TECHNICAL AND COMMUNITY ADVISORY COMMITTEE
CORE AREA WASTEWATER TREATMENT

Notice of Meeting on **Wednesday May 22, 2024 at 1:30 pm**
Online only through Microsoft Teams

Brenda Donald	Don Monsour	Jas Paul	Katie Wilson	Steve Rennick
Caterina Valeo	Doug Kobayashi (Vice-Chair)	Jim McAloon (CRD)	Lesley Hatch	Winona Pugh
Christopher Coleman (Chair)	Glenn Harris (CRD)	Joel Clary	Lori Nickerson (CRD)	
Claire Remington	Greg Gillespie	John Roe	Michael Engelsjord	
Dale Green (CRD)	Ivan Leung	Josh Andrews	Peter Kickham (CRD)	

AGENDA

1. Territorial Acknowledgement
2. Approval of Agenda
3. Adoption of Minutes of March 14, 2024
4. Chair's Remarks
5. Review of Long-Term Biosolids Management Plan – Peter Kickham
   a. Update to long-term management options format
   b. Public consultation update – Katie Hamilton
   c. First Nations engagement summary
   d. Process and next steps
6. Draft Amendment 13 (Inflow and Infiltration and Sanitary Overflows) – update on process and next steps – Dale Green
7. Next meeting(s): None currently booked, may need additional meetings pending the outcome of provincial review.
8. Closing Comments
9. Adjournment

Attachments: May 8, 2024 CRD Board Agenda Cover
May 8, 2024 CRD Board Agenda Items 7.1 and 7.2

Notice of Meeting and Meeting Agenda
Capital Regional District Board

Wednesday, May 8, 2024 **1:10 PM** **6th Floor Boardroom, 625 Fisgard Street, Victoria, BC**

The Capital Regional District strives to be a place where inclusion is paramount and all people are treated with dignity. We pledge to make our meetings a place where all feel welcome and respected.

1. TERRITORIAL ACKNOWLEDGEMENT

2. APPROVAL OF THE AGENDA

3. ADOPTION OF MINUTES

3.1. 24-443 Minutes of the April 10, 2024 Capital Regional District Board Meeting

Recommendation: That the minutes of the Capital Regional District Board meeting of April 10, 2024 be adopted as circulated.

Attachments: Minutes - April 10, 2024

4. REPORT OF THE CHAIR

5. PRESENTATIONS/DELEGATIONS

5.1. Presentations

5.2. Delegations

5.2.1. 24-480 Delegation - Andrea Miller; Resident of View Royal: Re: 6.13. Motion with Notice: Policy to Limit Bear Attractants (Director Tobias)

5.2.2. 24-481 Delegation - Melanie Austin; Resident of View Royal: Re: 6.13. Motion with Notice: Policy to Limit Bear Attractants (Director Tobias)

5.2.3. 24-482 Delegation - Dr. Philippe Lucas; Representing Biosolid Free BC: Re: Agenda Item: 7.2. Long-Term Biosolids Management Strategy

5.2.4. 24-485 Delegation - Jonathan O'Riordan; Mt. Work Coalition: Re: Agenda Item: 7.2. Long-Term Biosolids Management Strategy

5.2.5. 24-490 Delegation - Mollie Cameron; Representing Wild Wise: Re: Agenda Item: 6.13. Motion with Notice: Policy to Limit Bear Attractants (Director Tobias)

6. CONSENT AGENDA

6.1. 24-450 Governance Study of Magic Lake Estates, North Pender Island

Recommendation: There is no recommendation. This report is for information only.

Attachments: Staff Report: Governance Study of MLE, N. Pender Island
Appendix A: Services Scatterplot - Satisfaction vs. Importance
Appendix B: MLE Community Issues Assessment

6.2. 24-398 Solid Waste Management Plan - 2023 Progress Report

Recommendation: There is no recommendation. This report is for information only.

Attachments: Staff Report: SWMP - 2023 Progress Report
Appendix A: SWMP - 2023 Progress Report
Presentation: 2023 SWMP Progress Report

6.3. 24-396 Amendment to Environmental Resource Management Capital Plan

Recommendation: The Environmental Services Committee recommends to the Capital Regional District Board:
1. That an advancement of $500K from the 2025 Aggregate capital budget to the 2024 capital budget be approved; and
2. That the budget for the 2024 capital project Kitchen Scraps Transfer Station Relocation be increased by $800K to ensure a contract can be awarded at the completion of the procurement process.
(WP - All)

Attachments: Staff Report: Amendment to ERM Capital Plan

6.4. 24-278 Capital Regional District 2023 Audit Findings Report and Statement of Financial Information

Recommendation: The Finance Committee recommends to the Capital Regional District Board:
That the Capital Regional District 2023 Statement of Financial Information be approved.
(NWA)

Attachments: Staff Report: CRD 2023 Audit Findings Report SOFI
Presentation: 2023 SOFI
Appendix A: 2023 SOFI
Appendix B: Unaudited Statements
Appendix C: Other Financial Stmt Analysis
Appendix D: DBRS Rating Methodology
Appendix E: 2023 Financial Performance Measures
Appendix F: Audit Findings Report
Appendix G: Management Letter

6.5. 24-307 Capital Regional District External Grants Update

Recommendation: There is no recommendation. This report is for information only.

Attachments: Staff Report: CRD External Grants Update

Appendix A: External Grants Dashboard

Appendix B: Grant Alerts

6.6. 24-288 Capital Regional District External Grants 2023 Annual Report

Recommendation: There is no recommendation. This report is for information only.

Attachments: Staff Report: CRD External Grants Annual Report

Appendix A: CRD External Grants Activity 2023

Appendix B: GCF - Regional Electoral Projects

Appendix C: Safe Restart for Local Government

Appendix D: Status of Grants-Funded Projects

Appendix E: Grant Alignment Community Needs

6.7. 24-314 Royal and McPherson Theatre Services Advisory Committee Terms of Reference

Recommendation: The Finance Committee recommends to the Capital Regional District Board:
That the 2024 Royal & McPherson Theatres Advisory Committee Terms of Reference attached at Appendix A be approved.
(NWA)

Attachments: Staff Report: RMTSAC 2024 ToR

Appendix A: RMTSAC 2024 ToR_redline version

6.8. 24-355 First Nations Relations Operational Update

Recommendation: There is no recommendation. This report is for information only.

