Alberni-Clayoquot Regional District

WEST COAST COMMITTEE MEETING
WEDNESDAY, APRIL 17, 2019, 2:00 PM
Tofino Council Chambers, 121 3rd Street, Tofino, BC

AGENDA

PAGE #

1. **CALL TO ORDER**

Recognition of Territories.

2. **APPROVAL OF AGENDA**
(motion to approve, including late items requires 2/3 majority vote)

3. **ADOPTION OF MINUTES**

a. **West Coast Committee Financial Planning Meeting held February 4, 2019** **2-5**

THAT the minutes of the West Coast Committee Financial Planning meeting held on February 4, 2019 be received.

4. **REQUEST FOR DECISIONS & BYLAWS**

a. **REQUEST FOR DECISION**
Re: Regional Organics Diversion **6-104**

THAT the ACRD West Coast Committee receive this report for information and that the Committee provide its preliminary service and policy preferences, if any, to better focus next steps including potential upcoming public engagement;

AND THAT any Committee identified organics diversion service or policy preferences be recommended to the ACRD Board of Directors.

5. **LATE BUSINESS**

6. **IN CAMERA**

Motion to close the meeting to the public as per the Community Charter section 90 (1) (i): The receipt of advice that is subject to solicitor-client privilege, including communications necessary for that purpose.

7. **RECOMMENDATIONS FROM IN-CAMERA**

8. **ADJOURN**

Alberni-Clayoquot Regional District

MINUTES OF THE WEST COAST COMMITTEE
FINANCIAL PLANNING MEETING
MONDAY, FEBRUARY 4, 2019, 10:00 AM
District of Tofino Council Chambers, 121 3rd Street, Tofino, BC

MEMBERS PRESENT:
Josie Osborne, Chairperson, Mayor, District of Tofino
Mayco Noël, Vice-Chairperson, Mayor, District of Ucluelet
Kel Roberts, Director, Electoral Areal "C" (Long Beach)
Noah Plonka, Alternate, Member of Council, Toquaht Nation

REGRETS:
Kirsten Johnsen, Member of Council, Toquaht Nation
Alan McCarthy, Member of Legislature, Yuułuʔiłʔatḥ Government

STAFF PRESENT:
Rob Williams, General Manager of Environmental Services
Teri Fong, Manager of Finance

1. CALL TO ORDER

The Chairperson called the meeting to order at 10:01 am.

The Chairperson recognized the meeting is being held in the Tla-o-qui-aht First Nation Territories.

2. APPROVAL OF AGENDA

MOVED: *Director Roberts*
SECONDED: *Director Noël*

THAT the agenda be approved as circulated.

CARRIED

3. ADOPTION OF MINUTES

a. West Coast Committee Meeting – January 17, 2019

MOVED: *Director Noël*
SECONDED: *Director Plonka*

THAT the minutes of the West Coast Committee Meeting held on January 17, 2019 be adopted.

CARRIED

4. CORRESPONDENCE FOR INFORMATION

a. Central Westcoast Forest Society
Kennedy Flats Watershed Clean-up Report - 2018

MOVED: Director Noël
SECONDED: Director Roberts

THAT this correspondence be received for information.

CARRIED

5. REQUEST FOR DECISIONS & BYLAWS

a. Request for Decision regarding West Coast Multiplex – 2018-2023 Financial Plan.

MOVED: Director Noël
SECONDED: Director Plonka

THAT the West Coast Committee recommend the West Coast Multiplex proposed budget be included in the first reading of the 2019-2023 Alberni-Clayoquot Regional District Financial Plan.

CARRIED

b. Request for Decision regarding Long Beach Airport – 2019-2023 Financial Plan.

MOVED: Director Noël
SECONDED: Director Roberts

THAT the West Coast Committee recommend the Long Beach Airport proposed budget to be included in the first reading of the 2019-2023 Alberni-Clayoquot Regional District Financial Plan.

CARRIED

c. Request for Decision regarding West Coast Waste Management – 2019-2023 Financial Plan.

MOVED: Director Plonka
SECONDED: Director Roberts

THAT the West Coast Committee recommend that the West Coast Waste Management proposed budget be included in the first reading of the 2019-2023 Alberni-Clayoquot Regional District Financial Plan.

CARRIED

d. Request for Decision regarding Coastal Addendum to the ACRD Agriculture Plan.

MOVED: Director Roberts
SECONDED: Director Noël

THAT the West Coast Committee recommend to the Board of Directors that an additional $15,000 be allocated to Regional Planning under agricultural initiatives.

CARRIED

6. LATE BUSINESS

7. IN-CAMERA

MOVED: Director Plonka
SECONDED: Director Roberts

THAT the meeting be closed to the public as per section:

i. 90 (1) (j) of the Community Charter: Information that is prohibited, or information that if it were presented in a document would be prohibited from disclosure under section 21 of the Freedom of Information and Protection of Privacy Act.

CARRIED

The meeting was closed to the public at 11:09 am.

The meeting was re-opened to the public at 11:18 am.

8. RECOMMENDATIONS FROM IN-CAMERA

9. ADJOURN

MOVED: Director Roberts
SECONDED: Director Plonka

THAT this meeting be adjourned 11:19 am.

CARRIED

Certified Correct:

Josie Osborne,
Chairperson

Wendy Thomson,
Manager of Administrative Services

ALBERNI-CLAYOQUOT
REGIONAL DISTRICT

3008 Fifth Avenue, Port Alberni, B.C. CANADA V9Y 2E3 Telephone (250) 720-2700 FAX: (250) 723-1327

REQUEST FOR INFORMATION

To: West Coast Committee

From: Rob Williams, General Manager of Environmental Services

Meeting Date: April 17, 2019

Subject: Regional Organics Diversion

Recommendation:

THAT the ACRD West Coast Committee receive this report for information and that the Committee provide its preliminary service and policy preferences, if any, to better focus next steps including potential upcoming public engagement.

AND THAT any Committee identified organics diversion service or policy preferences be recommended to the ACRD Board of Directors.

Desired Outcome:

To continue moving forward with implementation of a regional organics diversion program.

Background:

ACRD staff presented a summary of information taken from the recently commissioned Tetra Tech Consulting report on organics diversion service options at the special ACRD Committee of the Whole meeting on March 6th, 2019. Specifically, staff outlined the following:

- An overview of the project and where we are to date,
- The approach taken by Tetra Tech to determine recommended service options,
- An overview of current solid waste collection services across the region,
- Estimated amount of regional organic material to be captured, as well as
- A summary of potential organic collection and processing service options for the Alberni Valley, Bamfield, and the West Coast.

See attached March 6th, 2019 Request for Decision report and full updated Tetra Tech consulting report on organics diversion service options.

The presentation was meant to start the discussion on what types of organic diversion collection and processing options are available to the Regional District, including associated policy and cost considerations. Staff recommended that this topic be referred to both the Alberni Valley & Bamfield and West Coast Committees in order to afford the necessary time for a comprehensive detailed discussion on local community visions regarding organics diversion and how this can help guide next steps towards moving forward with a particular service option(s). The ACRD Board adopted this resolution at their regular meeting of March 13th, 2019.

The April 17th, 2019 special designated West Coast Committee meeting has been scheduled in order to provide the necessary time and space for this comprehensive discussion on organics diversion. The objective of the meeting is to continue moving towards a preferred service option(s) for the West Coast. Specifically, staff are seeking the Committee's preferences regarding possible service and policy options for local organics diversion. If the Committee is not ready to make a recommendation after this meeting, additional meetings can be scheduled and more information presented as per the Committees wishes.

Financial:

Please note that ACRD budget impacts cannot be estimated until there is more refined service direction in regards to the collection and processing of municipal organic waste.

Options Considered:

1. That the Committee identify preliminary preferences, subject to more detailed comparative analysis, for:
    a. Implementing a local organics ban for the commercial and residential waste sectors,
    b. Collecting local organics via self-hauling or implementing a curbside program,
    c. Processing diverted organic material locally.

Submitted by: ____
Rob Williams, MSc, General Manager of Environmental Services

Approved by: ____
Douglas Holmes, BBA, CPA, CA, Chief Administrative Officer

ALBERNI-CLAYOQUOT

3008 Fifth Avenue, Port Alberni, B.C. CANADA V9Y 2E3 Telephone (250) 720-2700 FAX: (250) 723-1327

REQUEST FOR DECISION

To: ACRD Committee of the Whole

From: Rob Williams, General Manager of Environmental Services

Meeting Date: March 6, 2019

Subject: Regional Organics Diversion

Recommendation:

THAT the ACRD Committee of the Whole recommends that the ACRD Board of Directors refer this item to the respective Alberni Valley & Bamfield and West Coast Committees for further discussion and possible recommendations on moving forward with specific service options.

Desired Outcome:

That the ACRD move ahead with engaging the public on a specified recommended service options for a regional organic diversion program.

Background:

At their regular meeting of September 26, 2018, the ACRD Board of Directors awarded a contract to Tetra Tech Consulting in order to research and recommend feasible service options for the collection and processing of regional organics (organic food waste and yard and garden material, as well as other potential feedstocks such as biosolids and fish waste). This work is a key component of advancing the regional organics diversion program for the communities within the Alberni Valley, Bamfield, and the West Coast, as outlined in the approved project plan noted below. Costs associated with this work have been covered 100% by the Strategic Gas Tax Fund that has been secured for this project, with the total grant amount received totaling $6,000,000.

Project Actions	Estimated Completion	
1. UBCM Funding Agreement Executed	July/Aug	2018
2. Contract a Project Management Consultant	Sept-Oct	
3. Conduct Service Delivery Analysis (collection & processing)	Oct-Dec	
4. Confirm Board Direction on Feasible Service Options	**Jan/Feb**	**2019**
5. Community Engagement on Approved Options	Mar-Sept	
6. Select Preferred Service Option (community supported, area specific)	Sept	
7. Project Roll Out (permits, contracts, construction, bin delivery, education/outreach)	Spring/Summer	2020

Tetra Tech undertook a comprehensive process in order to determine feasible organics collection and processing options for the ACRD. Their project methodology included:

1. data collection and analysis in order to determine available regional feedstocks,
2. review of appropriate collection options that include disposal ban considerations in order to maximize diversion objectives
3. review processing technologies that would be feasible for applications for Bamfield, Alberni Valley and the West Coast based on available feedstocks
4. evaluate combined collection and processing options through a triple bottom line lens (i.e. economic, environmental and social) and provide recommendations.

The report outlines the service options and corresponding high level costs. The full detailed report is attached. There are a number of items that the Board should consider while reviewing this information. Specifically, the ACRD is currently working through the process to secure tenure at the Alberni Landfill and therefore there is uncertainty as to what the future holds with this site and therefore it may be advisable to wait and see how the application progresses prior to committing to any potential organics processing at this site. It should be noted that ACRD staff have been fully transparent with potential composting operations at the Alberni Landfill with both the Tseshaht and Hupacasath First Nations as well as the Province. Also, that it has been highlighted in the Coastal Addendum to the Alberni Agricultural Plan that there is a need for compost material on the West Coast in order to help with local food production and therefore there are merits to having a designated processing facility on the West Coast for the region in order to provide a supply of nutrient rich compost material to the area for local agricultural purposes. Lastly, as a reminder, a main objective of this initiative is to prevent or prolong the need to construct costly landfill gas capture infrastructure and that diverting regional organics from the waste stream can help achieve this.

Considering there is a lot of information to digest and understand with the Tetra Tech report, staff are recommending that this item be referred to the Alberni Valley & Bamfield as well as the West Coast Committees for a more detailed discussion and possible recommendations to the Board moving forward. As previously mentioned, it is understood that the varying needs of the communities across the District may result in different service levels across the region. Once there is direction with respect to preferred service option(s), staff will analyze and present the financial impacts regarding that direction.

Time Requirements – Staff & Elected Officials:

A sufficient amount of time will be required in order to complete the tender process in order to retain the services of a community engagement consultant.

Financial:

Costs associated with this phase of the project are 100% covered by the Strategic Priorities Gas Tax Grant. Additional operating funds may be required in order to implement part or a whole organics diversion program.

Policy or Legislation:

It is understood at this point that that the implementation of any new organics collection and or processing services align with the ACRD Solid Waste Management Plan and would be covered under existing ACRD waste management bylaws, however amendments will be required with respect to any policy changes such as recommended disposal bans.

Options Considered:

The other option would be to discuss this matter fully and confirm a service direction at this meeting and for staff to bring back the financial implications at an upcoming Board of Directors meeting prior to public consultation.

Submitted by: ______________________________

Rob Williams, MSc, General Manager of Environmental Services

Approved by: ______________________________

Douglas Holmes, BBA, CPA, CA, Chief Administrative Officer

Organic Waste Diversion Service Options


PRESENTED TO
Alberni-Clayoquot Regional District

APRIL 8, 2019
ISSUED FOR USE
FILE: 704-SWM.PLAN03073-01

Tetra Tech Canada Inc.
Suite 1000 – 10th Floor, 885 Dunsmuir Street
Vancouver, BC V6C 1N5 CANADA
Tel 604.685.0275 Fax 604.684.6241

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EXECUTIVE SUMMARY

The Alberni-Clayoquot Regional District (ACRD) has political and financial support to divert organic waste (food waste, yard waste and food soiled paper) from landfill disposal. The ACRD was successful in its 2017 application to the Gas Tax Strategic Priorities Fund and was awarded $6 million in capital funding towards implementing a regional organics diversion program.

Although the approved Gas Tax grant addresses the issue of capital funding for organic processing facilities, there are still outstanding service delivery issues related to organics feedstock characterization, organics collection in service areas, supporting collection policies, regulatory and technical requirements for organics processing facilities, and capital and operating costs of service delivery options. The ACRD has engaged Tetra Tech Canada Inc. (Tetra Tech) to review these service delivery issues and then outline the costs and benefits of feasible service options for collecting and processing organic waste material across the region.

Section 3 discusses the current waste management systems in the ACRD which is divided into two service areas: West Coast and Alberni Valley service areas. The ACRD's disposal rate is approximately 18,500 tonnes per year, with most from the Alberni Valley (14,000 tonnes per year) and lesser amount from the West Coast (4,500 tonnes per year). The estimated organics diversion rate is approximately **4,200 – 4,900 tonnes per year** in the Alberni Valley and Bamfield service area and **1,100 – 1,350 tonnes per year** in the West Coast service area. This represents a 29% to 35% reduction in the disposal rate.

Section 4 compares relevant organics collection programs in similar jurisdictions across BC, to provide a benchmark for future ACRD collection programs and outline expected costs, organics capture rates, and consequent GHG reduction. Table I-1 summarizes the environmental implications of identified collection options.

Table I-1: Summary of Collection Options

Option	Description	Cost	Diversion Tonnes	GHG Tonnes CO_2e
Bamfield #1	ICI Disposal Ban + Transfer to Alberni Valley	Moderate	7	13
Bamfield #2	ICI & Residential Disposal Ban + Transfer to Alberni Valley	Moderate	11	21
Bamfield #3	ICI & Residential Disposal Ban On-Site Processing	High	11	23
Alberni Valley #1	ICI Disposal Ban + Voluntary Residential Collection for City of Port Alberni	Moderate	1,516	3,150
Alberni Valley #2	ICI & Residential Disposal Ban Electoral Areas Out	High	1,690	3,505
Alberni Valley #3	ICI & Residential Disposal Ban Electoral Areas In	Moderate	1,891	3,879
West Coast #1	ICI Disposal Ban	Low	302	640
West Coast #2	ICI & Residential Disposal Ban Residential Self-Haul	Moderate	342	725
West Coast #3	ICI & Residential Disposal Ban Residential Curbside Collection	High	450	954

Section 5 assesses organics availability to determine potential feedstocks for organics management facilities. Determining the peak flow of organics feedstocks is integral to ensuring that developed organics management solutions will effectively serve the community into the future. This includes accounting for the growth and seasonal fluctuations of different waste streams, as well as the other required feedstocks to produce a viable finished product. In addition to biosolids and food and yard waste, there are opportunities to explore sources of organics from industrial operations such as the potential fishery feedstocks described in Section 5.3. The peak flows of organics material in the two service areas are shown in Table I-2. An assumption of 75% maximum capture of compostable organics from the residential and ICI sectors was made when determining peak flow.

Table I-2: Maximum Organics Flow by Service Area

Service Area	Maximum Flow of Organics (tonnes)	Monthly	Weekly	Feedstock %
Alberni Valley and Bamfield	Food Waste	246	57	39.9%
	Yard, Wood Waste	77	18	12.5%
	Compostable Paper	59	14	9.6%
	Biosolids	62	14	10.1%
	Required Bulking Agent	172	40	27.8%
	Total	**617**	**144**	**100.0%**
West Coast	Food Waste	153	36	46.1%
	Yard & Wood Waste	113	26	34.0%
	Compostable Paper	37	9	11.1%
	Biosolids	13	3	3.9%
	Required Bulking Agent	16	4	4.9%
	Total	**332**	**77**	**100.0%**

Further to calculating available feedstocks, Tetra Tech assessed organics processing technologies ranging from low-technology passive windrows to high-technology modular in-vessel composting systems. Two processing technologies were determined to be the most suitable for further exploration based on available feedstocks, geographical/climate considerations, and concerns about odour control expressed by ACRD staff. **Aerated static pile** and **membrane covered aerated static pile** technologies were chosen and cost estimated and used to evaluate the processing scenarios discussed in Section 7.0.

Section 7 outlines five different processing scenarios for managing organics generated within the ACRD, describing capital and operating costs, design and projected capture capacity, and associated transportation GHGs. The scenarios provide comparison between centralizing organics processing at one site to building processing facilities in each service area, to transferring all organics to out-of-region processing. Scenarios were then compared using a multi-criteria analysis, considering GHG emission reductions, local organics management, odour issues, traffic concerns, job creation, capital cost, operating cost, and unit processing costs (cost per tonne).

The top scenarios were Scenario 1 and 2. Scenario 1 built two processing facilities at the West Coast and Alberni Valley landfills, and **Scenario 2** built one regional processing facility at the Alberni Valley landfill and a transfer station at West Coast to transport organics to the Alberni Valley landfill.

Section 8 discusses recommendations for organics collection and organics processing service delivery.

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ACRONYMS & ABBREVIATIONS

Acronyms/Abbreviations	Definition
ACRD	Alberni-Clayoquot Regional District
BC	British Columbia
CMA	Carey McIver & Associates Ltd.
CO_{2e}	Carbon Dioxide Equivalent
CR&D	Construction Renovation and Demolition
EA	Electoral Area
EOW	Every Other Week
FW	Food Waste
G	Garbage
GHG	Greenhouse Gas
ICI	Industry Commercial and Institution
IR	Indian Reserve
LFG	Landfill Gas
MOE	BC Ministry of the Environment & Climate Change
MSW	Municipal Solid Waste
MV	Metro Vancouver
O	Organics
PMAC	Plan Monitoring Advisory Committees
R	Recycling
RDN	Regional District of Nanaimo
RFP	Request for Proposal
RMI	Resort Municipality Initiative
SWMP	Solid Waste Management Plan
UBCM	Union of British Columbia Municipalities
	Many acronyms for regional districts on figure 4.2

LIMITATIONS OF REPORT

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

1.0 INTRODUCTION

The Alberni-Clayoquot Regional District (ACRD) has long recognized the need to divert organic waste (food waste, yard waste and food soiled paper) from landfill disposal. The current ACRD Solid Waste Management Plan recommends that the feasibility of food waste composting be investigated once priority recycling and residual management initiatives were implemented. In 2014 the ACRD engaged consultants to complete an assessment of organic waste diversion opportunities in the Alberni Valley and West Coast. The resulting high-level organic diversion strategies informed the ACRD's successful 2017 application to the Gas Tax Strategic Priorities Fund, which will provide $6 million in capital funding towards implementing a regional organics diversion program.

Although the approved Gas Tax grant addresses the issue of capital funding for organic processing facilities, there are still outstanding service delivery issues related to:

- Which feedstocks will be processed (food waste, yard waste, wood waste, biosolids) and how much feedstock is available;
- How will these feedstocks be collected (self-haul, commercial collection or curbside collection);
- Which sectors (residential and industrial, commercial and institutional) will feedstocks be collected from;
- What policies (i.e. disposal bans) will be required to support collection programs;
- Do the proposed processing facilities identified in the grant application meet the requirements of the upcoming revisions to the Organic Matter Recycling Regulation, particularly with respect to odour management; and
- What capital and operating costs are associated with the service delivery options.

The ACRD has engaged Tetra Tech Canada Inc. (Tetra Tech) to review these service delivery issues and then outline the costs and benefits of feasible service options for collecting and processing organic waste material across the region.

1.1 Project Objectives and Methodology

distinct service areas: Alberni Valley & Bamfield (25,447 residents) and the West Coast (5,534 residents). Given the distance between communities located in the Alberni Valley and Bamfield, this project recognizes three communities for the development of collection options and processing scenarios: the Alberni Valley, Bamfield and the West Coast.

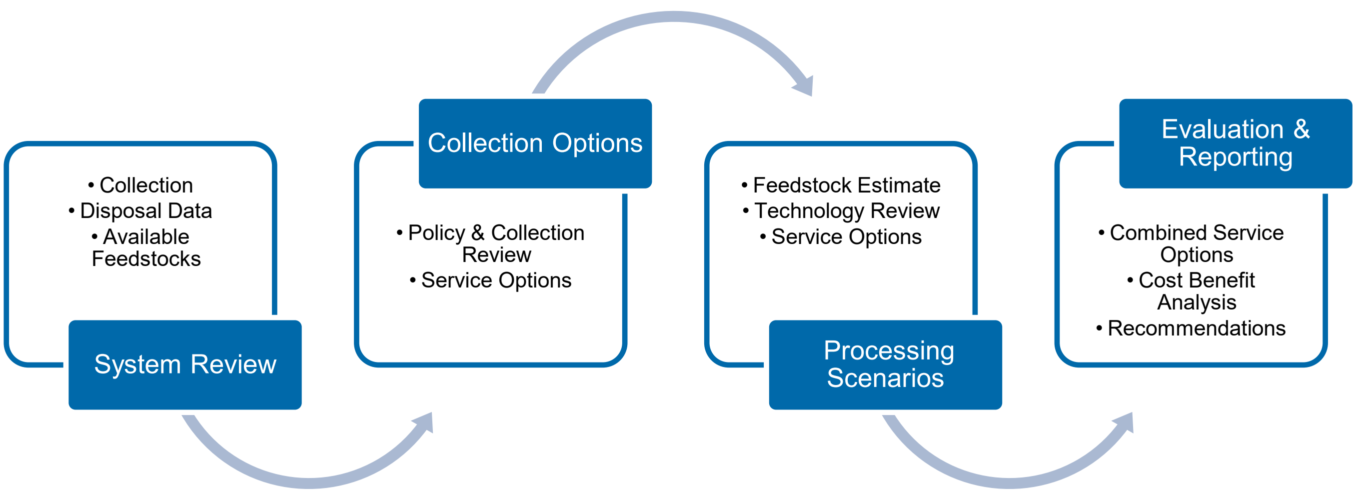
Specific project objectives are as follows:

- Research and present the most feasible organic waste collection and processing scenarios for the Alberni Valley, Bamfield and the West Coast. This includes options that target, as feasible, all waste sectors such as residential (single-family and multi-family) and industrial, commercial and institutional (ICI);
- Outline all capital and annual operating resources including labour, supervision, equipment, and costs associated with feasible collection options and processing scenarios;
- Outline the effect of presented options on landfill closure/post closure plans;
- Highlight required annual feedstock quantities to ensure ongoing operational efficiency on processing;

- Conduct an analysis and clearly outline potential processing locations, both new possible local public facilities and/or land as well as existing private facilities and/or land on Vancouver Island;
- As necessary with each processing scenario, clearly state the estimated quantities (metric tonnes) of finished material and highlight market or disposal options for such finished product; and
- Provide figures for estimated greenhouse gas (GHG) reductions associated with collection and processing service scenarios.

Tetra Tech's approach to fulfilling these objectives is illustrated on Figure 1-1. The methodology consisted of four steps: (1) a review of the current system for collection and disposal of solid waste in the ACRD; (2) the development of collection options based on a review of policy and collection systems in comparable jurisdictions on Vancouver Island; (3) the development of processing options founded on an updated estimate of available organic feedstocks based on actual capture rates associated with selected collection options as well a review of available processing technologies; and, (4) a triple bottom line cost benefit analysis of combined collection and processing service options including recommendations.

