Comox Strathcona Waste Management

Staff Report

DATE: September 4, 2020

FILE: 5360-30/Organics

TO: Chair and Directors
Comox Strathcona Waste Management Board

Supported by Russell Dyson
Chief Administrative Officer

R. Dyson

FROM: Russell Dyson
Chief Administrative Officer

RE: **Regional Organics Compost Project – September 2020**

Purpose
To provide an update on the Regional Organics Compost Project (the Project) related to the procurement of the compost processing facility and transfer station, cost estimates and timeline.

Recommendation from the Chief Administrative Officer:
THAT the 2020 – 2024 Financial Plan and Capital Expenditure Program for the Comox Strathcona Waste Management service, functions 391 – 393, be amended by increasing solid waste capital infrastructure expenses in 2020 by $830,601, from $400,000 to $1,230,601, to be funded by additional contributions from capital works reserves of the same amount for the Regional Organics Compost Project (#1049).

Executive Summary
The regional organics project continues to be the most critical and important improvement for the solid waste service. The Project will advance the diversion of organic waste from our landfills, reduce greenhouse gas emissions, improve leachate quality, increase valuable air space and provide a nutrient rich soil back to the community. The Project is complex and requires careful coordination with four member municipalities to ensure the successful implementation of future curbside collection programs.

The project follows Comox Strathcona Waste Management (CSWM) Board (Board) direction to advance the design and construction of a regional organics facility located at the Campbell River Waste Management Centre (CRWMC) (Block J) in the most timely and effective way possible. After careful consideration of options and risk, and feedback from project stakeholders this report presents a clear path forward, as well as budget and schedule changes required for delivery of this essential and strategic initiative.

- The design-build (DB) procurement for the organics processing facility at the CRWMC (Block J) closed on July 23, 2020 and no proposals were received in response. See Appendix A for a summary of the procurement process previously circulated to Board members August 17, 2020.
- During the DB procurement process, proponents did not select the composting technology used to develop project costs estimates. Based on this discrepancy, staff worked with our owners engineer to reconsider different technologies. This work has confirmed that membrane covered aerated static piles remains the most cost effective technology due to simplicity, reliability and modest operation costs. Also, this technology is currently used at the pilot composting facility. See Appendix B for the full comparison.
- Staff have re-evaluated procurement options and conclude that design-bid-build (DBB) is best suited for this project at this time. Within the DBB process staff will work with an experienced design

consultant to finalize detailed design of the compost facility and transfer station. Following detailed design, construction firms (both local and remote) use the design to develop construction pricing and a schedule. A request for proposals (RFP) for a design consultant will be issued early next week (September 8, 2020). See Appendix C for a detailed comparison of DBB versus design-build-operate (DBO).

- The project has been delayed by up to six months with the compost facility projected to start processing organic waste in the fall 2022. See Appendix D for a detailed timeline. Actual start up for municipal curb side programs will be further evaluated and informed by municipal stakeholders.
- Based on additional analysis completed, overall project cost estimates have been updated from $14.7M to $15.5M (+/- 30 per cent). Additional project funding will be from capital works reserves without a major impact to long term reserve fund balances. These costs result in a tipping fee estimate of $125-$159/tonne to be further refined and presented to the board when actual construction costs are known.
- Staff will provide a detailed project update at each future Board meeting. A recommendation for construction will be brought to the Board in late summer 2021.

Prepared by:	Concurrence:
G. Bau	***M. Rutten***
Gabriel Bau, P.Eng. Manager of CSWM Projects	Marc Rutten, P.Eng. General Manager Engineering Services

Government Partners and Stakeholder Distribution

City of Campbell River	✔
City of Courtenay	✔
Town of Comox	✔
Village of Cumberland	✔

Background/Current Situation

The Project is a strategic priority of the CSWM Board which supports the diversion of organic material from the regions landfills, reducing greenhouse gas emissions, improving leachate quality, increasing airspace volume and providing nutrient rich soil back to the community. Most recently, procurement challenges have prevented the project from advancing on schedule and a revised procurement strategy, budget and timeline are required.

Processing facility procurement process

The request for proposal (RFP) for the design and construction of the organics processing facility at the CRWMC (Block J) closed on July 23, 2020 and no proposals were received in response. Of the three proponents participating, one withdrew early citing internal personnel issues, another withdrew midway citing affordability limit concerns, and the third withdrew near the end of the process citing pricing and the fact that the operation of the facility was not included in this procurement process. In addition, proponents were pursuing high cost technologies that could have resulted in a narrowing of competition for future operations. Pursuing an alternative procurement as proposed will reduce capital costs and provide greater

flexibility for operations, when compared to the DB process. A summary of the DB procurement process is attached as Appendix A (as previously distributed to Directors on August 14, 2020).

In response, staff re-evaluated the procurement process and determined that DBB is best suited for this project at this time. The DBB process allows the facility design (including the selection of composting technology) to be finalized and specified prior to construction. As well, the DBB process supports pricing from local construction firms that may not have been able to participate on a DB team as part of the previous procurement.

DBB is favoured over the DBO procurement method as the accent of electors would be required for the long term operation contract adding unnecessary risk and time delay. Appendix C presents a detailed comparison between DBB and DBO procurement methods.

In response to feedback received from proponents during the DB procurement process staff have worked with our owners engineer (Jacobs) to reconsider and compare two composting technologies. This evaluation attached as Appendix B concludes that membrane covered aerated static piles is the most cost effective option due to its simplicity, reliability and modest operating costs.

In order to progress project implementation as effectively as possible an RFP for detailed design of the processing facility and transfer station will be issued early next week (September 8, 2020), followed by a separate procurement for construction in the summer 2021. At that time, the Board will be presented with a recommendation to award a contract for construction.

Transfer station (TS) procurement process

Staff continue to procure the transfer station through a DBB method and award the TS detailed design together with the processing facility detailed design.

Timeline:

- The project will be delayed by up to six months as no proposals were received in response to the DB procurement.
- The processing facility is now scheduled to be complete in fall 2022. Staff will be able to provide a fixed completion date by summer 2021, once the design, public consultation and regulatory approval is complete.
- The timely completion of regulatory approvals presents the greatest project risk and staff will work closely with regulators to ensure review and consideration of permit applications.
- An updated project timeline is presented below and an updated roadmap is included as Appendix D.

Proposed Timeline	2020	2021				2022			
	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall
RFP for design									
Design award									
Design									
Phase 2 Public engagement									
Regulatory approval*									
ITT for construction									
Construction award									
Construction									
Commissioning									
Pick-up collection phased in**									
RFP for operation									
Operation award									

* Regulatory approval – Development permits, Organic Matter Recycling Regulation and Ministry of Environment and Climate Change Strategies approvals can take up to 12 months. Indication from approval authorities is that they can be obtained sooner. The above timeline shows six months. Timely approval of permits is key to project success and remains a key schedule risk.

** Pick-up collection phased in – Comox Valley Regional District (CVRD) staff will work closely with municipal staff to align the project to their collection schedules.

Policy Analysis

The 2012 CSWM Solid Waste Management Plan recommends the development of regional organics processing capacity as the primary organics program diversion strategy, towards a target of 70 per cent diversion by 2022.

At its September 12, 2019 meeting the CVRD, CSWM Board, passed the following motion:

> *THAT the Comox Strathcona Waste Management compost processing facility and the compost transfer station be procured through a design-build or design-bid-build procurement method.*

At its November 14, 2019 meeting the CVRD, CSWM Board, passed the following motions:

> *THAT the regional organics processing facility shall be located at the Campbell River Waste Management Centre – Block J and the regional organics transfer station shall be located at the Comox Valley Waste Management Centre.*
>
> *THAT staff apply to the New Building Canada Fund grant program for a project scope change based on siting the regional organics facility at Block J and an extension for grant funding beyond March 2020.*

Options

The Board has the following options to consider:

1) Support DBB procurement as implemented for the regional organics processing facility and TS based on utilizing membrane covered aerated static piles.
2) Select an alternative procurement method such as DB or DBO for the regional organics facility
3) To not proceed with procurement at this time.

The CSWM service has completed significant work to progress the implementation of regional organics collection and processing. The Board has resolved to locate the facility in Campbell River; has successfully selected a site and incorporated public concerns and feedback into the development of the project. The removal of organic waste from the waste stream is a strategic objective of the Board and provides significant benefits to the service. The DBB procurement method provides an efficient and effective detailed design and supports the competitive involvement of local construction contractors. As such, Option 1 above provides the best path forward.

An RFP for detailed design of the processing facility and transfer station will be issued early next week (September 8, 2020).

Financial Factors

Capital cost:

- Project cost estimates have been updated from $14.7M to $15.5M based on feedback from the processing facility procurement process and the analysis of our owner engineer. Appendix B presents the cost breakdown and tipping fee calculations.
- Capital cost estimates based on construction in 2021 for the regional organics project – $15.5 Million (+30 per cent/-20 per cent).
- To date, capital costs for the project have been funded by $6,451,374 in grants and $8,269,399 in reserves, totalling $14,7M, which was reflected in the past three annual financial plans, including that for 2020 - 2024.
- Additional funding in the amount of $803,601 is now required to account for the updated estimated total project costs.
- Staff recommends an amendment to the 2020 – 2024 Financial Plan for the CSWM service by increasing the budget for solid waste capital expenditures in 2020 to be offset be additional contributions from capital works reserves, resulting in anticipated reserve requirements of $9.1M over the life of the project.
- The following table shows how project cost requirements have changed over time.

Description	Capital cost($ million)			Capacity (tonnes/year)
	Grants	Reserves	Total	
2017 estimate, including funds from the New Building Canada Fund	$5.5	$3.0	$8.5	12,875
2019 estimate, including funds from the Organic Infrastructure program	$6.4	$8.3	$14.7	14,500
2020 estimate, including additional $0.8M from reserves	$6.4	$9.1	$15.5	14,500

- Procurement expenditures to date have been $188,177. Some of this work will be leveraged in the preparation of procurement documents for the detailed design.

Operational Costs:

- Annual operating costs for a regional facility are estimated to be approximately $1.4M, equating to $96 per tonne.

- Based on the above, and accounting for reserve fund repayment over 20 years, tipping fees for the Program are estimated to range from $125 to $159 per tonne. A final tipping fee will be presented at the time of construction award.
- Staff will work closely with our consultant to identify cost savings and efficiencies with the objective of achieving a target tipping fee that is less than or comparable to municipal solid waste.
- The impact to taxpayers and the cost per household is still being finalized. The current estimated cost per month per household is $8.15 (including curbside pickup).

Grant funding:

- Staff has requested a further time extension to utilize grant funding up to March 2023 from the current March 2022 deadline.
- New Building Canada Fund Program maximum financial contribution: $5,541,744.
- Organics Infrastructure Program maximum financial contribution: $909,630.

Legal Factors

Throughout this project, staff continue to involve the Ministry of Environment and Climate Change Strategy to ensure that the project meets the required Organic Matter Recycling Regulation.

Intergovernmental Factors

Staff continues to work together with member municipalities (City of Courtenay, Town of Comox, Village of Cumberland, and City of Campbell River) to discuss the progress of the Project, the implementation of organic collection programs at the curbside, as well as other key project decisions. The most recent meeting was held on August 4, 2020.

Interdepartmental Involvement

This project is led by Engineering Services, with project support provided by Financial Services for project tendering and contract review, and Corporate Services for future project communications.

Citizen/Public Relations

- Information about this project can be accessed through the following project webpage: www.cswm.ca/organics/regional-organics-facility.
- Phase 1 public engagement including an online survey and open houses concluded in March 2020 with the presentation of input from the public regarding the planning and design.
- Phase 2 public engagement is scheduled for spring 2021 and will provide an opportunity to the public to comment on the design of the processing facility.

Attachments: Appendix A – "20200817 Dyson Organics facility update"
Appendix B – "Jacobs Processing facility technology analysis and updated cost estimate"
Appendix C – "Processing facility DBB versus DBO advantages and disadvantages' analysis"
Appendix D – "Project roadmap"
Appendix E – "Regional organics processing facility – Site layout"

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Comox Valley REGIONAL DISTRICT

August 17, 2020

File: 5360-30/Organics

Chair and Directors
Comox Strathcona Waste Management Board

Re: Regional Organics Processing Facility Design-Build - Update

As a follow up to previous emails, we provide the following summary of the design-build procurement process concluded on July 23, 2020 for the Regional Organics Processing Facility. A report will be coming forward to the September 10, 2020 CSWM board meeting regarding next steps.

Issue
The request for proposals (RFP) for the design and construction of the organics processing facility closed on July 23, 2020 and no proposals were received in response. The following 'background' outlines the steps leading up to this.

Background
CSWM Engineer: Jacobs (formerly CH2M Hill) – experience in design-build processes for composting facilities. Selected in late 2017 from a competitive process which considered methodology, qualifications, project understanding and cost.

- Fall 2019
  - Procurement options analysis completed by Deloitte Canada determines several procurement methods are feasible including design-build, design-build-operate or design bid build.
  - CSWM Board approved proceeding with design-build or design-bid-build procurement method.
- December 2019 – January 2020
  - Request for qualifications issued with the intent to shortlist three bidders to be invited to submit proposals to a Request for Proposal (RFP) for a design-build process.
  - Three bidders were shortlisted from the five responses received.
- February - July 2020
  - COVID-19 escalated. Staff solicited feedback from bidders on whether they were able to start the RFP process. No significant concerns were highlighted from the bidders.
  - RFP was issued to the three shortlisted bidders on March 24, 2020 with a close date of May 15, 2020.
  - Staff scheduled confidential collaborative meetings with each of the bidders to discuss the RFP, proposed bidder designs and project cost.
  - Throughout the process staff addressed feedback from bidders, including the RFP requirements and extending the RFP submission deadline to address concerns relating to the project affordability limit of $10.2 Million.
  - As the process unfolded, concerns around affordability lead two of the bidders to withdraw from the process with the last bidder notifying one week prior to close that they would not submit a proposal. The third bidder had staffing issues and was forced to withdraw earlier in the process.
  - Staff maintained confidentiality on bidder status throughout in order to maintain the competitive process. By all appearances the status of bidders was not known by the others.