Attachments: Staff Report: First Nations Relations Operational Update

6.9. 24-354 Government-to-Government Relationship Building Initiative Summary Report

Recommendation: The First Nations Relations Committee recommends to the Capital Regional District Board:
That staff incorporate the Government-to-Government Relationship Building Summary Report themes and recommendations into the development of a Reconciliation Action Plan.
(NWA)

Attachments: Staff Report: Gov-to-Gov Relationship Building Initiative Summary Report

Appendix A: Gov-to-Gov Relationship Building Initiative Summary Report

6.10. 24-440 Juan de Fuca Water Distribution 2024 Capital Plan Amendment

Recommendation: The Juan de Fuca Water Distribution Commission recommends that the Capital Regional District Board:
Approve amending the 2024 Juan de Fuca Water Distribution Five Year Capital plan to reallocate funding for projects 16-05, 20-03, 21-02, 24-02 and 24-03 as outlined in Table 1 of the staff report and reflected in the updated Capital Plan shown in Appendix A.
(WP - Colwood, Highlands, Langford, Metchosin, Sooke, View Royal, JDF)

Attachments: Staff Report: Juan de Fuca Water Dist. 2024 Capitals Plan Amendment
Appendix A: Updated 2024-2028 JDF Water Dist. Service Five Year Cap. Plan

6.11. 24-420 Regional Parks and Trails - 2023 Strategic Plan Progress Report

Recommendation: There is no recommendation. This report is for information only.

Attachments: Staff Report: Regional Parks & Trails - 2023 Strategic Plan Progress Report
Appendix A: 2023 Regional Parks & Trails Strategic Plan Progress Report
Presentation: 2023 Regional Parks & Trails Strategic Plan Progress Report

6.12. 24-404 Regional Parks and Trails - Compliance and Enforcement Program

Recommendation: [At the April 24, 2024 Regional Parks Committee meeting, this report was presented for information and the following motion arising was carried:]
The Regional Parks Committee recommends to the Capital Regional District Board:
That staff bring a report and recommendation to the Regional Parks Committee on formalizing an indigenous guardian program in parks at the governance level.
(NWA)

Attachments: Staff Report: RP&T - Compliance and Enforcement Program
Appendix A: 2022-2023 CRD RP&T Compliance and Enforcement Summary

6.13. 24-368 Motion with Notice: Policy to Limit Bear Attractants (Director Tobias)

Recommendation: The Regional Parks Committee recommends to the Capital Regional District Board:
That the CRD Staff work with municipalities to develop a consistent policy and bylaw to limit attractants to prevent bear - human interaction toward an outcome of co-existence particularly in those areas frequently visited by bears.
(NWA)

6.14. 24-401 Transportation Governance Update

Recommendation: There is no recommendation. This report is for information only.

Attachments: Staff Report: Transportation Governance Update

6.15. 24-402 Mass Transit Modelling and Climate Impacts

Recommendation: There is no recommendation. This report is for information only.

Attachments: Staff Report: Mass Transit Modelling and Climate Impacts

6.16. [24-427] Notice of Motion: BC Transit Bi-Annual Updates on Initiatives and Services (Director Plant)

Recommendation: The Transportation Committee recommends to the CRD Board:
That the CRD invite BC Transit representatives to present bi-annually (twice a year) to the Transportation Committee on regional and subregional initiatives and services. (NWA)

7. ADMINISTRATION REPORTS

7.1. [24-464] Biosolids Monthly Update - May

Recommendation: There is no recommendation. This report is for information only.

Attachments: Staff Report: Biosolids Monthly Update - May

7.2. 24-369 Long-Term Biosolids Management Strategy

Recommendation: That the CRD Board:
1. Endorse the following portfolio of options in alignment with the Long-Term Biosolids Management Strategy (prepared by GHD, April 2024), utilizing each option under a prioritization structure, as follows:
(a) Tier 1: Advanced thermal option: Constitutes the preferred long-term solution and will be pursued concurrently with options in other tiers. Current projects include:
(i) Develop a demonstration facility for advanced thermal processing, as planned. Outcomes from the demonstration project will serve as the basis for a scaled, long-term solution.

(b) Tier 2: Out-of-region compliance options: Constitute measures that the CRD will utilize to ensure regulatory compliance is continuously achieved while the Tier 1 thermal processing option is being implemented and when options in Tier 1 are unable to process the totality of biosolids produced in the region. These are (in priority order):
(i) Industrial land reclamation such as mine and quarry sites (acknowledging that some reclaimed sites may eventually have a pasture land end use)
(ii) Forest fertilization
(iii) Production of biosolids growing medium and/or feedstock in soil production
(iv) Partnerships with established biosolids programs
(v) Continue alternative fuel combustion in the cement manufacturing facility in Richmond, BC. Prioritize this option when available.

(c) Tier 3: In-region contingency options: Constitute contingency options to ensure compliance with regulatory requirements. The CRD would implement Tier 3 options on a contingency basis, only when options within the Tier 2 portfolio are unavailable. These include (in priority order):
(i) Industrial land reclamation such as mine and quarry sites (acknowledging that some reclaimed sites may eventually have a pasture land end use)
(ii) Forest fertilization
(iii) Maintain the option of biosolids application in engineered cover systems at Hartland Landfill to act as an emergency support option; subject to space availability and cover needs of the Landfill;

2. Direct staff to continue to explore biosolids beneficial use opportunities with those First Nations that express interest both in-region and out-of-region, and to address any concerns First Nations may have regarding the beneficial use options;

3. Refer the Draft Long-Term Biosolids Management Strategy and portfolio of options to the TCAC for review and comment;

4. Post the Draft Long-Term Biosolids Management Strategy and portfolio of options on the CRD webpage for 21 days (May 13-June 3) for First Nations and public review and comment; and

5. Direct staff to bring back the comments received during the 21-day posting period from the TCAC, First Nations and public, along with a final Long-Term Biosolids Management Strategy and portfolio of options for the Board's consideration and approval at the June 12, 2024 Board meeting, for submission to the Province by June 18, 2024.