Figure 1-1: Project Methodology



1.2 Overview and Structure of the Report

This report is structured as follows. Section 2 outlines the chronology associated with the organic waste diversion strategies developed for the two service areas in 2015. Section 3 outlines the existing collection and disposal system in the service areas and estimates the amount of organic waste that is currently going to landfill. Section 4 reviews successful policy and collection options implemented in comparable Vancouver Island jurisdictions, identifies policy and collection service options applicable to the ACRD and estimates the organics capture rates for each option in ACRD. Section 5 reviews the estimated organics collection capture rates combined with the availability of other feedstocks (such as biosolids) to develop design capacity estimates for processing facilities. Section 6 reviews organic waste processing approaches and identifies appropriated technologies for Alberni Valley & Bamfield and Waste Coast service areas. Section 7 combines collection and processing scenarios for these service areas and undertakes a triple bottom line cost benefit analysis to allow for comparison between scenarios. Section 8 provides conclusions and recommendations.

2.0 ORGANIC WASTE DIVERSION STRATEGY DEVELOPMENT

Diverting organic wastes from landfill and producing compost contributes to sustainability in many communities in British Columbia and North America due to the potential environmental, economic and social benefits outlined in Table 2-1.

Table 2-1: Benefits of Organic Waste Diversion

Environmental Benefits	Social Benefits	Economic Benefits
▪ Reduces GHG emissions	▪ Protects human health	▪ Extends landfill life
▪ Preserves landfill capacity	▪ Reduces landfill safety risks	▪ Produces a marketable product
▪ Reduces landfill leachate	▪ Contributes to land preservation	▪ Provides employment
▪ Improves soil	▪ Contributes to healthy local soils and agriculture	▪ Reduces costs to manage leachate and landfill gas

The ACRD has long recognized the benefits above and organic waste diversion is a component of the regional district's approved Solid Waste Management Plan (SWMP). In 2014, the ACRD initiated a process to review its SWMP (2007) and implement outstanding plan components. Since adopting the 2007 plan, the ACRD has made considerable progress on SWMP elements related to reduction and reuse, residential recycling, and residual waste management. However, program initiatives connected to Industry Commercial and Institution (ICI) sector recycling and organic waste diversion are still being developed.

The 2014 ACRD SWMP Review and Implementation Process resulted in the establishment of two Plan Monitoring Advisory Committees (PMAC), one for the Alberni Valley and one for the West Coast. The role of each PMAC was to review the implementation and effectiveness of the 2007 SWMP in their respective service areas and make recommendations to the Regional District Board regarding implementation of outstanding plan components related to ICI sector recycling and organic waste diversion.

In 2015 the ACRD engaged Carey McIver & Associates Ltd. (CMA) to assist in the SWMP (2007) Review and Implementation Process. CMA supported the two PMACs by: delivering presentations on the effectiveness of the existing solid waste management system in the ACRD; designing and assisting in delivery of disposal bans on recyclable materials generated by the ICI sector; and, undertaking an assessment of organic waste diversion opportunities in the Alberni Valley and West Coast.

CMA's organics diversion opportunities assessment consisted of the following tasks: assess and confirm organic waste quantities by source and type; review and assess local opportunities for reduction, collection, processing and markets; review and assess supporting policies; based on an assessment of local opportunities refine reduction and diversion estimates; prepare high level cost estimates and cost-benefit analysis including the impact on current system costs; and prepare two final reports outlining the organics diversion strategies recommended by Alberni Valley and West Coast PMAC respectively.

In 2015, after seven meetings each, the West Coast PMAC and the Alberni Valley PMAC met to review the final reports prepared by CMA on their respective organic waste diversion strategies. For the West Coast, the CMA assessment concluded that, due to economies of scale, the construction of an organics processing facility on the West Coast was not practical at that time. Instead the draft strategy identified issues related to available feedstocks (wood waste, yard waste, fish waste) that required further study as well as low cost actions that could be taken immediately to reduce organic wastes and thereby reduce associated greenhouse gas emissions (GHG).

The West Coast PMAC received the report and recommended that staff proceed with low cost food waste reduction initiatives. However, with respect to collection and processing, the PMAC recommended that the ACRD review the viability of establishing a food waste composting facility at the West Coast landfill when there is a need for local biosolids management upon implementation of the District of Tofino's Liquid Waste Management Plan.

For the Alberni Valley, the organics diversion strategy arising from the opportunity assessment came to the same conclusion. The proposed strategy identified a workplan to resolve issues related to feedstocks, collection and processing as well as a cost benefit analysis of organics composting versus landfill gas (LFG) collection. The proposed strategy also contained actions that could be taken immediately to reduce organic wastes and thereby reduce greenhouse gas emissions.

The Alberni Valley PMAC reviewed the proposed workplan, budget ($133,000) and schedule to resolve outstanding issues and recommended that the report containing the proposed organics diversion strategy be forwarded to the ACRD Board for review and approval and, that if approved, the options be considered in the 2016-2020 budget deliberations.

The ACRD Board received the recommendation from the Alberni Valley PMAC in November 2015 and referred the report to the Alberni Valley & Bamfield Services Committee for further discussion. In January 2016 this committee recommended that staff meet with the City of Port Alberni Council to discuss the strategy and then submit a workplan and budget for consideration during upcoming financial plan deliberations. In March 2016, the Board approved a revised workplan and budget to implement the organics diversion strategy ($95,000) for inclusion in the ACRD 2016-2020 Financial Plan.

One of the significant outstanding issues related to the organics diversion strategy was determining the cost-benefit of organics composting versus LFG collection to reduce GHG emissions. In February 2017 the Board received the Landfill Gas Generation Report for the Alberni Valley Landfill and, based on the cost of installing an LFG collection system, approved the staff recommendation to proceed with implementing waste diversion initiatives to defer or even eliminate the need for LFG collection in the future.

In May 2017 the ACRD applied to the Gas Tax Strategic Priorities Fund to undertake a consolidated strategic landfill diversion program that would implement a regional organics diversion program as well as upgrade recycling infrastructure at both landfills. In January 2018 the ACRD was notified by Union of British Columbia Municipalities (UBCM) that their application was successful in the amount of $6 million. In July 2018, the District's Board directed staff to execute the UBCM Strategic Priorities Funding Agreement and reviewed staff's draft project plan to proceed with implementing a regional organics diversion program.

Although the approved Gas Tax grant addresses the issue of capital funding, there are still outstanding service delivery issues related to:

- Which feedstocks will be processed (food waste, yard waste, wood waste, biosolids) and how much feedstock is available;
- How these feedstocks will be collected (self-haul, commercial collection or curbside collection);
- Which sectors will they be collected from (residential and ICI);
- What policies (i.e. disposal bans) will be required to support collection programs;
- Do the proposed processing facilities identified in the grant application meet the requirements of the upcoming revisions to the Organic Matter Recycling Regulation, particularly with respect to odour management; and
- What are the capital and operating costs associated with service delivery options.

Consequently, in August 2018 the ACRD issued an RFP seeking proposals from qualified consultants to research and present the cost-benefits of feasible service options for the collection and processing of organic food waste and yard and garden materials for the sub-regional areas of the Alberni Valley, West Coast and Bamfield. Tetra Tech submitted the successful proposal and was awarded the project.

3.0 EXISTING COLLECTION AND DISPOSAL SYSTEM

3.1 Demographics, Geography and Economy

The ACRD is a large and diverse area of over 7,440 square kilometres centrally located on the west side of Vancouver Island. The ACRD is a federation consisting of three municipalities, four Treaty First Nations and six electoral areas. The ACRD provides solid waste management services to approximately 31,000 people in two service areas: (1) Alberni Valley & Bamfield and (2) West Coast.

Table 3-1 lists the population and households for each of the member municipalities, Treaty First Nations and electoral areas based on the 2016 Census.

Table 3-1: ACRD Population and Households by Solid Waste Management Service Area

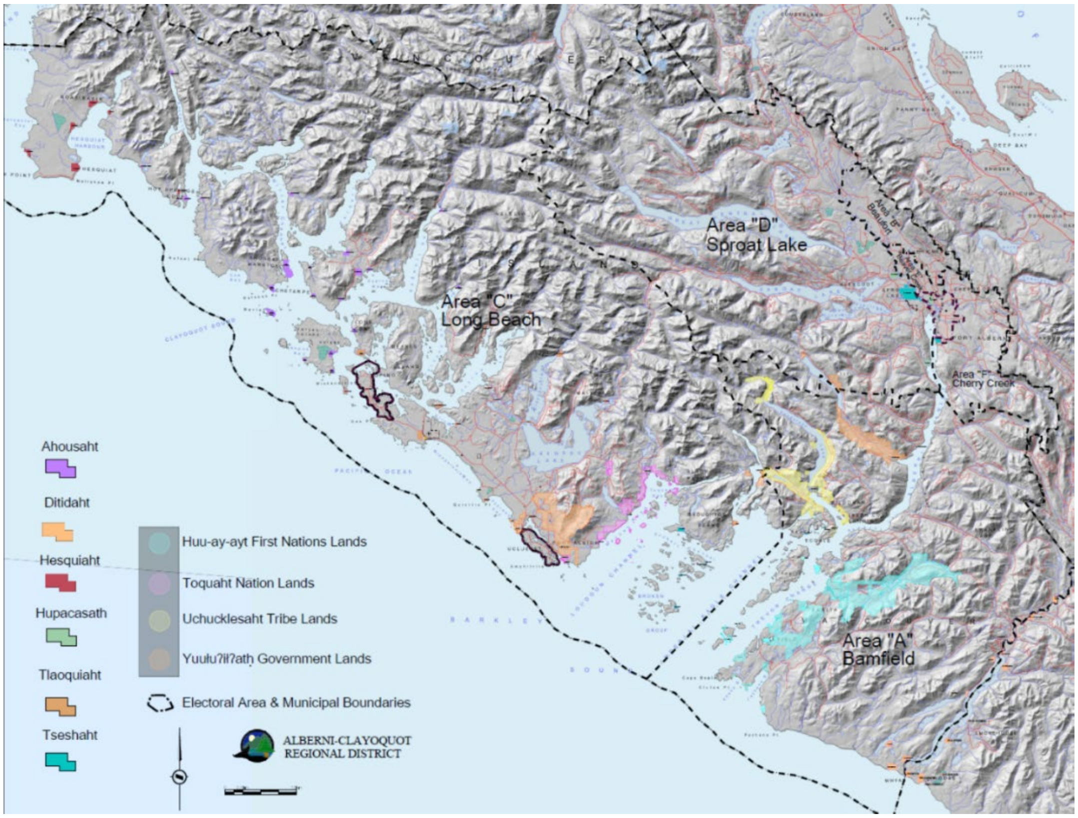
Waste Management Service Area	Census Population	Census Households
Alberni Valley and Bamfield		
City of Port Alberni	17,678	8,119
Electoral Area A – Bamfield	243	132
Electoral Area B - Beaufort	443	199
Electoral Area D – Sproat Lake	2,173	774
Klehkoot & Tseshaht First Nations	-	182
Electoral Area E – Beaver Creek	2,873	1,189
Ahahswinis First Nation	-	54
Electoral Area F – Cherry Creek	1,945	841
Alberni First Nation	-	3
Treaty First Nations in Alberni Valley Area		
Huu-ay-aht First Nation	87	38
Uchucklesaht Tribe	5	1
Sub-Total (Alberni Valley & Bamfield)	**25,447**	**11,532**
West Coast		
District of Tofino	1,932	755
District of Ucluelet	1,717	737
Electoral Area C – Long Beach	1,592	359
First Nation Reserves (5 Nations)	-	53

Waste Management Service Area	Census Population	Census Households
Treaty First Nations in West Coast Area		
Toquaht Nation	19	9
Yuulu?il?ath Government	274	86
Sub-Total (West Coast)	**5,534**	**2,213**
ACRD Total	**30,981**	**13,745**

Figure 3-1 provides a map of the administrative boundaries of the Alberni Clayoquot Regional District while Figure 3-2 provides these boundaries on a topographical map format.

Figure 3-1: Administrative Boundaries of the ACRD

Figure 3-2: ACRD Municipal, Treaty First Nation and Electoral Area Boundaries



Forbidden Plateau, on the east by the Beaufort Range and Mount Arrowsmith, on the south by the Nitnat River and Lake, and on the west by the Pacific Ocean. The ACRD experiences a predominantly maritime climate with heavy rainfall on the West Coast due to the prevailing weather systems that are forced to rise over the mountain ranges.

As indicated on Figure 3-2, the two waste management service areas of Alberni Valley & Bamfield and the West Coast are geographically distinct. The distance between Port Alberni and Tofino is 126 km on the Pacific Rim Highway equivalent to two hours of travel time (see Figure 3-1)

The economies of the two waste service areas are also very different. In the Alberni Valley & Bamfield service area, the City of Port Alberni has the largest population base and is the commercial hub of the region. The population of the City of Port Alberni and the surrounding areas has been stable for more than a decade with minimal growth predicted for the future. Although the economy of the area had been based on the management and processing of natural resources, in response to significant changes in international commodity markets and resource availability, the local economy is currently more diverse and flexible with a focus on the manufacture of wood products.

Tourism is the primary economic driver of the West Coast area, while traditional forms of forestry and fishing are no longer significant economic contributors. Located between the municipalities of Tofino and Ucluelet is the Long Beach Unit of the Pacific Rim National Park Reserve. Parks Canada reports that over 700,000 visitors each year visit Long Beach, the Broken Group Islands, and the West Coast Trail each year. (https://www.pc.gc.ca/en/pn-np/bc/pacificrim/plan). As a result, Tofino and Ucluelet have established themselves as international tourist destinations showcasing natural beauty and outdoor recreation.

Unlike the City of Port Alberni, whose population declined by 0.3 percent between 2011 and 2016, the District of Tofino experienced a population growth of 3% with the District of Ucluelet at 5% over the same period. However, this census data on permanent residents does not reflect the full picture with respect to population in this area. Both Tofino and Ucluelet experience an influx of visitors and transient workers which results in an estimated equivalent annual population increase from 1,932 to 4,674 for Tofino and from 1,717 to 3,500 for Ucluelet.

Due to this influx of visitors and transient workers, both the District of Tofino and the District of Ucluelet are designated as resort municipalities and participate in the provincial funding Resort Municipality Initiative (RMI) program. The RMI program objective is to increase the number of visitors and their length of stay, to broaden resort activities to help expand the length of the tourist season and increase employment, and to diversify the local tax base.

Consequently, with respect to organic collection and processing serving options, infrastructure in the Alberni Valley and Bamfield waste management service area must be designed to accommodate little or no population growth while the infrastructure in the West Coast must accommodate an adjusted resort municipality population with moderate growth.

3.2 Collection System

3.2.1 Alberni Valley & Bamfield Service Area

Residential Collection Services – Alberni Valley

Table 3-2 outlines the current residential collection services for garbage and recycling in the Alberni Valley & Bamfield Waste Service Area. The City of Port Alberni currently provides weekly garbage collection using an automated system. The collection is provided by City staff. The collection of household recycling is managed by the Regional District using a contracted collector. Bi-weekly recycling collection is a manual collection system.

Figure 3-3: City of Port Alberni Automated Side Load Garbage Collection Truck

Under the City's program, residents of Port Alberni must register for a wheeled garbage cart. The cart is the property of the City. To promote greater waste reduction, the automated collection program offers residents the flexibility to choose the size of garbage cart that will meet their needs. The fees charged to residents are as follows: $83 per year for an 80 litre container; $98 per year for a 120 litre container; and $200 per year for a 240 litre container.

Table 3-2: Residential Collection Services in the Alberni Valley & Bamfield Waste Service Area

Community	Census		Curbside	Collection Service	
	Population	Households	Households	Garbage	Recycling
City of Port Alberni	17,678	8,119	6,605	Yes	Yes
Electoral Area A - Bamfield	243	132	-	No	No
Electoral Area B - Beaufort	443	199	-	No	No
Electoral Area D - Sproat Lake	2,173	774	-	No	No
Klehkoot FN	-	6	-	No	No
Tse'shaht FN	-	176	176	Yes	Yes
Electoral Area E - Beaver Creek	2,873	1,189	996	No	Yes
Ahahswinis	-	54	54	Yes	Yes
Electoral Area F - Cherry Creek	1,945	841	-	No	No
Alberni FN (IR 2)	-	3	-	No	No
Treaty First Nations					
Huu-ay-aht First Nation	87	38	38	Yes	No
Uchucklesaht Tribe	5	1	-	No	No
Total	**25,447**	**11,532**	**7,869**		

The collection program is regulated under Solid Waste Collection and Disposal Bylaw No. 4885 which prohibits the disposal of yard and garden waste. Yard and garden waste can be dropped off free of charge at the Alberni Valley Landfill. Although there has been no demand expressed for including this material in curbside collection, and disposal of it at the landfill is free, illegal dumping of yard waste still occurs in City of Port Alberni natural areas (particularly ravines) and on rural road-ends. City staff of Port Alberni indicate that including yard waste in an organics collection program would be a proactive measure to curb this practice/behaviour.

Residents of the four Electoral Areas located within the Alberni Valley are responsible for managing their household waste. Private haulers offer subscription collection services on a weekly and bi-weekly (every-other-week) basis to residents of Electoral Areas D, E, and F. Of the approximate 2,800 Electoral Area households, roughly a third take advantage of these services. Costs for this service are $215 per year for bi-weekly (every-other-week) collection, and $300 per year for weekly collection. Self haul of household waste to the Alberni Valley Landfill is likely more prevalent for Sproat Lake (EA 'D') and Beaver Creek (EA 'E') residents given their proximity to the Landfill.

The 1,100 households located in Beaver Creek (EA 'E') receive bi-weekly curbside recycling collection. The service is managed by the Regional District using a contracted collector. Bi-weekly recycling collection is provided using a manual collection system.

Approximately 700 people reside on First Nation reserves within the Alberni Valley. The two largest Nations (Tseshaht and Hupačasath First Nations), with around 235 homes combined, each provide household waste collection to their on-reserve households. Each collects garbage on a weekly schedule. Both Nations are included in the Regional District's contracted bi-weekly curbside recycling collection.

ICI Collection Services – Alberni Valley

Private sector waste hauling companies service the industrial, commercial, institutional (ICI) sector in the Alberni Valley. Sun Coast Waste Services, Nicklin Waste Disposal, Midland Waste, Waste Connections and Waste Management Canada represent five of the roughly eight companies providing garbage and recycling collection service to this sector. The City of Port Alberni also offers collection services for local businesses and organizations that produce amounts of garbage that can be collected weekly in the same 360L, 240L and 120L carts that the City provides to its residential customers.

Residential and ICI Collection Services – Bamfield

There is no curbside collection for residential waste and recyclables for Bamfield. Instead residents must self-haul their waste materials to the ACRD operated Bamfield Transfer Station. The Huu-ay-aht First Nation provides curbside collection services to Anacla Reserve and the Huu-ay-aht group of businesses located in Bamfield. The Bamfield Marine Science Centre provides solid waste management services for their facilities.

3.2.2 West Coast Service Area

Residential Collection Services – West Coast

Table 3-3 outlines the current residential collection services for garbage and recycling in the West Coast Waste Service Area.

The ACRD provides curbside collection of residential garbage and recycling to 1,300 homes in Tofino, Ucluelet and Electoral Area 'C'. The service is contracted out to a private hauler. Customers are provided a 120 litre garbage container which is collected weekly, and recycling bins are collected every-other-week. The fee charged to residents for this service is $115 per year.

The service in the West Coast is also regulated under ACRD Garbage and Recyclable Materials Collection Bylaw 1021 which prohibits the disposal of yard and garden waste. Yard and garden waste are accepted for free at the West Coast Landfill.

Toquaht First Nation provides both garbage and recycling collection to their residents.

Table 3-3: Residential Collection Services in the West Coast Waste Service Area

Community	Census		Curbside	Collection Service	
	Population	Households	Households	Garbage	Recycling
District of Tofino	1,932	755	1,287	Yes	Yes
District of Ucluelet	1,717	737		Yes	Yes
Electoral Area C - Long Beach	1,592	359		Yes	Yes
Esowista	-	29	-	-	-
Hesquiat	-	3	-	-	-
Marktosis	-	162	-	-	-
Opitsat	-	46	-	-	-
Refuge Cove	-	27	-	-	-
Treaty First Nations					
Toquaht Nation		9	9	Yes	Yes
Yuulu?il?ath Government	-	86	-	-	-
Total	**5,534**	**2,213**	**1,296**		

ICI Collection Services – West Coast

Private sector waste hauling companies provide waste collection service to the ICI sector in the West Coast. SonBird Refuse and Disposal and Ucluelet Rent It Centre represent two of the roughly five companies providing garbage collection and recycling service to this sector.

3.3 Residual Management System

3.3.1 Alberni Valley & Bamfield Service Area

Alberni Valley Landfill

The ACRD operates the Alberni Valley Landfill to dispose of municipal solid waste from the Alberni Valley & Bamfield Waste Management Service Area. The landfill is located on land leased by the ACRD from the Crown, approximately five (5) km west of the City of Port Alberni and operates under Operational Certificate Number MR-524 issued by the Ministry of Environment in 2004. While the landfill is under the jurisdiction of the ACRD, daily landfill operations are conducted by Berry & Vale Contracting Ltd, under contract to the ACRD.

The site is regulated under Alberni Valley Landfill Tipping Fee and Regulation Bylaw No. 1027. This bylaw prohibits the disposal of corrugated cardboard, stewardship materials, metal, tires and yard and garden waste. The tipping fee for garbage is $120 per tonne. There is no charge for yard and garden waste.

Figure 3-4: Alberni Valley Landfill Drop-off Depot

Bamfield Transfer Station

The ACRD provided solid waste and recycling services to Electoral Area A – Bamfield through the operation of the Bamfield Transfer Station. Huu-ay-aht First Nation provided solid waste management services to Anacla Reserve and the Huu-ay-aht group of businesses located in Bamfield. The Bamfield Marine Science Centre contracted out solid waste management services for their facilities. In 2018, the three service providers created the Bamfield Waste Partnership to combine services for efficiency and reduced costs.

In July 2018, the ACRD awarded a two-year contract to provide hauling services for the East Side (Bamfield) Transfer Station, the Bamfield Marine Science Centre, the Huu-ay-aht Government Businesses and Anacla Reserve. All waste collected from these sites is transferred to the Alberni Valley Landfill.

Figure 3-5: Bamfield Transfer Station

2018 Financial Plan

As indicated in Table 3-4, the current financial plan for the Alberni Valley & Bamfield Waste Management Service combines curbside collection services with residual management services. Except for the tax requisition to fund the Bamfield Transfer Station, the service is funded almost entirely from fees and charges. If curbside garbage and recycling collection is excluded from the financial plan, roughly 80% of revenue to fund residual management is obtained from tipping fees. However, recognizing that prior year surplus typically represents tipping fee revenue, this percentage increased to 97%. This means that organics diversion will have an impact on system costs and tipping fees will need to be adjusted accordingly.

Table 3-4: Alberni Valley & Bamfield Waste Management 2018 Financial Plan

Alberni Valley & Bamfield	2018
Revenue	
Prior Year Surplus	$383,992
Tax Requisition	$79,868
Fees & Charges	
Curbside Garbage and/or Recycling	*$8,640*
Tipping Fees	$1,900,000
Grants	$1,000
Recycle BC	*$320,000*
Other	$25,000
Total Revenue	**$2,718,500**
Expenditures	
Administration	$64,000
Bamfield Transfer Station	$80,000
Capital Fund Contribution	$650,000
Closure & Post Closure Fund Contribution	$120,000
Labour Related Costs	$138,000
Promotion & Education	$62,500
Recycle, Reduce, Reuse (includes collection)	*$476,000*
Residual Waste Management	$1,128,000
Total Expenditures	**$2,718,500**

3.3.2 West Coast Service Area

West Coast Landfill

The West Coast Landfill is located adjacent to Pacific Rim National Park Reserve, between the Districts of Tofino and Ucluelet. The site is owned by the ACRD and the daily operations are conducted by Berry & Vale Contracting Ltd., under contract to the ACRD. The site is regulated under West Coast Landfill Tipping Fee and Regulation Bylaw No. 1028. This bylaw prohibits the disposal of corrugated cardboard, stewardship materials, metal, tires and yard and garden waste. The tipping fee for garbage is $120 per tonne. There is no charge for yard and garden waste.

Figure 3-6: West Coast Landfill

2018 Financial Plan

As indicated in Table 3-5, the current financial plan for the West Coast Waste Management Service combines curbside collection services with residual management services. If curbside garbage and recycling collection is excluded from the financial plan, roughly 49% of revenue to fund residual management is obtained from tipping fees. However, recognizing that prior year surplus typically represents tipping fee revenue, this percentage increases to 88%. This means that organics diversion will have an impact on system costs and tipping fees will need to be adjusted accordingly.

Table 3-5: West Coast Waste Management 2018 Financial Plan

West Coast	2018
Revenue	
Prior Year Surplus	$394,045
Tax Requisition	$114,955
Fees & Charges	
Curbside Garbage and/or Recycling	$120,000
Tipping Fees	$490,000
Grants	$2,000
Recycle BC	$50,000
Other	$ -
Total Revenue	**$1,171,000**
Expenditures	
Administration	$29,000
Bamfield Transfer Station	
Capital Fund Contribution	$110,000
Closure & Post Closure Fund Contribution	$92,000
Labour Related Costs	$38,000
Promotion & Education	$20,000
Recycle, Reduce, Reuse (includes collection)	$184,000
Residual Waste Management	$698,000
Total Expenditures	**1,171,000**

3.4 Waste Characterization

Municipal solid waste (MSW) encompasses materials disposed of in regular garbage streams by the residential or ICI sector. This section seeks to quantify the tonnages and composition of MSW in the ACRD to identify the portion of the waste stream that is suitable for organics collection and composting.