Key Considerations

- Project cost estimates were based on conceptual design of the processing facility utilizing a GORE® Cover technology for composting. This is the technology used for our pilot project.
- Selection of composting technology was left to design-build proponents to encourage innovation, maximize use of the available space and provide best value to Comox Strathcona Waste Management (CSWM).
- Three things stood out from this process:
  - Bidder's actual costs were higher than the project budget.
  - For this project it became apparent the design-build approach is not well suited to on-island, local contractors;
  - Bidders based their detailed design costs on technologies other than the GORE® Cover technology.

Project Status as of August 2020

- Staff are reviewing cost estimates including lifecycle analysis based on Jacobs' preliminary design and plan to present the results to the CSWM Board in September.
- Staff are working closely with municipal staff to ensure timelines and processes reflect future municipal collection program changes.
- Staff have analyzed design-build-operate versus design-bid-build procurement methods and concluded the latter is best suited for this project at this time.
- Staff expect that the project may be delayed by up to six months and that the processing facility will be ready to start treating organic waste by September 2022, instead of April 2022. We will review requirements for the extension of grant funding and advise the Board in September.
- In the meantime, organic waste from The Town of Comox and Village of Cumberland can be processed through the organic pilot project at the Comox Valley Waste Management Centre.
- If organic waste from the City of Courtenay and the City of Campbell River has to be processed earlier than September 2022, alternatives such as processing organics waste at the Circular Waste BC facility in Nanaimo on a temporary basis can be explored.

A more fulsome staff report with options and recommendations will be provided to the CSWM Board at the September 10, 2020 meeting.

Sincerely,

Russell Dyson
Chief Administrative Officer

cc: Marc Rutten, General Manager Engineering Services
Gabriel Bau Baiges, Manager of CSWM Projects

Jacobs

Memorandum

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Subject	**Composting Facility NPV Analysis**	**Project Name**	Engineer Services for CSWM Regional Organics Management Facility
Attention	Gabriel Bau	**Project No.**	700041CH
From	John Berry		
Date	August 19, 2020		
Copies to	Adem Idris, Jordan Norris, Veronica Hansen, File		

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

In December 2018 Jacobs prepared a Technical Memorandum (TM) identifying several composting methods and evaluated their appropriateness and sustainability to the CVRD's application. The evaluation included an initial screening for 'fatal flaws' followed by a qualitative analysis on several technical criteria developed jointly by Jacobs and the CVRD.

In August 2020, CVRD requested that Jacobs re-evaluate two specific technologies, considering financial, operability, expandability, risk, etc. factors. These technologies are:

- **Agitated Bed Technology**: One of the more commonly known providers is 'BDP Industries'. In the interest of not referencing a specific vendor, we have called this technology Agitated Bed, as there are many other vendors in the market
- **Membrane Covered Aerated Static Pile (ASP) Technology**: One of the more commonly known providers is 'Gore'. In the interest of not referencing a specific vendor, we have called this technology Membrane Covered ASP, as there are other cover providers in the market.

This TM provides the results of the evaluation and recommendations for the two technologies listed above.

1. Executive Summary

- The qualitative analysis for Agitated Bed and Membrane Covered ASP Technologies rates both technologies approximately equal. Membrane Covered ASP rates slightly higher on reliability, ability to handle high/low variations in feedstock quantities, and ease of documenting the process to further reduce pathogens (PFRP). However, Membrane Covered ASP has a slightly higher risk of generating leachate. Whereas Agitated Bed requires a higher level of technological expertise and consumes more electricity.

- The capital cost estimates show a slightly lower cost for Membrane Covered ASP versus Agitated Bed Technology ($11.56M versus $12.44M).
- The operating and maintenance cost estimates show a lower cost for Membrane Covered ASP versus Agitated Bed Technology ($97.63/tonne versus $106.64/tonne).
- Since Membrane Covered ASP technology has lower estimated capital and operating & maintenance costs, this calculates in to lower 20-year lifecycle costs as well ($50.9M for Membrane Covered ASP versus $53.2M for Agitated Bed).
- The estimated food and yard waste tipping fee for the municipalities is $159.55 per tonne.
- The NPV of the estimated program costs to the municipalities for the organics diversion program is $8.11 per month.

Based on the estimated lower capital, operating and maintenance, and lifecycle costs for Membrane Covered ASP versus Agitated Bed technology, it is Jacobs recommendation to pursue Membrane Covered ASP technology for the composting facility.

2. Qualitative Evaluation of Composting Technologies

Attachment 1 presents Exhibit 2 – Secondary Evaluation of Organic Waste Processing Technologies from Jacobs December 19, 2018 TM, titled "Composting Technology Evaluation". These two technologies have been highlighted in the tables. Appendix A presents the full TM.

2.1 Operational Considerations

Both technologies were rated approximately equal on operational considerations, with the following exceptions:

- Membrane Covered ASP was rated slightly higher on reliability, ability to handle high/low variations in feedstock quantities, and ease of documenting the process to further reduce pathogens (PFRP) conditions.
- Agitated Bed was rated slightly higher in level of technology and process training requirements, and in maintenance requirements for processing and support equipment.

2.2 Odours and Nuisances

Both technologies were rated equal on odour and nuisances criteria.

2.3 Residuals

Membrane Covered ASP was rated higher on leachate and contaminated surface water strengths (i.e. higher risk of generating more leachate and contaminated surface water).

2.4 Resource Consumption

Agitated Bed was rated slightly higher on power consumption. Whereas as Membrane Covered ASP was rated slightly higher on fuel consumption and land requirements (i.e. footprint).

2.5 Financial

A qualitative analysis of financial criteria was presented in the Jacobs December 19, 2018 TM, titled "Composting Technology Evaluation" (Appendix A). A quantitative analysis is presented in Section 3 of this document.

2.6 Development Considerations

Both technologies were rated approximately equal on development considerations, with the exceptions that Membrane Covered ASP was rated slightly higher on modularity/expandability and ability to expand in the future without affecting existing operations.

3. Quantitative Analysis of Composting Technologies

3.1 Capital Cost Estimates

Detailed capital cost estimates have been prepared for both technologies. The cost estimates are considered Class 3 estimates as defined by the American Association of Cost Engineers. As such, the estimates presented in this TM are considered accurate to plus 30 percent to minus 20 percent, based upon the limited design information.

This cost estimate has been prepared for guidance in project evaluation and implementation from the information available at the time of preparation. The final cost of the project will depend upon the following factors:

- Actual labour and material costs
- Competitive market conditions
- Final detailed design
- Final project costs
- Implementation schedule
- Other variable factors

As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed by the CSWM prior to making specific financial decisions to help support proper project evaluation and adequate funding.

Although design work is scheduled for 2020 with construction in 2021, we have not included costs related to Covid-19.

Table 1 presents a summary of the capital estimates for both technologies. Attachment 2 provides the complete cost summary.

Table 1 Capital Cost Estimate Summary

Description	Agitated Bed Technology	Membrane Covered ASP Technology
1. Block J Access Improvements and Utility Connections	$ 151,300	$ 151,300
2. Site Preparation	$ 701,600	$ 701,600
3. Stormwater Management	$ 45,800	$ 45,800
4. Staff/Administration Building and Entrance Area	$ 48,000	$ 48,000
5. Yard Waste Drop-off Area and Amendment Storage	$ 64,700	$ 64,700
6. Composting Building	$ 1,159,100	$ 1,855,800
7. Curing Building	$ 922,000	$ 922,000
8. Storage Pad	$ 249,100	$ 249,100
9. Composting System	$ 2,711,700	$ 1,818,000
10. Leachate Management	$ 158,600	$ 158,600
11. Biofilter - Composting Building	$ 273,600	$ 318,100
12. Biofilter - Curing Building	$ 184,200	$ 184,200
13. Stationary and Specialized Equipment	$ 1,191,200	$ 761,200
14. Miscellaneous	$ 162,500	$ 92,500
15. Contractor Project Management	$ 25,000	$ 25,000
Sub-total	**$ 8,048,800**	**$ 7,395,900**
16. Contingency (15% plus 10% for currency exchange on foreign equipment)	$ 1,222,900	$ 1,255,400
17. Administration, Management and Subcontractor Fees (12% admin. + 27% for contingency, EBIT and risk premium + Env. Impact Study)	$ 3,163,900	$ 2,909,400
Total Estimated Capital Cost	**$12,435,200**	**$11,560,700**
Low -20% per Class 3 accuracy range	**$ 9,948,160**	**$ 9,248,560**
High +30% per Class 3 accuracy range	**$16,165,760**	**$15,028,910**

The above cost estimate is approximately $1.3M higher than presented to the CSWM working committee in January 2020. However, the cost estimate is only $0.4M higher than presented to the CSWM working committee in August 2018. These differences are primarily due to more certainty in the estimate as the design evolves. Most of the changes are in #6 – Composting Building, #9 – Composting System, #11 – Biofilter, and #13 – Stationary and Specialized Equipment.

3.1.1 Local Market Conditions and Limitations

This estimate is based upon recent construction tenders and comparisons with other engineers' estimates for similar projects in the region. Despite the estimator's best practices and adjustments, bids are being driven by a variety of factors, including, among other factors:

- Market conditions
- The contractor's willingness to take on risk
- Fear and uncertainty of available projects
- Less union unrest over wages

Given that recent construction costs have been highly variable, a Market Adjustment Factor has been included with the assumptions that the following factors will affect pricing:

- Contractors selectively bidding jobs
- Contractors selectively choosing which owners they want to work for
- Premium wages to keep skilled workers and management staff
- Availability of crafts and trades
- Immigration impacts and uncertainty
- Abnormal fuel impacts and uncertainty
- Impacts from Covid-19 pandemic

3.1.2 Key Assumptions

The estimate is based on the underlying assumption that the work will be done on a competitive bid basis and that the contractor will have a reasonable amount of time to complete the work. All contractors are considered to be equal, assuming a reasonable project schedule, no scheduled overtime, and construction under a single contract with no liquidated damages.

Key assumptions for this cost estimate (in addition to those previously described) include the following:

- Based upon a facility with an annual processing capacity of 14,500 tonnes per year (tpy) of incoming Source Separated Organics (SSO)
- Cost estimates are based on year 2021 construction costs.
- All work will be carried out within the limits of the facility boundary. No land acquisition will be required.

- Excavation and backfill of debris will be hauled and placed within the Campbell River waste management centre (CRWMC).
- Temporary construction fencing will not be required.
- The project does not require environmental permitting, however the costs for an environmental impact study have been included.
- The project does not require specialty health and safety practices and precautions of working around a landfill and the inherent landfill hazards associated with landfill leachate and landfill gas.
- Trenching work will not require extensive shoring or waste removal and relocation.
- All materials required will be available locally.
- Contractors will be available for the required scope of work.

3.1.3 Excluded Costs

The cost estimate excludes the following costs:

- Non construction or soft costs for owner, including land acquisition, and legal and administration costs.
- Cost of financing.
- Land acquisition costs.
- Federal Goods and Services Tax and Provincial Sales Tax.
- Program support services, such as public education and awareness, and stakeholder consultations.
- Operations and maintenance.
- Material and labour adjustment allowances exceeding what is included at the time of the cost estimate.

3.2 Operating and Maintenance Cost Estimates

Detailed operating and maintenance cost estimates were prepared for both technologies. Table 2 presents a summary of these estimates. Attachment 3 provides the complete cost summary.

Table 2 Operating and Maintenance Cost Estimate Summary

Description	Agitated Bed Technology	Membrane Covered ASP Technology
1. Labour	$ 230,424	$ 230,424
2. Diesel Fuel	$ 48,748	$ 48,241
3. Electricity	$ 155,802	$ 78,367
4. Amendment	$ 23,557	$ 23,557

Table 2 Operating and Maintenance Cost Estimate Summary

Description	Agitated Bed Technology	Membrane Covered ASP Technology
5. Residual Disposal	$ 30,800	$ 30,800
6. Leachate Disposal Surcharge	$ 20,000	$ 20,000
7. Communications	$ 10,300	$ 10,300
8. Office/Administrative	$ 23,600	$ 23,600
9. Insurance	$ 20,000	$ 20,000
10. Product Marketing and Sales	$ 9,850	$ 9,850
11. Equipment Lease	$ 200,169	$ 200,169
12. Contract Services	$ 72,900	$ 72,900
13. Preventative Maintenance	$ 118,902	$ 116,843
14. Safety and Training	$ 3,650	$ 3,650
15. Consumable Supplies	$ 10,100	$ 10,100
16. Utilities	$ 17,820	$ 17,820
17. Net Revenue from Product Sales	($ 50,000)	($ 50,000)
Sub-total	**$ 946,622**	**$ 866,622**
18. Contingency (10%)	$ 94,662	$ 86,662
19. Operator's Contribution to Overhead, EBIT and Risk Premium	$ 505,023	$ 463,343
Total Estimated Annual Operating and Maintenance Costs	**$ 1,546,307**	**$ 1,415,627**
Annual Tonnage Processed	14,500	14,500
'Per Tonne' Operating and Maintenance Costs	**$106.64**	**$97.63**

The 'per tonne' operating and maintenance cost estimate is approximately $7 per tonne higher than presented to the CSWM working committee in January 2020 but is a reduction of approximately $35 per tonne than presented to the CSWM working committee in August 2019. The changes since January are primarily due to increases in equipment lease and preventative maintenance costs.