(WP - Colwood, Esquimalt, Langford, Oak Bay, Saanich, Victoria, View Royal)

Attachments:
Staff Report: Long-term Biosolids Management Strategy
Appendix A: Long-Term Options for the Beneficial Use of Biosolids - Tavola
Appendix B: LT Biosolids Management Plan - FN Engagement
Appendix C: TCAC - LT Biosolids Management Strategy Pres.
Appendix D: GHD Technical Memo: LT Biosolids Beneficial Use Strategy
Appendix E: Biosolids - Class A Biosolids Analysis - April 2024
Presentation: Long-term Biosolids Management Strategy

7.3. 24-452 Capital Region Housing Corporation Annual General Meeting

Recommendation: That the unanimous shareholder's resolution attached as Appendix A to the Capital Region Housing Corporation Annual General Meeting report be approved, and the Chair and Corporate Officer execute it on behalf of the Capital Regional District. (NWA)

Attachments:
Staff Report: CRHC Annual General Meeting
Appendix A: Unanimous Resolution of the CRHC Shareholders
Appendix B: CRHC 2023 Audited Financial Statements
Appendix C: CRHC 2023 Annual Report

7.4. 24-463 Capital Regional District 2023 Annual Report

Recommendation: There is no recommendation. This report is for information only.

Attachments:
Staff Report: Capital Regional District 2023 Annual Report
Appendix A: Capital Regional District 2023 Annual Report

8. REPORTS OF COMMITTEES

Finance Committee

8.1. 24-286 2025 Service and Financial Planning Guidelines

Recommendation: The Finance Committee recommends to the Capital Regional District Board:
That the service and financial planning guidelines be approved and that staff be directed to prepare the draft financial plan review based on the timeline presented. (NWA)

Attachments:
Staff Report: 2025 Service & Financial Guidelines
Appendix A: Corporate Planning Framework
Appendix B: Financial Planning Timetable
Appendix C: Financial Management Strategies
Appendix D: 5-Year Consolidated Req Forecast

8.2. 24-433 Bylaw No. 4614: 2024 to 2028 Financial Plan Bylaw, 2024, Amendment No. 1, 2024

Recommendation: The Finance Committee recommends to the Capital Regional District Board:
1. That Bylaw No. 4614, "2024 to 2028 Financial Plan Bylaw, 2024, Amendment Bylaw No. 1, 2024", be introduced and read a first, second, and third time; and
(WA)
2. That Bylaw No. 4614 be adopted.
(WA, 2/3rds on adoption)

Attachments: Staff Report: Bylaw No. 4614, 2024-2028 Fin Plan Amend No.1, 2024

Appendix A: Bylaw No. 4614

Environmental Services Committee

8.3. 24-382 Climate Action Strategy - 2023 Progress Report

Recommendation: [At the April 17, 2024 Environmental Services Committee meeting, this report was presented for information and the following motion arising was carried:]
The Environmental Services Committee recommends to the Capital Regional District Board:
That staff be directed to report back on options for reducing corporate transportation and building emissions, including Capital Region Housing Corporation buildings, and advise on options for advancing a corporate and regional adaptation strategy.
(NWA)

Attachments: Staff Report: Climate Action Strategy - 2023 Progress Report

Appendix A: 2023 Climate Action Progress Report

Presentation: 2023 Climate Action Progress Report

8.4. 24-406 Biosolids Literature Review - Update

Recommendation: [At the April 17, 2024 Environmental Services Committee, the staff recommendation was not moved. Instead, an alternative committee member motion (#1) was moved followed by a motion arising (#2) and carried as follows:]
The Environmental Services Committee recommends to the Capital Regional District Board:
1. Direct staff to continue the process of identifying suitable academic researchers to undertake an independent biosolids literature review, and report back to the Environmental Services Committee.
2. That staff be directed to proceed with an independent unbiased legal review of the risks associated with the land application of biosolids.
(NWA)

Attachments: Staff Report: Biosolids Literature Review - Update

Appendix A: Biosolids Literature Review - Terms of Reference

Electoral Areas Committee

8.5. 24-150 Bylaw No. 4592 to Expand Otter Point Fire Protection and Emergency Response Local Service Area Boundary (Bylaw No. 2042)

Recommendation: The Electoral Areas Committee recommends to the Capital Regional District Board:
1. That the attached Certificate of Results of the petitions to expand the service area boundary for the Otter Point Fire Protection and Emergency Response Service be received;
(NWA)
2. That Bylaw No. 4592, "Otter Point Fire Protection and Emergency Response Local Service Establishment Bylaw No. 1, 1992, Amendment Bylaw No. 8, 2024", be read a first, second, and third time; and
(NWA)
3. That elector approval be obtained by Electoral Area Director consent on behalf.
(NWA)

Attachments: Staff Report: BL 4592 to Expand OPF Prot'n & Emerg. Resp. Bndry.

Appendix A: Map Proposed OPF Prot'n Area Amendment

Appendix B: Certificate of Results of the Petitions

Appendix C: Bylaw No. 4592

8.6. 24-334 Fire Services Governance Review Report - 2024 - 2027 Implementation Plan and Draft Bylaw 4608 to Amend Bylaw 3654 for Fire Commissions

Recommendation: The Electoral Areas Committee recommends to the Capital Regional District Board:
1. That the 2024-2027 Fire Services Governance Review Implementation plan be approved; and
(WP - JDF, SSI, SGI)
2. That Bylaw No. 4608, "Fire Protection and Emergency Response Service Commissions Bylaw, 2010, Amendment Bylaw No. 2, 2024" be given first, second and third reading; and
(NWA)
3. That Bylaw No. 4608 be adopted.
(NWA, 2/3rds on adoption)

Attachments: Staff Report: Fire Svcs Governance Review Rpt-2024-27 Implementation Plan

Appendix A: Fire Svcs Governance Review Recommendations

Appendix B: Bylaw No. 4608

Appendix C: Redlined Consolidated Bylaw No. 3654

8.7. 24-237 Request for Inclusion of Property in the Ganges Sewer Service Area

Recommendation: The Ganges Sewer Local Services Commission recommends the Electoral Area Committee recommend to the Capital Regional District Board:
1. To expand the boundary of the Ganges Sewer Local Service Area to include 105 Kilner Road;
2. The Applicant agrees to pay for all costs to include the property into the service area, and also pays the capacity purchase charge;
3. The Applicant agrees to pay all engineering, administration, permit fees, and construction costs associated with the extension of the sewer and connection to the existing sewer and the property;
(NWA)
4. That Bylaw 4601, "Salt Spring Island Ganges Sewerage Local Service Establishment Bylaw, 1991, Amendment Bylaw No. 14, 2024, be introduced and read a first, second and third time.
(NWA)