3.4.1 Waste Disposal

Alberni Valley & Bamfield Service Area

The Alberni Valley and Bamfield service area encompasses the majority of the regional district's population and corresponding waste generation. In 2018, a total of 16,962 tonnes of waste was disposed at the Alberni Valley Landfill. Most of the waste is generated by the residential sector (45.6%) followed by the industrial, commercial, and institutional (ICI) sector (36.8%), and the construction, renovation, and demolition (CR&D) sector (17.5%).

Figure 3-7 shows that the distribution of disposal between the different sectors is relatively stable in the Alberni Valley Landfill.

Figure 3-7: Tonnages Disposed at Alberni Valley Landfill 2013-2018

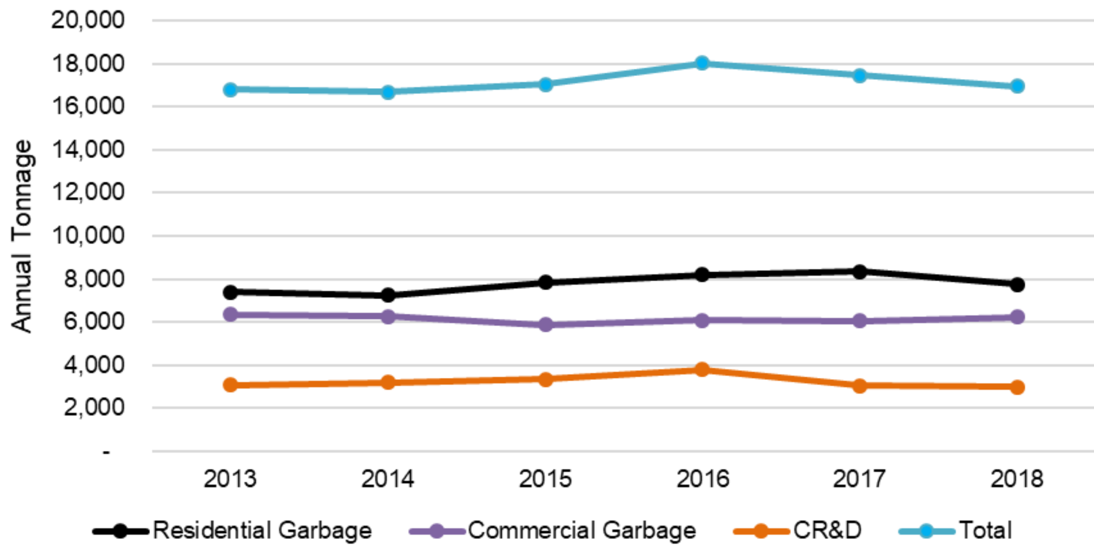


Table 3-6 shows the breakdown of waste hauling in the Alberni Valley. Commercial haulers comprise the majority of waste hauling, with approximately a third represented by self-haul or municipal curbside collection.

Table 3-6: Alberni Valley Landfill – Tonnage by Hauler Type

Hauler Type	Material Received at Alberni Valley Landfill (tonnes)					Average (%)
	2014	2015	2016	2017	2018	
Self-Haul (Cash)	1,015	1,080	1,247	1,311	1,138	8.3%
Municipal Curbside	2,699	2,730	2,808	2,897	2,960	20.2%
Commercial Haulers	9,783	9,901	10,212	10,208	9,887	71.5%
Sub-Total	**13,497**	**13,712**	**14,268**	**14,415**	**13,985**	**100%**

West Coast Service Area

While the West Coast contains fewer permanent residents than the Alberni Valley & Bamfield area, it hosts large numbers of tourists and temporary residents, as it is a prominent tourist destination. This reflects in the waste disposal data, as the 5,925 tonnes disposed in 2018 were primarily composed of ICI sector waste (60.2%) followed by CR&D (23.4%), and residential (15.4%). Figure 3-8 highlights the disposal variability in the CR&D sector over the past five years, as well as the steady increase in disposal from the ICI sector.

Figure 3-8: Tonnages Disposed at West Coast Landfill 2013-2018

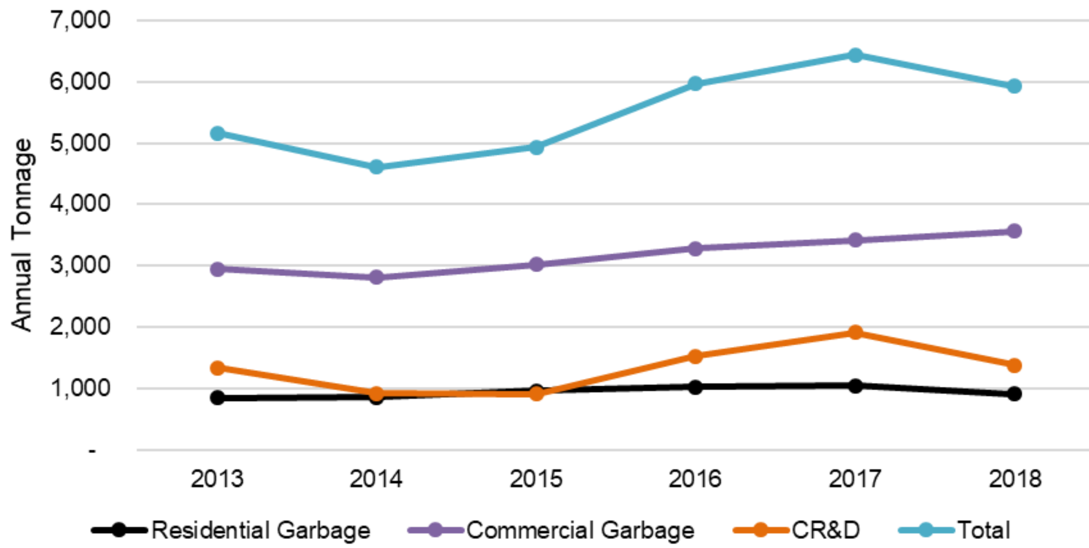


Table 3-7 shows disposal trends from another angle, highlighting the vast proportion of waste on the West Coast being hauled by commercial haulers, with small proportions either self-hauled or picked up by municipal haulers.

Table 3-7: West Coast Landfill – Tonnage by Hauler Type

Hauler Type	Material Received at West Coast Landfill (tonnes)					Average (%)
	2014	2015	2016	2017	2018	
Self-Haul (Cash)	260	276	338	329	295	7.2%
Municipal Curbside	597	689	670	708	593	15.5%
Commercial Haulers	2,821	3,026	3,308	3,447	3,598	77.3%
Sub-Total	**3,678**	**3,991**	**4,316**	**4,484**	**4,485**	**100%**

3.4.2 Waste Composition

This section outlines the estimated waste composition with respect to organics for the ACRD. Since the ACRD has not previously completed a waste composition study, this report will use waste composition data from a variety of other jurisdictions selected for geographical and collection program similarities. The composition data shown in Table 3-8 highlights that compostable organics typically comprise 31% – 36% of the waste stream in relevant jurisdictions, with the food waste representing the largest constituent at 20% – 24%.

Table 3-8: Municipal Solid Waste Stream Composition in Relevant Jurisdictions

Category	Average Southern Vancouver Island Composition	Comox Valley RD Composition	BC Mainland Composition[1]	Average
Food Waste	22.2%	20.2%	24.1%	22.2%
Yard Waste	2.6%	4.7%	3.1%	3.5%
Clean Wood Waste	2.3%	0.8%	2.5%	1.9%
Compostable Paper	4.1%	4.1%	5.8%	4.7%
Total Organics	**31.2%**	**29.8%**	**35.5%**	**32.2%**

[1] Average of jurisdictions without organics collection

3.4.3 Available Organic Waste

As described in Section 3.4.2, there are significant amounts of organics present in waste disposed in landfills. The predominant sectors with organic waste are the residential and ICI sectors where food and yard waste are mostly generated. However, clean wood waste from the CR&D sector can be chipped and mixed into compost. Figure 3-9 shows that approximately 4,200 – 4,900 tonnes of organics annually are present in the residential and ICI waste streams in the Alberni Valley and Bamfield service area. Figure 3-10 highlights an estimated 1,100 – 1,350 tonnes of organics annually are present in the residential and ICI waste streams in the West Coast Service Area.

Figure 3-9: Available Organics in Alberni Valley and Bamfield Service Area Waste Stream

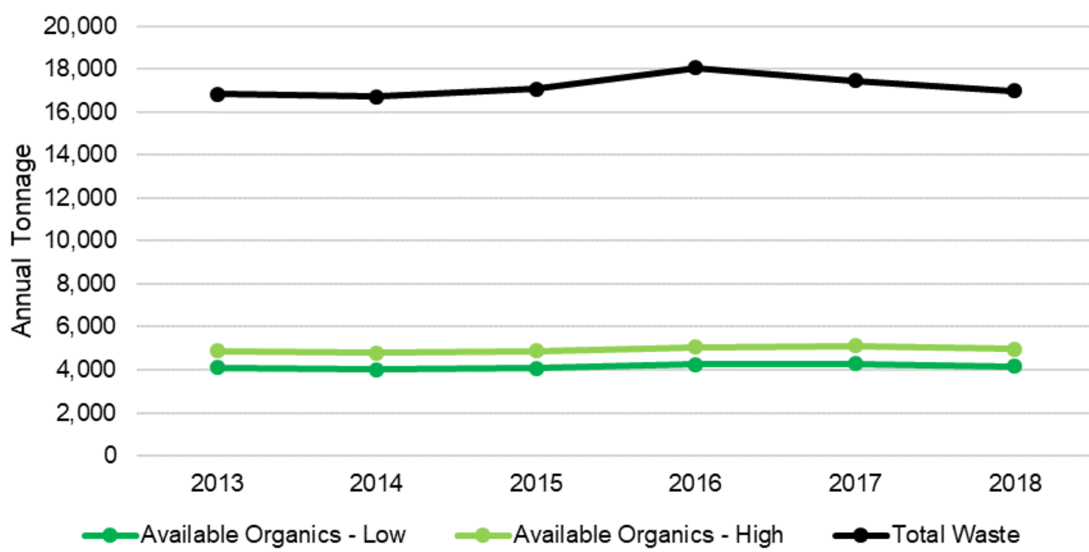
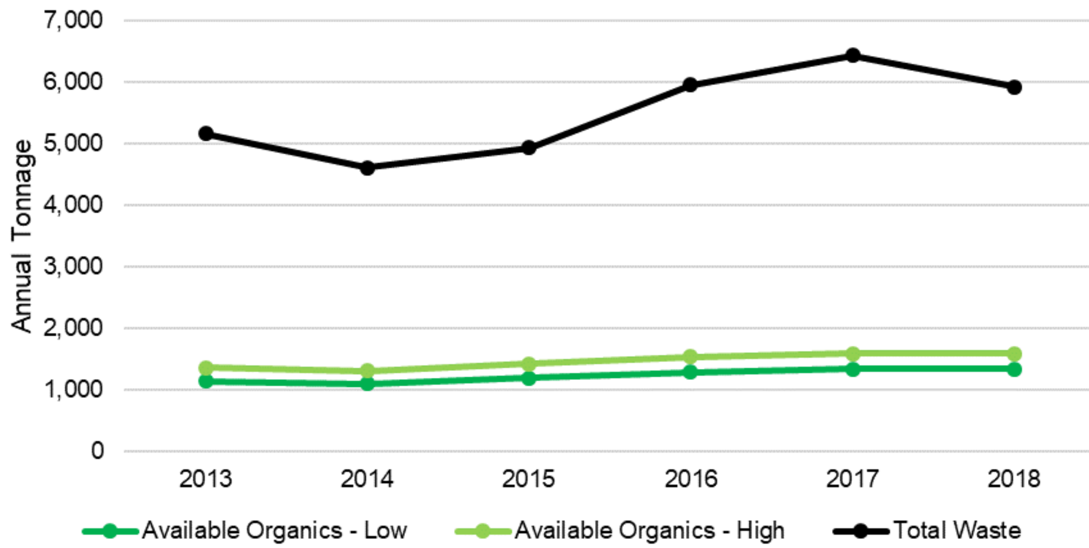


Figure 3-10: Available Organics in West Coast Service Area Waste Stream



Estimated available organics by service area.

- **Alberni Valley & Bamfield:** 4,200 to 4,900 tonnes per year
- **West Coast:** 1,100 to 1,350 tonne per year

4.0 COLLECTION OPTIONS

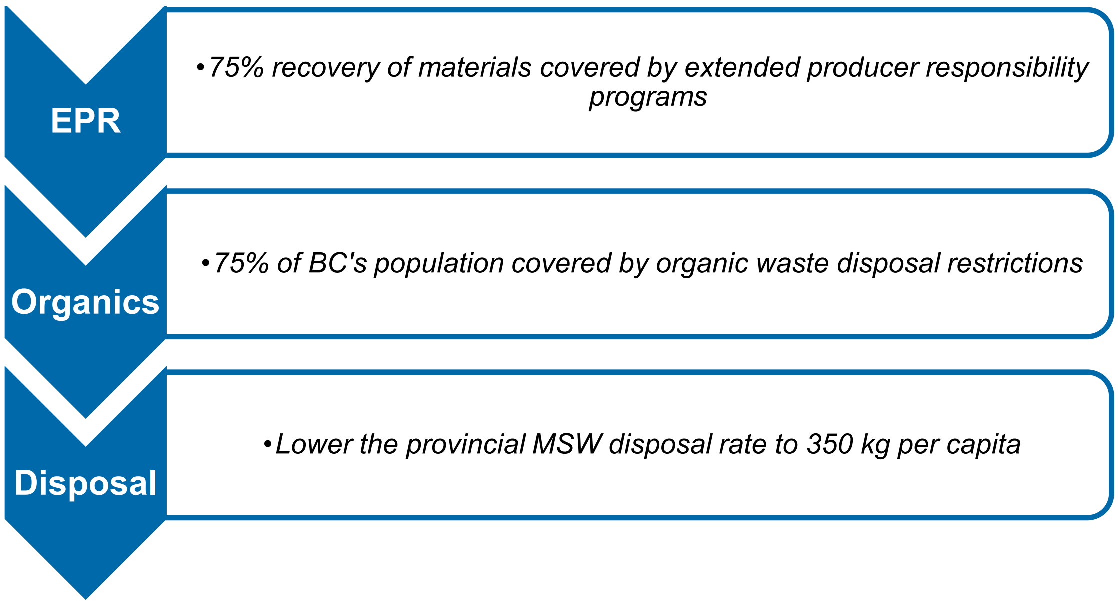
4.1 Organic Waste Disposal Bans

The environmental benefits associated with composting organic wastes, has prompted numerous municipalities and regional districts in BC to implemented policies and programs to divert these materials from their landfills to organics processing facilities.

In 2005 two regional districts on Vancouver Island (Regional District of Nanaimo and Cowichan Valley Regional District), introduced bans on the disposal of commercial organic wastes to reduce GHG emissions, preserve landfill capacity and reduce waste disposal costs. Residential collection programs followed roughly 5-7 years later in both of these regional districts. In 2015 the Capital Regional District and Metro Vancouver implemented organics disposal bans from both the commercial and residential sectors.

Based on the success of these disposal bans, in 2016 the Ministry of Environment updated their provincial goals for waste reduction and diversion to include support for organic waste disposal restrictions as shown on Figure 4-1

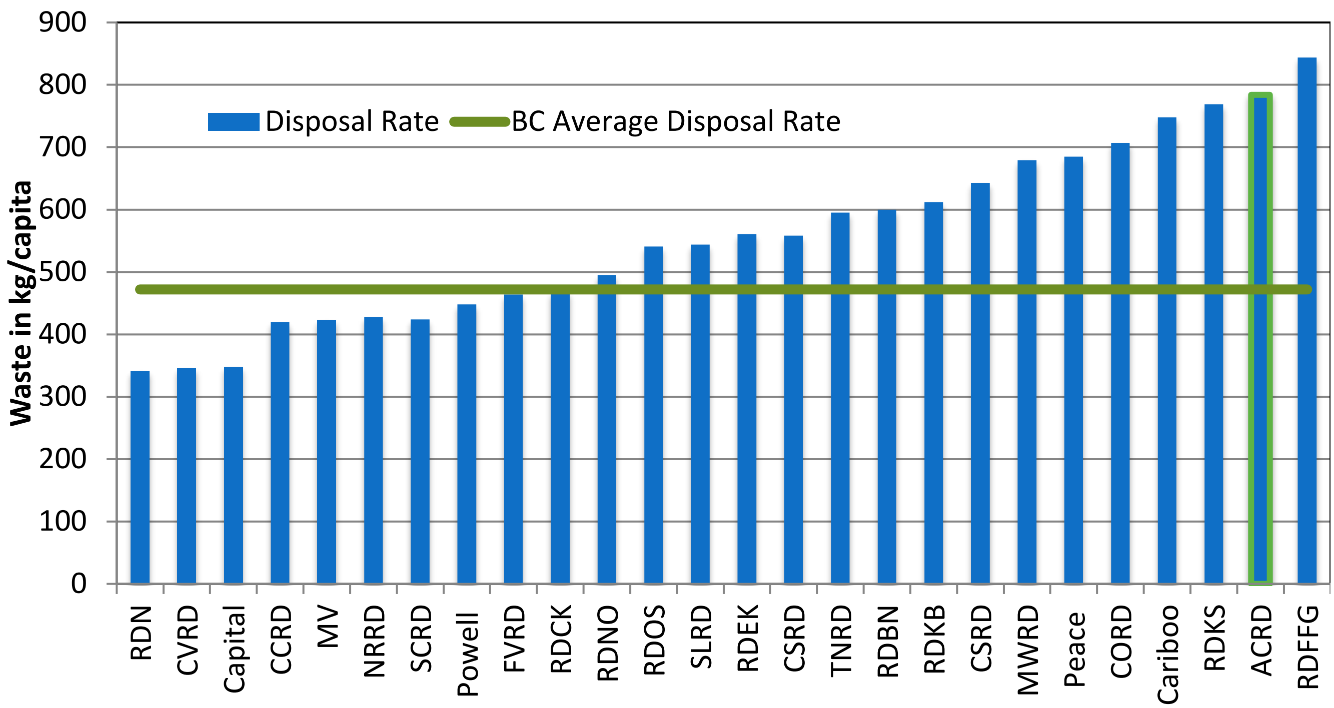
Figure 4-1: Provincial Targets for Waste Diversion and Disposal



In 2018 the Fraser Valley Regional District, the Squamish Lillooet Regional District and the Regional District of Kitimat-Stikine also introduced organic disposal restrictions. As a result, in 2018 roughly 75% of the population of BC is covered by an organic waste disposal ban.

Organics diversion is integral to meeting the provincial waste disposal target. As indicated on Figure 4-2, in 2016, the average disposal rate in 2016 was 472 kg per capita, however regional districts that divert organic wastes from disposal have the lowest disposal rates.

Figure 4-2: Regional District MSW Disposal Rates 2016



Disposal bans (for materials such as recyclables and organics) represent a low-cost policy tool that requires waste generators and waste collection companies to separate and divert recycle/compost specific materials from disposal. It is important to note that disposal bans would only be implemented when alternative processing options are readily available (e.g. cardboard, metal, yard waste).

ACRD landfill and tipping fee regulation bylaws currently prohibit the disposal of corrugated cardboard, gypsum, metals, product stewardship materials, tires, and yard and garden waste. Expanding the list of prohibited materials to include kitchen scraps such as food waste and soiled paper is a natural progression that will result in significantly more diversion than voluntary measures.

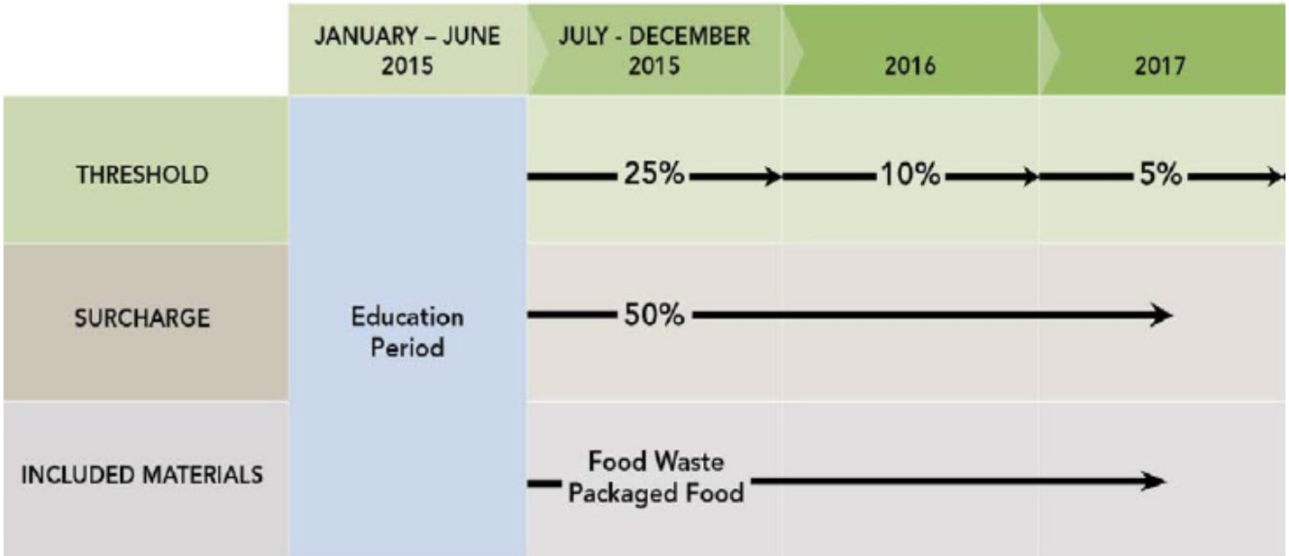
Disposal bans are typically enforced at the point of disposal (i.e. at transfer stations and landfills) through the application of significant surcharges on loads found to contain banned materials. To ensure sustained success, disposal bans may require the local government to work closely with waste generators (such as commercial waste haulers and their customers) in the design, start up and on-going maintenance of this policy. The following approach to implementing a disposal ban was followed by the ACRD when cardboard was banned from disposal in 2016:

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

Many regional districts have discovered that resources to enforce a disposal ban is short-term and minimal if adequate up-front collaboration with waste haulers, supported by effective education of waste generators, results in diversion becoming “business-as-usual”. In effect, waste haulers could take on the role as the enforcement officer since the implementation of a disposal ban provides them with the justification to increase service levels if they can provide more cost-effective collection options to their customers.

Metro Vancouver (MV) refined this approach with the introduction of their food scraps disposal ban in January 2015. From 2012-2013, MV planned their organics diversion strategy in collaboration with stakeholders and then released their implementation strategy in 2014. The strategy was based on a phased implementation approach as illustrated on Figure 4-3. Although the ban was effective January 2015, the first six months was established as an education period with no surcharge on tipping fees. However, from July to December 2015, if a hauler arrived with a load at a transfer station or disposal facility containing more than 25% food scraps, a 50% surcharge would be applied to their tipping fee. This 25% threshold was reduced to 10% in 2016 and then down to 5% in 2017.

Figure 4-3: Metro Vancouver Organics Disposal Ban Phased Implementation



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

Consequently, a disposal ban on residential and commercial organics should be considered as an important back-stop to all organic waste diversion service options identified in this report.

4.2 Organic Waste Collection Programs in Comparable Jurisdictions

4.2.1 Program Design Considerations

Issues to consider when planning to introduce organics collection include "program design" (collection type and frequency), strategies to encourage uptake and participation in organics diversion, and the financial implications of introducing a new collection stream to the system.

Program design considerations include whether the collection is manual or semi/fully automated, weekly or biweekly, and if limits are placed on amounts set out at the curb. Experience in most jurisdictions that have introduced organics collection would suggest that collecting organics weekly and garbage bi-weekly greatly assists in building participation for organics diversion. Some program managers have used the introduction of organics collection as the impetus for wholesale program change; switching collection frequencies, phasing out manual collection by moving to cart-based semi/automated collection, or expanding collection to include recycling or yard waste.

Limiting the amount of garbage collected at the curb is an effective strategy to encourage participation in recycling and organics diversion; in effect compelling use of the blue box and organics containers. When done in tandem with reduced garbage collection frequency, program managers have seen an impressive uptake in diversion (+30% reduction is disposal rate).

