	170
November	178	224	146	210
December	50	92	84	62
Total Curbside	1,675	1,936	1,904	2,056
SFHH Counts [1]	8,797	8,902	9,087	9,224
Diversion Rate (kg/SFHH/Yr)	190	217	210	223

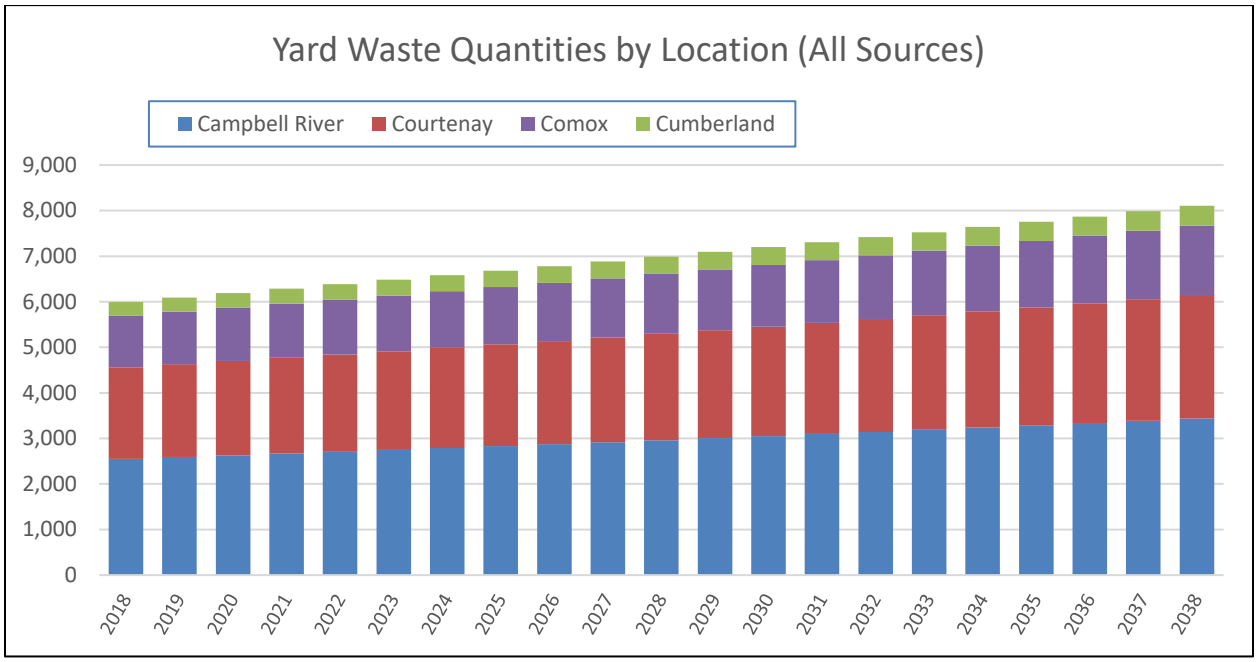
Notes:

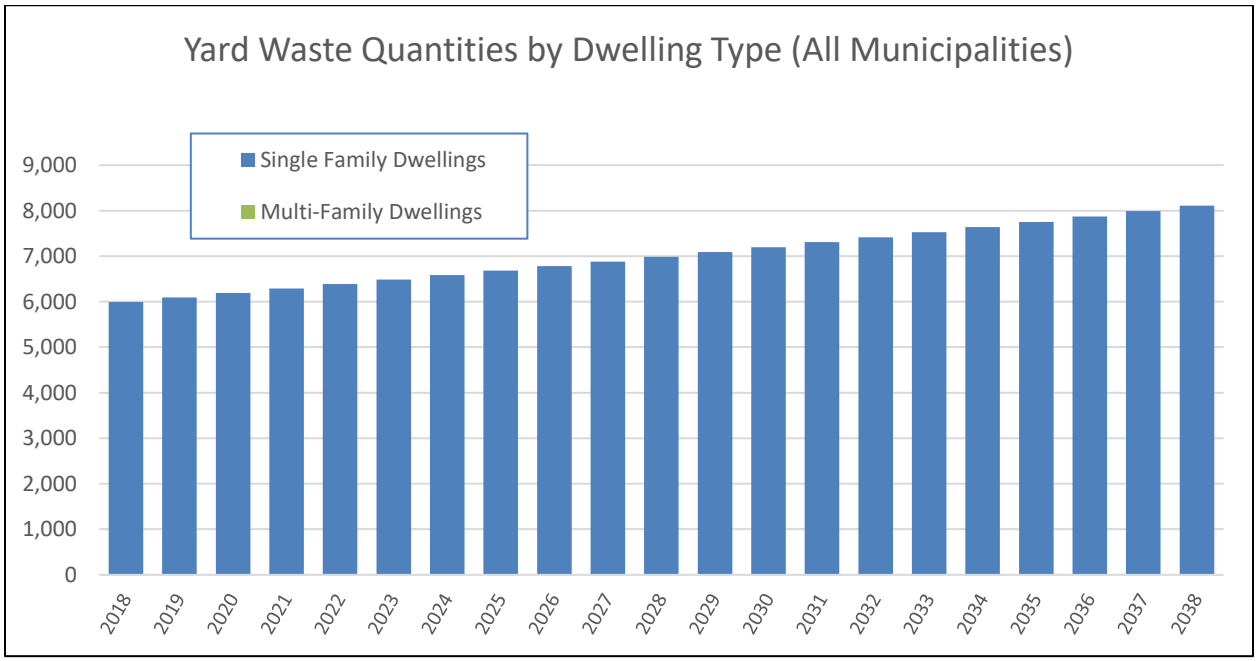
1. Average of monthly number of households that received curbside garbage collection.