Attachments: Staff Report: Request for Inclusion of Property in the Ganges Sewer Svc Area

Appendix A: SSI Community Services – Application Cover Letter, Dec 5, 2022

Appendix B: Bylaw No. 4601

Committee of the Whole

8.8. 24-453 Board Priorities Annual Check In

Recommendation: The Committee of the Whole recommends to the Capital Regional District Board:
1. That the current level of effort on Board Priorities be maintained; and
2. That staff, through the service and financial planning processes, provide recommendations on funding, timing and service levels for 2025 in accordance with 2023-2026 Board Priorities and Corporate Plan.
(NWA)

Attachments: Staff Report: Board Priorities Annual Check In

Presentation: 2023-2026 Board Priorities Annual Strategic Check In

Appendix A: 2023-2026 CRD Corporate Plan

Appendix B: 2023-2026 Board Priorities – Progress Report (2023)

Appendix C: 2023-2026 Corporate Plan – Progress Report (2023)

Appendix D: Staff Report: Regional Growth Strategy Indicators

9. BYLAWS

10. NOTICE(S) OF MOTION

11. NEW BUSINESS

12. MOTION TO CLOSE THE MEETING

12.1. 24-445 Motion to Close the Meeting

Recommendation: 1. That the meeting be closed for Appointments in accordance with Section 90(1)(a) of the Community Charter. [1 item]
2. That the meeting be closed for Employee Relations in accordance with Section 90(1)(c) of the Community Charter. [1 item]
3. That the meeting be closed for the Expropriation of Land in accordance with Section 90(1)(e) of the Community Charter. [1 item]
4. That such disclosures could reasonably be expected to harm the interests of the Regional District. [1 Item]
5. That the meeting be closed for intergovernmental negotiations in accordance with Section 90(2)(b) of the Community Charter. [2 Items]

13. RISE AND REPORT

14. ADJOURNMENT

Votinq Key:
NWA - Non-weighted vote of all Directors
NWP - Non-weighted vote of participants (as listed)
WA - Weighted vote of all Directors
WP - Weighted vote of participants (as listed)

REPORT TO CAPITAL REGIONAL DISTRICT BOARD
MEETING OF WEDNESDAY, MAY 08, 2024

SUBJECT **Biosolids Monthly Update – May**

ISSUE SUMMARY

To provide a monthly update to the Board on the status of the short-term options for biosolids management, as well as progress on the advanced thermal pilot project. The Long-term Biosolids Beneficial Use Strategy will be reported under separate cover.

BACKGROUND

The Capital Regional District (CRD) has been responsible for the beneficial use of Class A biosolids produced at the Residuals Treatment Facility since the commissioning of the core area wastewater treatment project in 2020. Currently, the CRD is operating under the Short-term Biosolids Management Plan (2020-2025), with the primary beneficial use options being incineration as an alternative fuel in a cement manufacturing plant in Richmond, BC, and integration with landfill cover systems as contingencies. When neither of these options are available, landfilling biosolids at Hartland Landfill has been the only alternative. In 2011, the CRD Board passed a resolution to ban the land application of biosolids from CRD facilities; however, in 2023, given the operational and logistical challenges with the short-term plan, the CRD Board amended its position to allow limited non-agricultural land application of biosolids as a contingency option. The CRD has secured the use of biosolids for industrial land reclamation at a quarry near Cassidy, BC. Staff continue to seek additional short-term beneficial use contingency options, in order to limit or avoid landfilling of biosolids when the other options are not available.

The CRD is also required to develop a Long-term Biosolids Beneficial Use Strategy by June 2024. Plan development has included input from the Technical and Community Advisory Committee, First Nations engagement and public consultation.

Short-term Biosolids Management Plan Implementation

Land Reclamation in Cassidy, BC: The quarry received the majority of biosolids produced in April. Biosolids are blended with sand and are being stored by the landowner under cover, pending regulatory approval for mixing and placement of biosolids growing medium (BGM), in accordance with the *Organic Matter Recycling Regulation* and approvals under the *Mines Act.* The quarry has capacity to accept 2,000 cubic metres in 2024 and received approximately 500 cubic metres through April.

Cement Kiln in Richmond, BC: The cement facility received one load (25 tonnes) of biosolids in early April, but an equipment malfunction occurred shortly after offloading that has prevented additional deliveries. The equipment is expected to be repaired in late May.

Landfilling at Hartland Landfill: In April, no biosolids were landfilled. Landfilling is not a beneficial use, as per provincial and federal expectations, and consumes valuable airspace at the landfill.

Second Quarry Site in the Regional District of Nanaimo: As reported last month, the CRD has been approached by a site operator of a second gravel quarry within the Regional District of

Nanaimo to receive CRD Class A biosolids for site reclamation. This option in on hold pending further consultation with First Nations and the Regional District of Nanaimo.

Composting Facilities in Parksville/Port Alberni/Chemainus: An operator of various composting facilities on southern Vancouver Island has expressed interest in receiving CRD biosolids and either mixing into BGM or co-composting with other organic feedstocks. Finished BGM or compost is sold wholesale throughout southern Vancouver Island. With Board approval, this is a viable short-term option for the program.

Provincial (Organic Matter Recycling Regulation) Technical Working Group (TWG) Review: In 2023, the provincial Ministry of Environment and Climate Change Strategy conducted a review of the Organic Matter Recycling Regulation, including an evaluation of emerging contaminants of concern in the context of land application. The TWG completed its work in late 2023; the final report is expected to be released in May. The Ministry has not altered its regulatory direction at this time. As per Board Direction in March, staff brought forward options to undertake an independent literature review at the April 17, 2024 Environmental Services Committee meeting, and Committee recommendations on completing independent literature and legal reviews are being presented to the Board under separate cover.

Letter to Minister Requesting Meeting: On March 19, the CRD Board Chair, as directed by the Board, sent a letter to the Minister of the Environment & Climate Change Strategy, requesting a meeting to discuss the extension of the submission deadline for the Long-Term Biosolids Beneficial Use Strategy. The CRD Board Chair was scheduled to meet with the Minister on May 6, 2024.