Collecting organics at the curb will have financial implications for the local government and the resident. These can include added collection costs if additional collection vehicles are required, costs to provide curbside containers (carts), and organics tipping/transfer/processing fees. The cost to tip garbage may go down, which can offset some of the collection costs, however this does result in reduced revenue for the landfill operations side of the equation. Offering different sized containers, particularly for garbage, is a feature of some programs which requires variable collection fees to be charged. This usually requires a higher level of administration to track container sizes for each residence, and for the billing process.

In preparing this report, Tetra Tech conducted a review of ten existing residential organics collection programs focusing on Vancouver Island jurisdictions. The programs represent collection of food waste only, food and yard waste combined, manual collection, and semi or fully automated collection systems.

4.2.2 Food Waste Only Programs

Manual Collection

Residential food waste only collection typically is a manual collection system because the weekly collection weights average around 2.5 kg per household. This level of service is most often provided by municipalities that do not already have a yard waste collection in place, or for municipalities where yard waste collection is not a priority.

This report examines the manual collection services offered to residents in the Regional District of Nanaimo (RDN), Town of Ladysmith, and District of North Cowichan (Table 4-1). Each of these programs schedules weekly collection of food waste, with garbage and recycling collected on alternate bi-weeks. Residents are required to use a 48 litre "green bin" for their curbside set-out.

Figure 4-4: Curbside Recycling and Organics

Table 4-1: Manual Collection Programs – Food Waste Only

Program Location	Households Serviced	Container Sizes: Garbage/Organics (litres)	Collection Frequency: G / R / O	Average Amount Collected FW/HH/Yr (kg)	Collected By:
RDN	29,880	100 / 48	EOW / EOW / W	112	G+R+O = Contractor
Ladysmith	3,450	100 / 48	EOW / EOW / W	125	G+R+O = Contractor
North Cowichan	10,640	77 / 48	EOW / EOW / W	100	G+O = Municipal R = Contractor

Ladysmith and the RDN contract out their collection services to the private sector who in each instance utilise split-body side-load trucks with a 60-40 or 70-30 split. The District of North Cowichan collects garbage and food waste with municipal staff while recycling is collected by contractor.

Figure 4-5: Split Truck for Collecting Multiple Material Streams

Figure 4-6: Operators Collecting Curbside Organics

The residential utility costs for collection varies depending on the organics processor and the individual community's landfill tipping fees for garbage. For these three programs, the 2017 annual all-inclusive utility fees ranged from $88 (North Cowichan) to $144 (Regional District of Nanaimo) to $168 (Town of Ladysmith).

Automated Collection

The City of Victoria provides residents with backyard collection service of garbage and food waste every two weeks. Residents are provided with a standard 120 litre wheeled cart for food waste, and have a choice of 80, 120 or 180 litres wheeled cart for garbage.

City staff enter private property each collection day and wheel the carts to the street where they are connected to the lifting mechanism and tipped into the truck (which is a split body). The carts are left at the curb for residents to reclaim and return to their backyards. This type of system, with a worker required to position the carts on the lift mechanism (aka the tipper), is called semi-automated collection.

The annual residential utility fee ranges from $192 to $257 depending on the size of garbage cart.

Figure 4-7: Curbside Organics Collection

Table 4-2: Automated Collection – Food Waste Only

Program Location	Households Serviced	Container Sizes: Garbage/Organics (litres)	Collection Frequency: G / R / O	Average Amount Collected FW/HH/Yr (kg)	Collected By:
City of Victoria	14,000	80-120-180 / 120	EOW / EOW / EOW	155	G+O = Municipal R = Contractor

Self-Haul

The qathet Regional District (formerly Powell River Regional District) does not provide any curbside collection service and ships all the waste received at its transfer station to Washington State at considerable expense. To reduce the costs of waste transfer and to divert compostable material from landfill, the Regional District has established a food waste drop-off depot which is accessible by Electoral Area residents, City or regional district residents, and businesses. The collected material is transferred to a composting facility in the Sunshine Coast Regional District. The operating and transfer costs were not available.

Table 4-3: Self-Haul Collection Food Waste Only

Program Location	Households Serviced	Container Sizes: Garbage/Organics (litres)	Collection Frequency: G / R / O	Average Amount Collected FW/HH/Yr (kg)	Collected By:
qathet Regional District	9,400	n/a	n/a	14 kg/capita/yr	n/a

4.2.3 Food and Yard Waste Programs

Manual Collection

Two curbside collection programs on Vancouver Island collect combined food and yard waste from residents as part of their manual collection systems: The Village of Cumberland, and the Town of Comox.

Table 4-4: Manual Collection Food & Yard Waste

Program Location	Households Serviced	Container Sizes: Garbage/Organics (litres)	Collection Frequency: G / R / O	Average Amount Collected F&YW/HH/Yr (kg)	Collected By:
Village of Cumberland	1,610	77 / 77	EOW / EOW / W	250 (calculated)	G+R+O = Contractor
Town of Comox	5,545	121 / 77	W / EOW / W	325	G+R+O = Contractor

Prior to implementing food waste collection in 2013, each program included bagged yard waste collection in their curbside collection services. Food waste was added to the yard waste as part of a pilot program with Comox Strathcona Waste Management in 2013. At the same time residents were no longer able to set out yard waste in Kraft bags but had to use a dedicated organics container. In each program residents provide their own organics container up to a 77 litre capacity. Decals to identify the containers are available from the respective municipal offices.

Figure 4-8: Example Organics Bin

To encourage organics diversion, Cumberland redesigned their collection program to collect organics weekly, and garbage and recycling on alternating bi-weeks. As with the organics, residents are required to provide their own 77 litre garbage container, and a suitable container for recyclables. The annual utility fee for the curbside collection program is $94. The collection is performed by a contractor (Sun Coast Waste Services).

Comox has retained the weekly garbage and organics collection schedule, with recycling collected bi-weekly. In addition to the organics container, residents are required to provide their own garbage container (to a maximum 121 litre size), and to purchase a blue box for recycling. The annual utility fee for the Comox program is $210. The collection is performed by a contractor (Emterra Environmental).

Automated Collection

Two of Vancouver Island's larger municipalities operate automated collection of residential food and yard waste: City of Nanaimo, and District of Saanich.

Figure 4-9: Example Organics Bin for Automated Collection

Until October 2017, residential collection was handled manually in the City of Nanaimo. The program was similar to that provided by the District of North Cowichan with a 77 litre garbage container, 48 litre green bin for food waste only, and large re-usable poly bags for recycling. Starting in October 2017 the City phased in their new collection system which switched to automated collection using wheeled carts and expanded organics to include yard waste.

Residents are provided with a standard 120 litre cart for organics and have the choice of a 120 or 240 litre for garbage, and a 240 or 360 litre cart for recycling. Organics is collected weekly, with garbage and recycling collected on the alternate bi-weeks. Depending on the size of garbage cart chosen, the annual utility fee ranges from $165 to $265.

The District of Saanich collection program provides residents with an array of cart sizes to choose from for their mixed food and yard waste, and garbage collection. Organics containers are 80, 120 or 240 litres, while garbage cart choices are 120 or 180 litres. Collection of recycling is provided by the Capital Regional District.

Organics and garbage are collected every two weeks, in separate trucks. The annual utility fee ranges between $175 and $232 depending on the size of garbage cart.

Figure 4-10: City of Nanaimo and Saanich Organics Collection

Table 4-5: Automated Collection Food & Yard Waste

Program Location	Households Serviced	Container Sizes: Garbage/Organics (litres)	Collection Frequency: G / R / O	Average Amount Collected F&YW/HH/Yr (kg)	Collected By:
City of Nanaimo	28,000	120-240 / 120	EOW / EOW / W	200+ (estimate - program is new)	G+R+O = Municipal
District of Saanich	32,000	120-180 / 80-120-240	EOW / EOW / EOW	285	G+O = Municipal R = Contractor

Program Utility Fees

As outlined for each of the programs reviewed and illustrated in Table 4-6, garbage and organics collection program utility fees vary. Factors influencing the utility fee include the tipping fees charged for both garbage and organics, the size of containers utilised, the capital costs to purchase and provide the containers to residents, the capital costs for collection vehicles, the geographic spread of the collection area, and whether the program is manual or automated.

Table 4-6: Summary of Programs and Utility Fees

Program Location	Households Serviced	Collection Type	Organics = FW or F&YW	Collected By:	Annual Utility Fee
RDN	29,880	Manual	Food	G+R+O = Contractor	$144
Ladysmith	3,450	Manual	Food	G+R+O = Contractor	$168
District of North Cowichan	10,640	Manual	Food	G+O = Municipal R = Contractor	$88
Village of Cumberland	1,610	Manual	Food & Yard	G+R+O = Contractor	$94
Town of Comox	5,545	Manual	Food & Yard	G+R+O = Contractor	$210
qathet RD (Powell River)	9,400	Self-haul to Drop Off	Food	Self-Haul	-
City of Victoria	14,000	Semi-Automated	Food	G+O = Municipal R = Contractor	$192 - $257
City of Nanaimo	28,000	Automated	Food & Yard	G+R+O = Municipal	$165 - $265
District of Saanich	32,000	Automated	Food & Yard	G+O = Municipal R = Contractor	$175 - $232

4.2.4 ICI Food Waste Collection Programs

As discussed in Section 4.1, a disposal ban on residential and commercial organics should be considered as an important back-stop to all organic waste diversion service options identified in this report. While the residential collection options identified in the above sections do not necessarily require the ACRD to implement a landfill disposal ban, a disposal ban is one of the only tools available to stimulate organic waste diversion from the ICI sector.

Sections 4.2 and 4.3 provide actual data on the quantity of organic waste diverted from a range of residential collection programs. However, data on tonnes of food waste diverted as a result of a commercial organics ban is limited. This is because most regional districts have implemented bans on organic wastes from both sectors and the data is difficult to separate.

However, the Regional District of Nanaimo has over ten years of data on food waste diverted from the commercial sector. Based on this data, it is reasonable to expect that a commercial food waste ban would divert roughly 30 kg per capita annually.

Table 4-7 provides an estimate of food waste that could be diverted from the commercial sector under a disposal ban in the ACRD. This estimate is based on the population equivalent for the West Coast and not direct census data.

Table 4-7: Food Waste Capture Estimate from the Commercial Sector

Service Area	Population	Food Waste (Tonnes)
Bamfield	243	7
Alberni Valley	25,204	756
West Coast	10,059	302
Total	**35,506**	**1,065**

4.3 Collection Options for ACRD Service Areas

The following Section 4.3 provides collection options for the ACRD service areas. All options assume that the ACRD will implement a disposal ban on commercial sector food waste. Options for residential waste are more varied and nuanced. As per the ACRD request, three collection options are presented for each of the three service areas.

In terms of calculating the amount of organics collected from the ICI and residential sectors, the following assumptions were made. For the ICI sector, as discussed in Section 4.2.4 above, 30 kg per capita was assumed. With regards the residential sector, assumptions were based on the organic waste capture rates reported by other jurisdictions with existing programs. For self-haul of residential organics, 30 kg per household per year was used, while 115 kg per household per year was used for estimating curbside collection quantities. Yard waste collection does not impact the GHG reduction estimates, and collection of this material may only make sense for the City of Port Alberni service area. If it is collected at the curb, the amount of yard waste is assumed to be 275 kg per household per year.

The review of other jurisdictions collection programs (Sections 4.2.2 and 4.2.3) shows that residential user fees for collection vary. Manual collection tends to result in a lower utility fee than automated collection programs. For estimating additional costs or new service levels for the ACRD options outlined below, an average of the other jurisdictions' user fees has been used. Manual collection of residential garbage and food waste has been calculated at $154 per household per year. Automated collection has been calculated at $215 per household per year

Given that yard waste is currently not subject to landfill disposal, the diversion and GHG reduction estimates for each option are limited to food waste only. Estimates were derived from the Ministry of Environment Climate Change Strategy B.C. Biogas & Composting Plant Greenhouse Gas Calculation Tool. This tool was developed for use in the Organics Infrastructure Program. For the Alberni Valley and Bamfield service area a growth rate of 1% was assumed. For the West Coast an annual growth of 3% was assumed. The calculation tool provides an estimate of average yearly GHG reductions in CO_2 equivalent (CO_{2e}).

4.3.1 Bamfield Service Area

Three options are provided for consideration.

Option 1: Commercial Disposal Ban + Transfer

Under Option 1, a disposal ban on organics is implemented for the commercial sector only. It is anticipated that the waste generators would contract collection or self-haul it to the Bamfield transfer station from where it would be transferred to the Alberni Valley for processing. This would divert an estimated seven tonnes of food waste organics from the commercial sector which would reduce GHG emissions from the Alberni Valley Landfill by 15 tonnes CO_2e. Given that collection is provided by private haulers, collection cost estimates are not available at this time. Residential organics would not be included in this option.

Option 2: Commercial & Residential Disposal Ban + Transfer

Under Option 2, organics disposal from all sources (residential and commercial sectors) would be subject to a disposal ban. As with Option 1, the commercial sector would contract collection or self-haul to the transfer station. Residents would be required to manage their food waste by composting or by taking it to the transfer station. An additional four tonnes of residential organics would be added to the seven tonnes of organics available from the commercial sector for a total of 11 tonnes. This would reduce GHG emissions from the Alberni Valley Landfill by 23 tonnes Co_2e. Collection cost estimates for residents would depend on how they choose to handle their organics and could range from no cost if self hauling, to $100 if installing an in-home Bokashi composting system.

The organics would be transferred to the Alberni Valley for processing.

Option 3: Commercial & Residential Disposal Ban + On-site Processing

Option 3 proposes an organics disposal ban for the residential and commercial sectors, with organics coming to the transfer station by way of contracted collection or self-hauling (as per Option 2). A small composting facility located at the transfer station would be able to process the material.

As with Option 2 above, 11 tonnes of organics would be diverted from landfill, for a reduction in GHG emissions of 23 tonnes CO_2e. Residents would be responsible for transporting their organics to the transfer station (in all likelihood at the same time as taking their garbage and recycling), and the commercial sector would be serviced by the private sector (or self-hauled) at their cost. Table 4-8 summarizes the environmental and financial implications of these options.

Table 4-8: Bamfield Service Area Collection Options Summary

Option	Description	Diversion Tonnes	GHG Tonnes CO_2e	Current Annual Costs	Additional Annual Costs
Option 1	ICI Disposal Ban + Transfer to Alberni Valley	ICI: 7 RES: 0 Total: 7	ICI: 15 RES: 0 Transfer: -2 Total: 13	NA	NA
Option 2	ICI & Residential Disposal Ban + Transfer to Alberni Valley	ICI: 7 RES: 4 Total: 11	ICI: 15 RES: 8 Transfer: -2 Total: 21	NA	NA $0-$100
Option 3	ICI & Residential Disposal Ban On-Site Processing	ICI: 7 RES: 4 Total: 11	ICI: 15 RES: 8 Total: 23	NA	NA

4.3.2 Alberni Valley Service Area

For the existing residential collection programs in the ACRD, the City of Port Alberni curbside garbage collection program is an automated system. The City owns a fleet of three split body trucks with mechanical lifting arms.

Residents are provided with wheeled carts that are compatible with the lifting mechanism. With this type of system already in place, and the smallest compatible container being 120 litres, collecting both food and yard waste should be considered. The City budgets an average of $104 per household per year to provide the service.

Manual collection of garbage is available to residents of Electoral Areas D, E, and F from private haulers (subscription collection) and First Nations communities by way of a Band provided service.

Option 1: Commercial Disposal Ban + Voluntary Residential Collection for City of Port Alberni

Option 1 for the Alberni Valley proposes implementing an organics disposal ban for the commercial sector only. Under this option, the commercial sector would contract collection or generators would haul it themselves to a local processing facility. An estimated 756 tonnes of food waste would be diverted, which would reduce GHG emissions from the Alberni Valley Landfill by 1,571 tonnes CO_2e. Given that collection is provided by private haulers, collection cost estimates are not available at this time.

This option proposes the City of Port Alberni, which has already purchased suitable collection vehicles, would expand its current curbside garbage collection service to include food and yard waste. Under this scenario, the 6,605 households would divert an estimated 760 tonnes of food waste from landfill, further reducing GHG emissions by an estimated 1,579 tonnes CO_2e (for a total of 3,150 tonnes CO_2e). The residential user fee charged for this service would increase depending on the service level implemented by the City. Weekly collection of organics would add an estimated $55 to the current user fee, whereas bi-weekly organics collection would add $27.

Residents of the Electoral Areas and First Nations communities would not be required to change how they manage their organics.

Option 2: Commercial & Residential Disposal Ban – Electoral Areas "Out"

Under Option 2, an organics disposal ban is put in place for both commercial and residential organics. As with Option 1, the commercial sector would contract collection or generators would haul it themselves to a local processing facility. An estimated 756 tonnes of food waste would be diverted, which would reduce GHG emissions from the Alberni Valley Landfill by 1,571 tonnes CO_2e.

The City of Port Alberni expands curbside garbage collection service to include food and yard waste for its 6,605 residents. The estimated 760 tonnes of food waste diverted would result in an estimated GHG emissions reduction of 1,579 tonnes CO_2e at the landfill. The residential user fee for collection would increase between $27 and $55, depending on the service level in place.

Residents of the Electoral Areas and First Nations communities would be required to divert their organics from disposal. This can be achieved by the private haulers (who offer subscription collection service) expanding their service levels, or by residents taking organics to a local processing facility themselves. An estimated 105 tonnes of food waste wold be diverted via subscription, and an estimated 69 tonnes diverted by residents self-hauling it to the landfill. This would result in GHG emission reductions of an estimated 218 tonnes CO_2e (from subscription collection food waste) and an estimated 137 tonnes CO_2e (self-hauled food waste).

For those residents serviced by subscription haulers, the current costs for their garbage collection range from $205 (for bi-weekly collection) to $300 (for weekly collection). By adding food waste collection to that service, those costs are estimated to increase by $107 to $150 depending on the service level (weekly or bi-weekly collection).

Option 3: Commercial & Residential Ban – Electoral Areas "In"

Option 3 builds on Option 2 by extending residential curbside organics collection to the Electoral Area and First Nations residents. An organics disposal ban is put in place for both commercial and residential organics. An estimated 756 tonnes of commercially-sourced food waste would be diverted, which would reduce GHG emissions from the Alberni Valley Landfill by 1,571 tonnes CO_2e. The City of Port Alberni curbside collection service includes food and yard waste for its 6,605 residents. The estimated 760 tonnes of food waste diverted reduces an estimated 1,579 tonnes CO_2e of GHG emissions at the landfill. The residential user fee for collection increase between $27 and $55, depending on the service level in place.

Under this option the Regional District would bring all electoral area households into a collection service by setting up and managing a contracted service to include garbage, recycling, and food waste collection for all single-family residences outside the City boundaries. An estimated 375 tonnes of food waste would be collected and diverted from landfill disposal, which would further reduce landfill GHG emissions by an estimated 779 tonnes CO_2e.

The cost to provide this service is based on user fees charged for similar programs in other jurisdictions and does depend on whether collection is a manual lift system, or automated. A manual system is estimated to cost $154 per household per year, whereas an automated system could cost in the range of $215. For those customers currently subscribing to a local private service, this ACRD managed contracted service would replace their subscription costs, not add to them. Table 4-9 summarizes the environmental and financial implications of these options.

Table 4-9: Alberni Valley Service Area Summary of Collection Options

Option	Description	Diversion Tonnes	GHG Tonnes CO_2e	Current Annual Costs	Additional Annual Costs
Option 1	ICI Disposal Ban + Voluntary Residential Collection for City of Port Alberni	ICI: 756 CPA: 760 Total: 1,516	ICI: 1,571 CPA: 1,579 Total: 3,150	ICI: NA CPA: $104	ICI: NA CPA: $27-$55
Option 2	ICI & Residential Disposal Ban Electoral Areas Out	ICI: 756 CPA: 760 EA: 105 SH: 69 Total: 1,690	ICI: 1,571 CPA: 1,579 EA: 218 SH: 137 Total: 3,505	ICI: NA CPA: $104 EA: $205-$300	ICI: NA CPA: $27-$55 EA: $107-$150
Option 3	ICI & Residential Disposal Ban Electoral Areas In	ICI: 756 CPA: 760 EA: 375 Total: 1,891	ICI: 1,521 CPA: 1,579 EA: 779 Total: 3,879	ICI: NA CPA: $104 EA: $0-$300	ICI: NA CPA: $27-$55 EA: Manual $154 Auto: $215

4.3.3 West Coast Service Area

The ACRD contracted program for West Coast residents is a manual system. While collection staff can handle properly sized containers containing both food and yard waste, the low volume of yard waste received at the West Coast landfill would indicate there is no need to collect this material at the curb. Introducing food waste only as part of curbside collection should be considered.

Option 1: Commercial Disposal Ban

Under Option 1, a disposal ban on organics is implemented for the commercial sector only. It is anticipated that the waste generators would contract collection or self-haul it to the West Coast landfill where the material will be composted on site. This would divert an estimated 302 tonnes of food waste from the commercial sector which would reduce GHG emissions from the West Coast Landfill by 640 tonnes CO_2e. Given that collection is provided by private haulers collection cost estimates are not available at this time.

Residential organics would not be included in this Option.

Option 2: Commercial & Residential Ban + Residential Self-Haul

Under Option 2, organics disposal from all sources (residential and commercial sectors) would be subject to a disposal ban, and organics collected would be composted at the West Coast landfill. As with Option 1, the commercial sector would contract collection or self-haul organics to the landfill which would see an estimated 302 tonnes diverted for an estimated GHG emission reduction of 640 tonnes CO_2e.

Residents would be required to manage their organics by taking them to secure collection points or directly to the landfill. This would divert an estimated 40 tonnes of food waste, which in turn reduces landfill GHG emissions by an estimated 85 tonnes CO_2e (for a total of 725 tonnes CO_2e when added to the commercial diversion). Although setting up and managing secure collection points, along with transferring materials from those satellite sites to the landfill comes with costs, these have not been estimated at this time. Likewise, the cost to a resident to self haul their food waste to the landfill has not been calculated.

Option 3: Commercial & Residential Ban+ Residential Curbside Collection

Option 3 builds on Option 2 by extending the residential curbside collection to include residential food waste. As per Option 2, the commercial sector would contract collection or self-haul organics to the landfill, diverting an estimated 302 tonnes of food waste for an estimated GHG emission reduction of 640 tonnes CO_2e.

Under this option, the Regional District would expand the current contracted collection service to include garbage, recycling, and food waste for all single-family residences. An estimated 148 tonnes of food waste would be diverted from landfill, with a commensurate GHG emission saving of an estimated 314 tonnes CO_2e (for a total of 954 tonnes CO_2e in GHG emission reduction).

The current user fee is $115 per household per year. Adding food waste collection to the current service contract would increase the annual residential user fee anywhere from $39 to $100. The estimated increase is based on user fees charged for similar programs in other jurisdictions and depends on the system in place. Table 4-10 summarizes the environmental and financial implications of these options.

Table 4-10: West Coast Service Area Summary of Collection Options

Option	Description	Diversion Tonnes	GHG Tonnes $CO_{2}e$	Current Annual Costs	Additional Annual Costs
Option 1	ICI Disposal Ban	ICI: 302 RES: 0 Total: 302	ICI: 640 RES: 0 Total: 640	ICI: NA RES: $115	ICI: NA RES: 0
Option 2	ICI & Residential Disposal Ban Residential Self-Haul	ICI: 302 RES: 40 Total: 342	ICI: 640 RES: 85 Total: 725	ICI: NA RES: $115	ICI: NA RES: 0
Option 3	ICI & Residential Disposal Ban Residential Curbside Collection	ICI: 302 RES: 148 Total: 450	ICI: 640 RES: 314 Total: 954	ICI: NA RES: $115	ICI: NA RES: Man $39 Auto: $100

4.3.4 Residential Collection Options Summary

Table 4-11 summarizes the environmental implications of each of the nine options. The environmental impacts relate to tonnes of food waste diverted from landfill which saves landfill space as well as reduces greenhouse gas emission (expressed as tonnes of $CO_{2}e$). The GHG emissions were calculated using the BC Ministry of Environment & Climate Change Strategy (MOE) GHG Calculator developed for organics diversion. This differs slightly from ACRD's existing landfill gas management reports, as the ACRD reports discuss methane emissions whereas the MOE calculator converts methane into standardized CO_{2e} emissions.