3.2.1 Key Assumptions

The following assumptions used in this operating and maintenance cost estimate are common to the two composting technologies evaluated:

- Year 2022 operating costs.
- The 14,500 tpy of incoming SSO feedstock produce approximately 10,000 cubic metres (m^3) of finished compost products per year.
  - Net revenue from product sales = $5.00 per m^3 of finished compost products is used to offset operating and maintenance costs.
- Utilities and consumables:
  - Electricity = $0.110 per kilowatt hour
  - Diesel fuel = $1.30 per litre
  - Diesel exhaust fluid = $0.80 per litre with a consumption rate of 0.008 litres per litre of diesel fuel consumed
  - Natural Gas = not applicable
  - Potable water = nil
- Wood amendment = $17.22 per tonne
- Biofilter replacement media = $18.27 per tonne for supply plus $15.00 per tonne labour and equipment charges to replace
- Residual and rejects disposal to the CRWMC = $77.00 per tonne (Quantity = 2.5 percent of incoming feedstock tonnage)
- Leachate treatment and disposal = $20,000 (All leachate is reused in the process. This allowance is for offsite treatment and disposal should the facility not consume all leachate during wet periods.)
- Labour rates (when applicable):
  - Equipment operator = $29.71 per hour
  - Labourer = $21.22 per hour
  - Marketing agent = $29.71 per hour (⅓ full time equivalent [FTE] position)
  - Facility Manager = $47.75 per hour
  - Salary burden = 20 percent of above rates
  - Overtime allowance = nil
- Equipment Lease
  - Lease of two front end loaders at $425,000 each, 5.5 percent annual lease rate for ten years
  - Lease of one trommel screen at $475,000, 5.5 percent annual lease rate for ten years
  - Lease of one water truck at $85,000, 5.5 percent annual lease rate for ten years

- Lease of one pickup truck at $45,000, 5.5 percent annual lease rate for five years

- Fuel Consumption Rates (when applicable and only during operating hours):
  - Front end loader = 12.5 litres per hour
  - Water truck = 20.0 litres per hour
  - Trommel screen = 4.6 litres per hour
  - Windrow turner = 52.6 litres per hour
  - Pickup truck = 4.0 litres per hour
  - Stacking conveyor = 4.0 litres per hour
- Annual allowances:
  - Communications (i.e. two way radios, cell phones, etc.)= $10,300
  - Marketing and sales expenses = $9,850
  - Contract services (i.e. analytical services, instrumentation, mechanic, cleaning, vacuum truck) = $72,900
  - Safety and training = $3,650
  - Consumables (i.e. lubricants, uniform service, sampling) = $10,100
  - Miscellaneous utilities (i.e. non potable water, waste collection, recycling) = $17,820
- Annual preventative maintenance costs:
  - Civil and landscape works = nil (no increase from existing operations)
  - Concrete works = 0.25 percent of capital expenditure (CAPEX)
  - Buildings = 1.00 percent of CAPEX
  - Electrical = 2.00 percent of CAPEX
  - Mechanical, heating and ventilation = 2.00 percent of CAPEX
  - Instrumentation, laboratory and safety equipment = $2,500
  - Compost system miscellaneous = $6,000
  - Biofilter miscellaneous = $6,000
  - Tools for basic repairs = $1,000
- Hourly preventative maintenance costs (when applicable and per operating hour):
  - Shredder = $16.00 for wearable parts
  - Front end loaders = $10.00
  - Trommel screen = $15.60
  - Water truck = $2.50
  - Pickup truck = $2.00

  - Tires = $12,000 for every 10,000 operating hours
- Contingency allowance = 10 percent of total annual costs, less revenue from sales
- Contribution to operator's overhead = 10 percent of total annual costs, less revenue, plus contingency allowance
- Contribution to operator's earnings before interest and taxes (EBIT) = 20 percent of total annual costs, less revenue, plus contingency allowance, plus contribution to operator's overhead
- Operator's risk premium = 15 percent of total annual costs, less revenue, plus contingency allowance, plus contribution to operator's overhead

3.2.2 Excluded Costs

The operating and maintenance cost estimate excludes the following costs:

- Cost of financing.
- Federal Goods and Services Tax and Provincial Sales Tax.
- Rent for occupied land within the CRWMC.
- Program support services, such as public education and awareness, and stakeholder consultations.
- Material and labour adjustment allowances exceeding what is included at the time of the cost estimate.

3.3 Net Present Value Analysis

Net Present Value (NPV) is the difference between the present value of cash inflows and the present value of cash outflows over a period of time. NPV is used in capital budgeting and investment planning to analyze the profitability of a projected investment or project. NPV compares the value of the dollar today to the value of that same dollar in the future - taking returns and inflation into account. NPV is intended to be used to facilitate discussion with stakeholders to understand the current cost of various solutions.

Both 20-year lifecycle and NPV analyses were completed for both technologies. Table 3 presents a summary of the analyses. Attachment 4 provides the complete analysis.

Table 3 Compost Facility Lifecycle and NPV Summary

Description	Agitated Bed Technology	Membrane Covered ASP Technology
Lifecycle Costs		
Capital	$14,866,266	$15,790,286
Operating and Maintenance	$38,382,168	$35,139,739
Total Estimated Life Cycle Cost	**$53,248,434**	**$50,930,025**
Net Present Value		
Capital	$14,061,916	$14,420,587
Operating and Maintenance	$29,713,009	$27,202,461
Total Estimated Net Present Value	**$43,774,925**	**$41,623,048**

3.3.1 Key Assumptions

The following assumptions were used in the life cycle and NPV analyses:

- 20-year life cycle
- Discount rate = 2.4 percent (Recommended 20 and 25-year borrowing rate as determined by the Municipal Finance Authority of British Columbia)
- Capital inflation rate = 5.0 percent
- Operating and Maintenance inflation rate = 2.0 percent
- Periodic capital renewal/replacement costs are included in the analyses. For example, some of the membrane covers are replaced in years 10, 15 and 20.
- The per tonne operating costs are factored by the quantity of incoming SSO feedstock for each year. The quantity and composition of incoming SSO feedstock was presented in Jacobs April 2019 TM.
- Some components of the operating and maintenance costs vary depending upon the quantity of incoming SSO feedstock – these have been prorated accordingly.

3.3.2 Excluded Costs

The lifecycle and NPV analyses exclude the following costs:

- Cost of financing.
- Federal Goods and Services Tax and Provincial Sales Tax.
- Program support services, such as public education and awareness, and stakeholder consultations.

4. Estimated Program Costs

The organics diversion program spearheaded by the CSWM includes more than just the composting facility. Other major components include:

- A Waste transfer station to collect organics from the southern region of the CSWM service area.
- Waste transfer vehicles to transfer organics collected in the southern region of the CSWM service area to the composting facility located at the CRWMC.
- One-time distribution of kitchen pails to single family households to encourage program participation.
- A public education and promotion program to encourage citizen adoption and acceptance of the program
- Program administration costs.

Total estimated program expenditures in the years 2020 and 2021 are $15,453,146.

Table 4 presents the estimated NPV per single family household (Hhld) for the program.

Table 4 Estimated Cost Per Household

Municipality	NPV ($/Hhld/ month)	Collection Cost (% of NPV)	Comingled Food and Yard Waste		Separate Yard Waste	
			Collection (per Hhld/ month)	Food and Yard Waste Tipping Fee (per tonne)	Collection (per Hhld/ month)	Processing (per tonne)
Campbell River	$8.11	53%	$5.00	$159.55	NA	$53.60
Courtenay	$8.11	53%	$5.00	$159.55	NA	$53.60
Comox	$8.11	53%	$5.00	$159.55	NA	$53.60
Cumberland	$8.15	53%	$5.00	$159.55	NA	$53.60

Note: Cumberland's $0.04/Hhld/month difference in NPV is due to their higher estimated future growth rate. However, it is our understanding that the agreement is for all municipalities to pay the same monthly rate.

The NPV ($/Hhld/month) has increased by $0.27 from those presented to the CSWM working committee in January 2020. This is due to further refinement of the organics diversion program, which provides more certainty in program costs.

4.1.1 Sensitivity Analysis

The capital cost estimates presented in Section 3.1 are considered accurate to plus 30 percent to minus 20 percent, based upon the limited design information.

- Should the construction costs for both the composting facility and the transfer station be 30 percent higher, then the NPVs presented in Table 4 will increase by $0.44/Hhld/month and the Food and Yard Waste Tipping Fee will increase by $18.53/tonne.
- Should the construction costs for both the composting facility and the transfer station be 20 percent lower, then the NPVs presented in Table 4 will decrease by $0.30/Hhld/month and the Food and Yard Waste Tipping Fee will decrease by $12.35/tonne.

4.1.2 Key Assumptions

The following assumptions were used in calculating the estimated program costs:

- 20-year life cycle
- Discount rate = 2.4 percent (Recommended 20 and 25-year borrowing rate as determined by the Municipal Finance Authority of British Columbia).
- One-time provincial government grant of $5,541,744 to offset capital construction costs.
- One-time provincial government "*Organic Infrastructure Program*" grant of $909,630 to offset capital construction costs.
- An allowance of $9.00 per tonne of SSO feedstock to offset to CSWM's administration costs.
- Avoided landfill costs of $75.00 per tonne of SSO feedstock.
- Incremental municipal cost to collect comingled food and yard waste of $5.00 per household per month.
- Processing of separate yard waste elsewhere (i.e. not at new facility).
- Capital cost estimate for the composting facility of $11,560,700 (i.e. Membrane Covered ASP, as per Table 1)
- Operating and maintenance cost estimate for the composting facility of $97.63 per tonne (i.e. Membrane Covered ASP, as per Table 2)
- Transfer station capital cost estimate as per Morrison Hershfield's April 2020 estimate for the two bay transfer station (i.e. $2,592,502.50 including engineering and contingency).
- Transfer station operating costs as per Morrison Hershfield's August 2019 cost estimate titled, "Organics Transfer Station – Class C Preliminary Capital Cost Estimate".
- Transfer vehicle operating costs as per Morrison Hershfield's March 19, 2019 TM titled, "CSWM Regional Compost Facility – Organics Transfer Station Hauling Options".
- A $5.00 per kitchen pail allowance for the purchase and distribution of kitchen pails.
- An initial public education and promotion program to encourage citizen adoption and acceptance of the program, cost $75,000.

4.1.3 Excluded Costs

The estimated program costs exclude the following:

- Cost of financing.
- Federal Goods and Services Tax and Provincial Sales Tax.
- Curbside collection in each municipality.
- Other program support services, such as stakeholder consultations.
- Additional organics diversion programs that may be planned by the CSWM for implementation in the future.

5. Conclusions

- The qualitative analysis for Agitated Bed and Membrane Covered ASP Technologies rates both technologies approximately equal. Membrane Covered ASP rates slightly higher on reliability, ability to handle high/low variations in feedstock quantities, and ease of documenting PFRP. However, Membrane Covered ASP has a slightly higher risk of generating leachate. Whereas Agitated Bed requires a higher level of technological expertise and consumes more electricity.
- The capital cost estimates show a slightly lower cost for Membrane Covered ASP versus Agitated Bed Technology ($11.56M versus $12.44M).
- The operating and maintenance cost estimates show a lower cost for Membrane Covered ASP versus Agitated Bed Technology ($97.63/tonne versus $106.64/tonne).
- Since Membrane Covered ASP technology has lower estimated capital and operating & maintenance costs, this calculates in to lower 20-year lifecycle costs as well ($50.9M for Membrane Covered ASP versus $53.2M for Agitated Bed).
- The estimated food and yard waste tipping fee for the municipalities is $159.55 per tonne.
- The NPV of the estimated program costs to the municipalities for the organics diversion program is $8.11 per month.

6. Recommendations

Based on the estimated lower capital, operating and maintenance, and lifecycle costs for Membrane Covered ASP versus Agitated Bed technology, it is Jacobs recommendation to pursue Membrane Covered ASP technology for the composting facility.

Attachment 1

Secondary Evaluation of Organic Waste Processing Technologies

(Exhibit 2 from Jacobs December 19, 2018 Technical Memorandum titled "Composting Technology Evaluation")

EXHIBIT 2: SECONDARY EVALUATION OF ORGANIC WASTE PROCESSING TECHNOLOGIES

Excerpt from Jacobs December 19, 2018 technical memorandum titled "Composting Technology Evaluation"

Processing Method/Technology	Operational Considerations								
	Typical pre-processing requirements	Typical post-processing requirements	Reliability of processing equipment and support equipment	Maintenance requirements for processing and support equipment	Ability to handle high/low variations in feedstock quantities	Level of technical & process training required to operate system	Typical processing time from receiving through production of final product(s) [1]	Ease of Documenting PFRP[2] Conditions	Potential for exposure of workers to poor air quality
Outdoor (i.e. unenclosed) Forced Aeration Systems									
Negatively Aerated Static Pile	Shredding/Mixing	Curing & Screening	High	Low	High	Moderate	4 to 6 months	High	Low
Covered Aerated Static Pile (positive or negative aeration)	Shredding/Mixing	Curing & Screening	High	Low	High	Moderate	4 to 6 months	High	Low
Indoor or Fully Enclosed Forced Aeration Systems									
Positively Aerated Static Pile	Shredding/Mixing	Curing & Screening	High	Low	High	Moderate	4 to 6 months	High	Moderate to High
Negatively Aerated Static Pile	Shredding/Mixing	Curing & Screening	High	Low	High	Moderate	4 to 6 months	High	Moderate to High
Covered Aerated Static Pile (positive or negative aeration)	Shredding/Mixing	Curing & Screening	High	Low	High	Moderate	4 to 6 months	High	Moderate to High
Channel	Shredding	Curing & Screening	Moderate to High	Moderate	Moderate to High	Moderate to High	4 to 6 months	Moderate to High	Moderate to High
Agitated Bed	Shredding	Curing & Screening	Moderate to High	Moderate to High	Moderate to High	High	4 to 6 months	Moderate to High	Moderate to High
Static Containers/Vessels	Shredding/Mixing	Curing & Screening	High	Moderate	High	Moderate	4 to 6 months	High	Low
Agitated Containers/Vessels	Shredding	Curing & Screening	Moderate to High	Moderate to High	High	Moderate to High	4 to 6 months	Moderate to High	Low
Tunnel	Shredding/Mixing	Curing & Screening	High	Low to Moderate	High	Moderate to High	4 to 6 months	High	Moderate
Small Rotating Drum	Shredding	Add'l Composting, Curing & Screening	Moderate	Moderate to High	Moderate to High	Moderate	4 to 6 months	Moderate to High	Low

Notes:

1. Range includes winter and summer conditions, and assumes all curing of compost is done outdoors.
2. PFRP = Process to Further Reduce Pathogens, to reduce populations of human and plant pathogens, as well as destroy noxious weed seeds.