EXHIBIT 6
ESTIMATED ANNUAL L&YW QUANTITIES (TONNES) IN STUDY AREA

			2018	2023	2028	2033	2038
Single Family Households							
Campbell River	210.0	kg/hhld/yr	2,552	2,749	2,961	3,190	3,437
Courtenay	210.0	kg/hhld/yr	2,010	2,165	2,332	2,513	2,707
Comox	210.0	kg/hhld/yr	1,134	1,222	1,316	1,418	1,527
Cumberland	210.0	kg/hhld/yr	301	350	377	406	438
Total			**5,996**	**6,486**	**6,987**	**7,527**	**8,109**
Multi-Family Households							
Campbell River	0.0	kg/hhld/yr	0	0	0	0	0
Courtenay	0.0	kg/hhld/yr	0	0	0	0	0
Comox	0.0	kg/hhld/yr	0	0	0	0	0
Cumberland	0.0	kg/hhld/yr	0	0	0	0	0
Total			**0**	**0**	**0**	**0**	**0**
All Household Types							
Campbell River			2,552	2,749	2,961	3,190	3,437
Courtenay			2,010	2,165	2,332	2,513	2,707
Comox			1,134	1,222	1,316	1,418	1,527
Cumberland			301	350	377	406	438
Total			**5,996**	**6,486**	**6,987**	**7,527**	**8,109**

EXHIBIT 7
ESTIMATED DIVERTABLE L&YW QUANTITIES (TONNES) IN THE STUDY AREA BY LOCATION AND DWELLING TYPE



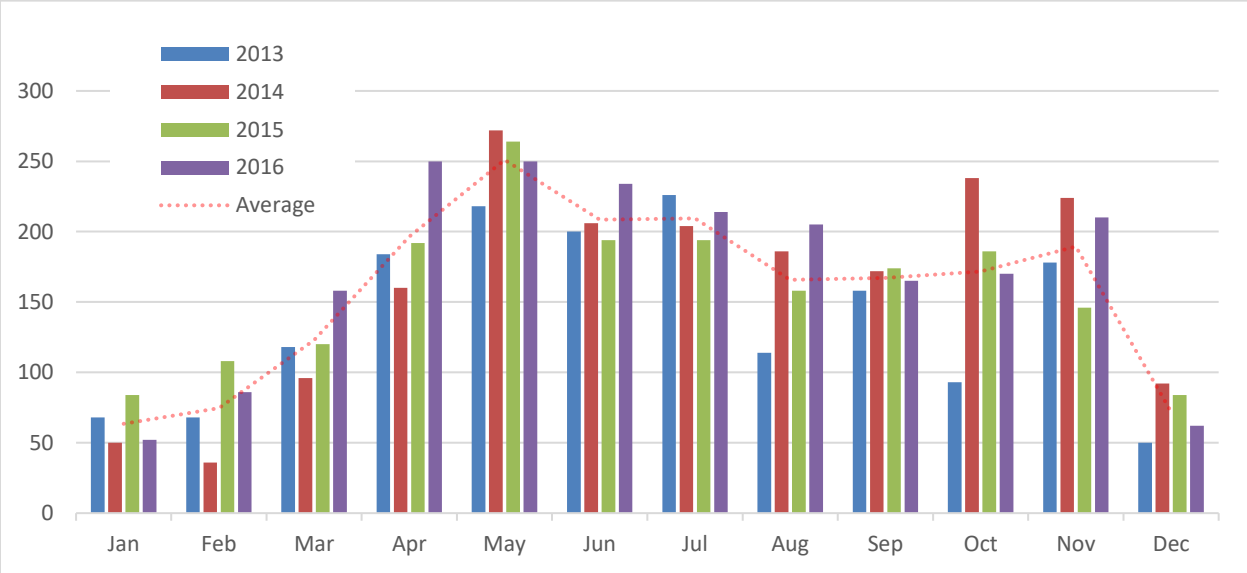


3.2 Factors Affecting L&YW Quantities

L&YW generation rates vary over the course of the year more than most other components of the municipal solid waste stream. L&YW quantities increase in the spring, usually during mid to late March when residents collect any remaining leaves from the previous season and begin preparing yards and gardens for planting. Green grass clippings normally predominate the stream by May and continue to be a major component of the L&YW stream into September. In October and into November, the L&YW stream is predominantly comprised of garden debris, brush trimmings, and leaves.

Peaking factors are often used to express the variation in solid and organic waste quantities from annual averages. An analysis of the historical data from the City of Courtenay's curbside program showed that the peaking factor ranged from 1.5 to 1.7 during the period between 2013 and 2016. In every year except 2013, the peak amount of material was collected in April or May. The historical data from Courtenay is shown graphically in Exhibit 8.

EXHIBIT 8
SEASONAL VARIATIONS IN COURTENAY YARD WASTE QUANTITIES (2013-2016)



L&YW quantities can also vary up and down from year to year within a given area. Intuitively, these variations can be attributed mainly to climatic variations which directly affect the growth rate of grass and trees. The primary factors would be variations in temperatures, precipitation, and hours of sunlight.

Climatic variations are offset somewhat in urban settings by irrigation and fertilization practices. For example, the effects of a dry summer season on residential lawns can be offset by watering on a regular basis.

The age of residential and commercial developments, and the resulting maturity of trees used in landscaping, can lead to great variations in L&YW quantities within a municipality. For example, the amount of leaves generated by 50 to 75-year-old trees in older neighborhoods is significantly greater than the quantities in newer subdivisions where trees are less mature.