Table 4-11: Summary of Annual Collection Options

Option	Description	Annual Diversion (Tonnes)	GHG Reduction (Tonnes $CO_{2}e$)
Bamfield #1	ICI Disposal Ban + Transfer to Alberni Valley	7	13
Bamfield #2	ICI & Residential Disposal Ban + Transfer to Alberni Valley	11	21
Bamfield #3	ICI & Residential Disposal Ban + On-Site Processing	11	23
Alberni Valley #1	ICI Disposal Ban + Voluntary Residential Collection for City of Port Alberni	1,516	3,150
Alberni Valley #2	ICI & Residential Disposal Ban + Residential Collection for City of Port Alberni + Optional for Electoral Areas	1,690	3,505
Alberni Valley #3	ICI & Residential Disposal Ban + Residential Collection for City of Port Alberni & Electoral Areas	1,891	3,879
West Coast #1	ICI Disposal Ban	302	640
West Coast #2	ICI & Residential Disposal Ban + Residential Self-Haul	342	725
West Coast #3	ICI & Residential Disposal Ban + Residential Curbside Collection	450	954

Financial implications are somewhat more difficult to quantify. As discussed for each service area, the cost to generators will increase by different amounts depending on the option selected. With regard to the financial impact of these various options to the ACRD, the major implication will be reduced revenues from tipping fees at the Alberni Valley and West Coast Landfills.

Under all scenarios shown above, the amount of garbage requiring disposal will decrease by anywhere from seven to 3,879 tonnes per year, with a commensurate decrease in landfill tipping revenues. For the Alberni Valley and Bamfield, this equates to reduced annual revenues of $183,000 to $228,000 based on the current (2018) tip fee rate of $120/tonne. The lost revenue for the West Coast service area is estimated to range between $36,000 and $54,000 per year.

The cost of handling and processing the organic waste would be accounted for in an organics tipping fee that would be calculated by ACRD. This fee will be set once the preferred processing system has been chosen, designed and constructed.

To fully comprehend the financial implications of the reduction in garbage tipping fee revenue, along with expenditure changes to the solid waste budget associated with organics processing and transfer, the Regional District would need to include these new costs in the adopted 2019-2023 Financial Plan to determine whether tipping fees or taxes need to be increased to offset potential revenue loss. However, it is also recognized that organic waste diversion from landfill also saves space which has larger long-term cost benefit.

Social implications are also difficult to estimate given that the ACRD has not yet undertaken any public consultation.

4.4 Collection Options Comparison

The ranking proposed for each of the collection options presented is based on a qualitative ranking of low, medium and high of the evaluation criteria. Table 4-12 describes the criteria used to select the preferred options.

Table 4-12: Evaluation Criteria to Select Options

Criteria	Description
Environmental	
Preserve landfill capacity	Diverting food waste from landfill preserves landfill capacity. Due to limited landfill capacity, this was one of the main justifications for implemented food waste diversion programs in the RDN, CVRD, CRD and Metro Vancouver.
Reduce GHG emissions	When food waste decomposes in a landfill it generates methane, a potent greenhouse gas. Diverting food waste from landfill reduces greenhouse gas emissions.
Social	
Public Support	Diverting food waste from landfill will be successful if programs are convenient and supported by both residents and businesses in the region.
Hauler Support	Diverting ICI food waste from landfill will be successful if private haulers are engaged in a collaborative manner to ensure that the implementation of landfill restrictions on food waste addresses hauler concerns and receives hauler support.
Economic	
Cost	Diverting food waste from landfill should be cost-effective.
Ease of Implementation	Diverting food waste from landfill should not be difficult to implement.

Using these criteria, the following tables provide a comparison of options for each of the three service areas. Given that the ACRD has not yet presented these options to the public, rankings for public support are to be determined (TBD) following a public consultation process.

Table 4-13: Bamfield Service Area Options Comparison

Criteria	Option 1 ICI Disposal Ban + Transfer	Option 2 ICI & Residential Disposal Ban + Transfer	Option 3 ICI & Residential Disposal Ban + On-Site Processing
Environmental			
Tonnes Per Year	7	11	11
Diversion Potential	Moderate	High	High
Tonnes CO_2e	15	23	23
GHG Reduction	Moderate	High	High
Social			
Public Support	TBD	TBD	TBD
Hauler Support	High	High	Moderate
Economic			
Cost	Moderate	Moderate	High
Ease of Implementation	High	High	Moderate

Table 4-14: Alberni Valley Service Area Options Comparison

Criteria	Option 1 ICI Disposal Ban + CPA Residential Collection	Option 2 ICI & Residential Disposal Ban Electoral Areas "Out"	Option 3 ICI & Residential Disposal Ban Electoral Areas "In"
Environmental			
Tonnes Per Year	1,516	1,690	1,891
Diversion Potential	Low	Moderate	High
Tonnes CO_2e	3,150	3,505	3,879
GHG Reduction	Low	Moderate	High
Social			
Public Support	TBD	TBD	TBD
Hauler Support	High	High	Moderate
Economic			
Cost	Moderate	High	Moderate
Ease of Implementation	Moderate	Moderate	Moderate

Table 4-15: West Coast Service Area Options Comparison

Criteria	Option 1 ICI Disposal Ban Only	Option 2 ICI & Residential Disposal Ban Residential Self-Haul	Option 3 ICI & Residential Disposal Ban Residential Curbside Collection
Environmental			
Tonnes Per Year	302	342	450
Diversion Potential	Low	Moderate	High
Tonnes CO_2e	640	725	954
GHG Reduction	Low	Moderate	High
Social			
Public Support	TBD	TBD	TBD
Hauler Support	High	Moderate	High
Economic			
Cost	Low	Moderate	High
Ease of Implementation	High	Low	High

Without the benefit of a public consultation program in each of the service areas it is difficult to make a recommendation for preferred options. The selection of preferred collection options will also be impacted by the recommendation flowing from the organics processing scenarios discussed in the following sections.

Prior to further effort by the ACRD in advancing the collection options, the focus now shifts to the processing infrastructure assessment.

5.0 DESIGN CAPACITY FOR PROCESSING FACILITIES

Determining process design capacity is a key step in developing organics management options, as material flows fluctuate depending on seasonality and population growth, among other factors. This section outlines the required design capacity for the Alberni Valley and Bamfield, and West Coast Service Areas based on peak flows.

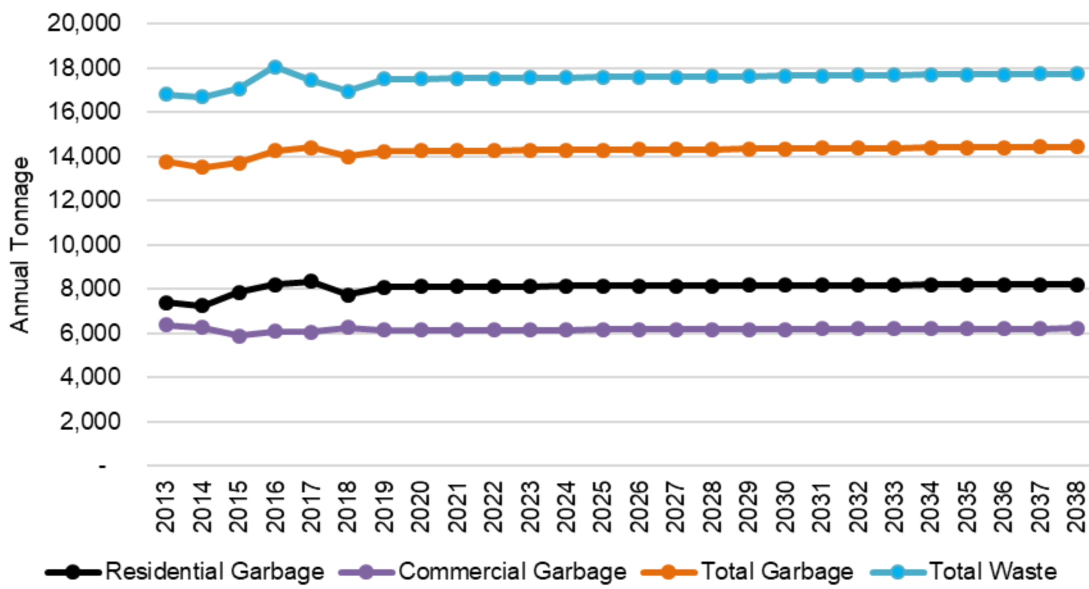
5.1 Food and Yard Waste

Food and yard waste generated by the residential and ICI sectors is the primary source of organic material in ACRD. Furthermore, these sources typically contain notable quantities of compostable paper (e.g. paper towel, napkins) that are disposed of along with food waste. These sources are significantly impacted by population growth with more people entailing higher generation, as well as seasonality throughout the year. Available organics presented in Section 3.4.3 were modified in this section to determine the peak organics flow.

Alberni Valley & Bamfield Service Area

The population growth in the Alberni Valley from 2011-2016 was very low and is expected to maintain a similar trajectory. Figure 5-1 shows the projected waste generation over the next 20 years (projections until year 2038) according to population growth.

Figure 5-1: Alberni Valley and Bamfield – Projected Waste Generation Over 20 Years



In addition to population growth, waste generation varies across seasons. Figure 5-2 highlights the variability of waste generation throughout the year with peaks in the summer months. It should be noted that there was an influx of contaminated soil in September 2017, leading to the second peak in waste generation.

Figure 5-2: Alberni Valley and Bamfield – Monthly Waste Generation in 2017

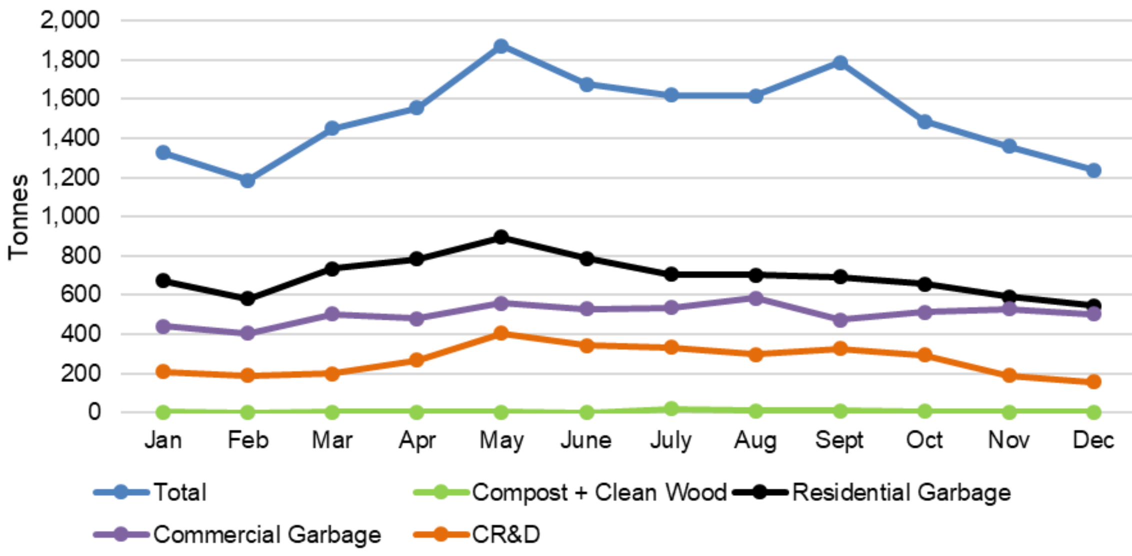
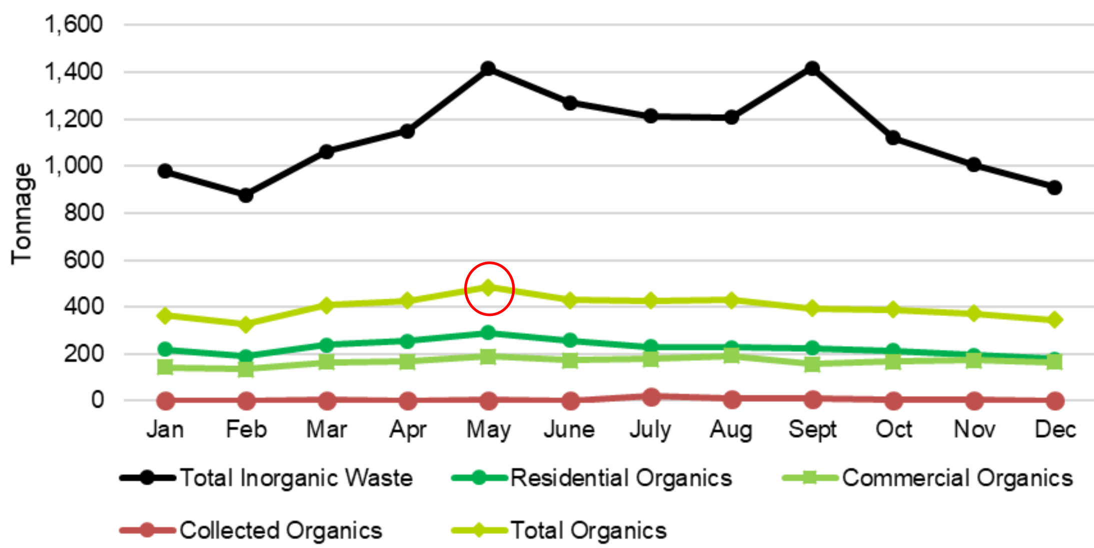


Figure 5-3 projection combines population growth, seasonality, and waste composition to determine peak organics flow from residential and ICI sources. It shows that a maximum of approximately 500 tonnes of food and yard waste per month could be expected to be generated in May 2038. This will inform facility designs, to ensure that any facility would be able to store, and process received organics during peak generation months.

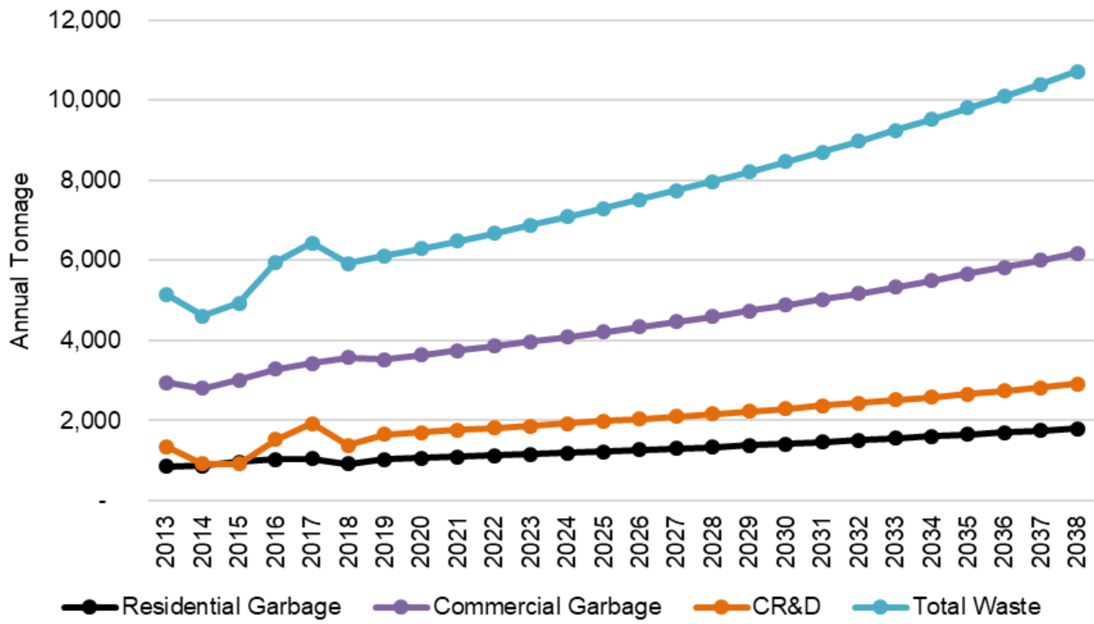
Figure 5-3: Alberni Valley and Bamfield – Peak Monthly Organics Generation in 2038



West Coast Service Area

In contrast to the Alberni Valley population growth on the West Coast from 2011-2016 has been steady at approximately 3% annually. Figure 5-4 shows the projected waste generation over the next 20 years assuming similar population growth in that time. As Figure 5-4 shows, this has a significant influence on waste generation, almost doubling over the next 20 year period.

Figure 5-4: West Coast – Projected Waste Generation Over 20 Years



In addition to population growth, waste generation varies across seasons. Figure 5-5 highlights the variability of waste generation throughout the year with peaks in the summer months similar to the Alberni Valley.

Figure 5-5: West Coast – Monthly Waste Generation in 2017

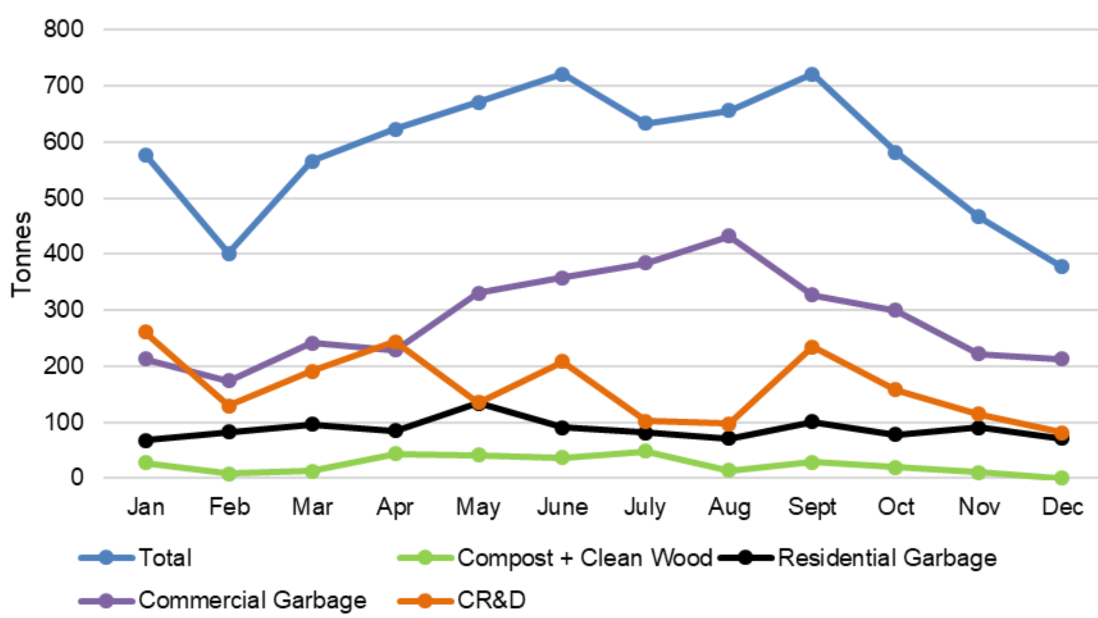
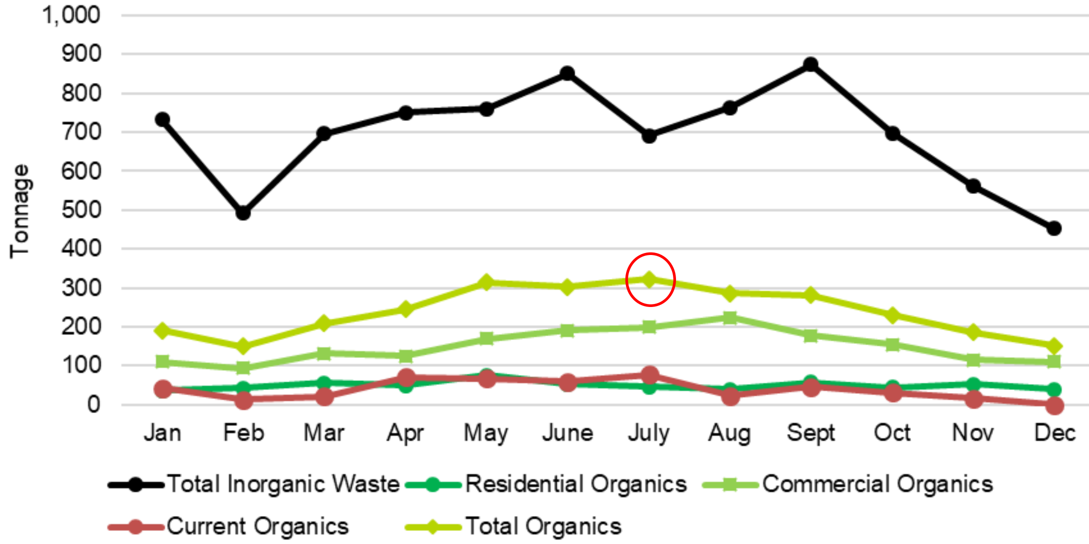


Figure 5-6 projections combine population growth, seasonality, and waste composition to determine peak organics flow from residential and ICI sources in 2038. It shows that a maximum of approximately 300 tonnes of food and yard waste per month could be expected to be generated in July 2038. This will inform facility designs, to ensure that any facility would be able to store, and process received organics during peak generation months.

Figure 5-6: West Coast – Peak Monthly Organics Generation in 2038



5.2 Biosolids from Wastewater Treatment Facilities

Biosolids are another potential feedstock source for alternative technologies. Biosolids are produced as byproducts from wastewater treatment facilities that are anaerobically digested and thickened into a sludge. The District of Tofino recently completed its Stage 3 Liquid Waste Management Plan, which includes projections for residual biosolids production from a future treatment plant. In addition, there has been some preliminary interest in finding a beneficial use application for the residual biosolids, such as composting. Table 5-1 shows the estimated annual residual biosolids production from wastewater treatment plants across three jurisdictions.

Table 5-1: Projected Biosolids Production Per Capita Across Regional Districts

Residual Biosolids Production (kg/capita/year)	District of Tofino	Capital Regional District	Squamish Lillooet Regional District
Dry Weight	29.8	20.3	25.4
Wet Weight[1]	149.1	101.7	126.8

[1] Dewatered biosolids are assumed to be 80% moisture, 20% solids by weight

While both wet and dry weight data are presented, it is likely that any biosolids utilized for composting would be mostly dry due to logistical considerations. Furthermore, Table 5-2 shows the extrapolation of biosolids production across the populations serviced by the Alberni Valley and West Coast Landfills.

Table 5-2: Projected Biosolids Production for West Coast and Alberni Valley Landfills

Biosolids Production (tonnes/year)[1]	West Coast	Alberni Valley
Population Serviced	***5,200***	***25,000***
High	155.0	745.4
Medium	131.9	634.0
Low	105.8	508.7

[1] https://tofino.civicweb.net/filepro/document/66272/2017-06-09%20Stage%203%20Report.pdf

5.3 Industrial Feedstocks (e.g. Fishery Waste)

Different industries operate within the ACRD who produce organic waste potentially suitable for composting operations. For example, ACRD and Tetra Tech have been in communication with a commercial fishery operating in Tofino that is currently piloting a waste water management project aiming to produce an organic sludge suitable for composting. Detailed information about the feedstock is currently unavailable, as the pilot project is still in development, but the operator estimates that approximately 2,000 – 3,000 lbs. (0.9 – 1.4 tonnes) per day of material will be generated. This leads to an estimated monthly generation of ~27 – 41 tonnes of organic sludge. A midpoint of 33 tonnes per month is included in Table 5-3 below.

It is worthwhile for the ACRD to consider feedstocks from industrial sources, as they typically have higher consistency in composition, leading to consistency in finished compost product. Additionally, higher tonnages received at composting facilities would reduce unit operating costs ($/tonne). However, it should be noted that feedstocks with high nitrogen content (e.g. fishery waste) would require corresponding quantities of bulking agent to manage the carbon-nitrogen ratio of the compost mixture.

5.4 Summary of Feedstocks

Appropriately determining the peak flow of organics feedstocks is integral to ensuring that developed organics management solutions will effectively serve the community into the future. This includes accounting for the growth and seasonal fluctuations of different waste streams, as well as the other required feedstocks to produce a viable finished product. In addition to biosolids and food and yard waste, there are opportunities to explore sources of organics from industrial operations such as the potential fishery feedstocks described in Section 5.3. Only preliminary information on these potential feedstocks was available at the time of writing.

Additionally, Section 6.1 discusses the appropriate balance of feedstocks to ensure an effective composting process and produce a quality finished compost. This equilibrium is approximately 1:1 biosolids and food waste to yard, wood, and compostable paper. Most composting operations require bulking agent (typically woodchips) to balance the quantities of food waste and biosolids collected. The amount of bulking agent required to augment collected organics was determined by utilizing the New Mexico Recycling Coalition/Organics Recycling Organization (NMORO) Composting Mixture Calculator. The NMORO calculator models key properties of a compost mixture based on input feedstocks.

The peak flows of organics material in the two service areas are shown in Table 5-3. An assumption of 75% maximum capture of compostable organics from municipal solid waste in the residential and ICI sectors was made when determining peak flow. It should also be noted that compostable paper is separated out from food and yard waste in Table 5-3, as it has different composting characteristics. Compostable paper (e.g. paper towels, napkins, soiled paper) typically accompanies food waste, and would be included as an acceptable material within programs designed to capture food waste.