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EXHIBIT 2: SECONDARY EVALUATION OF ORGANIC WASTE PROCESSING TECHNOLOGIES

Excerpt from Jacobs December 19, 2018 technical memorandum titled "Composting Technology Evaluation"

Processing Method/Technology	Odours and Nuisances				Residuals	
	Potential for offsite Odour impacts	Potential for wildlife attraction	Potential for offsite dust impacts	Potential for offsite litter impacts	Leachate and contaminated surface water quantity	Leachate and contaminated surface water strength
Outdoor (i.e. unenclosed) Forced Aeration Systems						
Negatively Aerated Static Pile	Moderate	Low to Moderate	Moderate	Moderate	Moderate to High	Low to Moderate
Covered Aerated Static Pile (positive or negative aeration)	Moderate	Low to Moderate	Moderate	Moderate	Moderate to High	Low to Moderate
Indoor or Fully Enclosed Forced Aeration Systems						
Positively Aerated Static Pile	Low	Low	Low	Low	Low	Moderate
Negatively Aerated Static Pile	Low	Low	Low	Low	Low	High
Covered Aerated Static Pile (positive or negative aeration)	Low	Low	Low	Low	Low	High
Channel	Low	Low	Low	Low	Low	Moderate
Agitated Bed	Low	Low	Low	Low	Low	High
Static Containers/Vessels	Low	Low	Low	Low	Low	High
Agitated Containers/Vessels	Low	Low	Low	Low	Low	High
Tunnel	Low	Low	Low	Low	Low	High
Small Rotating Drum	Low	Low	Low	Low	Low	Moderate to High

Notes:
1. Range includes winter and summer conditions, and assumes all curing of compost is done outdoors.
2. PFRP = Process to Further Reduce Pathogens, to reduce populations of human and plant pathogens, as well as destroy noxious weed seeds.

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EXHIBIT 2: SECONDARY EVALUATION OF ORGANIC WASTE PROCESSING TECHNOLOGIES

Excerpt from Jacobs December 19, 2018 technical memorandum titled "Composting Technology Evaluation"

Processing Method/Technology	Resource Consumption				Financial	
	Potable water consumption	Power consumption	Fuel consumption	Land requirements (including odour treatment and curing)	Relative construction cost per tonne of annual capacity	Relative O&M costs per tonne of feedstock
Outdoor (i.e. unenclosed) Forced Aeration Systems						
Negatively Aerated Static Pile	Low to Moderate	Low	Low to Moderate	Low to Moderate	Low to Moderate	Low to Moderate
Covered Aerated Static Pile (positive or negative aeration)	Low to Moderate	Low	Low to Moderate	Moderate	Moderate	Low to Moderate
Indoor or Fully Enclosed Forced Aeration Systems						
Positively Aerated Static Pile	Low to Moderate	Moderate	Low to Moderate	Low to Moderate	Moderate to High	Moderate
Negatively Aerated Static Pile	Low to Moderate	Moderate	Low to Moderate	Low to Moderate	Moderate	Moderate
Covered Aerated Static Pile (positive or negative aeration)	Low to Moderate	Moderate	Low to Moderate	Moderate	Moderate to High	Moderate
Channel	Low to Moderate	Moderate to High	Low	Low to Moderate	High	Moderate to High
Agitated Bed	Low to Moderate	Moderate to High	Low	Low	High	Moderate to High
Static Containers/Vessels	Low to Moderate	Moderate	Moderate	Moderate	High	Moderate to High
Agitated Containers/Vessels	Low to Moderate	Moderate to High	Low	Low to Moderate	High	Moderate
Tunnel	Low	Moderate	Low	Low	High	Moderate
Small Rotating Drum	Low	Moderate to High	Low	Moderate	High	High

Notes:
1. Range includes winter and summer conditions, and assumes all curing of compost is done outdoors.
2. PFRP = Process to Further Reduce Pathogens, to reduce populations of human and plant pathogens, as well as destroy noxious weed seeds.

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EXHIBIT 2: SECONDARY EVALUATION OF ORGANIC WASTE PROCESSING TECHNOLOGIES

Excerpt from Jacobs December 19, 2018 technical memorandum titled "Composting Technology Evaluation"

Processing Method/Technology	Development Considerations			
	Time requirements for construction and commissioning	Modularity/ Expandability to Handle Increases in Feedstock Quantities	Ability to be expanded without affecting operations	Anticipated permitting difficulty
Outdoor (i.e. unenclosed) Forced Aeration Systems				
Negatively Aerated Static Pile	Low to Moderate	High	High	Moderate
Covered Aerated Static Pile (positive or negative aeration)	Low to Moderate	High	High	Moderate
Indoor or Fully Enclosed Forced Aeration Systems				
Positively Aerated Static Pile	Moderate	Moderate to High	Moderate	Low to Moderate
Negatively Aerated Static Pile	Moderate	Moderate to High	Moderate	Low to Moderate
Covered Aerated Static Pile (positive or negative aeration)	Moderate	Moderate to High	Moderate	Low to Moderate
Channel	Moderate	Low to Moderate	Low to Moderate	Low to Moderate
Agitated Bed	High	Low to Moderate	Low to Moderate	Moderate
Static Containers/Vessels	Low to Moderate	High	High	Moderate
Agitated Containers/Vessels	Moderate	High	High	Moderate
Tunnel	High	Low to Moderate	Low to Moderate	Moderate
Small Rotating Drum	Moderate to High	High	Moderate	Moderate

Notes:
1. Range includes winter and summer conditions, and assumes all curing of compost is done outdoors.
2. PFRP = Process to Further Reduce Pathogens, to reduce populations of human and plant pathogens, as well as destroy noxious weed seeds.

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Attachment 2

Compost Facility Construction Cost Summary Sheets

Comox Valley Regional District
Organics Processing Facility - 14,500 Tonnes Per Year Capacity
Agitated Bed Technology
Block J at Campbell River Waste Management Centre - Revised Layout West of Existing Storm Pond
2021 Construction Date

	Description	Qty 14,500 TPY	Unit	Unit Cost	14,500 tonnes / year
1.	**Block J Access Improvements and Utility Connections**				**$151,300**
.1	Driveway Approach Widening	1	LS	$10,000.00	$10,000
.2	Drainage	1	LS	$16,100.00	$16,100
.3	Water	1	LS	$22,666.00	$22,700
.4	Sanitary	1	LS	$15,000.00	$15,000
.5	Electrical	1	LS	$45,000.00	$45,000
.6	Contractor Administration	1	LS	$35,000.00	$35,000
.7	Allowance for telephone/internet service	1	LS	$7,500.00	$7,500
2.	**Site Preparation**				**$701,600**
.1	Brush Clearing	0	M2	$6.50	$0
.2	Allowance for topsoil stripping , 300 mm deep and stockpile onsite	0	M3	$11.00	$0
.3	Allowance for excavation (400 mm/16 inches avg depth) and stockpile onsite	1,137	M3	$13.00	$14,800
.4	Allowance for subgrade preparation	22,253	M2	$1.40	$31,200
.5	Granular sub-base (75 mm minus, 300 mm thick)	22,253	M2	$15.75	$350,500
.6	Granular base (19 mm minus, 150 mm thick)	22,253	M2	$10.50	$233,700
.7	Asphalt (100 mm thick)	1,190	M2	$60.00	$71,400
3.	**Stormwater Management**				**$45,800**
.1	Catch Basin	0	LS	$0.00	$0
.2	U/G Storm Sewer	0	M	$0.00	$0
.3	Retention pond synthetic liner, supply and install	0	LS	$75,000.00	$0
.4	Interceptor Ditch	220	M	$140.00	$30,800
.5	Connection to existing pond	1	EA	$15,000.00	$15,000
4.	**Staff/Administration Building and Entrance Area**				**$48,000**
.1	Allowance for Prefab Trailer (12' x 40') incl shower/washroom/first aid	1	LS	$45,000.00	$45,000
.2	Allowance for prefab trailer electrical hookups	1	LS	$0.00	$0
.3	Scale (100 ft) supply install	0	LS	$110,000.00	$0
.4	Scale House, software and installation	0	LS	$2,000.00	$0
.5	Computers and Instrumentation Monitoring Software	1	LS	$3,000.00	$3,000
5.	**Yard Waste Drop-off Area and Amendment Storage**				**$64,700**
.1	Lock-Block bunker walls (5' high, supply and rough place)	90	EA	$500.00	$45,000
.2	Amendment Storage Pad (15M x 15 M)	225	M2	$87.65	$19,700
6.	**Composting Building**				**$1,159,100**
.1	Concrete slab (30 MPa, 8" thick, reinforced)	700	M3	$450.00	$315,000
.2	Lock-Block precision placement (7.5' high, supply and place)	560	EA	$500.00	$280,000
.3	Lock-block foundation wall bracing	0	LS	$0.00	$0
.4	Fabric covered, metal frame building including end walls and penetrations (supply and install)	3,500	SQ.M.	$125.40	$438,900
.5	Bollards at Vehicle Doorways, both inside and outside	4	EA	$1,000.00	$4,000
.6	Overhead rapid vertical doors (12' wide)	0	EA	$0.00	$0
.7	Concrete Lock-Block interior bunkers (7.5' high, supply and place)	50	EA	$500.00	$25,000
.8	Building electrical allowance (lighting and doors)	1	LS	$0.00	$0
.9	Building mechanical allowance	0	LS	$0.00	$0
.10	Building sprinkler system	0	LS	$0.00	$0
.11	Biofilter Blowers, 75 HP 600/3/60	2	Each	$12,930.00	$25,900
.12	Biofilter Roof Exhaust Fans, 40 HP 600/3/60	1	Each	$10,330.00	$10,300
.13	Building Ventilation, 600/3/60	3	Each	$7,990.00	$24,000
.14	Pumps, 600/3/60	3	Each	$10,330.00	$31,000
.15	Instrumentation Infrastructure	1	LS	$5,000.00	$5,000

Comox Valley Regional District
Organics Processing Facility - 14,500 Tonnes Per Year Capacity
Agitated Bed Technology
Block J at Campbell River Waste Management Centre - Revised Layout West of Existing Storm Pond
2021 Construction Date

Description	Qty 14,500 TPY	Unit	Unit Cost	14,500 tonnes / year
7. Curing Building				**$922,000**
.1 Concrete slab (30 MPa, 8" thick, reinforced)	640	M3	$450.00	$288,000
.2 Lock-Block foundation walls (7.5' high, supply to site)	0	M	$165.00	$0
.3 Lock-Block precision placement (7.5' high, supply and place)	416	M	$500.00	$208,000
.4 Lock-block foundation wall bracing	0	LS	$0.00	$0
.5 Fabric covered, metal frame building including end walls and penetrations (supply and install)	3,200	SQ.M.	$125.40	$401,300
.6 Bollards at Vehicle Doorways, both inside and outside	4	EA	$1,000.00	$4,000
.7 Overhead rapid vertical doors (12' wide)	0	EA	$0.00	$0
.8 Concrete Lock-Block interior bunkers (7.5' high, supply and place)	0	EA	$165.00	$0
.9 Building electrical allowance (lighting and doors)	1	LS	$0.00	$0
.10 Building mechanical allowance	0	LS	$0.00	$0
.11 Building sprinkler system	0	LS	$0.00	$0
.12 Building ventilation ducting and fan supply and install	2	EA	$10,330.00	$20,700
8. Storage Pad				**$249,100**
.1 Asphalt Pad (16" thick)	2,842	M3	$87.65	$249,100
.2 Lock-Block foundation walls (7.5' high, supply to site)	0	EA	$500.00	$0
.3 Lock-Block precision placement (7.5' high, supply and place)	0	M	$50.00	$0
.4 Lock-block foundation wall bracing	0	LS	$0.00	$0
.5 Fabric covered, metal frame building including end walls and penetrations (supply and install)	0	SQ.M.	$125.35	$0
.6 Standard overhead vertical doors (14' wide) supply and install	3	EA	$0.00	$0
.7 Overhead rapid vertical doors (12' wide)	2	EA	$0.00	$0
.8 Concrete Lock-Block interior bunkers (7.5' high, supply and place)	0	EA	$500.00	$0
.9 Building electrical allowance (lighting and doors)	1	LS	$0.00	$0
.10 Building mechanical allowance	0	LS	$0.00	$0
.11 Building sprinkler system	0	LS	$0.00	$0
.12 Building ventilation ducting and fan supply and install	0	LS	$35,000.00	$0
9. Composting System - Agitated Bed with u/g Air Channels				**$2,711,700**
.1 Underground Aeration Laterals - 200 mm diameter PVC Pipe	607.5	LM	$256.00	$155,500
.2 Spigot Tubes and Orifices in Aeration Laterals	540	Each	$27.00	$14,600
.3 Hub Drains from end of Aeration Laterals to Water Lock Manholes	45	Each	$230.00	$10,400
.4 Inlet Ductwork and Damper Controls	5	Each	$9,000.00	$45,000
.5 Roof Fresh Air Inlet Goosenecks, Ductwork, Dampers and Controls	5	Each	$3,500.00	$17,500
.6 Wall Louvers, Dampers and Controls for Inlet Air to Space above Tunnels, for blending of recirculation and fresh air	1	Each	$11,000.00	$11,000
.7 Frost Walls and footings	656	LM	$1,750.00	$1,148,000
.8 Lock-Block pony walls (supply and rough place)	0	M	$55.00	$0
.9 Cast In Place Reinforced Concrete Pony Walls for Channel Side Walls (2.5 m high) - Agitated Bed Composting Building	525	LM	$2,180.00	$1,144,500
.10 Channel Blowers, 20 HP 600/3/60	5	Each	$9,030.00	$45,200
.11 PLC	1	EA	$120,000.00	$120,000
10. Leachate Management				**$158,600**
.1 Underground leachate drain line and sump (650 gal, inside building, installed)	2	EA	$10,000.00	$20,000
.2 Leachate submersible transfer pump (stainless steel), installed	2	EA	$5,000.00	$10,000
.3 Low Strength Leachate Pond Excavation	2,700	M3	$12.00	$32,400
.4 Low Strength Leachate Pond Liner	1,350	M3	$12.00	$16,200
.5 High Strength Leachate Tanks	3	EA	$10,000.00	$30,000
.6 High Strength Leachate Tanks Odor Control Unit	1	EA	$30,000.00	$30,000
.7 Pump and connection for liquid removal	2	EA	$10,000.00	$20,000
11. Biofilter 1 (Agitated Bed Building)				**$273,600**
.1 Biofilter media	800	T	$18.27	$14,600
.2 Lock-Block perimeter walls (2.5 ft high), supply and rough place	100	EA	$500.00	$50,000
.3 Underground Aeration Laterals - 300 mm diameter HDPE Pipe	350	LM	$321.00	$112,400
.4 Spigot Tubes and Orifices in Aeration Laterals	300.0	EA	$27.00	$8,100
.5 Hub Drains from end of Aeration Laterals to Water Lock Manholes	2	EA	$230.00	$500
.6 Biofilter Blowers, 75 HP 600/3/60	1	EA	$40,000.00	$40,000
.7 Biofilter Roof Exhaust Fans, 30 HP 600/3/60	0	EA	$28,990.00	$0
.8 Sprinkler System for Wetting Biofilter Media	300	sq.m.	$160.00	$48,000