Advanced Thermal Pilot Project Status

The CRD hired GHD as the technical advisor to support staff to develop terms and technical requirements for a Request For Proposals (RFP) for a demonstration plant. The advisor has begun working on the technical specifications, and it is anticipated that the RFP for the demonstration plant will be issued in Q2, with a preferred proponent selected in Q3-Q4 2024.

CONCLUSION

The Capital Regional District continues to implement the Short-term Biosolids Management Plan while also developing the draft Long-term Biosolids Management Plan. The short-term program continues to experience operational challenges and there is inadequate contingency capacity to ensure the sustainable beneficial use of biosolids. Staff are currently exploring additional contingency options to support short-term and long-term operations.

RECOMMENDATION

There is no recommendation. This report is for information only.

Submitted by:	Glenn Harris, Ph.D., R.P.Bio., Senior Manager, Environmental Protection
Concurrence:	Luisa Jones, MBA, General Manager, Parks, Recreation & Environmental Services
Concurrence:	Ted Robbins, B. Sc., C. Tech., Chief Administrative Officer

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EHQ 24-29

REPORT TO CAPITAL REGIONAL DISTRICT BOARD
MEETING OF WEDNESDAY, MAY 08, 2024

SUBJECT **Long-term Biosolids Management Strategy**

ISSUE SUMMARY

The Capital Regional District (CRD) is required to submit a long-term biosolids management strategy to the BC Ministry of Environment and Climate Change Strategy by June 18, 2024 as a requirement of the CRD's commitments under the Core Area Liquid Waste Management Plan.

BACKGROUND

The CRD submitted Amendment No. 11 to the Core Area Liquid Waste Management Plan (CALWMP) to the Ministry of Environment and Climate Change Strategy (ENV) in 2016, committing to the determination of a long-term management strategy for the beneficial use of biosolids produced at the Residuals Treatment Facility (RTF), that would be built as part of the Core Area Wastewater Treatment Program that was commissioned in 2020. ENV approved the Amendment, requiring the CRD to develop a Definitive Plan for biosolids by 2019 that outlined a short-term (2020-2025) plan for the beneficial use of the Class A biosolids, as well as a long-term beneficial use strategy.

In 2019, the Minister of Environment and Climate Change Strategy approved the CRD Biosolids Beneficial Use Strategy, forming part of the CALWMP (Amendment 11) with short-term and long-term conditions. For the Long-Term Strategy, there were three specific conditions noted, as follows:

a) The CRD must include land application in the options analysis and conduct consultation for the long-term biosolids strategy that is intended to be implemented by January 1, 2025.
b) Options considered should include a range of beneficial uses including, but not limited to, forestry (for example: fertilizer/soil conditioner), reclamation (for example: mines), landfill closure and agriculture.
c) Consultation process must include citizens, local government, and Indigenous communities within the CRD.

The short-term plan had a primary focus to provide biosolids to a cement manufacturing plant in Richmond, BC, as an alternative fuel source for its kiln operations. A supplement to the short-term plan has been the beneficial use of biosolids as a cover material at the regional landfill. Due to significant maintenance, operational and economic challenges at the cement plant, and limited space for cover material, as previously reported, a significant volume of biosolids has been landfilled under emergency measures, which is out of compliance with provincial regulatory direction, while other possible short-term contingency alternatives are explored.

In July 2011, prior to introducing wastewater treatment in the core area, the CRD Board passed a resolution to ban the production and land application of biosolids at CRD facilities and parks, and on farmland in the CRD, based on public health and environmental concerns raised by members of the public. In 2023, due to ongoing challenges with existing options, the CRD Board amended the land application ban to allow for out-of-region, non-agricultural application of biosolids as a short-term contingency alternative.

As of 2023, the RTF produces approximately 10 tonnes of dried biosolids per day, or 3,650 tonnes per year. This volume will increase over time with population growth and the incorporation of residuals from other wastewater treatment plants in the region.

PREPARING THE LONG-TERM BIOSOLIDS MANAGEMENT STRATEGY

ENV requires submission of a long-term biosolids strategy by June 18, 2024, with the expectation that all biosolids be beneficially used through a range of options, in accordance with provincial regulation. Current technical information, public consultation and First Nations engagement outcomes are key components of a Long-Term Biosolids Management Strategy.

The CRD retained a technical consultant, GHD, who provided a long-term biosolids management options analysis report, which was presented to the Environmental Services Committee in July 2023. In addition to including the options analysis, the report contained an updated review of international biosolids management practices and a summary and evaluation of the advanced thermal (gasification and pyrolysis) pilots procured in 2022.

The production, distribution, storage, sale and usage of biosolids are regulated under the BC Organic Matter Recycling Regulation (OMRR), which includes minimum standards for biosolid product quality (vector attraction reduction, pathogen and heavy metals limits) and land application practices (e.g., nutrient loading and erosion control). The biosolids from the RTF are characterized as Class A, under Section 3.2.6 of the OMRR, which regulates the production and beneficial use of compost and biosolids.

In 2023, ENV conducted a review of the OMRR, including an evaluation of emerging contaminants of concern in the context of land application. The technical working group assigned to this task completed its work in late 2023; the final report is expected to be released in May. ENV has not altered its regulatory direction at this time. On March 13, 2024, the CRD Board directed staff to reinitiate consideration of a legal liability review and a scientific literature review of biosolids land application, given the recent delays in reports supporting the current OMRR review. Staff brought forward options to undertake an independent literature review at the April 17, 2024 Environmental Services Committee meeting, and Committee recommendations on completing independent literature and legal reviews are being presented to the Board under separate cover.

On March 19, 2024, the CRD Board Chair, as directed by the Board, sent a letter to the Minister of Environment & Climate Change Strategy, requesting a meeting to discuss the extension of the submission deadline for the Long-Term Biosolids Beneficial Use Strategy. The CRD Board Chair was scheduled to meet with the Minister on May 6, 2024.

Public Consultation Summary

Public engagement on the Long-term Biosolids Management Strategy occurred from January 11 to March 6, 2024. Despite the CRD Board's 2011 resolution banning the land application of biosolids, several land application options were included for public consideration, in accordance with explicit direction from the provincial regulator. The consultation process was commissioned to the Tavola Strategy Group ("Tavola") for design and implementation. Tavola followed a comprehensive approach to encourage broad public participation and capture their feedback. The process included:

- A project engagement page on the CRD's website with detailed background information, including context on provincial regulatory requirements and the Board's direction on land application.
- An online survey ("CRD Survey") hosted on the CRD's project engagement page. The CRD Survey rendered 569 responses.
- A representative survey ("Ipsos Survey") of 516 residents across the region, designed and facilitated by market research and public opinion specialist, Ipsos.
- A virtual open house on February 20, 2024, which included presentations from CRD staff and the technical consultant, as well as a moderated question-and-answer period. Approximately 59 participants attended the virtual event.
- Various avenues to submit comments, pose questions and receive answers.
- A subscription service to allow receipt of information added to the site as the engagement period progressed.