Table 5-3: Maximum Organics Flow by Service Area

Service Area	Maximum Flow of Organics (tonnes)	Monthly	Weekly	Feedstock %
Alberni Valley and Bamfield	Food Waste	246	57	39.9%
	Yard, Wood Waste	77	18	12.5%
	Compostable Paper	59	14	9.6%
	Biosolids	62	14	10.1%
	Required Bulking Agent	172	40	27.8%
	Total	**617**	**144**	**100.0%**
West Coast	Food Waste	153	36	46.1%
	Yard & Wood Waste	113	26	34.0%
	Compostable Paper	37	9	11.1%
	Biosolids	13	3	3.9%
	Required Bulking Agent	16	4	4.9%
	Total	**332**	**77**	**100.0%**
ACRD Total		**949**	**221**	
Potential ICI Fisheries Waste		*33*	*8*	
Additional Bulking Agent Required		*33*	*8*	
West Coast Total with ICI		**398**	**93**	
ACRD Total with ICI		**1015**	**236**	

6.0 PROCESSING OPTIONS

6.1 Composting Process Overview

There are two general types of organic processing technologies –composting and anaerobic digestion. Both types utilize microbial degradation where microorganisms break down the organic fraction of MSW into valuable products (e.g. energy and soil amendment/compost). The following is a general description of a few common types of organic processing technologies.

Composting is a biological decomposition process that reduces organic material (in the presence of oxygen) to produce a peat-like humus. Composting processes can range from very simple pile systems, generally only suitable for composting yard and garden waste, to more complex self-contained systems that are capable of processing mixed organics.

Composting is utilized in many jurisdictions for processing food scraps, food soiled paper, yard and garden waste, animal by-products, manure, and biosolids. Composting generates heat which is used to destroy pathogens within the compost pile (i.e. heat is generated and used to reduce pathogen levels in the compost) provided a certain duration and temperature is maintained. Composting is also often used after anaerobic digestion to produce a more stable and marketable organic rich compost.

Although different technologies may utilize different configurations, there are three basic phases to a composting process.

1. **Pre-processing** of the organic waste is usually implemented prior to the composting stage. Pre-processing may include particle size reduction, screening, and the addition of amendments. The goal of pre-processing is to create a more homogeneous input into the system, to extract contaminants (such as metals, plastics and glass) and to create a feedstock that has the necessary ratio of carbon to nitrogen. The addition of amendments is especially important, because there is little opportunity to alter the mix once the material has been incorporated into piles, laid in beds, or sealed in the compost vessel. Feedstock 'recipes' must therefore, be fairly consistent to allow for proper operation. Required equipment includes a grinder and/or shredder, screens (such as trommels), and mixing equipment (this may be combined with the grinder if the feedstock is soft enough).

2. The **primary composting phase** involves the actual breakdown of the material. Once the pre-processing is complete, the organic waste is loaded into the compost system (piles, vessels or beds). In the case of in-vessel systems, the sealed composting unit is then connected to the aeration and monitoring equipment. In covered aerated static pile systems, the piles are built over the aeration system, which may be a series of in-ground vents, or a network of air distribution piping. During this phase, the temperature, oxygen and moisture levels in the vessel are monitored and adjusted as needed to maintain the optimum operating conditions. Air and water may be introduced into the vessel via piping systems if the system requires additional air or moisture. Excess moisture may be drained off the compost and stored for later use in adding moisture to dry feedstock. Exhaust air is typically run through a biofilter and/or wet scrubber to minimize odours.

3. Once the material has finished in the primary composting phase, the material is stabilized and cured in windrows or static piles. During the **stabilization phase**, continued aeration is necessary to complete the composting process. Aeration may be achieved either by using a forced aeration system such as the system used in covered aerated static pile systems, or by turning the piles on a regular basis. During the curing phase, aeration is not required. Stabilization typically lasts 4-6 weeks and is a minimum requirement; curing can last an additional 4-6 weeks, or as long as is available. Many facilities store curing compost for 12 – 18 months after completion of the primary composting phase.

Figure 6-1: Finished Compost

6.2 Passive Systems

Passive systems typically encompass the simplest forms of composting. At a fundamental level, they involve stacking organic materials into piles and then waiting for decomposition to take its course. Generally, materials would either be formed into a circular or oblong shape (static pile), or long thin piles (windrows). Once formed, passive systems rely on natural convection of air through the pile to provide oxygen to the decomposition process. These systems typically have the highest residency times of up to two years, depending on the material composting and climate.

Table 6-1: Passive Composting

Advantages	Disadvantages
▪ Simplicity – minimal skills required by operator ▪ Low capital cost and operating cost ▪ Applicable to small volumes of leaf and yard waste	▪ Pathogen reduction temperatures not achieved ▪ Extended time to produce compost product ▪ Not suited to food waste or biosolids composting ▪ Exposure to rain, wind, and cold can be problematic unless in a covered environment

Figure 6-2: Static Pile

Figure 6-3: Windrow

6.2.1 Turned Windrows or Piles

Turned composting consists of placing the mixture of organic materials into piles, or windrows, which are turned on a regular basis. Turned windrows is the most common method of composting in North America. Typically, windrows are formed for this application, that are up to 2 m high for dense or tightly packed materials such as manures, and 3 to 4 m feet high for porous or less dense materials such as yard waste (leaves and branches). In colder climates, windrows can be taller and wider to reduce heat loss. The equipment used for turning these windrows determines the size, shape, and spacing of the windrows. Front-end bucket loaders or telescopic handlers with a long reach can build higher and wider windrows. Windrows formed with turning machines are sized based on the equipment design. Small pull-type turners form smaller windrows, while large self-propelled machines form 3 or 4 m piles with a base width of 6 m or more.

Windrows aerate primarily by natural or passive air movement (convection and gaseous diffusion). The rate of air exchange depends on the porosity of the windrow. Turning the rows mixes the materials, rebuilds the porosity of the windrow, and releases trapped heat, water vapor and gases. This type of compost technology is best suited to composting yard and garden waste. Windrow systems have been used for composting food waste if it is incorporated and covered with non-food substrates as it is received. Composting times can be expected to be six months or longer depending on feedstocks and climate

Figure 6-4: Self-Powered Windrow Turner

Figure 6-5: Second Windrow Turner Example

Figure 6-6: Pulled Windrow Turner

Table 6-2: Windrow Composting Advantages and Disadvantages[1]

Advantages	Disadvantages
▪ Can handle feedstocks with lower Carbon to Nitrogen (C:N) ratios ▪ Relatively-low capital costs and low technology requirements (windrow turners, front-end loaders, or farm equipment will suffice) ▪ Can achieve pathogen reduction temperatures with careful management and monitoring of the pile ▪ Relatively low operating costs ▪ No electric power needed ▪ Large amount of industry practical experience	▪ Large land area required ▪ More labor intensive that aerated static pile, particularly for feedstock with low C:N ratio or porosity ▪ Can be odourous, which may require larger buffer area between operation and neighbors ▪ More challenges to overcome if food waste or biosolids are included due to increased odours and attraction of food waste to pests and wildlife ▪ Exposure to rain, wind, and cold can be problematic unless in a covered environment

[1] Sourced from http://aep.alberta.ca/waste/reports-data/documents/LeafYardWasteDiversionStrategy-Aug2010.pdf

6.2.2 Passive Aeration

A method of augmenting a passive composting system is by introducing aeration systems at the base of the compost pile. Perforated pipes are laid on the ground, as shown on Figure 6-7, where air flows into the pipe and then percolates upwards through the compost by convection. This aids in achieving aerobic conditions in the pile, as it reduces the likelihood of anaerobic pockets of material occurring throughout the pile. Passive aerated piles can still benefit from turning the piles to re-build porosity. However, these systems can still require significant composting periods (up to two years) and are not well-suited to process feedstocks with food waste or low C:N ratios.

Figure 6-7: Example of Passive Aeration

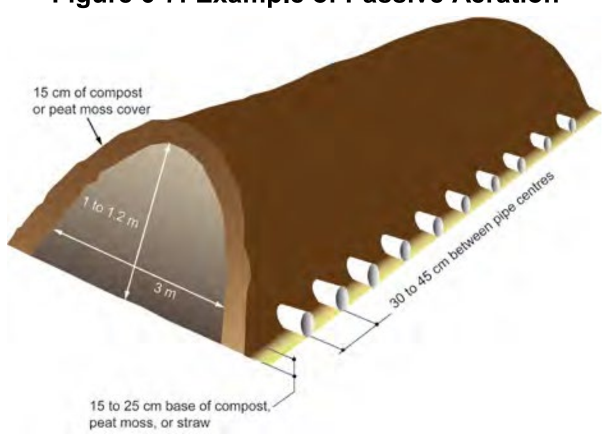


Table 6-3: Passive Aeration Systems Advantages and Disadvantages

Advantages	Disadvantages
▪ Low capital and operating costs ▪ Well-suited to small quantities of material ▪ No electric power needed ▪ Large amount of industry practical experience	▪ Not suitable for food waste, ▪ Odours can be problematic ▪ Pathogen reduction temperatures may not be well controlled ▪ Not suitable for large quantities of material ▪ Constructing piles overtop aeration systems can be complex ▪ Exposure to rain, wind, and cold can be problematic unless under cover

6.3 Active Aeration Systems

Active aeration differs from the above described technologies in that air is forced through the composting pile using fans or blowers.

6.3.1 Aerated Static Pile

This composting approach should have the composting area built on an impermeable surface such as a concrete or asphalt pad with a 2% grade to allow for leachate collection. Each pile can be equipped with a concrete floor with imbedded aeration channels or piping, or perforated pipe is placed on the compost pad and compost piles are built over top. The aeration pipes are connected to a blower equipped with a control system to moderate temperature and oxygen content in the pile. The control system tracks operating conditions to determine aeration rates, usually based on temperature feedback. Condensate and leachate are collected in the trench with drainage to a sump. Odour is managed by maintaining aerobic conditions in the pile and placing a cover of finished compost over the pile surface with positive air systems. With negative aeration systems, exhaust air is treated through a biofilter consisting of a wood chip and compost based medium (for negative air systems). The composting time for this type of system is typically three months with a curing stage of 3 to 6 months, depending on feedstocks and climate.

Figure 6-8: Aerated Static Pile Inside Bunker Walls

Table 6-4: Aerated Static Pile Composting Advantages and Disadvantages[1]

Advantages	Disadvantages
▪ Can be suitable for composting food waste and biosolids ▪ Forced aeration reduces land requirements and mixing ▪ Can result in more rapid stabilization in the high rate compost stage ▪ Use of negative aeration with a biofilter can help control odours ▪ Smaller surface area relative to windrows ▪ Can have lower operating equipment requirements with less mixing/turning ▪ Can achieve pathogen reduction temperatures	▪ Slightly higher capital cost for forced-aeration equipment ▪ Moisture addition may be required if piles dry from over aeration ▪ Feedstock pre-processing requires a higher degree of care; feedstocks must be well mixed and properly sized and moistened ▪ More operator skill required to manage aeration systems ▪ Aeration systems generally require three phase electrical supply ▪ Exposure to rain can be problematic if pile becomes over saturated, unless it is under cover

[1] Sourced from http://aep.alberta.ca/waste/reports-data/documents/LeafYardWasteDiversionStrategy-Aug2010.pdf

6.3.2 Membrane Cover Aerated Systems

The covered aerated static pile composting area is typically constructed on an impermeable surface such as concrete or asphalt with a 2% grade to allow for leachate collection. The aeration system design uses an aeration channel built into the impermeable compost pad. Leachate collection in the aeration channel and drains to a sump. Surface leachate is drained over the pad to a leachate pond or sump. The system shown on Figure 6-9 is the GORE Cover System that operates using positive aeration. The cover is made of a microporous membrane (PTFE) sandwiched between a bottom and top fabric. The cover is placed over the pile and secured to the ground or to support walls on the side of the pile. As air is injected into the pile, the breathable membrane expands like a balloon to create an in-vessel like environment. The sealed edges create a fully-enclosed system. This membrane allows for the management and retention of moisture, temperature, and odour. Odours are reduced with efficient aeration, and with odour molecules being absorbed into the moisture film forming inside the cover. The control system monitors oxygen content and pile temperature. The control system uses oxygen feedback to activate the blowers to maintain oxygen levels. The composting process consists of the main active phase (4 weeks under GORE cover), second active phase (2 weeks under GORE cover) and curing phase (2 weeks without GORE cover). The residence time for this type of system is approximately 56 days. Further curing of the compost can be expected with a market ready compost produced in 6 to 9 months, depending on feedstocks and climate.

Recent systems are being constructed inside a sheltered structure for the first stage. This enhances odour controls in sensitive areas.

Figure 6-9: Membrane Covered Aerated Static Pile

Table 6-5: Membrane Covered Aerated Static Pile Composting Advantages and Disadvantages[1]

Advantages	Disadvantages
▪ System uses low volume blowers and has reduced energy consumption over other static pile systems ▪ Lower space requirements than windrow systems ▪ Contained system reduces potential for odour emissions and contaminated storm water ▪ Pathogen reduction temperatures are exceeded ▪ Moisture loss due to aeration is minimal compared to uncovered aerated piles	▪ Potential steam or dust issues inside if inside a building enclosure ▪ Indoor air must be managed in odour control system prior to release (possibly biofilter) ▪ Requires advanced operating skills ▪ Moderate to high capital and operating costs

[1] Sourced from http://aep.alberta.ca/waste/reports-data/documents/LeafYardWasteDiversionStrategy-Aug2010.pdf

6.3.3 Mass Bed

There are several iterations of mass bed systems that vary from passive to in-vessel in design. The commonality is that they are all designed to process large quantities of material (15,000 to 150,000 tonnes). These systems are typically appropriate for a wide range of feedstocks and involve an active composting period of 2 weeks to 12 months depending on variables, such as active aeration, turning, or enclosed systems. Feedstocks are generally placed in large piles and turned or agitated on a regular basis to ensure appropriate mixing. Active aeration may be built into the ground or a surrounding building to augment the composting process, as well as manage odours. For more complex systems, automated equipment may be used to manage processing parameters, turn/agitate material, and move material through the building. Due to increased complexity, these systems need to process significant quantities of material in order to justify the high capital and operating costs.

Figure 6-10: Agitated Mass Bed

Figure 6-11: Turned Mass Bed

Table 6-6: Mass Bed Advantages and Disadvantages

Advantages	Disadvantages
▪ Able to process large quantities of material in short timeframes depending on process setup ▪ Reduced footprint compared to turned windrows ▪ Suitable for high levels of automation to reduce labour costs and increase consistency ▪ Can increase moisture retention due to low surface area to volume ratio	▪ Can be high capital costs due to complexity of system and equipment involved ▪ Specialized equipment is required ▪ Frequent maintenance that may require significant expertise depending on the system design ▪ Proper preparation and mixing of feedstocks is critical to smooth operation ▪ Difficult to add moisture in outdoor operations ▪ Convection of oxygen through pile is limited and can result in anaerobic (odourous) conditions.

6.4 In-Vessel

In the in-vessel composting process, the compost is aerated continuously (with a combination of positive and negative air flow) in a contained vessel. Systems typically include automatic control systems for aeration and moisture adjustments. Composting is typically contained within a rigid structure. In-vessel systems are commonly proprietary with numerous variations.

6.4.1 Enclosed Aerated Static Pile

Permanent facilities may be made of concrete, with gasketed and insulated stainless steel doors. These offer significant advantages for corrosion resistance and odour containment. The residence time for these types of systems is in the order of 28 days to stabilize and with 6 to 9 months for curing. The vessel is equipped with an aeration floor and condensate/leachate collection system. The control system tracks operating conditions to optimize aeration rates. Exhaust gases are treated with wet scrubbers and biofilters to control odours.

Figure 6-12: In-Vessel Composting Bunker

Table 6-7: Enclosed Aerated Static Pile (Tunnel) Composting Advantages and Disadvantages[1]

Advantages	Disadvantages
▪ High degree of odour control except for receiving area and when doors are opened ▪ Controlled aeration and moisture ▪ Lower space requirements ▪ Enclosed facility is not impacted by weather ▪ Reduced structural corrosion, as composting is contained within concrete tunnel ▪ Suitable for food waste and biosolids	▪ A high degree of operating and maintenance expertise required to manage more complex aeration and control systems ▪ High capital and operating costs. ▪ Shorter residence time claims by some vendors can result in unstable compost and requires an additional composting stage. ▪ Requires additional operations to cure compost (e.g. turned windrows, static pile)

[1] Sourced from http://aep.alberta.ca/waste/reports-data/documents/LeafYardWasteDiversionStrategy-Aug2010.pdf

6.4.2 Static or Agitated Container

More temporary or modular in-vessel facilities may involve sealed metal containers similar to 40 yd^3 roll-off bins (static container) or a smaller version of the agitated mass bed (agitated container). These containers offer modularity and flexibility compared to a fixed concrete structure, as more containers can be added if feedstocks increase and site layout can be readily modified to changing conditions.

Static containers often involve modular metal bins that can be filled with material, sealed from the or side, moved around site, and connected to an active aeration system. These systems are typically batch systems with low quantities of material per container (up to 900 tonnes per year) but can easily be scaled with acquisition of more containers. The active composting period of materials is typically quite short (2 to 3 weeks), which results in higher odour content of material entering the curing and maturing phase, than in systems with longer composting periods.

Agitated containers differ in processing flow, as material continuously flows through the system. Input organics undergo active composting while slowly travelling through the system. Compost exiting the system after the 2 to 4 week processing time still requires curing and maturing. Agitated containers are generally used for smaller quantities of material (300 kg to 10 tonnes per day), but are highly modular, as they can be run in parallel. These systems also typically involve more sophisticated control systems that automatically adjust temperature, water input, and other control parameters.

Figure 6-13: Static Container System

Figure 6-14: Agitated Container System (Wright Digestor)

Figure 6-15: Hot Rot Compost System

Table 6-8: Static and Agitated Container Advantages and Disadvantages

Advantages	Disadvantages
▪ High degree of odour control except for when material is removed ▪ Lower space requirements, static and agitated containers are relatively mobile, so site layouts can be modified ▪ May allow for modular expansion if feedstocks grow or are larger than expected. ▪ Agitated containers are highly automated	▪ Operating and maintenance expertise required to manage more complex aeration and control systems ▪ Higher capital and operating costs (varies with technologies) ▪ May require skilled maintenance staff ▪ Some vendors claim shorter residence time (one to four weeks) and are used in combination with another composting method/technology.

6.4.3 Rotating Drum

Rotating drum composters are similar to rotating dryers or cement kiln drums. Organics are process in a continuous flow through the drum. Rotating drum compost equipment vary in size and capacity from 10s of tonnes per day to 100s of tonnes per day. The drums are slightly sloped from the feed end to the discharge end. Materials slowly travel through the drum as the drums rotate. Drums may be aerated using a complex piping fixture with exhaust air capture for treatment in a biofilter. Active composting can range between one and seven days. Rotating Drums are normally paired with other composting technologies to fully stabilize and cure the compost.

Figure 6-16: Rotating Drum System

Table 6-9: Rotating Drum Advantages and Disadvantages

Advantages	Disadvantages
▪ Effectively mixes feedstocks and amendments ▪ Effective for initial decomposition of organic feedstocks ▪ Can be used for a variety of feedstocks and feedstock blends including yard waste, food waste, biosolids and other sources. ▪ Drums can be located outside or inside buildings, depending on drum size ▪ Aeration of drums reduces anaerobic conditions	▪ Results in an unstable compost that requires further processing to produce a finished marketable product ▪ highly mechanical and can require specialized maintenance staff (e.g. millwright) ▪ Drum wear and corrosion may occur depending on drum design and maintenance of the drum interior ▪ Complex loading and unloading ▪ Non-aerated drums result in anaerobic conditions

6.5 Compost Aging Technology

The third stage of composting (curing or aging) is typically defined as a period of 20 to 60 days after the active first stage of composting. Curing is a less active process. It represents the transition from high heat production and active bacterial conversion of the recognizable feedstock into a brown, gray, or black organic material. Aging converts this organic material into a less-odourous, darker, more uniform texture, with favourable characteristics for plant cultivation and growth. Aging represents both bacterial and fungal conversion. Aeration and agitation are still beneficial but can be designed at lower rates and frequencies. Regardless of the selected active composting technology, three of the most common aging technologies are presented:

- Large windrows;
- Conveyor stockpiling, and
- Membrane systems.

Windrows

Large windrows are typically formed using a bucket loader or excavator with trapezoidal cross sections and windrow lengths according the site conditions. Large trapezoidal cross sections (i.e., 3–5 m high and 7–12 m wide at the base) are desirable to minimize moisture loss, wind borne organic transport, space used, and odour control. The feedstock is usually managed in a first-in, first-out basis to maintain a consistent residence time. Impervious surface and pavement vary according to local regulation and design preferences. Drainage systems are integrated into the surface, usually with 1.5–2.5% slope on the surface to prevent any ponding or accumulation of storm water or snowmelt. There is an option to turning or agitate the piles at a mid-point in the residence time to improve product quality and increase the yield of fine particles upon screening. Aeration is typically passive or with above ground, reusable piping.

Conveyor Stockpiling

Conveyor stockpiling is similar to large windrows except that the windrows have an isosceles triangular cross section with a center peak rather than a flat top trapezoid. The peak can be much higher (i.e., 8–12 m high and 8.5–12.5 m wide at the base). The conveyor is typically self-propelled, mobile, and includes a hopper and metering device to insure proper and efficient conveyance. Some conveyors can swing in a radius from the feeding end to create a crescent-shaped windrow rather than linear windrows. Conveyors can be designed for any length, but portable and radial swing conveyors are typically 23 to 40 m long. The shorter lengths are ideal for movement, cost, and windrow forming. The primary advantage of conveyors is that it requires less time for bucket loader or excavator handling, labour, repair, and fuel use. Operating costs for conveyors are very low in comparison to a bucket loader or excavator. There can be a significant space saving as the largest conveyor windrow has nearly twice the volumetric capacity of the largest bucket loader/excavator windrow as described above. Space savings can bring benefits in reduced pavement cost, drainage system cost, and travel distances and operating costs for bucket loaders and excavators. Aeration is typically passive or with above-ground, reusable piping.

Membrane System

The membrane system for compost aging is similar to what was described for active first stage composting. The advantage of membranes would be moisture conservation within the feedstock and protection from wind effects causing airborne organic transport if smaller windrows are formed. The largest cross section for membrane windrows might be 2 to 3 m high and 6 to 9 m wide at the base. Aeration is usually with below grading piping or above-grade, reusable piping.

6.6 Processing Options Comparison

Table 6-10 provides a comparison of operational and cost considerations for the various composting approaches discussed in previous sections. Two processing technologies were determined to be the most suitable for further exploration based on available feedstocks, geographical/climate considerations, and concerns about odour control expressed by ACRD staff. Aerated static pile, and membrane covered aerated static pile technologies were costed and used to develop the processing scenarios discussed in Section 7.0.

Table 6-10: Processing Technology Attributes[1]

Composting Approach	Odour & Nuisance Control Measures	Maintenance Requirements	Staffing Needs	Capital Cost	Operating Cost	Space Requirements	Typical Processing Time	Additional Curing/ Time Required
Turned Windrow or Static Pile	Low – Moderate	Low – Moderate	Moderate	Low – Moderate	Low – Moderate	High	4 to 12 months	No
Passive Aeration System	Low – Moderate	Low	Low – Moderate	Low – Moderate	Low – Moderate	High	4 to 12 months	No
Aerated Static Pile	Low – High	Low	Low – Moderate	Low – Moderate	Low – Moderate	Low – Moderate	3 to 6 months	Yes
Membrane Covered Aerated Static Pile	High	Low	Low – Moderate	Moderate – High	Low – Moderate	Low – Moderate	2 to 4 months	Yes
Mass Bed	High	Moderate – High	Low	High	High	Low – High	1 to 4 months	Yes
Enclosed Aerated Static Pile	High	Moderate	Low – Moderate	High	High	Low – Moderate	1 to 4 months	Yes
Static or Agitated Container	High	Moderate – High	Low – Moderate	Moderate – High	Moderate	Low	1 to 4 weeks	Yes
Rotating Drum	High	Moderate – High	Medium – High	Moderate – High	High	Low	1 to 4 weeks	Yes

[1] Sourced from http://aep.alberta.ca/waste/reports-data/documents/LeafYardWasteDiversionStrategy-Aug2010.pdf

Table 6-11 summarizes the scalability, suitability for ACRD, feedstock preference, and output considerations for the various organic processing technologies discussed.