Similarly, the amount and type of "green space" in a particular community will also affect the amount of L&YW attributed to municipal operations. There is generally less green space in smaller or older communities which are developed on a "grid pattern" of streets, than in newer communities which are typically developed with non-grid road networks, neighborhood trail systems, and more park areas.

Snowfall can also impact L&YW quantities, since snowfall contributes to soil moisture which affects growing conditions during the following season. Snowfall can also affect quantities in a less obvious manner. For example, an early snowfall can disrupt leaf collection activities and force it to be deferred to the following spring. This will have the effect of reducing annual quantities in one year, and increasing it in the next. The delay can also increase seasonal peaks and affect a composting facility's processing capabilities.

Spring snow storms and other major storm events can also increase L&YW quantities. When snow storms happen late in the spring after trees have leafed out, there can be significant breakage of tree limbs from the weight of the snow.

Tree diseases (such as Dutch elm disease), insect infestations, and the need for pruning and other control measures, can also affect the amount of L&YW generated. L&YW debris resulting from control of these diseases/infestations is sometimes managed outside of diversion programs for other L&YW due to concerns over the spread of diseases.

Other factors that affect the amount of generated L&YW material that is collected from residents and delivered to a composting facility including:

- Financial incentives for diversion: there is considerable research showing that pay-as-you-throw (PAYT) programs increase diversion compared to flat fee or tax-funded programs.
- Bans and other legislation: Diversion can be increased by banning organics from disposal; organics collection can be decreased by banning grass from disposal.
- Education and promotion: Strong messaging can help influence behavior.
- Container type: The size and type of container can affect diversion. Large, wheeled bins typically result in more diversion than smaller bins or customer-supplied bins or bags that must be lifted and placed at the curb.
- Collection frequency: More frequent collection of organics and/or less frequent collection of garbage supports increased diversion.

3.3 Anticipated Compost Quality

Provided that industry-standard composting and post-processing practices are followed, the compost produced from L&YW diverted from residential (and other) sources in the study area can be expected to be of superior quality. It should not be difficult for the product to meet provincially mandated and industry standards for pathogen levels, trace elements, stability and sharps/foreign matter content. The compost produced is also expected to meet the quality criteria specified by the Canadian Food Inspection Agency (CFIA) through the Fertilizer Regulation and associated trade memoranda.

APPENDIX A

POPULATION AND HOUSEHOLD PROJECTIONS

Client: CVRD
Project: Organic Waste Processing Study
Date: Feb-14-2018
Sheet: Population and Housing Statistics

Dwelling Counts	Campbell River			Courtenay			Comox			Cumberland		
Type of dwelling	**Number of Dwelling**	**Population Counts**	**Proportion**	**Number of Dwelling**	**Population Counts**	**Proportion**	**Number of Dwelling**	**Population Counts**	**Proportion**	**Number of Dwelling**	**Population Counts**	**Proportion**
Single-detached house	8785	21875	68.5%	5970	14275	57%	4150	10115	74%	1165	2920	21%
Semi-detached house	735	1610	5.0%	1765	3765	15%	0	1180	9%	75	150	1%
Row house	950	2175	6.8%	855	1780	7%	715	1035	8%	85	110	1%
Apartment, building that has five or more storeys	5	5	0.0%	45	65	0%	575	0	0%	0	0	0%
Apartment, building that has fewer than five storeys	2355	3490	10.9%	2305	3600	14%	590	1020	7%	55	95	1%
Apartment, duplex	750	1690	5.3%	370	850	3%	95	195	1%	125	280	2%
Other single-attached house	0	10	0.0%	15	30	0%	0	5	0%	15	25	0%
Movable dwelling	620	1100	3.4%	385	630	3%	85	155	1%	50	100	1%
Total Dwellings	14,200	31,955		11,710	24,995		6,210	13,705		1,570	3,680	
SF Dwellings	11,090	26,770	84%	8,990	20,480	82%	4,950	12,490	91%	1,390	3,305	90%
MF Dwellings	3,110	5,185	16%	2,720	4,515	18%	1,260	1,215	9%	180	375	10%
	SF cap/hhld		2.4			2.3			2.5			2.4
	MF cap/hhld		1.7			1.7			1.0			2.1

2016 Census References:

2016 Dwelling Type:
http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/hlt-fst/td-tl/Table.cfm?Lang=Eng&T=107&S=2&O=A
2016 Population by Dwelling Type:
http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/dt-td/Rp-eng.cfm?TABID=6&LANG=E&APATH=3&DETAIL=0&DIM=0&FL=A&FREE=0&GC=0&GID=1163734&GK=0&GRP=1&PID=109534&PRID=10&PTYPE=109445&S=0&SHOWALL=0&SUB=0&Temporal=2016&THEME=116&VID=0&VNAMEE=&VNAMEF=&D1=0&D2=0&D3=0&D4=0&D5=0&D6=0#L1G1163718

Client: CVRD
Project: Organic Waste Processing Study
Date: Feb-14-2018
Sheet: Population and Household Projections