Tavola's Summary Consultation Report summarizing the public engagement is attached as Appendix A. Key themes heard from the public during the public engagement are:

- Respondents to both the Ipsos representative survey and the CRD survey indicated that *Environmental Impacts [air, water and soil contaminants]* were the most important consideration when planning for the beneficial use of biosolids. Costs, climate/greenhouse gas emissions and community impacts (truck traffic, odour and noise emission, dust) were less important.

- The two surveys solicited very different results when it came to support for long-term biosolids management options.
  - The Ipsos survey indicates the broader general public is supportive of all options, while respondents to the CRD survey have substantial levels of opposition to most options other than Advanced Thermal, with the least support for bagged fertilizer for residential use and agricultural fertilizer.
  - For this research, Ipsos conducted an online panel survey of 516 adult (18+ years) CRD residents. The final data has been weighted to ensure that the gender/age and regional distribution reflects that of the actual population in the CRD according to 2021 Census data. The precision of Ipsos online polls is measured using a credibility interval. In this case, the poll is accurate to within ±4.9 percentage points, 19 times out of 20, of what the results would have been had all adult CRD residents been polled.
  - Ipsos provided respondents with background information related to biosolids (including regulatory context and the Board's ban on land application).

The most popular option (advanced thermal) in the CRD survey was the least popular for the broader general public in the Ipsos survey. The level of opposition to all options was higher in the CRD survey.

- The concerns associated with various options varied depending on the survey. The level of opposition to all options and associated concerns were much greater in the voluntary CRD survey, than in the Ipsos representative survey. Many respondents to the CRD survey expressed concerns related to the potential contaminants (e.g., PFAS) and potential health and environmental risks of land application. Many respondents in the CRD survey felt land application options are not a "beneficial-use" due to potential risks, and advanced thermal/biochar options are the most effective method to reduce risks of biosolids.

- Many respondents who submitted correspondence, attended the open house and participated in the CRD survey would like more detail about plans, progress and timelines towards piloting advanced thermal options, and more information about the testing, scientific research and risks associated with land applying biosolids. Some would also like to better understand the cost benefit analysis of options and the feasibility, experience and case studies of various options in other jurisdictions.

First Nations Consultation Summary

First Nations consultation on the Long-term Biosolids Management Strategy is ongoing. CRD commissioned the design and facilitation of the initial outreach to 50th Parallel Public Relations ("50th Parallel"). Nineteen First Nations were provided the following opportunities for input over the last two months:

- attending separate in-person and virtual open houses
- participation in an online survey
- open invitation to meet with staff at any time regarding biosolids management planning.

To date, staff have had discussions on the topic of biosolids management with representatives from the Pacheedaht, T'Souke and Pauquachin Nations. CRD staff provided a brief presentation and overview of the wastewater treatment project and resulting requirement to beneficially use biosolids. Staff also presented the full suite of available options for biosolids management, including various land application scenarios, incineration and advanced thermal treatment. Staff also highlighted the concern raised by several groups regarding land application of biosolids.

The 50th Parallel report summarizing the First Nations engagement is attached as Appendix B. The overarching themes expressed by the First Nations included:

- a clear expectation of CRD to engage further with the Nations on any land application projects across the region
- questions regarding scenarios relevant to their traditional territories
- general questions regarding options

Opportunities to provide input are ongoing, and all feedback received will be provided to the Province with the CRD's submission of the Long-Term Biosolids Management Strategy. Following approval of the Long-term Strategy, further engagement with First Nations will be pivotal in the development of specific land application projects located on their traditional territories.

Technical and Community Advisory Committee

In September 2023, staff reconvened the Technical and Community Advisory Committee (TCAC) to advise on several liquid waste management issues, including biosolids management. The presentation materials provided to the TCAC are attached as Appendix C. The TCAC assessed and ranked all beneficial use options. All options had majority support, with the following order of preference (highest to lowest): industrial land reclamation, forest fertilization, wholesale distribution, residential use, advanced thermal, combustion/incineration and agricultural. While some comments and concerns were raised about land application contaminant risks, the TCAC generally felt that the nutritive value in biosolids outweighed the contaminant risks; agricultural land application had the lowest level of TCAC support due to these contaminant concerns. In addition, concerns were raised about the greenhouse gas implications, cost/benefit and feasibility of the advanced thermal option. Greenhouse gas concerns were also raised for the combustion/incineration option.

DRAFT LONG-TERM BIOSOLIDS MANAGEMENT STRATEGY

The CRD retained a technical consultant, GHD, to prepare a draft long-term biosolids beneficial use strategy. GHD assessed all available beneficial use options and provided an options analysis report, which was presented to the Board on August 9, 2023. Based on its analysis, GHD recommended that the CRD pursue a portfolio of biosolids management options to ensure beneficial use of biosolids is resilient and sustainable into the future. This is consistent with the CRD's experience to date with options that are not continuously available or reliable, as well as a review of the experiences of other jurisdictions.

Based on:

- the Minister of Environment and Climate Change Strategy's direction and provincial requirements
- the CRD Board's ban of the land application of biosolids in the CRD
- the feedback received in the various public engagement processes detailed above
- the technical recommendations provided by GHD in order to develop a robust program that is flexible and provides redundancy in order to minimize operational and compliance risks
- the CRD's goal to have a strategy that:
  - utilizes the existing RTF infrastructure and Class A biosolids already being produced but also prioritizes implementing advanced thermal technology infrastructure
  - minimizes negative impacts on the natural environment
  - protects the health and safety of the public and workers involved in biosolids operations
  - is cost effective, while balancing all of the above considerations

staff recommend procuring a portfolio of options in alignment with the GHD Long-term Biosolids Management Strategy (Appendix D) and utilizing each option under a prioritization structure, as follows:

Tier 1: **Advanced thermal option**
Constitutes the preferred long-term solution and will be pursued concurrently with options in other tiers. Current projects include:

a) Develop a demonstration facility for advanced thermal processing, as planned. Outcomes from the demonstration project will serve as the basis for a scaled, long-term solution.