Table 6-11: Suitability of Organic Processing Options for the ACRD

Technology Type	Scalability	Suitability for ACRD
Turned Static Piles or Windrows	▪ Inexpensive, only need larger paved surface ▪ Requires significant land footprint for multiple windrows	▪ Minimal odour control ▪ Unsuitable for climates with intense moisture variability ▪ Suitable for Yard Waste Only
Passive Aeration Systems	▪ Inexpensive, only need larger paved surface ▪ Requires significant land footprint for multiple windrows	▪ Limited odour control ▪ Unsuitable for climates with significant moisture variability ▪ Suitable for yard waste with small amounts of food waste, no biosolids
Aerated Static Piles	▪ Low to moderate costs, sealed aerated surface is required ▪ Requires significant land footprint for multiple windrows	▪ Moderate odour control possible ▪ Unsuitable for climates with significant moisture variability ▪ Suitable for yard waste with moderate amounts of food waste and biosolids
Membrane Covered Aerated Static Piles	▪ Moderate cost, need sealed surface and more membrane covers ▪ Smaller footprint than non-covered windrows, need additional space for maturing compost	▪ Good odour control possible ▪ Suitable for many environments, as membrane enables moisture and temperature control ▪ Suitable for yard waste, food waste, and biosolids
Mass Beds	▪ Expensive equipment required to scale appropriately ▪ Small footprint for primary processing, but additional surface required for curing and maturing stages	▪ Good odour control possible ▪ Suitable for many environments, closed structure allows for moisture and temperature control ▪ Suitable for yard waste, food waste, and biosolids
Enclosed Aerated Static Pile	▪ Scaled up by adding more vessels ▪ Small footprint for primary processing, but additional surface required for curing and maturing stages	▪ Good odour control possible ▪ Suitable for many environments, closed structure allows for moisture and temperature control ▪ Suitable for yard waste, food waste, and biosolids
Static or Agitated Container	▪ Moderate to expensive to scale up by adding more vessels ▪ Small footprint for primary processing, but additional surface required for curing and maturing stages	▪ Good odour control possible ▪ Suitable for many environments, closed structure allows for moisture and temperature control ▪ Suitable for yard waste, food waste, and biosolids
Rotating Drum	▪ Significant facility upgrade to scale up ▪ Small footprint for initial processing, but need significant space to finish composting process	▪ Good odour control possible ▪ Suitable for many environments, closed structure allows for moisture and temperature control ▪ Suitable for yard waste, food waste, and biosolids

6.7 Finished Compost End Markets

An important part of developing organics processing capacity is developing reliable end markets for the finished compost. End markets will ensure that finished compost does not continuously stockpile onsite and may enable revenue generation from compost sales. There are several typical end markets for finished compost products.

Domestic Use – ACRD can directly sell to residents/other small-scale applications for garden application and lawn top-dressing. This is typically public pick up and would require development of an area that can be supervised as well as equipment to load small vehicles. Additional options include having bags that customers pay for and fill themselves, akin to a garden centre.

Garden Centre Sales – Selling to garden centres will likely be more effective if the ACRD doesn't compete with ACRD direct compost sales. Some may also purchase compost for soil blending operations to augment with their own amendments.

Municipal/Regional District Operations – These include landscaping, public park gardens, park and sport field topdressing, land reclamation, erosion control applications. There's also potential applications for run-off siltation control – using compost filled filter socks or constructed filter berms.

Commercial – Commercial applications are similar to municipal/regional district operations, as contractors may choose to utilize compost over other soil products for environmental considerations.

Agriculture – Agriculture applications can be a high volume, but financial return can vary depending on type and value of agricultural products. Potential for application in tree farms, berry farms, orchards,

There are several important considerations when developing compost end markets.

- Compost uses require different processing and screening qualities (e.g. Top dressing – typically screened to ¼ inch, erosion control applications – screened to ½ inch);
- Market applications will influence screening equipment selection (e.g. Some trommel screens feature "quick change drums" to modify screen size, whereas potentially cheaper options might not have sizing flexibility);
- The BC Organics Regulation dictates standards for compost application, and the Canada Fertilizers Act is important when considering the sale and labelling of compost; and
- It is important to develop and implement a marketing campaign before processing facilities become operational. This allows time for end markets to emerge and grow for when finished compost is being produced.

Last but perhaps most importantly, there is the potential to provide compost material for incorporation into final cover for the landfills. Most landfills have a shortfall in the quantity of topsoil available for inclusion in the final cover. The availability of compost to supplement and improve this growing medium can be an immediate benefit to parts of a mature landfill that is undergoing final closure. It can also have a financial benefit through reducing or removing the cost of topsoil importation.

7.0 PROCESSING SCENARIOS

This section outlines five different processing scenarios for managing organics generated within the ACRD. The following assumptions were used in the development and costing of these options:

- Design capacity of the processing facilities was based on:
  - a maximum 75% capture rate for organics from the residential and ICI sectors along with existing yard waste received at facilities;
  - capture of available biosolids from WWTPs and procurement of required bulking agents. Feedstocks are modeled to grow correlated to population over a 20-year period, as shown in Section 5.3;
  - Alberni Valley Service Area – Design Capacity: 7,500 tonnes/year (144 tonnes/week);
  - West Coast Service Area – Design Capacity: 4,000 tonnes/year (77 tonnes/week);
- Projected capacity was based on the expected organics collection during Year 1 of implementation:
  - This comprises projected residential and ICI collection of food and yard waste as shown in Section 4.3.4 as well as available biosolids (Section 5.2), currently collected yard waste, and required bulking agent;
  - Alberni Valley Service Area – Projected Capture: 5,000 tonnes/year;
  - West Coast Service Area – Projected Capture: 1,100 tonnes/year;
- Sizing and consequent costing of each facility accounts for the volume reduction of material over each stage of the composting process;
- Capital costs includes a 10% cost factor for engineering design and 25% contingency factor on non-mobile equipment costs;
- Capital costs are annualized at a borrowing interest rate of 4.5% over a 20-year period;
- Capital costs (minus the grant) have distributed the $6,000,000 funds between the West Coast and Alberni Valley with a proportionality of $2,000,000 and $4,000,000 respectively where applicable;
  - Some processing scenarios did not require the entire grant to be spent;
  - Capital costs include site preparation and pre-construction, construction of facility(ies), procurement of required equipment, and engineering design and contingency factors;
  - For scenarios with transfer stations, capital costs are inclusive of constructing an enclosed receiving building with air filtration, where organics are dumped, and then loaded into transfer trailer trucks. Costs include the ACRD procurement of a loader to facilitate transfer activities;
- It was assumed that the ACRD would purchase certain mobile equipment for use on-site to facilitate organics processing. If mobile equipment were contracted out each year, then this would reduce the capital costs and potentially increase operating costs; and
- Operating costs for organics processing include utility costs (e.g. diesel, electricity, water), labour, equipment maintenance, procurement of bulking agents, and a contingency factor of 20%.
  - For transfer station scenarios, operating costs also include the labour, diesel, and vehicle maintenance costs (as well as tipping fees if material is transported to a facility outside the ACRD).

7.1 Scenario 1 – One Processing Facility in Each Service Area

Two organic processing facilities (one in each service area), Alberni Valley and West Coast. Collected organics from each service area are taken to their respective processing facilities.

Environmental Considerations

- Minimal transportation required to move organics to local facilities resulting in minimal GHG emissions;
- Builds local organics processing capacity, setting an example for other jurisdictions across the province; and
- Construction needs are different depending on where the facilities are sited, and construction materials required.

Social Impact

- Positive impact on supply of local compost material for landscaping and other activities;
- Positive impact on local resiliency, as organics processing is independent of out of region processing;
- Less traffic on highway compared to other processing scenarios;
- Reduced concerns around potential odour production/release from transporting organics; but
- Potential for odour issues, that could negatively affect tourism and/or ACRD's relationship with communities located proximally to the processing facilities.

Financial Implications

- Capital costs for two facilities are highest of all scenarios, full costing is shown in Table 7-1 and Table 7-2;
- Provides the most job opportunities within the ACRD compared to other scenarios;
- Potential to sell finished compost product locally to offset costs; and
- Operating costs are not subject to the tipping fees of out of region processing facilities.

Table 7-1: Alberni Valley Processing Facility Capital and Operating Costs

Alberni Valley Facility	Aerated Static Pile		Membrane Covered Aerated Static Pile	
	Design Capacity	Projected Capture (Yr 1)	Design Capacity	Projected Capture (Yr 1)
Total Capital Cost	$3,817,700		$5,195,600	
Annual Amortized Capital (20 years)	$293,500		$399,400	
Annual Amortized Capital w/ Grant (20 years)[1]	$0		$91,900	
Annual Operating Cost	$475,600	$345,700	$572,500	$424,300
Annualized Cost (w/o Grant)	**$769,100**	**$639,200**	**$971,900**	**$823,700**
Annualized Cost (w/ Grant)	**$475,600**	**$345,700**	**$664,400**	**$516,200**
Cost per Tonne (w/o Grant)	**$103**	**$127**	**$130**	**$164**
Cost per Tonne (w/ Grant)	**$64**	**$69**	**$89**	**$102**

[1] Assume $4M of grant applied

Table 7-2: West Coast Processing Facility Capital and Operating Costs

West Coast Facility	Aerated Static Pile		Membrane Covered Aerated Static Pile	
	Design Capacity	Projected Capture (Yr 1)	Design Capacity	Projected Capture (Yr 1)
Total Capital Cost	$2,478,400		$3,330,600	
Annual Amortized Capital (20 years)	$190,500		$256,000	
Annual Amortized Capital w/ Grant (20 years)[2]	$22,800	$36,800	$102,300	
Annual Operating Cost	$250,600	$182,500	$309,600	$238,600
Annualized Cost (w/o Grant)	**$441,100**	**$373,000**	**$565,700**	**$494,700**
Annualized Cost (w/ Grant)	**$273,400**	**$219,300**	**$411,900**	**$340,900**
Cost per Tonne (w/o Grant)	**$110**	**$339**	**$141**	**$450**
Cost per Tonne (w/ Grant)	**$68**	**$199**	**$103**	**$310**

[2] Assume $2M of grant applied

7.2 Scenario 2 – West Coast Transfer Station to Alberni Valley Facility

One centralized organic processing facility in Alberni Valley that can accommodate organics from the entire regional district. Organics collected from Alberni Valley are taken to the processing facility directly and organics collected from the West Coast are taken to a transfer station and reloaded for transport to the Alberni Valley organic processing facility.

Environmental Considerations

- Greenhouse gas impacts from transporting organics from the West Coast (WC) to Alberni Valley (AV) facility shown in Table 7-3;
- Builds local organics processing capacity, setting an example for other jurisdictions across the province; and
- Less organics processing resiliency than building two local facilities.

Table 7-3: Annual Transportation GHG Emissions For Organics Transfer – WC to AV

West Coast to Alberni Valley	Design Capacity	Projected Capture
# Trucks per Week	7.0	1.3
Kilometres per Two-Way Trip	190	
Annual Kilometres	68,776	12,424
Annual GHG Emissions (tonnes)	**102.8**	**18.6**

Social Impact

- Positive impact on supply of local compost material for landscaping and other activities;
- Positive impact on local resiliency, as organics processing is independent of out of region processing;
- More traffic on highways, increases risk of accidents especially during poor conditions or high tourism months; and
- Higher potential for odour issues if material is transported to and centralized at one facility that could negatively affect tourism and/or ACRD's relationship with communities located in close proximally to the processing facility.

Financial Implications

- Provides job opportunities within the ACRD compared to other scenarios;
- Potential to sell finished compost product locally to offset costs;
- Centralized larger facility offers reduced capital costs compared to building two facilities, reducing the overall cost per tonne for processing as shown in Table 7-4; but
- Transporting organics is an added expense and subject to fluctuations in fuel prices and travel time between facilities.

Table 7-4: Alberni Valley Processing Facility and West Coast Transfer Station Costs

Alberni Valley Facility West Coast Transfer Station	Aerated Static Pile		Membrane Covered Aerated Static Pile	
	Design Capacity	Projected Capture (Yr 1)	Design Capacity	Projected Capture (Yr 1)
West Coast Transfer Station Capital	$442,000		$442,000	
West Coast Transfer Station Operating	$52,500	$39,400	$52,500	$39,400
Transportation (to Alberni Valley)	$144,100	$26,000	$144,100	$26,000
Alberni Valley Facility Capital Cost	$4,424,400		$5,972,300	
Alberni Valley Facility Operating Cost	$530,600	$373,700	$666,400	$441,400
Total Capital Cost	**$4,866,400**		**$6,414,300**	
Annual Amortized Capital (20 years)	$374,100		$493,100	
Annual Amortized Capital w/ Grant (20 years)[3]	$0		$31,900	
Total Operating Cost (Annual)	$727,200	$439,100	$863,000	$506,800
Annualized Total Cost (w/o Grant)	**$1,101,300**	**$813,200**	**$1,356,100**	**$999,900**
Annualized Total Cost (w/ Grant)	**$727,200**	**$439,100**	**$894,900**	**$538,700**
Cost per Tonne (w/o Grant)	**$96**	**$133**	**$118**	**$164**
Cost per Tonne (w/ Grant)	**$63**	**$72**	**$78**	**$88**

[3] Assume $6M of grant applied

7.3 Scenario 3 – Alberni Valley Transfer Station to West Coast Facility

One organic processing facility in the West Coast service area that can accommodate organics from the entire regional district. Organics collected from West Coast are taken to the processing facility directly and organics collected from the Alberni Valley are taken to a transfer station and reloaded for transport to the regional organic processing facility.

Environmental Considerations

- Greenhouse gas impacts from transporting organics from the Alberni Valley to West Coast facility shown in Table 7-5 are higher than Scenario 2, due to higher volumes generated in the Alberni Valley and more required trips;
- Builds local organics processing capacity, setting an example for other jurisdictions across the province;
- Less organics processing resiliency than building two local facilities.

Table 7-5: Annual Transportation GHG Emissions For Organics Transfer – AV to WC

Alberni Valley to West Coast	Design Capacity	Projected Capture
# Trucks per Week	8.9	6.7
Kilometres per Two-Way Trip	190	
Annual Kilometres	87,112	65,806
Annual GHG Emissions (tonnes)	**130.2**	**98.3**

Social Impact

- Positive impact on supply of local compost material for landscaping and other activities;
- Positive impact on local resiliency, as organics processing is independent of out of region processing;
- More traffic on highways, increases risk of accidents especially during poor conditions or high tourism months; and
- Higher potential for odour issues if material is transported to and centralized at one facility that could negatively affect tourism and/or ACRD's relationship with communities located proximally to the processing facility.
  - However, the location of the West Coast facility is buffered from residents and tourists compared to the Alberni Valley. Ownership of property also less contentious.

Financial Implications

- Some job opportunities within the West Coast compared to other scenarios;
- Potential to sell finished compost product locally to offset costs and can backhaul products to Alberni Valley;
- Similar capital costs to Scenario 2, but higher transport costs due to larger organics quantities requiring additional handling/transfer, as shown in Table 7-6; and
- Transporting organics is an added expense and subject to fluctuations in fuel prices and travel time between facilities.

Table 7-6: West Coast Processing Facility and Alberni Valley Transfer Station Costs

West Coast Facility Alberni Valley Transfer Station	Aerated Static Pile		Membrane Covered Aerated Static Pile	
	Design Capacity	Projected Capture (Yr 1)	Design Capacity	Projected Capture (Yr 1)
Alberni Valley Transfer Station Capital Cost	$499,800		$499,800	
Alberni Valley Transfer Station Operating Cost	$56,800	$42,600	$56,800	$42,600
Transportation Cost (to West Coast)	$182,600	$105,400	$182,600	$105,400
West Coast Facility Capital Cost	$4,424,400		$5,972,300	
West Coast Facility Operating Cost	$530,600	$373,700	$666,400	$441,400
Total Capital Cost	$4,924,200		$6,472,100	
Annual Amortized Capital (20 years)	$378,554		$497,550	
Annual Amortized Capital w/ Grant (20 years)[4]	$0		$36,293	
Total Operating Cost	$770,000	$521,700	$905,800	$589,400
Annualized Total Cost (w/o Grant)	**$1,148,600**	**$900,300**	**$1,403,400**	**$1,087,000**
Annualized Total Cost (w/ Grant)	**$770,000**	**$521,700**	**$942,100**	**$625,700**
Cost per Tonne (w/o Grant)	**$100**	**$148**	**$122**	**$178**
Cost per Tonne (w/ Grant)	**$67**	**$86**	**$82**	**$103**

[4] Assume $6M of grant applied

7.4 Scenario 4 – West Coast Facility, Alberni Valley Transfer Station to Out of Region

One organic processing facility to manage the West Coast service area, a transfer station in Alberni Valley to transport organics to a processing facility in the Regional District of Nanaimo and tipping fees for processing of organics from the Alberni Valley.

Environmental Considerations

- Greenhouse gas impacts from transporting organics from the Alberni Valley to Regional District of Nanaimo shown in Table 7-7; and
- Some local organics processing for the West Coast, but less resiliency overall for the ACRD.

Table 7-7: Annual Transportation GHG Emissions For Organics Transfer – Alberni Valley to RDN

Alberni Valley to Regional District Nanaimo	Design Capacity	Projected Capture
# Trucks per Week	8.9	6.7
Kilometres per Two-Way Trip	100	
Annual Kilometres	45,409	34,303
Annual GHG Emissions (tonnes)	**67.9**	**51.3**

Social Impact

- Positive impact on supply of local compost material for landscaping and other activities within the West Coast;
- Positive impact on local resiliency of the West Coast, as organics management is independent of out of region processing capacity;
- More traffic on highways, increases risk of accidents especially during poor conditions or high tourism months;
- Potential for odour issues that could negatively affect tourism and/or the West Coast's relationship with communities located proximally to the processing facility, although the West Coast facility would be buffered from residents and tourists; and
- No control of processing facilities in the event tipping fees are increased or odours are impacting nearby receptors.

Financial Implications

- Some additional job opportunities within the West Coast compared to other scenarios;
- Potential to sell finished compost product locally to offset costs;
- Lower capital costs for one facility on West Coast, but still requires one transfer station as discussed in Table 7-8 and Table 7-9; and
- Transporting organics can be expensive and subject to fluctuations in fuel prices and travel time between facilities; and
- Operating costs increased due to tipping fees for processing of organics.

Table 7-8: West Coast Processing Facility Capital and Operating Costs

West Coast Facility	Aerated Static Pile		Membrane Covered Aerated Static Pile	
	Design Capacity	Projected Capture (Yr 1)	Design Capacity	Projected Capture (Yr 1)
Total Capital	$2,478,400		$3,330,600	
Annual Amortized Capital (20 years)	$190,500		$256,000	
Annual Amortized Capital w/ Grant (20 years)[5]	$0		$0	
Annual Operating	$250,600	$182,500	$309,600	$238,600
Total Annual Cost (w/o Grant)	**$441,100**	**$373,000**	**$565,700**	**$494,700**
Annualized Total (w/ Grant)	**$250,600**	**$182,500**	**$309,600**	**$238,600**
Cost per Tonne (w/o Grant)	**$110**	**$339**	**$141**	**$450**
Cost per Tonne (w/ Grant)	**$68**	**$199**	**$103**	**$310**

[5] Assume full amount of capital cost paid by the grant

Table 7-9: Alberni Valley Transfer Station (Out of Region) Capital and Operating Costs

Alberni Valley Transfer Station	Design Capacity	Projected Capture (Yr 1)
Total Capital Cost	$499,800	$499,800
Annual Amortized Capital (20 years)	$38,400	$38,400
Annual Amortized Capital w/ Grant (20 years)[6]	$0	$0
Annual Operating Cost	$56,800	$42,600
Transportation and Processing Cost (to RDN)	$601,900	$347,500
Annualized Total Cost (w/o Grant)	**$697,100**	**$428,500**
Annualized Total Cost (w/ Grant)	**$658,700**	**$390,100**
Cost per Tonne (w/o Grant)	**$151**	**$162**
Cost per Tonne (w/ Grant)	**$142**	**$147**

[6] Assume full amount of capital cost paid by the grant

7.5 Scenario 5 – Two Transfer Stations to Out of Region

Transfer stations at each of the service areas and transport of all organics to processing facilities in the RDN. Tipping fees for processing of organics charged to ACRD.

Environmental Considerations

- Greenhouse gas impacts from transporting organics from the ACRD to Regional District of Nanaimo are the highest of all scenarios, as shown in Table 7-10; and
- Low local resiliency, as organics processing is dependent on external processors.

Table 7-10: Annual Transportation GHG Emissions For Organics Transfer – ACRD to RDN

ACRD to Regional District Nanaimo	From Alberni Valley		From West Coast	
	Design Capacity	Projected Capture	Design Capacity	Projected Capture
# Trucks per Week	8.9	6.7	7.0	1.3
Kilometres per Two-Way Trip	100		290	
Annual Kilometres	45,409	34,303	104,628	18,900
Annual GHG Emissions (tonnes)	**67.9**	**51.3**	**156.3**	**28.2**

Social Impact

- Low organics management resiliency due to reliance on out of region processing leaves programs vulnerable;
- More traffic on highways, increases risk of accidents especially during poor conditions or high tourism months; and
- Some potential for odour issues from material transportation could negatively affect tourism and/or ACRD's relationship with communities located on transportation routes.

Financial Implications

- Minimal additional job opportunities within the ACRD compared to other scenarios;
- Lower capital costs compared to organics processing, but still require two transfer stations as discussed in Table 7-11 and Table 7-12; and
- Transporting organics are an added cost and subject to fluctuations in fuel prices and travel time between facilities.

Table 7-11: Alberni Valley Transfer Station (Out of Region) Capital and Operating Costs

Alberni Valley Transfer Station	Design Capacity	Projected Capture (Yr 1)
Total Capital Cost	$499,800	$499,800
Annual Amortized Capital (20 years)	$43,600	$43,600
Annual Amortized Capital w/ Grant (20 years)	$0	$0
Annual Operating Cost	$56,800	$42,600
Transportation and Processing Cost (to RDN)	$601,900	$454,700
Annualized Total Cost (w/o Grant)	**$702,300**	**$540,900**
Annualized Total Cost (w/ Grant)	**$658,700**	**$497,300**
Cost per Tonne (w/o Grant)	**$152**	**$204**
Cost per Tonne (w/ Grant)	**$142**	**$187**

Table 7-12: West Coast Transfer Station (Out of Region) Capital and Operating Costs

West Coast Transfer Station	Design Capacity	Projected Capture (Yr 1)
Total Capital Cost	$442,000	$442,000
Annual Amortized Capital (20 years)	$38,500	$38,500
Annual Amortized Capital w/ Grant (20 years)	$0	$0
Annual Operating Cost	$52,500	$39,400
Transportation and Processing Cost (to RDN)	$619,400	$111,900
Annualized Total Cost (w/o Grant)	**$710,400**	**$189,800**
Annualized Total Cost (w/ Grant)	**$671,900**	**$151,300**
Cost per Tonne (w/o Grant)	**$195**	**$284**
Cost per Tonne (w/ Grant)	**$185**	**$226**

7.6 Scenario A – Bamfield Processing Facility

This scenario discusses two options for managing organics from the Bamfield area. Option 1 involves constructing a small composting pad at the Bamfield Transfer Station where organics would be composted. Option 2 involves having an enclosed container (Figure 7-1) where organics would be dropped-off at the transfer station and transported to the Alberni Valley for composting. The following considerations were used in developing the two options.

Figure 7-1: Example of an organics container that could be transported to a composting facility.

- Available residential and ICI organics (mostly food waste) that could be collected approximately 11 tonnes annually;
- Processing capacity for composting approximately 22 tonnes per year (includes bulking agent that is mixed with the collected organics);
- Processing would occur on the small asphalt pad separated into two sections by concrete lock-blocks. Collected organics would be mixed with bulking agent and placed in the first "active area", growing the pile as more organics are collected. The pile would be turned regularly to avoid anaerobic decomposition to mitigate odours. The piles should be placed under a covered by a permanent structure to manage moisture and reduce potential leachate concerns during high rainfall events;
- Mobile equipment procured should have the flexibility to mix composting materials and conduct other tasks around the site, such as moving materials and loading bins on the transfer vehicle; and
- Transfer costs for Option 2 are estimated to be approximately $6,500 per year (dedicated collection once per month). Costs can be reduced if hauled in conjunction with other material streams.

Table 7-13 lists estimated capital and operating costs for a small organics processing facility at the Bamfield Transfer Station.