			2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Growth Rate																									
Campbell River				1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
Courtenay				1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
Comox				1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
Cumberland				3.50%	3.50%	3.50%	3.50%	3.50%	2.50%	2.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
Total Population																									
Campbell River			33,696	34,201	34,714	35,235	35,764	36,300	36,845	37,398	37,959	38,528	39,106	39,693	40,288	40,892	41,505	42,128	42,760	43,401	44,052	44,713	45,384	46,065	46,756
Courtenay			26,056	26,447	26,844	27,247	27,656	28,071	28,492	28,919	29,353	29,793	30,240	30,694	31,154	31,621	32,095	32,576	33,065	33,561	34,064	34,575	35,094	35,620	36,154
Comox			14,400	14,616	14,835	15,058	15,284	15,513	15,746	15,982	16,222	16,465	16,712	16,963	17,217	17,475	17,737	18,003	18,273	18,547	18,825	19,107	19,394	19,685	19,980
Cumberland			3,562	3,687	3,816	3,950	4,088	4,231	4,337	4,445	4,512	4,580	4,649	4,719	4,790	4,862	4,935	5,009	5,084	5,160	5,237	5,316	5,396	5,477	5,559
Single Family Population																									
Campbell River	84.0%		28,305	28,729	29,160	29,597	30,042	30,492	30,950	31,414	31,886	32,364	32,849	33,342	33,842	34,349	34,864	35,388	35,918	36,457	37,004	37,559	38,123	38,695	39,275
Courtenay	82.0%		21,366	21,687	22,012	22,343	22,678	23,018	23,363	23,714	24,069	24,430	24,797	25,169	25,546	25,929	26,318	26,712	27,113	27,520	27,932	28,352	28,777	29,208	29,646
Comox	91.0%		13,104	13,301	13,500	13,703	13,908	14,117	14,329	14,544	14,762	14,983	15,208	15,436	15,667	15,902	16,141	16,383	16,628	16,878	17,131	17,387	17,649	17,913	18,182
Cumberland	90.0%		3,206	3,318	3,434	3,555	3,679	3,808	3,903	4,001	4,061	4,122	4,184	4,247	4,311	4,376	4,442	4,508	4,576	4,644	4,713	4,784	4,856	4,929	5,003
Multifamily Family Population																									
Campbell River			5,391	5,472	5,554	5,638	5,722	5,808	5,895	5,984	6,073	6,164	6,257	6,351	6,446	6,543	6,641	6,740	6,842	6,944	7,048	7,154	7,261	7,370	7,481
Courtenay			4,690	4,760	4,832	4,904	4,978	5,053	5,129	5,205	5,284	5,363	5,443	5,525	5,608	5,692	5,777	5,864	5,952	6,041	6,132	6,223	6,317	6,412	6,508
Comox			1,296	1,315	1,335	1,355	1,376	1,396	1,417	1,438	1,460	1,482	1,504	1,527	1,550	1,573	1,596	1,620	1,645	1,669	1,694	1,720	1,745	1,772	1,798
Cumberland			356	369	382	395	409	423	434	444	451	458	465	472	479	486	493	501	508	516	524	532	540	548	556
Single Family Households																									
Campbell River	2.4	cap/hhld	11,794	11,970	12,150	12,332	12,518	12,705	12,896	13,089	13,286	13,485	13,687	13,893	14,101	14,312	14,527	14,745	14,966	15,190	15,418	15,650	15,885	16,123	16,365
Courtenay	2.3	cap/hhld	9,290	9,429	9,570	9,714	9,860	10,008	10,158	10,310	10,465	10,622	10,781	10,943	11,107	11,273	11,443	11,614	11,788	11,965	12,144	12,327	12,512	12,699	12,890
Comox	2.5	cap/hhld	5,242	5,320	5,400	5,481	5,563	5,647	5,732	5,818	5,905	5,993	6,083	6,174	6,267	6,361	6,456	6,553	6,651	6,751	6,852	6,955	7,060	7,165	7,273
Cumberland	2.4	cap/hhld	1,336	1,383	1,431	1,481	1,533	1,587	1,626	1,667	1,692	1,718	1,743	1,770	1,796	1,823	1,851	1,878	1,907	1,935	1,964	1,993	2,023	2,054	2,085
Multi-Family Households																									
Campbell River	1.7	cap/hhld	3,171	3,219	3,267	3,316	3,366	3,416	3,468	3,520	3,572	3,626	3,681	3,736	3,792	3,849	3,906	3,965	4,025	4,085	4,146	4,208	4,271	4,335	4,401
Courtenay	1.7	cap/hhld	2,759	2,800	2,842	2,885	2,928	2,972	3,017	3,062	3,108	3,155	3,202	3,250	3,299	3,348	3,398	3,449	3,501	3,554	3,607	3,661	3,716	3,772	3,828
Comox	1.0	cap/hhld	1,296	1,315	1,335	1,355	1,376	1,396	1,417	1,438	1,460	1,482	1,504	1,527	1,550	1,573	1,596	1,620	1,645	1,669	1,694	1,720	1,745	1,772	1,798
Cumberland	2.1	cap/hhld	170	176	182	188	195	201	207	211	215	218	221	225	228	231	235	239	242	246	250	253	257	261	265
Total Households																									
Campbell River			14,965	15,189	15,417	15,648	15,884	16,121	16,364	16,609	16,858	17,111	17,368	17,629	17,893	18,161	18,433	18,710	18,991	19,275	19,564	19,858	20,156	20,458	20,766
Courtenay			12,049	12,229	12,412	12,599	12,788	12,980	13,175	13,372	13,573	13,777	13,983	14,193	14,406	14,621	14,841	15,063	15,289	15,519	15,751	15,988	16,228	16,471	16,718
Comox			6,538	6,635	6,735	6,836	6,939	7,043	7,149	7,256	7,365	7,475	7,587	7,701	7,817	7,934	8,052	8,173	8,296	8,420	8,546	8,675	8,805	8,937	9,071
Cumberland			1,506	1,559	1,613	1,669	1,728	1,788	1,833	1,878	1,907	1,936	1,964	1,995	2,024	2,054	2,086	2,117	2,149	2,181	2,214	2,246	2,280	2,315	2,350

TECHNICAL MEMORANDUM

ICI Organic Waste Quantities & Characteristics

PREPARED FOR: Comox Valley Regional District

PREPARED BY: CH2M

DATE: March 13, 2018

VERSION: FINAL

PROJECT NUMBER: 700041

1 Introduction

CH2M and Morrision Hershfield are assisting the Comox Valley Regional District (CVRD) and its member municipalities with the planning and procurement of a new organic waste transfer station and a regional composting facility that will service municipalities in the southern portion of the Comox Strathcona Waste Management (CSWM) service area.