Comox Valley Regional District
Organics Processing Facility - 14,500 Tonnes Per Year Capacity
Agitated Bed Technology
Block J at Campbell River Waste Management Centre - Revised Layout West of Existing Storm Pond
2021 Construction Date

Description	Qty 14,500 TPY	Unit	Unit Cost	14,500 tonnes / year
12. Biofilter 2 (Small Biofilter)				**$184,200**
.1 Biofilter media	530	T	$18.27	$9,700
.2 Lock-Block perimeter walls (2.5 ft high), supply and rough place	100	EA	$500.00	$50,000
.3 Underground Aeration Laterals - 300 mm diameter HDPE Pipe	150	LM	$321.00	$48,200
.4 Spigot Tubes and Orifices in Aeration Laterals	150.0	EA	$27.00	$4,100
.5 Hub Drains from end of Aeration Laterals to Water Lock Manholes	1	EA	$230.00	$200
.6 Biofilter Blowers, 75 HP 600/3/60	1	EA	$40,000.00	$40,000
.7 Biofilter Roof Exhaust Fans, 30 HP 600/3/60	0	EA	$28,990.00	$0
.8 Sprinkler System for Wetting Biofilter Media	200	sq.m.	$160.00	$32,000
13. Stationary and Specialized Equipment				**$1,191,200**
.1 Stationary Mixing Unit (Luck 475)	0	EA	$450,000.00	$0
.2 Discharge conveyor for mixer or grinder	1	LS	$20,000.00	$20,000
.3 Tarp winder for membrane system	0	LS	$35,000.00	$0
.4 Trommel Screen	0	LS	$250,000.00	$0
.5 Vacuum Air separator	1	LS	$35,000.00	$35,000
.6 Electrical allowance	1	LS	$51,200.00	$51,200
.7 Agitator for bays	1	LS	$500,000.00	$500,000
.8 Stationary Grinder (electric)	1	LS	$585,000.00	$585,000
14. Miscellaneous				**$162,500**
.1 Allowance for site fencing	1	LS	$70,000.00	$70,000
.2 Traffic signs	1	LS	$5,000.00	$5,000
.3 Weather Station	1	LS	$1,500.00	$1,500
.4 Entrance and other facility signs	1	LS	$2,000.00	$2,000
.5 Well Drilling and Development	1	LS	$74,000.00	$74,000
.6 Water Storage Tank for Fire Protection	1	LS	$10,000.00	$10,000
15. Contractor Project Management				**$25,000**
.1 Surveys/Plans/Permits/Etc.	1	LS	$25,000.00	$25,000
.2 Overhead and Profit	1	LS	$0.00	$0
Subtotal				**$8,048,400**
Contractor Mob and General Conditions			0%	$0
Contractor Overheads and Profit			0%	$0
Probable Construction Cost (excluding GST/PST)				**$8,048,400**
Contingency				**$1,222,900**
Contractor Contingency	1	LS		$0
Contingency	15%	of		$1,207,300
Contingency for Euro exchange rate	10%	of		$15,600
Administration, Management and Subcontractor Fees				**$3,163,900**
Engineering/Construction Management/Contract Management	12%	of		$965,800
Allowance for Specialty Consulting and BC MOE Permitting	1	EA	$25,000.00	$25,000
Allowance for geotechnical investigation	1	LS		$0
Escalation for 2021 Work	27%	of		$2,173,100
Total Probable Cost (excluding GST/PST)				**$12,435,200**
Low -20% per Class 3 accuracy range				**$ 9,948,160**
High +30% per Class 3 accuracy range				**$ 16,165,760**

Comox Valley Regional District
Organics Processing Facility - 14,500 Tonnes Per Year Capacity
Membrane Covered Aerated Static Pile Technology
Block J at Campbell River Waste Management Centre - Revised Layout West of Existing Storm Pond
2021 Construction Date

Description	Qty 14,500 TPY	Unit	Unit Cost	14,500 tonnes / year
1. Block J Access Improvements and Utility Connections				**$151,300**
.1 Driveway Approach Widening	1	LS	$10,000.00	$10,000
.2 Drainage	1	LS	$16,100.00	$16,100
.3 Water	1	LS	$22,666.00	$22,700
.4 Sanitary	1	LS	$15,000.00	$15,000
.5 Electrical	1	LS	$45,000.00	$45,000
.6 Contractor Administration	1	LS	$35,000.00	$35,000
.7 Allowance for telephone/internet service	1	LS	$7,500.00	$7,500
2. Site Preparation				**$701,600**
.1 Brush Clearing	0	M2	$6.50	$0
.2 Allowance for topsoil stripping , 300 mm deep and stockpile onsite	0	M3	$11.00	$0
.3 Allowance for excavation (400 mm/16 inches avg depth) and stockpile onsite	1,137	M3	$13.00	$14,800
.4 Allowance for subgrade preparation	22,253	M2	$1.40	$31,200
.5 Granular sub-base (75 mm minus, 300 mm thick)	22,253	M2	$15.75	$350,500
.6 Granular base (19 mm minus, 150 mm thick)	22,253	M2	$10.50	$233,700
.7 Asphalt (100 mm thick)	1,190	M2	$60.00	$71,400
3. Stormwater Management				**$45,800**
.1 Catch Basin	0	LS	$0.00	$0
.2 U/G Storm Sewer	0	M	$0.00	$0
.3 Retention pond synthetic liner, supply and install	0	LS	$75,000.00	$0
.4 Interceptor Ditch	220	M	$140.00	$30,800
.5 Connection to existing pond	1	EA	$15,000.00	$15,000
4. Staff/Administration Building and Entrance Area				**$48,000**
.1 Allowance for Prefab Trailer (12' x 40') incl shower/washroom/first aid	1	LS	$45,000.00	$45,000
.2 Allowance for prefab trailer electrical hookups	1	LS	$0.00	$0
.3 Scale (100 ft) supply install	0	LS	$110,000.00	$0
.4 Scale House, software and installation	0	LS	$2,000.00	$0
.5 Computers and Instrumentation Monitoring Software	1	LS	$3,000.00	$3,000
5. Yard Waste Drop-off Area and Amendment Storage				**$64,700**
.1 Lock-Block bunker walls (5' high, supply and rough place)	90	EA	$500.00	$45,000
.2 Amendment Storage Pad (15M x 15 M)	225	M2	$87.65	$19,700
6. Composting Building				**$1,855,800**
.1 Concrete slab (30 MPa, 8" thick, reinforced)	1,280	M3	$450.00	$576,000
.2 Lock-Block foundation walls (7.5' high, supply to site)	0	EA	$0.00	$0
.3 Lock-Block precision placement (7.5' high, supply and place)	672	EA	$500.00	$336,000
.4 Lock-block foundation wall bracing	0	LS	$0.00	$0
.5 Fabric covered, metal frame building including end walls and penetrations (supply and install)	6,400	SQ.M.	$125.40	$802,600
.6 Bollards at Vehicle Doorways, both inside and outside	4	EA	$1,000.00	$4,000
.7 Overhead rapid vertical doors (12' wide)	0	EA	$0.00	$0
.8 Concrete Lock-Block interior bunkers (7.5' high, supply and place)	50	EA	$500.00	$25,000
.9 Building electrical allowance (lighting and doors)	1	LS	$0.00	$0
.10 Building mechanical allowance	0	LS	$0.00	$0
.11 Building sprinkler system	0	LS	$0.00	$0
.12 Biofilter Blowers, 75 HP 600/3/60	2	Each	$12,930.00	$25,900
.13 Biofilter Roof Exhaust Fans, 40 HP 600/3/60	1	Each	$10,330.00	$10,300
.14 Building Ventilation, 600/3/60	5	Each	$7,990.00	$40,000
.15 Pumps, 600/3/60	3	Each	$10,330.00	$31,000
.16 Instrumentation Infrastructure	1	LS	$5,000.00	$5,000

Comox Valley Regional District
Organics Processing Facility - 14,500 Tonnes Per Year Capacity
Membrane Covered Aerated Static Pile Technology
Block J at Campbell River Waste Management Centre - Revised Layout West of Existing Storm Pond
2021 Construction Date

	Description	Qty 14,500 TPY	Unit	Unit Cost	14,500 tonnes / year
7.	**Curing Building**				**$922,000**
.1	Concrete slab (30 MPa, 8" thick, reinforced)	640	M3	$450.00	$288,000
.2	Lock-Block foundation walls (7.5' high, supply to site)	0	EA	$500.00	$0
.3	Lock-Block precision placement (7.5' high, supply and place)	416	EA	$500.00	$208,000
.4	Lock-block foundation wall bracing	0	LS	$0.00	$0
.5	Fabric covered, metal frame building including end walls and penetrations (supply and install)	3,200	SQ.M.	$125.40	$401,300
.6	Bollards at Vehicle Doorways, both inside and outside	4	EA	$1,000.00	$4,000
.7	Overhead rapid vertical doors (12' wide)	0	EA	$0.00	$0
.8	Concrete Lock-Block interior bunkers (7.5' high, supply and place)	0	EA	$500.00	$0
.9	Building electrical allowance (lighting and doors)	1	LS	$0.00	$0
.10	Building mechanical allowance	0	LS	$0.00	$0
.11	Building sprinkler system	0	LS	$0.00	$0
.12	Building ventilation ducting and fan supply and install	2	EA	$10,330.00	$20,700
8.	**Storage Pad**				**$249,100**
.1	Asphalt Pad (16" thick)	2,842	M3	$87.65	$249,100
.2	Lock-Block foundation walls (7.5' high, supply to site)	0	EA	$500.00	$0
.3	Lock-Block precision placement (7.5' high, supply and place)	0	M	$50.00	$0
.4	Lock-block foundation wall bracing	0	LS	$0.00	$0
.5	Fabric covered, metal frame building including end walls and penetrations (supply and install)	0	SQ.M.	$125.35	$0
.6	Standard overhead vertical doors (14' wide) supply and install	3	EA	$0.00	$0
.7	Overhead rapid vertical doors (12' wide)	2	EA	$0.00	$0
.8	Concrete Lock-Block interior bunkers (7.5' high, supply and place)	0	EA	$500.00	$0
.9	Building electrical allowance (lighting and doors)	1	LS	$0.00	$0
.10	Building mechanical allowance	0	LS	$0.00	$0
.11	Building sprinkler system	0	LS	$0.00	$0
.12	Building ventilation ducting and fan supply and install	0	LS	$35,000.00	$0
9.	**Composting System - Membrane Covered Aerated Static Pile with u/g Air Channels**				**$1,818,000**
.1	Six 6 heap composting system (including air trenches, fans, tarps, water traps and controls)	4	EA	$365,000.00	$1,460,000
.2	Six 6 heap composting system installation (mechanical/electrical/trenches)	4	EA	$82,500.00	$330,000
.3	Lock-Block pony walls (supply and rough place)	56	EA	$500.00	$28,000
.4	Allowance for automated damper supply/install	0	EA	$0.00	$0
.5	Lock-Block curing bunker walls (supply and rough place)	0	M	$500.00	$0
10.	**Leachate Management**				**$158,600**
.1	Underground leachate drain line and sump (650 gal, inside building, installed)	2	EA	$10,000.00	$20,000
.2	Leachate submersible transfer pump (stainless steel), installed	2	EA	$5,000.00	$10,000
.3	Low Strength Leachate Pond Excavation	2,700	M3	$12.00	$32,400
.4	Low Strength Leachate Pond Liner	1,350	M2	$12.00	$16,200
.5	High Strength Leachate Tanks	3	EA	$10,000.00	$30,000
.6	High Strength Leachate Tanks Odor Control Unit	1	EA	$30,000.00	$30,000
.7	Pump and connection for liquid removal	2	EA	$10,000.00	$20,000
11.	**Biofilter 1 (Large Biofilter)**				**$318,100**
.1	Biofilter media	1,060	T	$18.27	$19,400
.2	Lock-Block perimeter walls (2.5 ft high), supply and rough place	110	EA	$500.00	$55,000
.3	Underground Aeration Laterals - 300 mm diameter HDPE Pipe	400	LM	$321.00	$128,400
.4	Spigot Tubes and Orifices in Aeration Laterals	400.0	EA	$27.00	$10,800
.5	Hub Drains from end of Aeration Laterals to Water Lock Manholes	2	EA	$230.00	$500
.6	Biofilter Blowers, 75 HP 600/3/60	1	EA	$40,000.00	$40,000
.7	Biofilter Roof Exhaust Fans, 30 HP 600/3/60	0	EA	$28,990.00	$0
.8	Sprinkler System for Wetting Biofilter Media	400	sq.m.	$160.00	$64,000

Comox Valley Regional District
Organics Processing Facility - 14,500 Tonnes Per Year Capacity
Membrane Covered Aerated Static Pile Technology
Block J at Campbell River Waste Management Centre - Revised Layout West of Existing Storm Pond
2021 Construction Date