Tier 2: **Out-of-region compliance options**
Constitute measures that the CRD will utilize to ensure regulatory compliance is continuously achieved while the Tier 1 thermal processing option are being implemented and when options in Tier 1 are unable to process the totality of biosolids produced in the region. These include (in priority order):

a) Industrial land reclamation, such as mine and quarry sites (acknowledging that some reclaimed sites may eventually have a pasture land end use)
b) Forest fertilization
c) Production of biosolids growing medium and/or feedstock in soil production
d) Partnerships with established biosolids programs
e) Continue alternative fuel combustion in the cement manufacturing facility in Richmond, BC. Prioritize this option, when available.

Tier 3: In-region contingency options
Constitute contingency options to ensure compliance with regulatory requirements. The CRD would implement Tier 3 options on a contingency basis, only when options within the Tier 2 portfolio are unavailable. These include (in priority order):
a) Industrial land reclamation such as mine and quarry sites (acknowledging that some reclaimed sites may eventually have a pasture land end use)
b) Forest fertilization
c) Maintain the option of biosolids application in engineered cover systems at Hartland Landfill to act as an emergency support option; subject to space availability and cover needs of the Landfill

Note: The CRD will continue to explore beneficial use opportunities with those Nations that express interest both in-region and out-of-region. The CRD will also listen to any concerns Nations may have regarding the beneficial use options and is committed to working with individual Nations to address their concerns.

The Strategy focuses on pursuing the in-region thermal management of biosolids utilizing advanced thermal treatment technology to produce biochar and synthetic fuels, while the tiered approach balances the Board's direction on land application and meeting regulatory requirements. As previously reported, given that it is anticipated to take 2-3 years to design, permit, construct, commission and pilot a thermal demonstration plant and longer for a full scale facility, the other options in the portfolio will be necessary to pursue in the 2025-2035 time period. Direct agricultural application would be excluded at this time but reclamation of industrial lands where the end use is pasture lands may be considered.

The landfilling of biosolids at the Hartland Landfill would only be required as an emergency measure when the RTF fails to produce a Class A biosolids product due to an operational emergency, such as a process equipment failure.

The above recommended portfolio of options, the Long-Term Biosolids Management Strategy and the Long-Term Biosolids Beneficial Use Option Analysis documents prepared by GHD, and the summary consultation reports, together form the CRD's Long-Term Biosolids Management Strategy. The Strategy will likely require updating in the next ten years as the CRD gains experience with the portfolio implementation, further develops the thermal option, considers advances in technology over time, and responds to any regulatory or Board policy changes.

Biosolids Advanced Thermal Site Trial Update

A Request for Proposals (RFP) for a technical advisor to support CRD staff in developing terms and technical requirements for a demonstration plant closed on March 11, and a preferred technical advisor has been selected. The subsequent RFP for the demonstration plant is in development and is expected to be issued in Q2, with a preferred proponent selected in Q3/Q4 2024. Once a proponent and technology are selected, staff will have sufficient information to support initiating the provincial permitting process, which is anticipated to take 1.5-2 years. To support the permit application, additional public and First Nations engagement will be required inclusive of project specifics (e.g., siting, air discharge (exhaust) composition and rates etc.).

Next Steps

With Board endorsement, the draft Long-Term Biosolids Management Strategy will be referred back to the TCAC for its final review and comment and posted on the CRD's webpage for a final three-week comment period between May 13 and June 3. A summary of the comments received along with the final Long-Term Biosolids Management Strategy will be presented at the June 12, 2024 Board meeting for consideration, and with final Board approval, would be submitted to the provincial regulator by June 18, 2024.

ALTERNATIVES

Alternative 1
That the CRD Board:

1. Endorse the following portfolio of options in alignment with the Long-Term Biosolids Management Strategy (prepared by GHD, April 2024), utilizing each option under a prioritization structure, as follows:

   (a) **Tier 1**: **Advanced thermal option:** Constitutes the preferred long-term solution and will be pursued concurrently with options in other tiers. Current projects include:
   (i) Develop a demonstration facility for advanced thermal processing, as planned. Outcomes from the demonstration project will serve as the basis for a scaled, long-term solution.

   (b) **Tier 2**: **Out-of-region compliance options:** Constitute measures that the CRD will utilize to ensure regulatory compliance is continuously achieved while the Tier 1 thermal processing option is being implemented and when options in Tier 1 are unable to process the totality of biosolids produced in the region. These are (in priority order):
   (i) Industrial land reclamation such as mine and quarry sites (acknowledging that some reclaimed sites may eventually have a pasture land end use)
   (ii) Forest fertilization
   (iii) Production of biosolids growing medium and/or feedstock in soil production
   (iv) Partnerships with established biosolids programs
   (v) Continue alternative fuel combustion in the cement manufacturing facility in Richmond, BC. Prioritize this option when available.

   (c) **Tier 3: In-region contingency options**: Constitute contingency options to ensure compliance with regulatory requirements. The CRD would implement Tier 3 options on a contingency basis, only when options within the Tier 2 portfolio are unavailable. These include (in priority order):
   (i) Industrial land reclamation such as mine and quarry sites (acknowledging that some reclaimed sites may eventually have a pasture land end use)
   (ii) Forest fertilization

(iii) Maintain the option of biosolids application in engineered cover systems at Hartland Landfill to act as an emergency support option; subject to space availability and cover needs of the Landfill;

2. Direct staff to continue to explore biosolids beneficial use opportunities with those First Nations that express interest both in-region and out-of-region, and to address any concerns First Nations may have regarding the beneficial use options;
3. Refer the Draft Long-Term Biosolids Management Strategy and portfolio of options to the TCAC for review and comment;
4. Post the Draft Long-Term Biosolids Management Strategy and portfolio of options on the CRD webpage for 21 days (May 13-June 3) for First Nations and public review and comment; and
5. Direct staff to bring back the comments received during the 21-day posting period from the TCAC, First Nations and public, along with a final Long-Term Biosolids Management Strategy and portfolio of options for the Board's consideration and approval at the June 12, 2024 Board meeting, for submission to the Province by June 18, 2024.