As part of the facility development process, it is necessary to understand the sources, quantities, and characteristics of source-separated organic (SSO) feedstock materials that could be received at the facility. This memorandum specifically discusses quantities and characteristics of SSO from industrial/ commercial/ institutional (ICI) sources.

2 ICI Organic Wastes

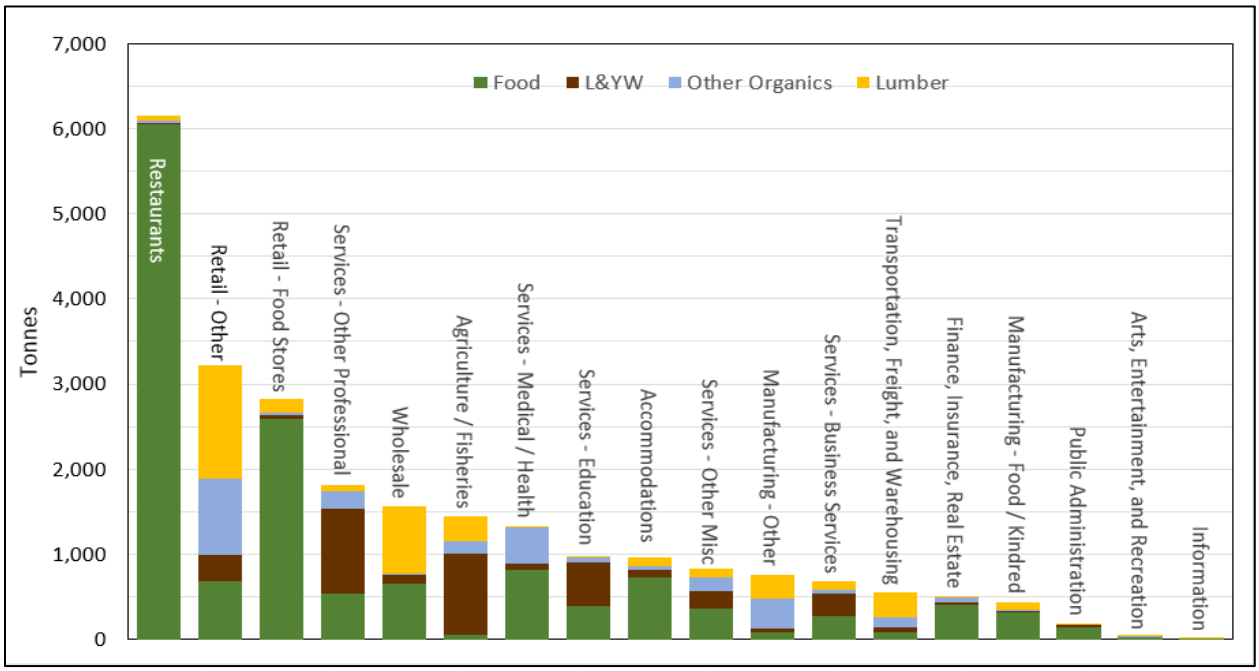
The ICI waste stream differs from the residential stream in that different industries and businesses tend to produce specific types of solid waste. For example, restaurants produce large quantities of food waste and cardboard, while solid wastes from manufacturing facilities may contain more metal, cardboard, or plastic. Due to the different types and volumes of waste generated, ICI waste diversion programs are often developed on a sector-by-sector basis.

An understanding of how the quantities and composition of waste vary between ICI sectors is needed to develop approaches and programs that target specific materials in the ICI waste stream for diversion. The breakdown of quantities of specific materials typically involves using proprietary computer models that combine total ICI waste quantities with employment numbers in each ICI sector and typical "per employee" waste generation rates (e.g. kg/employee per year).

While a detailed analysis of the waste quantities and composition from the various ICI waste sectors in the study area is beyond the scope of work for this project, general trends and estimates of organic waste quantities can be extrapolated from other jurisdictions.

A breakdown of the estimated organic waste quantities generated by ICI sector for the City of Red Deer is provided in Exhibit 1. The general trends illustrated by this data are similar to what has been found in the Cities of Calgary and Saskatoon; the main sources of organic waste in the ICI sector are the accommodation and food services sector.

EXHIBIT 1 ESTIMATED FOOD WASTE QUANTITIES IN RED DEER BY ICI SECTOR, 2014



The commercial sector classifications used in Exhibit 1 are based on the North American Industry Classification System (NAICS) used by Statistics Canada[1] and other agencies. The NAICs codes for the five sectors in Exhibit 1 that generate the most food waste, and a summary of the types of businesses in each, are provided in the following table.

EXHIBIT 2 COMMERCIAL SECTOR DESCRIPTIONS

Commercial Sector	NAICS	Summary
Restaurants	722	This subsector comprises establishments primarily engaged in preparing meals, snacks and beverages, to customer order, for immediate consumption on and off the premises. This subsector does not include food service activities that occur within establishments such as hotels, civic and social associations, amusement and recreation parks, and theatres.
Retail - Food Stores	445	This subsector comprises establishments primarily engaged in retailing a general or specialized line of food or beverage products.
Services - Medical / Health	62	This sector comprises establishments primarily engaged in providing health care by diagnosis and treatment, providing residential care for medical and social reasons, and providing social assistance, such as counselling, welfare, child protection, community housing and food services, vocational rehabilitation and child care, to those requiring such assistance.
Accommodations	721	This subsector comprises establishments primarily engaged in providing short-term lodging for travelers, vacationers and others. In addition to lodging, many establishments have restaurants. Lodging establishments are classified in this subsector even if the provision of complementary services generates more revenues.
Wholesale	41	This sector comprises establishments primarily engaged in wholesaling merchandise (generally in large quantities and without transformation) to retailers, and business and institutional clients.