Description	Qty 14,500 TPY	Unit	Unit Cost	14,500 tonnes / year
12. Biofilter 2 (Small Biofilter)				**$184,200**
.1 Biofilter media	530	T	$18.27	$9,700
.2 Lock-Block perimeter walls (2.5 ft high), supply and rough place	100	EA	$500.00	$50,000
.3 Underground Aeration Laterals - 300 mm diameter HDPE Pipe	150	LM	$321.00	$48,200
.4 Spigot Tubes and Orifices in Aeration Laterals	150.0	EA	$27.00	$4,100
.5 Hub Drains from end of Aeration Laterals to Water Lock Manholes	1	EA	$230.00	$200
.6 Biofilter Blowers, 75 HP 600/3/60	1	EA	$40,000.00	$40,000
.7 Biofilter Roof Exhaust Fans, 30 HP 600/3/60	0	EA	$28,990.00	$0
.8 Sprinkler System for Wetting Biofilter Media	200	sq.m.	$160.00	$32,000
13. Stationary and Specialized Equipment				**$761,200**
.1 Stationary Mixing Unit (Luck 475)	0	EA	$450,000.00	$0
.2 Discharge conveyor for mixer or grinder	1	LS	$20,000.00	$20,000
.3 Tarp winder for membrane system	2	LS	$35,000.00	$70,000
.4 Trommel Screen	0	LS	$250,000.00	$0
.5 Vacuum Air separator	1	LS	$35,000.00	$35,000
.6 Electrical allowance	1	LS	$51,200.00	$51,200
.7 Windrow turner	0	LS	$500,000.00	$0
.8 Stationary Grinder (electric)	1	LS	$585,000.00	$585,000
14. Miscellaneous				**$92,500**
.1 Allowance for site fencing	0	LS	$70,000.00	$0
.2 Traffic signs	1	LS	$5,000.00	$5,000
.3 Weather Station	1	LS	$1,500.00	$1,500
.4 Entrance and other facility signs	1	LS	$2,000.00	$2,000
.5 Well Drilling and Development	1	LS	$74,000.00	$74,000
.6 Water Storage Tank for Fire Protection	1	LS	$10,000.00	$10,000
15. Contractor Project Management				**$25,000**
.1 Surveys/Plans/Permits/Etc.	1	LS	$25,000.00	$25,000
.2 Overhead and Profit	1	LS	$0.00	$0
Subtotal				**$7,395,900**
Contractor Mob and General Conditions			0%	$0
Contractor Overheads and Profit			0%	$0
Probable Construction Cost (excluding GST/PST)				**$7,395,900**
Contingency				**$1,255,400**
Contractor Contingency	1	LS		$0
Contingency	15%	of		$1,109,400
Contingency for Euro exchange rate	10%	of		$146,000
Administration, Management and Subcontractor Fees				**$2,909,400**
Engineering/Construction Management/Contract Management	12%	of		$887,500
Allowance for Specialty Consulting and BC MOE Permitting	1	EA	$25,000.00	$25,000
Allowance for geotechnical investigation	1	LS		$0
Escalation for 2021 Work	27%	of		$1,996,900
Total Probable Cost (excluding GST/PST)				**$11,560,700**
Low -20% per Class 3 accuracy range				**$ 9,248,560**
High +30% per Class 3 accuracy range				**$ 15,028,910**

Attachment 3

Compost Facility Operating and Maintenance Cost Summary Sheets

Jacobs

Client: CVRD
Project Name: Regional Compost Facility
Date: August 19, 2020
Scenario: AGITATED BED

Direct Operating Cost Summary

			Annual Cost
Direct Labour (incl burden)			$ 230,424
Overtime Allowance			$ -
Diesel	37,499	L	$ 48,748
Electricity - Aeration and Bldg. Fans	1,469,277	kWh	$ 146,928
Electricity - Processing Equipment	88,737	kWh	$ 8,874
Amendment Supply	1,368	tonnes	$ 23,557
Residual Disposal	400	tonnes	$ 30,800
Leachate Disposal Surcharge			$ 20,000
Communications			$ 10,300
Office/Administrative			$ 23,600
Insurance			$ 20,000
Product Marketing and Sales			$ 9,850
Equipment Purchase	Includes 2 FELs and 1 trommel screen		$ 200,169
Contract Services			$ 72,900
Prev. Maintenance			$ 118,902
Safety & Training			$ 3,650
Consumable Supplies			$ 10,100
Utilities			$ 17,820
Net revenue from product sales			$ (50,000)
	Subtotal Annual Cost		$ 946,622
	Contingency	10%	$ 94,662
	Subtotal Incl. Contingency		**$ 1,041,284**
	Contribution to Overhead	10%	$ 104,128
	Contribution to EBIT	20%	$ 229,083
	Risk Premium	15%	$ 171,812
	Total Annual Cost		**$ 1,546,307**
	Annual Throughput (design capacity)		**14,500**
	Cost per tonne of Feedstock		**$ 106.64**

Rate Assumptions

Power Rate	$ 0.100	per kWh	
Diesel Rate	$ 1.30	per L	
Salary Burden	20%		
Overtime Allowance	0.0%	of Salary	
Amendment	$ 17.22	per tonne	
Reject Disposal @ LF	$ 77.00	per tonne	
Leachate Surcharge	$ 20,000	annual allowance	
DEF Rate	$ 0.80		
Biofilter Media	$ 18.27	Per Tonne	

Fuel Consumption

Front-end Loader	12.5	L per hour	(Cat 930)
Truck	20.0	L per hour	(Assumed)
Trommel Screen	4.6	L per hour	(Vermeer TR5300)
Windrow Turner	52.6	L per hour	(Vermeer CT616)
Site Truck	4.0	L per hour	(Assumed)
Stacking Conveyor	4.0	L per hour	(Assumed)

Notes:
1. Facility is assumed to be managed and operated by private contractor.
2. Estimates in 2022 Dollars based on 14,500 tonnes per year of feedstock.
3. Maintenance costs based on preventative maintenance only. Maintenance reserve contributions called out separately.
4. Utilities assumes no potable water usage in the composting process.
5. An allowance is included for offsite leachate treatment and disposal.
6. Residuals assumed to be 2.5% (by wt.) of total feedstock quantities.
7. Debt servicing of capital expenditure (if any) not included.

Jacobs

Client: CVRD
Project Name: Regional Compost Facility
Date: August 19, 2020
Scenario: MEMBRANE COVERED AERATED STATIC PILE

Direct Operating Cost Summary

				Annual Cost
Direct Labour (incl burden)			$	230,424
Overtime Allowance			$	-
Diesel	37,109	L	$	48,241
Electricity - Aeration and Bldg. Fans	735,183	kWh	$	73,518
Electricity - Processing Equipment	48,490	kWh	$	4,849
Amendment Supply	1,368	tonnes	$	23,557
Residual Disposal	400	tonnes	$	30,800
Leachate Disposal Surcharge			$	20,000
Communications			$	10,300
Office/Administrative			$	23,600
Insurance			$	20,000
Product Marketing and Sales			$	9,850
Equipment Purchase	Includes 2 FELs and 1 trommel screen		$	200,169
Contract Services			$	72,900
Prev. Maintenance			$	116,843
Safety & Training			$	3,650
Consumable Supplies			$	10,100
Utilities			$	17,820
Net revenue from product sales			$	(50,000)
	Subtotal Annual Cost		$	866,622
	Contingency	10%	$	86,662
	Subtotal Incl. Contingency		**$**	**953,284**
	Contribution to Overhead	10%	$	95,328
	Contribution to EBIT	20%	$	209,723
	Risk Premium	15%	$	157,292
	Total Annual Cost		**$**	**1,415,627**
	Annual Throughput (design capacity)			**14,500**
	Cost per tonne of Feedstock		**$**	**97.63**

Rate Assumptions

Power Rate	$ 0.100	per kWh	
Diesel Rate	$ 1.30	per L	
Salary Burden	20%		
Overtime Allowance	0.0%	of Salary	
Amendment	$ 17.22	per tonne	
Reject Disposal @ LF	$ 77.00	per tonne	
Leachate Surcharge	$ 20,000	annual allowance	
DEF Rate	$ 0.80		
Biofilter Media	$ 18.27	Per Tonne	

Fuel Consumption

Front-end Loader	12.5	L per hour	(Cat 930)
Truck	20.0	L per hour	(Assumed)
Trommel Screen	4.6	L per hour	(Vermeer TR5300)
Windrow Turner	52.6	L per hour	(Vermeer CT616)
Site Truck	4.0	L per hour	(Assumed)
Stacking Conveyor	4.0	L per hour	(Assumed)

Notes:
1. Facility is assumed to be managed and operated by private contractor.
2. Estimates in 2022 Dollars based on 14,500 tonnes per year of feedstock.
3. Maintenance costs based on preventative maintenance only. Maintenance reserve contributions called out separately.
4. Utilities assumes no potable water usage in the composting process.
5. An allowance is included for offsite leachate treatment and disposal.
6. Residuals assumed to be 2.5% (by wt.) of total feedstock quantities.
7. Debt servicing of capital expenditure (if any) not included.

Attachment 4

Compost Facility Net Present Value Analysis

Jacobs

Lifecycle Cost and NPV Calculation

LIFECYCLE COST SUMMARY NET PRESENT VALUE (NPV)		
NPV Total Capital Cost	$	14,061,916
NPV Total Operating Cost	$	29,713,009
TOTAL NET PRESENT VALUE COST	**$**	**43,774,925**

Project:
CVRD - Organics Processing Facility
Option 2: AGITATED BED

Cost Escalation/Construction Inflation	0%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Cost Escalation/Operating Inflation	0%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%

Cost Components		Detail by Year ($k)																			
Type	Description	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Capital Cost		Enter cash flow in current dollars ($K). Inflation will be automatically calculated.																				
Construction	1. Block J Access Improvements and Utility Connections	151,300																				
Construction	2. Site Preparation	701,600																				
Construction	3. Stormwater Management	45,800																				
Construction	4. Staff/Administration Building and Entrance Area	48,000																				
Construction	5. Yard Waste Drop-off Area and Amendment Storage	64,700																				
Construction	6. Composting Building	1,159,100																				
Construction	7. Curing Building	922,000																				
Construction	8. Storage Pad	249,100																				
Pre-construction	9. Composting System - Agitated Bed with u/g Air Channels	2,711,700																				
Construction	10. Leachate Management	158,600																				
Pre-construction	11. Biofilter 1 (Agitated Bed Building)	273,600																				
Construction	12. Biofilter 2 (Small Biofilter)	184,200																				
Construction	13. Stationary and Specialized Equipment	1,191,200																				
Construction	14. Miscellaneous	162,500																				
Construction	15. Contractor Project Management	25,000																				
Construction	Contingency	1,222,900																				
Capex Benefit	Capex Replacement During Operations	0			29,100		7,500	29,100			29,100	12,500		29,100			433,887			29,100		474,500
Construction	Administration, Management and Subcontractor Fees	3,163,900																				
	Total Annual Capex:	12,435,200	0	0	29,100	0	7,500	29,100	0	0	29,100	12,500	0	29,100	0	0	433,887	0	0	29,100	0	474,500
	Total Annual Capex with Inflation	12,435,200	0	0	33,687	0	9,573	38,997	0	0	45,144	20,362	0	52,260	0	0	902,020	0	0	70,033	0	1,258,990
Operating Cost		Enter cash flow in current dollars ($K). Inflation will be automatically calculated.																				
Salaries and Benefits	Direct Labour (incl burden)		230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424
Salaries and Benefits	Overtime Allowance		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operate	Diesel		34,252	34,783	45,604	46,236	46,876	47,529	48,188	48,856	49,536	50,223	50,921	51,629	52,346	53,076	53,816	54,564	55,325	56,155	56,997	57,852
Operate	Electricity - Aeration and Bldg. Fans		146,928	146,928	146,928	146,928	146,928	146,928	146,928	146,928	146,928	146,928	146,928	146,928	146,928	146,928	146,928	146,928	146,928	146,928	146,928	146,928
Operate	Electricity - Processing Equipment		6,235	6,332	8,301	8,416	8,533	8,652	8,772	8,893	9,017	9,142	9,269	9,398	9,529	9,661	9,796	9,932	10,071	10,222	10,375	10,531
Operate	Amendment Supply		16,552	16,809	22,037	22,343	22,652	22,968	23,286	23,609	23,938	24,270	24,607	24,949	25,296	25,648	26,006	26,367	26,735	27,136	27,543	27,956
Operate	Residual Disposal		21,641	21,977	28,813	29,213	29,617	30,029	30,446	30,868	31,298	31,732	32,173	32,620	33,073	33,534	34,002	34,474	34,955	35,480	36,012	36,552
Operate	Leachate Disposal Surcharge		20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Operate	Communications		10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300
Operate	Office/Administrative		23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600
Operate	Insurance		20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Operate	Product Marketing and Sales		9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850
Operate	Equipment Purchase		200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169
Operate	Contract Services		72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900
Operate	Prev. Maintenance		118,902	118,902	118,902	118,902	118,902	118,902	118,902	118,902	118,902	118,902	118,902	118,902	118,902	118,902	118,902	118,902	118,902	118,902	118,902	118,902
Operate	Safety & Training		3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650
Operate	Consumable Supplies		7,096	7,207	9,448	9,580	9,712	9,847	9,984	10,122	10,263	10,406	10,550	10,697	10,845	10,997	11,150	11,305	11,463	11,635	11,809	11,986
Operate	Utilities		17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820
Operate	Net revenue from product sales		(35,131)	(35,676)	(46,775)	(47,423)	(48,080)	(48,749)	(49,425)	(50,110)	(50,808)	(51,513)	(52,229)	(52,954)	(53,690)	(54,439)	(55,198)	(55,965)	(56,746)	(57,597)	(58,461)	(59,338)
Operate	Contingency		94,662	94,662	94,662	94,662	94,662	94,662	94,662	94,662	94,662	94,662	94,662	94,662	94,662	94,662	94,662	94,662	94,662	94,662	94,662	94,662
Operate	Contribution to Overhead		104,128	104,128	104,128	104,128	104,128	104,128	104,128	104,128	104,128	104,128	104,128	104,128	104,128	104,128	104,128	104,128	104,128	104,128	104,128	104,128
Operate	Contribution to EBIT		229,083	229,083	229,083	229,083	229,083	229,083	229,083	229,083	229,083	229,083	229,083	229,083	229,083	229,083	229,083	229,083	229,083	229,083	229,083	229,083
Operate	Risk Premium		171,812	171,812	171,812	171,812	171,812	171,812	171,812	171,812	171,812	171,812	171,812	171,812	171,812	171,812	171,812	171,812	171,812	171,812	171,812	171,812
	Total Annual Opex:	0	1,524,872	1,525,659	1,541,658	1,542,593	1,543,539	1,544,504	1,545,478	1,546,466	1,547,472	1,548,488	1,549,520	1,550,566	1,551,627	1,552,706	1,553,800	1,554,906	1,556,032	1,557,259	1,558,504	1,559,768
	Total Annual Opex with Inflation:	0	1,555,370	1,587,296	1,636,020	1,669,752	1,704,192	1,739,363	1,775,269	1,811,932	1,849,373	1,887,599	1,926,634	1,966,493	2,007,196	2,048,763	2,091,211	2,134,553	2,178,821	2,224,150	2,270,447	2,317,734

TOTAL LIFECYCLE CAPITAL COST	**$ 14,866,266**
TOTAL LIFECYCLE OPERATING COST	**$ 38,382,168**
TOTAL LIFECYCLE COST	**$ 53,248,434**

Operating costs that are hi-lighted in green vary depending upon incoming feedstock tonnage.
Operating costs that are hi-lighted in yellow do not vary depending upon incoming feedstock tonnage.