Table 7-13: Bamfield Processing Facility Costs

Bamfield Processing Facility	Turned Static Pile
Mobilization, Demobilization, Surveying, Testing	$10,000
Facility Construction	$20,800
Mobile Equipment (small loader/Bobcat)	$40,000
Engineering and Contingency (10%, 25%)	*$7,300*
Total Capital Cost	**$78,100**
Annualized Capital Cost (w/o Grant)	**$6,000**
Utilities (water, electricity, diesel)	$700
Labour (composting operations only)	$12,300
Bulking Agent Procurement	$400
Equipment Maintenance	$2,000
Total Operating Cost	**$15,500**
Annualized Total (w/o Grant)	**$21,500**
Annualized Total (w/ Grant)	**$15,500**
Cost per Tonne (w/o Grant)	**$977**
Cost per Tonne (w/ Grant)	**$704**

7.7 Scenario Comparison

The ranking proposed for each of the collection options presented is based on a qualitative ranking of low, medium and high of the evaluation criteria. Table 7-14 describes the criteria used to select the preferred options and the preliminary relative weighting. The evaluation of the organics processing options is based on preliminary weighting determined from previous meetings with ACRD staff, shifting the weighting of criteria, or including new criteria that may change the results

Table 7-14: Processing Scenario Criteria Descriptions

Criteria	Weighting	Description
Environmental		
Reduce GHG emissions	1	While all processing options involve diverting food waste from the landfill, some require more transportation related GHG emissions from moving material between locations. Processing options rated highly will involve the least amount of GHG emissions from transportation
Local Organics Management	2	Local organics management is important so that implemented programs are not dependent on external processing capacity, as well as raising the profile of local environmental resiliency. Options rated highly will maximize local processing resiliency
Social		
Odour Issues	3	Odour management is critically important to successful operation of organics processing facilities. Odour issues can pose significant challenges once they begin, as public pressure may escalate quickly depending on the number of people affected. Options rated highly will involve the smallest risk of odour release.
Traffic Concerns	2	Traffic safety is an important consideration for both staff and residents in the regional district. This fluctuates throughout the year due to significant population fluctuations from tourism. Options rated highly will involve the fewest vehicles transporting organic material within the ACRD.
Job Creation	2	Job creation can be a vital component of building public support for new organics management infrastructure and initiatives. Options rated highly will involve the most job creation in the ACRD.
Economic		
Capital Cost	2	Capital cost refers to the upfront expenditures for infrastructure and equipment for organics management. These costs may be eligible to be subsidized by the Organics Infrastructure Program grant that ACRD has received. Options rated highly will involve the lowest capital costs.
Operating Cost	2	Operating cost describes the ongoing annual costs to managing organics that the ACRD will need to finance. Options rated highly will involve the lowest operating costs.
Cost per Tonne	3	Cost per tonne defines the unit cost for organics management, relating the quantity of organics diverted from the landfill to the capital and operating costs. Options rated highly will involve the lowest cost per tonne.

Table 7-15 provides an initial multi-criteria analysis ranking the priority of the organics processing scenarios using nominal value comparison.

Table 7-15: Processing Scenario Comparison

Scenario	Environmental Considerations		Social Impact			Financial Implications			Score (/48)
Criteria	GHG Emissions (3 – Low GHGs, 1 – High GHGs)	Local Organics Management (3 – Local Capacity, 1 – No Local Capacity)	Odour Issues (3 – Low Odour Potential, 1 – High Odour Potential)	Traffic Concerns (3 – No Increased Traffic, 1 – High Increased Traffic)	Job Creation (3 – Creates Jobs, 1 – No Job Creation)	Capital Cost (3 – Low Capital Cost, 1 – High Capital Cost)	Operating Cost (3 – Low Operating Cost, 1 – High Operating Cost)	Unit Cost per Tonne (3 – Low Unit Cost, 1 – High Unit Cost)	
Weighting	1	2	3	2	2	2	2	3	
1 – One Facility in Each Service Area	3	3	2	3	3	1	2	2	**39**
2 – West Coast Transfer Station to Alberni Valley Facility	2	2	2	2	3	2	3	3	**41**
3 – Alberni Valley Transfer Station to West Coast Facility	1	2	2	2	3	2	2	2	**35**
4 – West Coast Facility, Alberni Valley Transfer Station to Regional District of Nanaimo	2	2	3	2	2	3	1	1	**34**
5 – Two Transfer Stations to Regional District of Nanaimo	1	1	3	1	1	3	1	2	**30**

8.0 RECOMMENDATIONS

The recommendations for this report are divided into two parts: options for collection and options for processing. While both are integral components to an effective organics management program, the decision points for each are different to warrant separate analysis.

8.1 Organics Collection

Organics collection options compared in Section 4.4 describe the possible approaches in each service area of the ACRD. Recommended options are described by area below.

Bamfield Service Area

- Options 2 (ICI, Residential Disposal Ban and Transfer) and 3 (ICI, Residential Disposal Ban and On-Site Processing) are the highest rated options for the Bamfield area. Each has tradeoffs as it relates to local processing and cost savings;
  - Option 2 is the most cost effective, as it does not involve capital and operating costs for a composting facility and allows generators of organic waste an option for diverting this material; and
  - Option 3 is costlier but provides an opportunity for more community involvement and local use for the end product. Operating costs could be shared by having staff to manage organics processing and oversee transfer station operations.

Alberni Valley Service Area

- Options 1, 2 and 3 have a spectrum of considerations that can be summarized as higher level of service results in higher diversion rates but also higher costs for collection. Key points for all three options include:
  - Residential tonnages are equivalent to ICI tonnages in the Alberni Valley, but capture rates are typically higher in residential collection; and
  - Effective education and enforcement of organics bans is required to ensure sufficient and high-quality feedstocks are collected.

West Coast Service Area

- Options 1 and 3 are the recommended options for the West Coast service area because reliance on self-haul of organics (Option 2) may not result in desired diversion rates;
  - Residential curbside collection is important when implementing a residential organics ban, as it would be difficult to sufficiently motivate residents (especially temporary residents or tourists) to source separate waste and bring organics to the landfill;
- All options for the West Coast include an ICI disposal ban, which is crucial, as the majority of disposal comes from the ICI Sector;
  - With effective engagement, organics collection from the ICI sector could be higher than projected, as most of the ICI sector is comprised of hotels, resorts, and similar establishments that can have higher control over their waste stream than others such as grocery stores.

8.2 Organics Processing

The organics processing scenario comparison in Section 7.7 shows that Scenario 1 or 2 would be the highest ranked scenarios. Scenarios 3-5 all involved significant transportation logistics, which involve significant operational costs that would likely only increase over time and results in additional GHG emissions being produced. Furthermore, Scenarios 1 and 2 have additional benefits as follows:

- Scenario 1 features higher capital costs than Scenario 2 but provides more flexibility and resiliency with processing organics in two locations;
  - This distributes the quantity of organics between two locations, which provides an option in the event one of the processing facilities is not operational, particularly at the Alberni Valley site;
  - As the population in the West Coast service area grow, the unit processing cost at the West Coast facility will go down in Scenario 1, compared to transportation costs rising in Scenario 2; and
  - This option provides the highest social and environmental benefits, as job creation and finished compost production are distributed throughout the ACRD.
- Scenario 2 presents certain economic advantages to Scenario 1, as centralizing organics processing in one facility significantly reduces capital cost and unit operating costs;
  - Capital cost for one larger organic processing facility at Alberni Valley and a transfer facility at West Coast is 20-25% less than two organic processing facilities at each of the service areas; and
  - The operating costs in the first several years of implementing organics collection would be lower than Scenario 1, as transporting the relatively small quantities of organics from the West Coast to the Alberni Valley is more cost-effective than operating another facility.

8.2.1 Cost Saving Considerations

General cost saving considerations for both processing scenarios include:

- Designing organics processing facility(ies) to be scalable over time, as this will allow the ACRD to save initial capital costs by initially building for current collection capacity and expanding the facility as population and organic feedstocks grow;
- Current costing scenarios include ACRD purchasing certain mobile equipment such as grinders, screeners, and separators. These pieces of equipment could likely be contracted out, shifting capital expenditures to operating expenses. This is a better economical option as organics collection numbers are expected to be low during initial implementation years;
- If Scenario 1 is selected, there are advantages to choosing the same technology for both facilities (even though costs may be higher);
  - The same technology allows greater flexibility and resiliency for staffing, as operators could be switched between sites if required; and
  - It also allows for additional sharing of technology (e.g. membrane covers) during periods where maintenance or repair is required at one site.

9.0 CLOSURE

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

Respectfully submitted,
Tetra Tech Canada Inc.

Prepared by:
Jeremy Reid, E.I.T.
Project Engineer-in-Training
Solid Waste Management Practice
Direct Line: 778.945.5766
Jeremy.Reid@tetratech.com

Prepared by:
Jeff Ainge
Principal
Jeff Ainge & Associates Inc.
Direct Line: 250.821.3830
jeffainge@shaw.ca

Prepared by:
Carey McIver
Principal
Carey McIver & Associates
Direct Line: 250.821.9889
Carey@careymciver.com

Reviewed by:
Claudia Castro Miravalles, M.Sc., EP
Environmental Scientist
Solid Waste Management Practice
Direct Line: 604.608.8902
Claudia.CastroMiravalles@tetratech.com

Reviewed by:
Paul Evans, P.Eng., MBA
Project Engineer / Senior Consultant
Solid Waste Management Practice
Direct Line: 403.723.6878
Paul.Evans@tetratech.com

Reviewed by:
James Lapp
Senior Project Technologist
Solid Waste Management Practice
Direct Line: 587.460.3630
James.Lapp@tetratech.com

Reviewed by:
Wilbert Yang, P.Eng.
Senior Planning Engineer
Solid Waste Management Practice
Direct Line: 604.608.8648
Wilbert.Yang@tetratech.com

/tv

APPENDIX A

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LIMITATIONS ON USE OF THIS DOCUMENT

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APPENDIX B

FULL SCENARIO COSTING

APPENDIX B – FULL SCENARIO COSTING

Figure B-1: Alberni Valley Composting Facility

Item	Aerated Static Pile		Membrane Covered Aerated Static Pile	
	Design Capacity	Projected Capture	Design Capacity	Projected Capture
Capital				
General Site Grading and Preparation	$322,300	$322,300	$265,400	$265,400
Leachate and Surface Water Management	$120,400	$120,400	$111,600	$111,600
Receiving Building	$222,100	$222,100	$222,700	$222,700
Organics Processing	$1,440,200	$1,440,200	$2,559,900	$2,559,900
Curing, Screening, and Storage	$130,400	$130,400	$96,300	$96,300
Equipment (mobile)	$800,000	$800,000	$800,000	$800,000
Subtotal Capital (without mobile equipment)	$2,235,300	$2,235,300	$3,256,000	$3,256,000
Subtotal Capital (with mobile equipment)	$3,035,300	$3,035,300	$4,056,000	$4,056,000
Engineering (10% of non-mobile equipment capital)	$223,500	$223,500	$325,600	$325,600
Contingency (25% of non-mobile equipment capital)	$558,800	$558,800	$814,000	$814,000
Total Capital	**$3,817,700**	**$3,817,700**	**$5,195,600**	**$5,195,600**
Total Capital Minus Grant	**$0**	**$0**	**$1,195,600**	**$1,195,600**
Annual Amortized Capital (20 years)	**$293,500**	**$293,500**	**$399,400**	**$399,400**
Annual Amortized Capital w/ Grant (20 years)	**$0**	**$0**	**$104,200**	**$104,200**
Operations				
Electricity	$23,600	$23,600	$24,300	$24,300
Water	$400	$200	$200	$100
Diesel	$11,300	$4,500	$11,300	$4,500
Labour	$123,700	$78,100	$125,100	$78,500
Equipment Maintenance and Use	$161,000	$120,800	$239,900	$185,200
Subtotal	$375,700	$263,000	$456,400	$328,400
Contingency (20%)	$75,100	$52,600	$91,300	$65,700
Total Operating	**$475,600**	**$345,700**	**$572,500**	**$424,300**
Total Costs				
Annualized Cost (w/o Grant)	**$769,100**	**$639,200**	**$971,900**	**$823,700**
Annualized Cost (w/ Grant)	**$475,600**	**$345,700**	**$664,400**	**$516,200**
Cost per Tonne (w/o Grant)	**$103**	**$127**	**$130**	**$164**
Cost per Tonne (w/ Grant)	**$64**	**$69**	**$89**	**$102**

Figure B-2: West Coast Composting Facility

Item	Aerated Static Pile		Membrane Covered Aerated Static Pile	
	Design Capacity	Projected Capture	Design Capacity	Projected Capture
Capital				
General Site Grading and Preparation	$261,500	$261,500	$257,500	$257,500
Leachate and Surface Water Management	$107,000	$107,000	$104,000	$104,000
Receiving Area	$123,400	$123,400	$123,600	$123,600
Organics Processing	$959,600	$959,600	$1,598,500	$1,598,500
Screening, Curing, and Storage	$88,000	$88,000	$87,100	$87,100
Equipment (mobile)	$400,000	$400,000	$400,000	$400,000
Subtotal Capital (without mobile equipment)	$1,539,500	$1,539,500	$2,170,800	$2,170,800
Subtotal Capital (with mobile equipment)	$1,939,500	$1,939,500	$2,570,800	$2,570,800
Engineering (10% of non-mobile equipment capital)	$154,000	$154,000	$217,100	$217,100
Contingency (25% of non-mobile equipment capital)	$384,900	$384,900	$542,700	$542,700
Total Capital	**$2,478,400**	**$2,478,400**	**$3,330,600**	**$3,330,600**
Total Capital Minus Grant	**$296,000**	**$296,000**	**$1,330,600**	**$1,330,600**
Annual Amortized Capital (20 years)	**$190,500**	**$190,500**	**$256,000**	**$256,000**
Annual Amortized Capital w/ Grant (20 years)[2]	**$22,800**	**$36,800**	**$102,300**	**$102,300**
Operations				
Electricity	$8,400	$7,500	$8,300	$8,300
Water	$200	$100	$100	$100
Diesel	$4,500	$1,200	$4,500	$4,500
Labour	$92,500	$61,400	$92,100	$79,600
Equipment Maintenance and Use	$103,200	$81,900	$153,000	$106,300
Subtotal	$208,800	$152,100	$258,000	$198,800
Contingency (20%)	$41,800	$30,400	$51,600	$39,800
Total Operating	**$250,600**	**$182,500**	**$309,600**	**$238,600**
Total Costs				
Annualized Cost (w/o Grant)	**$441,100**	**$373,000**	**$565,700**	**$494,700**
Annualized Cost (w/ Grant)	**$273,400**	**$219,300**	**$411,900**	**$340,900**
Cost per Tonne (w/o Grant)	**$110**	**$339**	**$141**	**$450**
Cost per Tonne (w/ Grant)	**$68**	**$199**	**$103**	**$310**

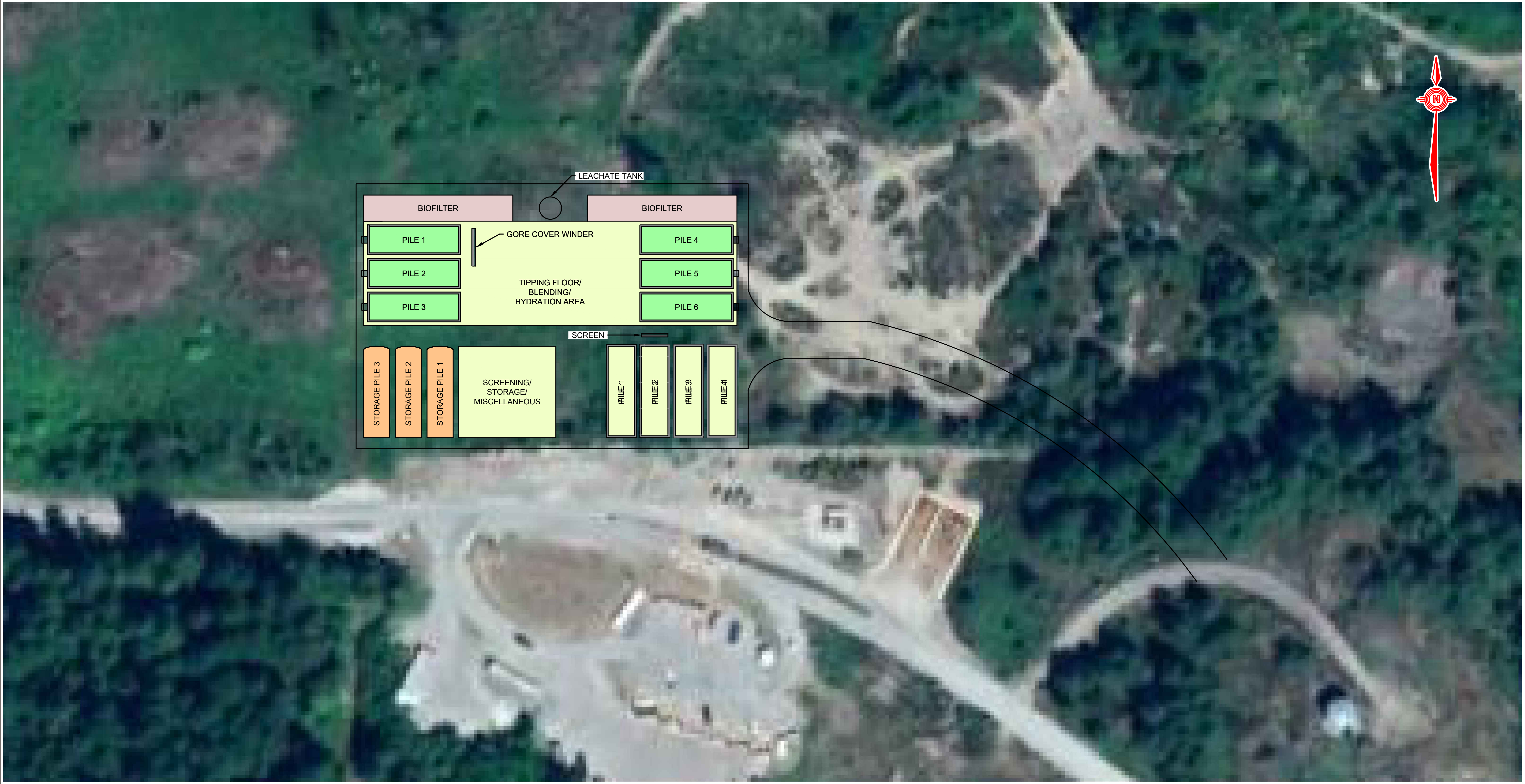
Figure B-3: ACRD Composting Facility with West Coast Transfer Station

Item	Aerated Static Pile		Membrane Covered Aerated Static Pile	
	Design Capacity	Projected Capture	Design Capacity	Projected Capture
Transfer Station				
General Site Grading and Preparation	$14,300	$14,300	$14,300	$14,300
Receiving Building	$165,000	$165,000	$165,000	$165,000
Equipment (mobile)	$ 200,000	$200,000	$200,000	$200,000
Engineering (10% of non-mobile equipment capital)	$17,900	$17,900	$17,900	$17,900
Contingency (25% of non-mobile equipment capital)	$44,800	$44,800	$44,800	$44,800
Transfer Station Capital	**$442,000**	**$442,000**	**$442,000**	**$442,000**
Transfer Station Operating	**$52,500**	**$39,400**	**$52,500**	**$39,400**
Transportation from West Coast to Alberni Valley	**$144,100**	**$26,000**	**$144,100**	**$26,000**
ACRD Compost Facility				
General Site Grading and Preparation	$337,500	$337,500	$277,900	$277,900
Leachate and Surface Water Management	$129,000	$129,000	$118,700	$118,700
Receiving Building	$241,100	$241,100	$242,000	$242,000
Organics Processing	$1,782,000	$1,782,000	$3,052,100	$3,052,100
Curing, Screening, and Storage	$195,100	$195,100	$140,700	$140,700
Equipment (mobile)	$800,000	$800,000	$800,000	$800,000
Subtotal Capital (without mobile equipment)	$2,684,800	$2,684,800	$3,831,400	$3,831,400
Subtotal Capital (with mobile equipment)	$3,484,800	$3,484,800	$4,631,400	$4,631,400
Engineering (10% of non-mobile equipment capital)	$268,500	$268,500	$383,100	$383,100
Contingency (25% of non-mobile equipment capital)	$671,200	$671,200	$957,800	$957,800
ACRD Compost Facility Capital	**$4,424,400**	**$4,424,400**	**$5,972,300**	**$5,972,300**
ACRD Compost Facility Operating				
Electricity	$23,700	$23,700	$24,300	$24,300
Water	$500	$300	$300	$300
Diesel	$18,100	$9,100	$15,900	$9,800
Labour	$142,400	$107,000	$145,700	$109,200
Equipment Maintenance and Use	$171,600	$116,700	$283,200	$169,600
Bulking Agent Procurement	$85,900	$54,600	$85,900	$54,600
Subtotal	$442,200	$311,400	$555,300	$367,800
Contingency (20%)	$88,400	$62,300	$111,100	$73,600
ACRD Facility Operating Costs	**$530,600**	**$373,700**	**$666,400**	**$441,400**
Total Capital	**$4,866,400**	**$4,866,400**	**$6,414,300**	**$6,414,300**

Item	Aerated Static Pile		Membrane Covered Aerated Static Pile	
	Design Capacity	Projected Capture	Design Capacity	Projected Capture
Total Capital Minus Grant	$0	$0	$414,300	$414,300
Annual Amortized Capital (20 years)	$374,100	$374,100	$493,100	$493,100
Annual Amortized Capital w/ Grant (20 years)	$0	$0	$31,900	$31,900
Total Operating	**$727,200**	**$439,100**	**$863,000**	**$506,800**
Annualized Total Cost (w/o Grant)	**$1,101,300**	**$813,200**	**$1,356,100**	**$999,900**
Annualized Total Cost (w/ Grant)	**$727,200**	**$439,100**	**$894,900**	**$538,700**
Cost per Tonne (w/o Grant)	**$96**	**$133**	**$118**	**$164**
Cost per Tonne (w/ Grant)	**$63**	**$72**	**$78**	**$88**

APPENDIX C

CONCEPTUAL DESIGNS FOR SCENARIOS 1 AND 2



NOTES:

1. DESIGN CAPACITY OF SCENARIO 1A, ALBERNI VALLEY LANDFILL, IS 7,500 TONNES.
2. THE TOTAL ESTIMATED PAVED AREA IS 7,500 SQUARE METERS.
3. THE LAYOUT IS A PRELIMINARY DRAWING. EXACT SIZE, SCALE AND ORIENTATION ARE ESTIMATES.

0 — 50 m

Scale: 1: 1000

PERMIT

PROFESSIONAL SEAL

CLIENT

ALBERNI-CLAYOQUOT REGIONAL DISTRICT

TETRA TECH

ACRD BC ORGANIC DIVERSION
PORT ALBERNI, BC

APPENDIX C - CONCEPTUAL DESIGN 1A

PROJECT No.	OFFICE	DES	CKD	REV	DRAWING
704-SWM.PLAN03073-01	EDM	JR	WY	1	Figure C-1
DATE:	SHEET No.	DWN	APP	STATUS	
January 30, 2019	1 of 1	KO	WY	A	

C:\Users\C.CASTROMIRAVALLES\SharePoint\704-SWM.PLAN03073-01 ACRD BC - Doc\001\Data\Conceptual Drawings\Layout_Alberni-vr.05 CC.dwg [FIGURE C-1] February 07, 2019 - 9:09:25 am (BY: CASTROMIRAVALLES, CLAUDIA)

NOTES:

1. DESIGN CAPACITY OF SCENARIO 1B, WEST COAST LANDFILL, IS 4,000 TONNES.
2. THE TOTAL ESTIMATED PAVED AREA IS 5,500 SQUARE METERS.
3. THE LAYOUT IS A PRELIMINARY DRAWING. EXACT SIZE, SCALE AND ORIENTATION ARE ESTIMATES.

0 50 m

Scale: 1: 1000

PERMIT

PROFESSIONAL SEAL

CLIENT

ALBERNI-CLAYOQUOT REGIONAL DISTRICT

TETRA TECH

APPENDIX C - CONCEPTUAL DESIGN 1B

PROJECT No.	OFFICE	DES	CKD	REV	DRAWING
704-SWM.PLAN03073-01	EDM	JR	WY	1	
DATE:	SHEET No.	DWN	APP	STATUS	Figure C-2
January 30, 2019	1 of 1	KO	WY	A	

C:\Users\c.castromiravalles\Documents\Layout_WestCoast-vr.05 CC.dwg [FIGURE C-2] February 07, 2019 - 11:52:45 am (BY: CASTROMIRAVALLES, CLAUDIA)

1. DESIGN CAPACITY OF SCENARIO 2, REGIONAL LANDFILL 11,500 TONNES.
2. THE TOTAL ESTIMATED PAVED AREA IS 11,000 SQUARE METERS.
3. THE LAYOUT IS A PRELIMINARY DRAWING. EXACT SIZE, SCALE AND ORIENTATION ARE ESTIMATES.

0 — 50 m

Scale: 1: 1000

PERMIT

PROFESSIONAL SEAL

CLIENT

ALBERNI-CLAYOQUOT REGIONAL DISTRICT

TETRA TECH

APPENDIX C - CONCEPTUAL DESIGN 2

PROJECT No.	OFFICE	DES	CKD	REV	DRAWING
704-SWM.PLAN03073-01	EDM	JR	WY	1	Figure C-3
DATE:	SHEET No.	DWN	APP	STATUS	
January 30, 2019	1 of 1	KO	WY	A	

C:\Users\C.CASTROMIRAVALLES\SharePoint\704-SWM.PLAN03073-01 ACRD BC - Doc\001\Data\Conceptual Drawings\Layout_Alberni_ALL-vr.02 CC.dwg [FIGURE C-3] February 07, 2019 - 4:56:38 pm (BY: CASTROMIRAVALLES, CLAUDIA)