[1] (http://www.statcan.gc.ca/eng/subjects/standard/naics/2012/introduction

For this study, the detailed data from Red Deer was used to develop "per capita" generation rates for five ICI sectors that produce large quantities of food wastes. These per capita rates were then combined with current populations to develop the "planning-level" estimates of ICI organic waste quantities. Exhibit 3 presents the total estimated amount of ICI organic waste generated in Comox, Courtenay, Cumberland and Campbell River.

While this approach does not have provide a high level of precision, it does provide order-of-magnitude estimates of available quantities which can be used for program planning purposes. It should be noted however that the Comox and Campbell River areas have higher levels of tourism than Red Deer, and thus the amounts of organic wastes from the restaurant and accommodation sectors may be underestimated. Also, the base data used does not accurately reflect the organic wastes generated by agricultural and fisheries sector.

EXHIBIT 3 PLANNING-LEVEL ESTIMATES OF AVAILABLE ICI ORGANIC WASTE QUANTITIES

	Food Waste	L&YW	Other Organics	Lumber	Total
Restaurants	5,738	8	26	59	5,831
Retail - Food Stores	2,455	47	22	159	2,684
Services - Medical / Health	775	69	403	6	1,253
Accommodations	686	83	49	93	911
Wholesale	617	94	19	753	1,483
All Other Commercial Sectors	3,180	3,225	1,954	2,465	10,824
Total	13,451	3,526	2,473	3,535	22,986

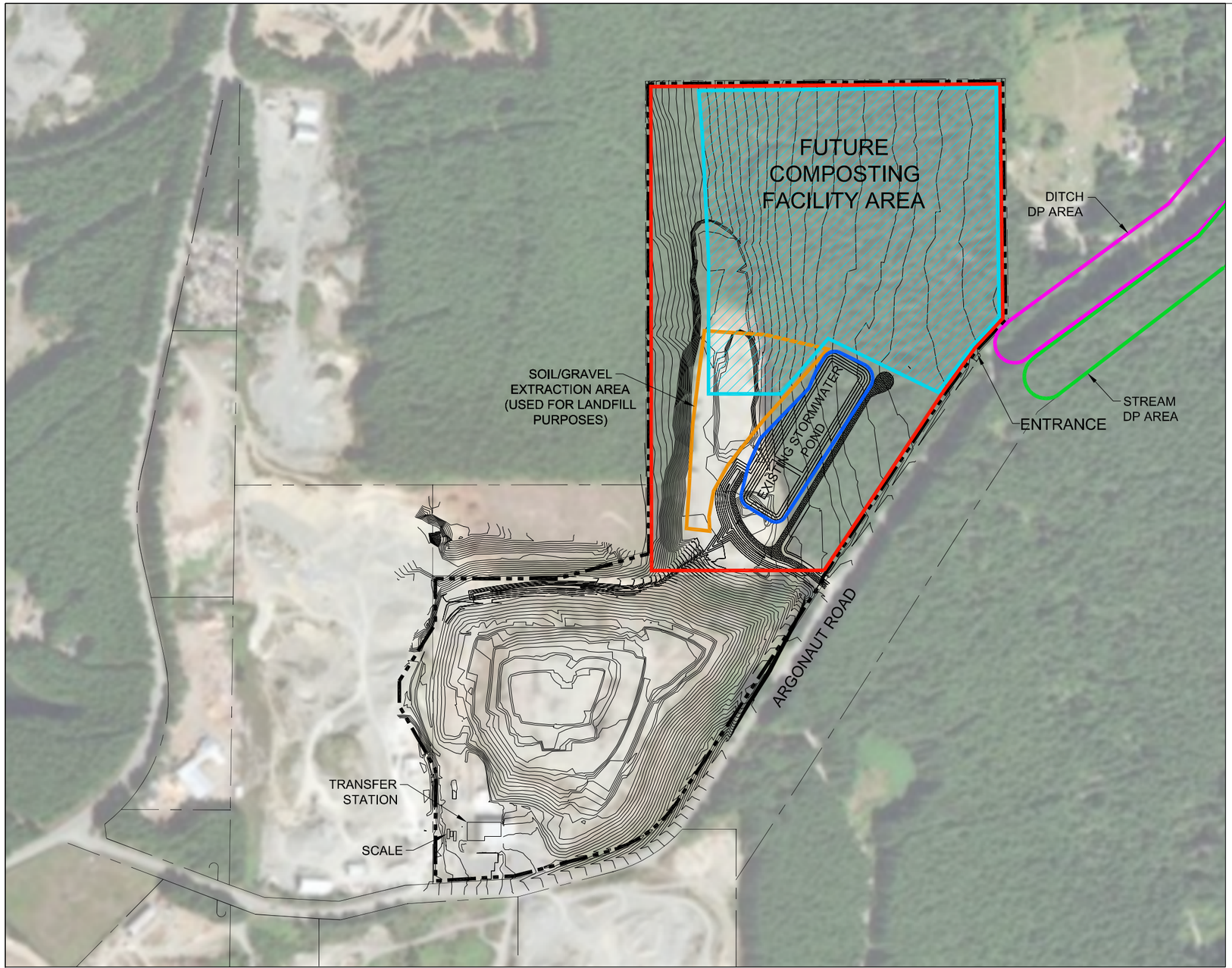
3 Anticipated Compost Quality

Compost made from food waste and food soiled paper collected from ICI sources in the CSWM service area can be expected to be of moderate to high quality, depending on the source.