Basis of Annual Feedstock Tonnage (tpy) =	14500																				
Anticipated Feedstock Tonnages (tpy) =	0	10,188	10,346	13,565	13,753	13,943	14,137	14,333	14,532	14,734	14,939	15,146	15,357	15,570	15,787	16,007	16,230	16,456	16,703	16,954	17,208

Jacobs

Lifecycle Cost and NPV Calculation

LIFECYCLE COST SUMMARY NET PRESENT VALUE (NPV)		
NPV Total Capital Cost	$	14,420,587
NPV Total Operating Cost	$	27,202,461
TOTAL NET PRESENT VALUE COST	**$**	**41,623,048**

Project:
CVRD - Organics Processing Facility
Option 1: MEMBRANE COVERED ASP

Cost Escalation/Construction Inflation	0%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Cost Escalation/Operating Inflation	0%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%

Cost Components		Detail by Year ($k)																			
Type	Description	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Capital Cost		Enter cash flow in current dollars ($K). Inflation will be automatically calculated.																				
Construction	1. Block J Access Improvements and Utility Connections	151,300																				
Construction	2. Site Preparation	701,600																				
Construction	3. Stormwater Management	45,800																				
Construction	4. Staff/Administration Building and Entrance Area	48,000																				
Construction	5. Yard Waste Drop-off Area and Amendment Storage	64,700																				
Construction	6. Composting Building	1,855,800																				
Construction	7. Curing Building	922,000																				
Construction	8. Storage Pad	249,100																				
Construction	9. Composting System - Membrane Covered Aerated Static Pile with u/g Air Channels	1,818,000																				
Construction	10. Leachate Management	158,600																				
Construction	11. Biofilter 1 (Large Biofilter)	318,100																				
Construction	12. Biofilter 2 (Small Biofilter)	184,200																				
Construction	13. Stationary and Specialized Equipment	761,200																				
Construction	14. Miscellaneous	92,500																				
Construction	15. Contractor Project Management	25,000																				
Construction	Contingency	1,255,400																				
Capex Benefit	Capex Replacement During Operations	0			29,100		7,500	29,100			29,100	432,500		29,100			433,887			29,100		894,500
Construction	Administration, Management and Subcontractor Fees	2,909,400																				
	Total Annual Capex:	11,560,700	0	0	29,100	0	7,500	29,100	0	0	29,100	432,500	0	29,100	0	0	433,887	0	0	29,100	0	894,500
	Total Annual Capex with Inflation	11,560,700	0	0	33,687	0	9,573	38,997	0	0	45,144	704,497	0	52,260	0	0	902,020	0	0	70,033	0	2,373,375
Operating Cost		Enter cash flow in current dollars ($K). Inflation will be automatically calculated.																				
Salaries and Benefits	Direct Labour (incl burden)		230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424	230,424
Salaries and Benefits	Overtime Allowance		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operate	Diesel		33,895	34,421	45,129	45,755	46,389	47,034	47,686	48,348	49,021	49,701	50,392	51,092	51,802	52,524	53,256	53,996	54,750	55,571	56,405	57,251
Operate	Electricity - Aeration and Bldg. Fans		73,518	73,518	73,518	73,518	73,518	73,518	73,518	73,518	73,518	73,518	73,518	73,518	73,518	73,518	73,518	73,518	73,518	73,518	73,518	73,518
Operate	Electricity - Processing Equipment		3,407	3,460	4,536	4,599	4,663	4,728	4,793	4,860	4,927	4,996	5,065	5,136	5,207	5,279	5,353	5,427	5,503	5,586	5,670	5,755
Operate	Amendment Supply		16,552	16,809	22,037	22,343	22,652	22,968	23,286	23,609	23,938	24,270	24,607	24,949	25,296	25,648	26,006	26,367	26,735	27,136	27,543	27,956
Operate	Residual Disposal		21,641	21,977	28,813	29,213	29,617	30,029	30,446	30,868	31,298	31,732	32,173	32,620	33,073	33,534	34,002	34,474	34,955	35,480	36,012	36,552
Operate	Leachate Disposal Surcharge		20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Operate	Communications		10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300	10,300
Operate	Office/Administrative		23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600	23,600
Operate	Insurance		20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Operate	Product Marketing and Sales		9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850	9,850
Operate	Equipment Purchase		200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169	200,169
Maintain	Contract Services		72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900	72,900
Maintain	Prev. Maintenance		116,843	116,843	116,843	116,843	116,843	116,843	116,843	116,843	116,843	116,843	116,843	116,843	116,843	116,843	116,843	116,843	116,843	116,843	116,843	116,843
Operate	Safety & Training		3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650
Operate	Consumable Supplies		7,096	7,207	9,448	9,580	9,712	9,847	9,984	10,122	10,263	10,406	10,550	10,697	10,845	10,997	11,150	11,305	11,463	11,635	11,809	11,986
Operate	Utilities		17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820	17,820
Operate	Net revenue from product sales		(35,131)	(35,676)	(46,775)	(47,423)	(48,080)	(48,749)	(49,425)	(50,110)	(50,808)	(51,513)	(52,229)	(52,954)	(53,690)	(54,439)	(55,198)	(55,965)	(56,746)	(57,597)	(58,461)	(59,338)
Operate	Contingency		86,662	86,662	86,662	86,662	86,662	86,662	86,662	86,662	86,662	86,662	86,662	86,662	86,662	86,662	86,662	86,662	86,662	86,662	86,662	86,662
Operate	Contribution to Overhead		95,328	95,328	95,328	95,328	95,328	95,328	95,328	95,328	95,328	95,328	95,328	95,328	95,328	95,328	95,328	95,328	95,328	95,328	95,328	95,328
Operate	Contribution to EBIT		209,723	209,723	209,723	209,723	209,723	209,723	209,723	209,723	209,723	209,723	209,723	209,723	209,723	209,723	209,723	209,723	209,723	209,723	209,723	209,723
Operate	Risk Premium		157,292	157,292	157,292	157,292	157,292	157,292	157,292	157,292	157,292	157,292	157,292	157,292	157,292	157,292	157,292	157,292	157,292	157,292	157,292	157,292
	Total Annual Opex:	0	1,395,540	1,396,277	1,411,270	1,412,146	1,413,033	1,413,937	1,414,850	1,415,776	1,416,719	1,417,671	1,418,638	1,419,618	1,420,612	1,421,624	1,422,649	1,423,685	1,424,740	1,425,890	1,427,057	1,428,242
	Total Annual Opex with Inflation:	0	1,423,451	1,452,687	1,497,651	1,528,553	1,560,103	1,592,323	1,625,219	1,658,808	1,693,110	1,728,133	1,763,899	1,800,420	1,837,714	1,875,803	1,914,699	1,954,415	1,994,981	2,036,523	2,078,954	2,122,293

TOTAL LIFECYCLE CAPITAL COST	**$**	**15,790,286**
TOTAL LIFECYCLE OPERATING COST	**$**	**35,139,739**
TOTAL LIFECYCLE COST	**$**	**50,930,025**

Operating costs that are hi-lighted in green vary depending upon incoming feedstock tonnage.
Operating costs that are hi-lighted in yellow do not vary depending upon incoming feedstock tonnage.

Basis of Annual Feedstock Tonnage (tpy) =	14500																				
Anticipated Feedstock Tonnages (tpy) =	0	10,188	10,346	13,565	13,753	13,943	14,137	14,333	14,532	14,734	14,939	15,146	15,357	15,570	15,787	16,007	16,230	16,456	16,703	16,954	17,208

Appendix A

Jacobs December 19, 2018 Technical Memorandum titled “Composting Technology Evaluation”)

JACOBS

Memorandum

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Subject	**Composting Technology Evaluation**	**Project Name**	Comox Valley Regional District Composting Facility
Attention	Gabriel Bau	**Project No.**	700041CH
From	John Berry		
Date	December 19, 2018		
Copies to	File		

1. Introduction

Jacobs[1] and Morrison Hershfield are assisting the Comox Valley Regional District (CVRD) and its member municipalities with the planning and procurement of a new organic waste transfer station and a regional composting facility that will service municipalities in the southern portion of the Comox Strathcona Waste Management (CSWM) service area.

As part of this project, Jacobs identified several composting methods and technologies that could potentially be used to manage the organic waste collected in the service area. This technical memorandum outlines the results of the technical feasibility of these methods and technologies and identifies the range of options that at this preliminary stage appear more appropriate. Once the requirements related to the processing facility location become available, this range of technologies may vary.

The list of processing methods and technologies considered in this evaluation was limited to composting in order to increase the CSWM service waste diversion rate according to the CSWM Solid Waste Management Plan (SWMP). According to the Ministry of Environment, anaerobic digestion is not considered a reduction, re-use or recycling alternative, and therefore any diversion achieved through this processing method would not count towards the 70% diversion rate target established in the SWMP. Additionally, the grant funding for the CSWM Service Regional Organics Compost project provided by the New Building Canada Fund was based on the use of composting as the processing method.

To evaluate appropriateness and sustainability, Jacobs undertook a two-step evaluation process. The initial screening consisted of a “fatal flaw analysis” that was based on several pass/fail criteria. The second step was a qualitative analysis based on several technical criteria developed by Jacobs.

[1] *On December 15, 2017, all CH2M HILL companies became part of Jacobs and are now wholly owned direct subsidiaries of Jacobs. CH2M HILL Canada Limited remains a separate legal entity and we will continue to operate and conduct business under this entity in Canada; however, we refer to ourselves in deliverables, including this technical memorandum, as Jacobs.*

2. Initial Screening Analysis

A long list of processing methods was established and included within the scope of the initial screening. Based on previous reviews completed in the study area and discussions with CVRD, the processing methods were limited to composting.

A set of initial screening criteria for the processing technologies was established in consultation with personnel from CVRD. These screening criteria were applied on a pass/fail basis by Jacobs based on the background research completed and professional judgment. If a processing method or technology failed to meet any one criteria, it was excluded from further consideration. Exhibit 1 presents the criteria and the results from the initial screening process.

3. Secondary Analysis of Processing Options

To provide a relative comparison of the processing methods, a secondary analysis was conducted using a set of criteria developed by Jacobs and reviewed by CVRD personnel. The secondary evaluation criteria were based on performance requirements that are common to the organic processing industry, and on specific issues of importance to CVRD. The secondary criteria included operational considerations, space requirements, odour control, resource consumption, leachate and surface water quality, worker health and safety, development considerations, and additional processing requirements required to meet product maturity requirements.

The evaluation of processing options was done based on Jacob's professional judgment and experience, and each technology was given a relative ranking of low, low to moderate, moderate, moderate to high, or high.

The evaluation took into consideration necessary supporting infrastructure that would be required along with the processing technologies (e.g. buildings, HVAC systems, curing pads, weigh scales, surface water ditches, ponds and other controls, curing facilities, etc.) so that all technologies would meet a consistent performance specification. This approach is necessary to provide a balanced evaluation of the technologies.