The primary variability that can be expected is related to the presence of sharps and foreign matter content. Pre-consumer food waste diverted from food processors and wholesalers, grocery stores, and restaurant kitchens generally has lower level of contamination. Comparatively, post-consumer food waste from the dining area of restaurants, and in particular from quick-service restaurants, tends to have higher levels of contamination.

As with residential food waste sources, inspection and removal of contaminants during the pre- and post-processing operations at the composting facility are necessary to meet the sharps and foreign matter criteria contained in the Canadian Council of Ministers of the Environment's (CCME's) *Guidelines for Compost Quality* may not be met.

Compost made from ICI food waste should easily meet the provincially mandated standards contained in the Organic Matter Recycling Regulation (OMRR) as well as industry standards for pathogen levels, trace elements, and stability. It is also expected that the compost would meet the quality criteria specified by the Canadian Food Inspection Agency (CFIA) through the Fertilizer Regulation and associated trade memoranda.



N

LEGEND

- CRWMC
- BLOCK J
- SOIL / GRAVEL EXTRACTION AREA
- STREAM DP AREA
- DITCH DP AREA
- EXISTING STORMWATER POND
- PROPOSED NON-FARM USE AREA APPROX 10.3 ha

Municipal Address

6300 Argonaut Road, Campbell River

Legal Description

Block J, District Lot 85, Sayward Land District
Lease/Permit/Licence # 103555

Lot Size

+/- 19.0 hectares

Area Required for Composting Facility

+/- 10.3 hectares

Land Use Zoning

I-4, Industrial Four

0 100 200 m
1:5000

PROPOSED NON-FARM USE AREA, APROXIMATELY 10.3 ha
COMOX STRATHCONA WASTE MANAGEMENT SERVICE
REGIONAL ORGANIC PROCESSING FACILITY

700041CH

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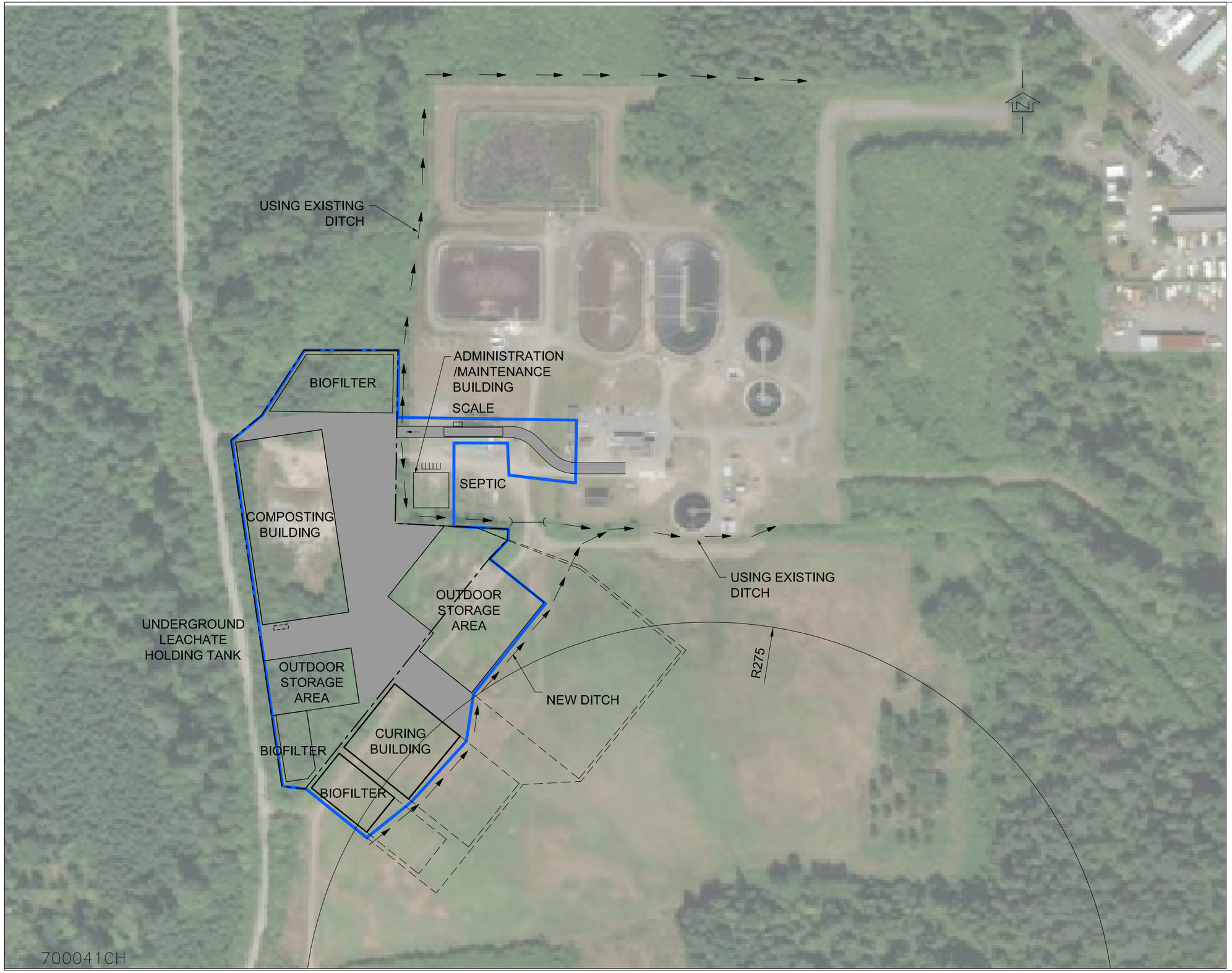

PROPOSED AREA

ADDRESS:

NORM WOOD ENVIRONMENTAL CENTRE
4000 N. ISLAND HIGHWAY

AREA REQUIRED FOR COMPOSTING FACILITY:

+/– 4.5 ha
2.9 ha ORIGINAL SITE AREA
0.5 ha SCALE AND ADMINISTRATION BUILDING
1.1 ha CURING BUILDING, BIOFILTER AND OUTDOOR STORAGE AREA

0 50 100 m
1:2500

COMOX VALLEY REGIONAL DISTRICT

16,500 TPY REGIONAL ORGANICS PROCESSING FACILITY CONCEPTUAL SITE LAYOUT

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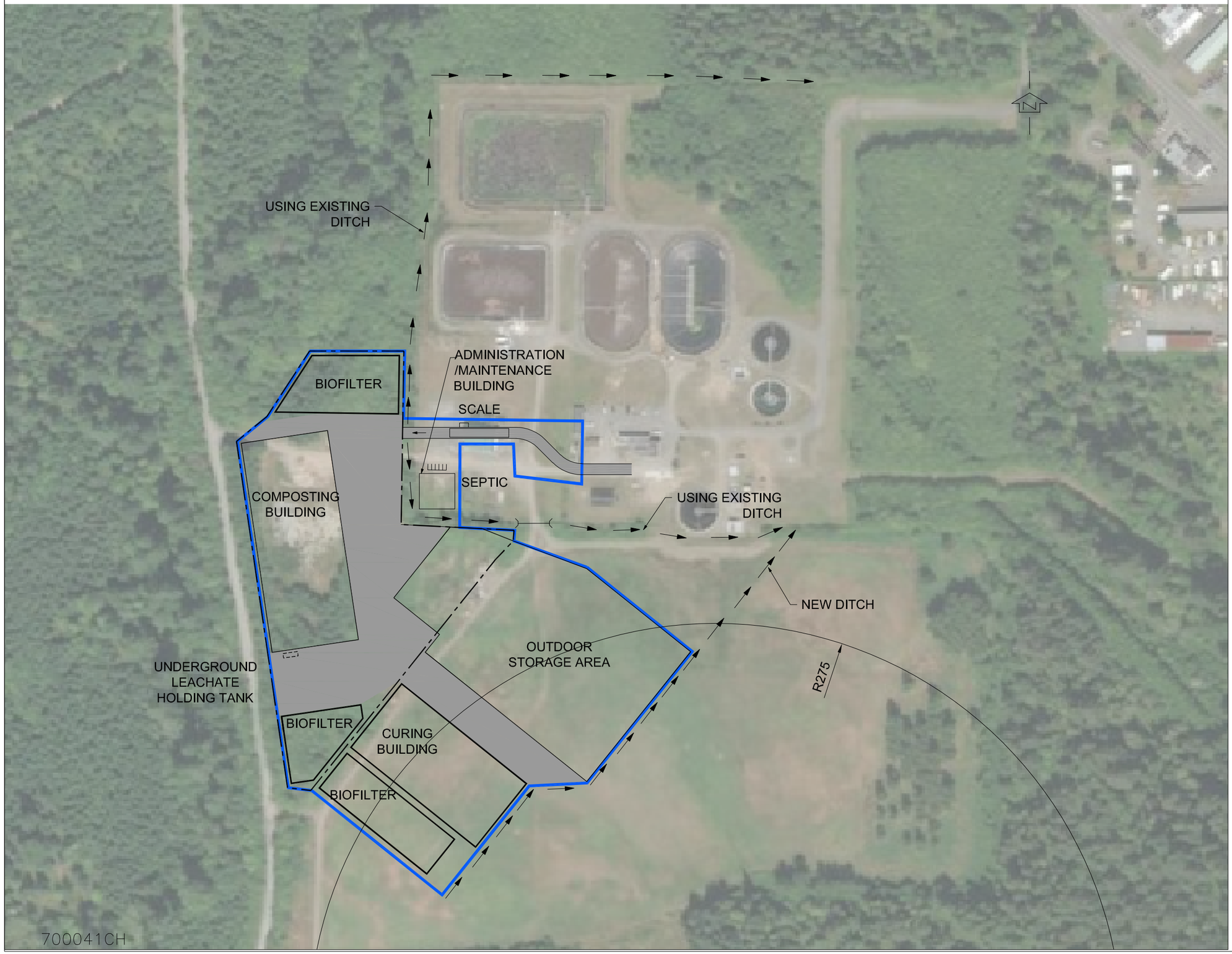

PROPOSED AREA

ADDRESS:

NORM WOOD ENVIRONMENTAL CENTRE
4000 N. ISLAND HIGHWAY

AREA REQUIRED FOR COMPOSTING FACILITY:

+/– 6.4 ha
- 2.9 ha ORIGINAL SITE AREA
- 0.5 ha SCALE AND ADMINISTRATION BUILDING
- 3.0 ha CURING BUILDING, BIOFILTER AND OUTDOOR STORAGE AREA

0 50 100 m
1:2500

COMOX VALLEY REGIONAL DISTRICT

30,300 TPY REGIONAL ORGANICS PROCESSING FACILITY CONCEPTUAL SITE LAYOUT

700041CH

3/20/2019

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