Exhibit 2 summarizes the results from the secondary analysis and the relative scoring of each processing technology.

attachments: Exhibit 1
Exhibit 2

/jb

EXHIBIT 1:
INITIAL SCREENING OF ORGANIC WASTE PROCESSING TECHNOLOGIES

Processing Method/Technology	Demonstrated as being capable of handling commingled food waste/yard waste from residential sources	Successfully operating on a commercial basis with a similar capacity for more than 5 years	Suitable for year-round operation in the local climate	Ability to comply with current Provincial & Federal regulations with commingled food waste/yard waste as the primary feedstock [1]	Able to effectively control nuisance conditions when processing commingled food waste/yard waste in an urban-industrial location[1]	Practical relative to CSWM situation [2]		Pass/Fail Evaluation
Outdoor Passively Aerated Systems								
Passively Aerated Static Pile	No	No	Yes	No	No	No	c	**Fail**
Bunker	No	No	Yes	No	No	No	b	**Fail**
Passively Aerated Windrow	No	No	Yes	No	No	No	b	**Fail**
Turned Windrow	Yes	Yes	Yes	Yes	No	No	c	**Fail**
Unaerated Turned Mass Bed	No	No	Yes	Yes	No	Yes		**Fail**
Outdoor (i.e. unenclosed) Forced Aeration Systems								
Positively Aerated Static Pile	Yes	Yes	Yes	Yes	No	Yes		**Fail**
Negatively Aerated Static Pile	Yes	Yes	Yes	Yes	Yes	Yes		**Pass**
Covered Aerated Static Pile (postive or negative aeration)	Yes	Yes	Yes	Yes	Yes	Yes		**Pass**
Aerated Turned Mass Bed	Yes	No	Yes	Yes	No	Yes		**Fail**
Indoor or Fully Enclosed Forced Aeration Systems								
Positively Aerated Static Pile	Yes	Yes	Yes	Yes	Yes	Yes		**Pass**
Negatively Aerated Static Pile	Yes	Yes	Yes	Yes	Yes	Yes		**Pass**
Covered Aerated Static Pile (postive or negative aeration)	Yes	Yes	Yes	Yes	Yes	Yes		**Pass**
Aerated Turned Mass Bed	No	No	Yes	Yes	Yes	Yes		**Fail**
Channel	Yes	Yes	Yes	Yes	Yes	Yes		**Pass**
Agitated Bed	Yes	Yes	Yes	Yes	Yes	Yes		**Pass**
Static Containers/Vessels	Yes	Yes	Yes	Yes	Yes	Yes		**Pass**
Agitated Containers/Vessels	Yes	Yes	Yes	Yes	Yes	Yes		**Pass**
Onsite Agitated Containers/Vessels	No	No	Yes	Yes	Yes	No	b	**Fail**
Tunnel	Yes	Yes	Yes	Yes	Yes	Yes		**Pass**
Small Rotating Drum	Yes	Yes	Yes	Yes	Yes	Yes		**Pass**
Large Rotating Drum	Yes	Yes	Yes	Yes	Yes	No	a, b	**Fail**

General Notes:

1. Technology is considered In combination with other infrastructure employed in a typical installation.
3. Financial feasibility including cost of acquiring land for processing and post-processing (e.g. curing) activities is not considered in this screening criteria

Rationale for Practicality Assessment:

a. Not compatible with residential SSO material generated/collected in study area.
b. Capacity restriction of technology relative to projected feedstock quantities in the study area.
c. Processing method requires excessive amount of land.

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EXHIBIT 2: SECONDARY EVALUATION OF ORGANIC WASTE PROCESSING TECHNOLOGIES

Processing Method/Technology	Operational Considerations								
	Typical pre-processing requirements	Typical post-processing requirements	Reliability of processing equipment and support equipment	Maintenance requirements for processing and support equipment	Ability to handle high/low variations in feedstock quantities	Level of technical & process training required to operate system	Typical processing time from receiving through production of final product(s) [1]	Ease of Documenting PFRP[2] Conditions	Potential for exposure of workers to poor air quality
Outdoor (i.e. unenclosed) Forced Aeration Systems									
Negatively Aerated Static Pile	Shredding/Mixing	Curing & Screening	High	Low	High	Moderate	4 to 6 months	High	Low
Covered Aerated Static Pile (positive or negative aeration)	Shredding/Mixing	Curing & Screening	High	Low	High	Moderate	4 to 6 months	High	Low
Indoor or Fully Enclosed Forced Aeration Systems									
Positively Aerated Static Pile	Shredding/Mixing	Curing & Screening	High	Low	High	Moderate	4 to 6 months	High	Moderate to High
Negatively Aerated Static Pile	Shredding/Mixing	Curing & Screening	High	Low	High	Moderate	4 to 6 months	High	Moderate to High
Covered Aerated Static Pile (positive or negative aeration)	Shredding/Mixing	Curing & Screening	High	Low	High	Moderate	4 to 6 months	High	Moderate to High
Channel	Shredding	Curing & Screening	Moderate to High	Moderate	Moderate to High	Moderate to High	4 to 6 months	Moderate to High	Moderate to High
Agitated Bed	Shredding	Curing & Screening	Moderate to High	Moderate to High	Moderate to High	High	4 to 6 months	Moderate to High	Moderate to High
Static Containers/Vessels	Shredding/Mixing	Curing & Screening	High	Moderate	High	Moderate	4 to 6 months	High	Low
Agitated Containers/Vessels	Shredding	Curing & Screening	Moderate to High	Moderate to High	High	Moderate to High	4 to 6 months	Moderate to High	Low
Tunnel	Shredding/Mixing	Curing & Screening	High	Low to Moderate	High	Moderate to High	4 to 6 months	High	Moderate
Small Rotating Drum	Shredding	Add'l Composting, Curing & Screening	Moderate	Moderate to High	Moderate to High	Moderate	4 to 6 months	Moderate to High	Low

Notes:

1. Range includes winter and summer conditions, and assumes all curing of compost is done outdoors.
2. PFRP = Process to Further Reduce Pathogens, to reduce populations of human and plant pathogens, as well as destroy noxious weed seeds.

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EXHIBIT 2: SECONDARY EVALUATION OF ORGANIC WASTE PROCESSING TECHNOLOGIES

Processing Method/Technology	Odours and Nuisances				Residuals	
	Potential for offsite Odour impacts	Potential for wildlife attraction	Potential for offsite dust impacts	Potential for offsite litter impacts	Leachate and contaminated surface water quantity	Leachate and contaminated surface water strength
Outdoor (i.e. unenclosed) Forced Aeration Systems						
Negatively Aerated Static Pile	Moderate	Low to Moderate	Moderate	Moderate	Moderate to High	Low to Moderate
Covered Aerated Static Pile (positive or negative aeration)	Moderate	Low to Moderate	Moderate	Moderate	Moderate to High	Low to Moderate
Indoor or Fully Enclosed Forced Aeration Systems						
Positively Aerated Static Pile	Low	Low	Low	Low	Low	Moderate
Negatively Aerated Static Pile	Low	Low	Low	Low	Low	High
Covered Aerated Static Pile (positive or negative aeration)	Low	Low	Low	Low	Low	High
Channel	Low	Low	Low	Low	Low	Moderate
Agitated Bed	Low	Low	Low	Low	Low	High
Static Containers/Vessels	Low	Low	Low	Low	Low	High
Agitated Containers/Vessels	Low	Low	Low	Low	Low	High
Tunnel	Low	Low	Low	Low	Low	High
Small Rotating Drum	Low	Low	Low	Low	Low	Moderate to High

Notes:
1. Range includes winter and summer conditions, and assumes all curing of compost is done outdoors.
2. PFRP = Process to Further Reduce Pathogens, to reduce populations of human and plant pathogens, as well as destroy noxious weed seeds.

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EXHIBIT 2: SECONDARY EVALUATION OF ORGANIC WASTE PROCESSING TECHNOLOGIES

Processing Method/Technology	Resource Consumption				Financial	
	Potable water consumption	Power consumption	Fuel consumption	Land requirements (including odour treatment and curing)	Relative construction cost per tonne of annual capacity	Relative O&M costs per tonne of feedstock
Outdoor (i.e. unenclosed) Forced Aeration Systems						
Negatively Aerated Static Pile	Low to Moderate	Low	Low to Moderate	Low to Moderate	Low to Moderate	Low to Moderate
Covered Aerated Static Pile (positive or negative aeration)	Low to Moderate	Low	Low to Moderate	Moderate	Moderate	Low to Moderate
Indoor or Fully Enclosed Forced Aeration Systems						
Positively Aerated Static Pile	Low to Moderate	Moderate	Low to Moderate	Low to Moderate	Moderate to High	Moderate
Negatively Aerated Static Pile	Low to Moderate	Moderate	Low to Moderate	Low to Moderate	Moderate	Moderate
Covered Aerated Static Pile (positive or negative aeration)	Low to Moderate	Moderate	Low to Moderate	Moderate	Moderate to High	Moderate
Channel	Low to Moderate	Moderate to High	Low	Low to Moderate	High	Moderate to High
Agitated Bed	Low to Moderate	Moderate to High	Low	Low	High	Moderate to High
Static Containers/Vessels	Low to Moderate	Moderate	Moderate	Moderate	High	Moderate to High
Agitated Containers/Vessels	Low to Moderate	Moderate to High	Low	Low to Moderate	High	Moderate
Tunnel	Low	Moderate	Low	Low	High	Moderate
Small Rotating Drum	Low	Moderate to High	Low	Moderate	High	High

Notes:
1. Range includes winter and summer conditions, and assumes all curing of compost is done outdoors.
2. PFRP = Process to Further Reduce Pathogens, to reduce populations of human and plant pathogens, as well as destroy noxious weed seeds.

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EXHIBIT 2: SECONDARY EVALUATION OF ORGANIC WASTE PROCESSING TECHNOLOGIES

Processing Method/Technology	Development Considerations			
	Time requirements for construction and commissioning	Modularity/ Expandability to Handle Increases in Feedstock Quantities	Ability to be expanded without affecting operations	Anticipated permitting difficulty
Outdoor (i.e. unenclosed) Forced Aeration Systems				
Negatively Aerated Static Pile	Low to Moderate	High	High	Moderate
Covered Aerated Static Pile (positive or negative aeration)	Low to Moderate	High	High	Moderate
Indoor or Fully Enclosed Forced Aeration Systems				
Positively Aerated Static Pile	Moderate	Moderate to High	Moderate	Low to Moderate
Negatively Aerated Static Pile	Moderate	Moderate to High	Moderate	Low to Moderate
Covered Aerated Static Pile (positive or negative aeration)	Moderate	Moderate to High	Moderate	Low to Moderate
Channel	Moderate	Low to Moderate	Low to Moderate	Low to Moderate
Agitated Bed	High	Low to Moderate	Low to Moderate	Moderate
Static Containers/Vessels	Low to Moderate	High	High	Moderate
Agitated Containers/Vessels	Moderate	High	High	Moderate
Tunnel	High	Low to Moderate	Low to Moderate	Moderate
Small Rotating Drum	Moderate to High	High	Moderate	Moderate

Notes:
1. Range includes winter and summer conditions, and assumes all curing of compost is done outdoors.
2. PFRP = Process to Further Reduce Pathogens, to reduce populations of human and plant pathogens, as well as destroy noxious weed seeds.

Organics Processing facility Procurement Comparison: Design-Build-Operate (DBO) vs. Design-Bid-Build (DBB)

DBO advantages

1. More preferred than design-build (DB) by some companies in the market place.
2. Transferability of some front end and technical specs from the existing DB procurement (save time and money on procurement process)
3. Depending on the actual provisions in the contract, risk transfer to DBO proponents (cost, schedule and performance) while maintaining some level of control over the project.
4. Allows for innovation in design, construction and operation of the facility.
5. Fixed project cost upfront as opposed to market price changing throughout the project milestones.
6. Operations team input during design stage.
7. Cost of project potentially amortized over a longer term period (capital cost spread out over operation contract)

DBO disadvantages

1. Determining whether a DBO is appropriate for this project may take time and expense (e.g. preparation of value for money analysis)
2. Costs of negotiating and drafting the DBO project documents can be significant.
3. Requirements for electoral assent (EA) prior to entering into DBO agreement.
4. EA may discourage proponents from submitting bids.
5. Additional time and resources required to conduct an EA process.
6. Similar process to the already unsuccessful DB process, but more complex.
7. Greater uncertainty on cost, schedule, selected technology and ultimately the ability to secure a preferred DBO team for the project.
8. Lack of extended organizational familiarity with the process.
9. Unlikely to attract local bidders.
10. Could result in higher cost due to risk priced in exchange for obtaining a fixed price in current uncertain times.
11. Risk of procurement process failing with no direct salvageable value left in the procurement documents.
12. Risk of time wasted if not successful.
13. Loss of operational control.
14. Complexities with tipping fee structure
15. Potential for increased tipping fee if additional capital costs are to be recouped through the operation's period.

DBB advantages	**DBB disadvantages**
1. Familiar process for staff and the local marketplace. 2. Provides more control over design, construction and operations. 3. More chances of attracting local contractors. 4. Potentially cheaper project cost due to lack of risk premiums. 5. DBB does not require electoral assent (EA). 6. Work can be partially staggered (i.e. work on construction procurement documents during the later stages of design, work on operations procurement during the construction period). 7. More consistent with the intended path for the Transfer Station procurement. Opportunities for the two projects to be lumped together to achieve efficiency during the construction period. 8. Transferability of the indicative design from the existing DB procurement (save time and money on procurement process).	1. The CSWM service bears the risks for design errors 2. Lack of input from construction/ operations teams during the design or planning stage. 3. Lack of efficiency from a timing perspective (sequential design and construction results in longer schedules) 4. Rigid process, may not allow for innovation. 5. More work on staff to manage multiple procurement processes as well as design and construction. 6. Construction costs unknown until contract award (lack of fixed cost of project upfront for accurate budgetary/affordability purposes).

The Road to Regional Organics

Fall 2019
Board decision – siting the facility

Winter 2020
Public consultation

September 2020
Board direction on procurement

Winter 2021
Facility design

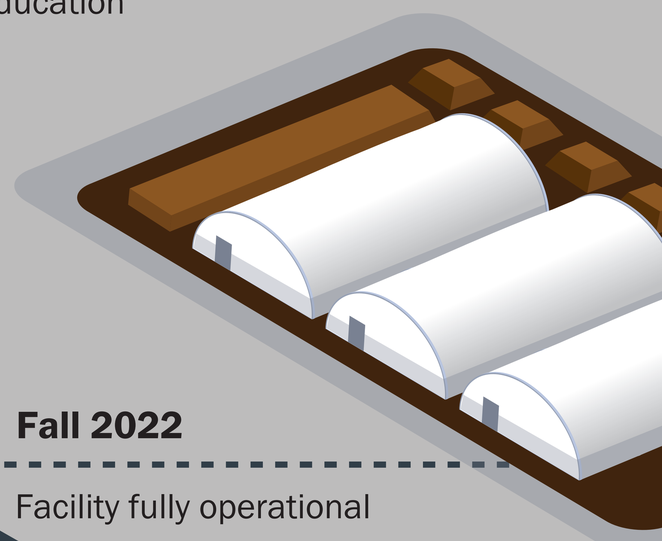
Spring 2021
Public consultation - design

Spring - Summer 2021
Regulatory approvals

Fall 2021
Construction

Winter - Spring 2022
Public education

Summer – Fall 2022
Phased in curbside collection and commissioning



Fall 2022
Facility fully operational

Appendix E – "Regional organics processing facility – Site layout"
CAMPELL RIVER WASTE MANAGEMENT CENTRE (BLOCK J)