Alternative 2
That the CRD Board:
1. Endorse the following portfolio of options in alignment with the Long-Term Biosolids Management Strategy (prepared by GHD, April 2024), utilizing each option under a prioritization structure, as follows:

(a) **Tier 1**: **Advanced thermal option**. Constitutes the preferred long-term solution and will be pursued concurrently with options in other tiers. Current projects include:
(i) Develop a demonstration facility for advanced thermal processing, as planned. Outcomes from the demonstration project will serve as the basis for a scaled, long-term solution.
(b) **Tier 2**: **Out-of-region and In-region compliance options.** Constitute measures that the CRD will utilize to ensure regulatory compliance is continuously achieved while the Tier 1 thermal processing option is being implemented and when options in Tier 1 are unable to process the totality of biosolids produced in the region. These are (in priority order):
(i) Industrial land reclamation such as mine and quarry sites (acknowledging that some reclaimed sites may eventually have a pasture land end use)
(ii) Forest fertilization
(iii) Production of biosolids growing medium and/or feedstock in soil production
(iv) Partnerships with established biosolids programs
(v) Continue alternative fuel combustion in the cement manufacturing facility in Richmond, BC. Prioritize this option, when available.
(vi) Maintain the option of biosolids application in engineered cover systems at Hartland Landfill to act as an emergency support option, subject to space availability and cover needs of the Landfill;

2. Direct staff to continue to explore biosolids beneficial use opportunities with those First Nations that express interest both in-region and out-of-region, and to address any concerns First Nations may have regarding the beneficial use options;
3. Refer the Draft Long-Term Biosolids Management Strategy and portfolio of options to the TCAC for review and comment;

4. Post the Draft Long-Term Biosolids Management Strategy and portfolio of options on the CRD webpage for 21 days (May 13-June 3) for First Nations and public review and comment; and
5. Direct staff to bring back the comments received during the 21-day posting period from the TCAC, First Nations and public, along with a final Long-Term Biosolids Management Strategy and portfolio of options for the Board's consideration and approval at the June 12, 2024 Board meeting, for submission to the Province by June 18, 2024.

Alternative 3
That this report be referred back to staff for additional information.

IMPLICATIONS

Climate Action Implications

All beneficial reuse long-term biosolids management options have potential greenhouse gas (GHG) emission implications. Land application options have higher emissions the further away the land application sites are due to transportation requirements. However, these could be offset by the enhanced GHG sequestration within the soils following land application. Thermal and advanced thermal options result in direct GHG emissions to the atmosphere, in addition to transportation-related emissions. Advanced thermal options partially mitigate GHG emissions with sequestration in biochar. Respondents to both the Ipsos representative survey and the CRD survey indicated that "Environmental Impacts (air, water and soil contaminants)" were the most important consideration when planning for the beneficial use of biosolids. Costs, climate/GHG emissions and community impacts (truck traffic, odour and noise emission, dust) were less important.

Environmental Implications

Under the Canadian governance framework, provincial and federal regulators and agencies are responsible to ensure that biosolids reuse options are safe for the intended purposes and protective of human health and the environment when produced and used in accordance with regulations. Agencies assess the risks and benefits associated with specific resources and products and recommend policies that are incorporated into regulatory frameworks, which are evaluated on a regular and ongoing basis. Current regulations support the beneficial use of biosolids, including all of the options considered by the technical consultant.

All options have some level of risks and benefits. Advanced thermal technologies with biosolids feedstock are not yet commercially proven in Canada or the United States. Thermal options have the benefit of reduced (but not eliminated) contaminant levels in end-products. Despite concerns for risks associated with contaminants for land application options, the most significant land application risks are associated with over fertilization (too many nutrients). Both sets of risks can be mitigated by following properly designed land application plans and complying with the OMRR. Land application options have the benefit of recycling nutrients, enhancing plant growth and offsetting use of commercial GHG-intensive fertilizers.

Community concerns around the land application of biosolids are largely based on the presence, or suspected presence, of unregulated organic chemical compounds, commonly referred to as "contaminants of emerging concern" (CECs). CECs include Volatile and Semi-

Volatile Organic Compounds (VOC & SVOC), Per and Polyfluoroalkyl substances (PFAS), Polybrominated flame retardants (PBDE), dioxins, pharmaceuticals and personal care products (PPCP) and microplastics. There is concern that biosolids with detectable levels of unregulated CECs could impact soil quality, surface water or groundwater.

In recent years, there has been an increased interest in PFAS and their effects on human and environmental health. PFAS are a class of over 4,700 substances that do not occur naturally. PFAS make products non-stick, water repellent and fire resistant, and are found in a wide range of consumer and industrial products, including cookware, food packaging, clothing and firefighting foams. PFAS are sometimes referred to as "forever chemicals" because the molecules are characterized by a chain of strong fluorine-carbon bonds, which result in highly stable and long-persisting chemicals. Exposure to sufficient concentrations of PFAS is associated with an increased risk of cancer, increased cholesterol levels, and can affect the immune system.

In June 2022, ENV released the Organic Matter Recycling Regulation Project Update, which contained some discussion of CECs. "Due to advances in analytical chemistry, the ability to measure CECs has generally outpaced the ability to understand the impacts of CECs on human health and the environment. For this reason, the impacts of CECs in biosolids and wastewater treatment discharges is the subject of ongoing scientific research." The ENV intends to add the authority for a director to require the testing of biosolids for CECs but does not intend to regulate the concentration of CECs in biosolids. ENV advocates for a prevention-first approach to reducing CECs in biosolids by implementing source control measures to discourage the discharge of certain wastes to the system.

On May 19, 2023, the Canadian Food Inspection Agency (CFIA) proposed an interim standard for PFAS in biosolids used in Canada as fertilizers. The CFIA worked with Environment and Climate Change Canada, Health Canada and provincial partners to assess an appropriate standard for PFAS. The proposed standard will protect human health by preventing the small proportion of biosolids products that are heavily impacted by industrial inputs from being applied to agricultural land in Canada. The proposed standard is 50 ppb PFOS (one type of PFAS). The concentration of PFOS in CRD biosolids is under the proposed standard at approximately 6 ppb (ng/g) (based on two samples). For comparison, a 2020 study found that the PFOS concentration in household dust was 100 ppb (100ng/g).

With regards to the Core Area Wastewater Treatment Program, during the wastewater treatment process at the McLoughlin Point Wastewater Treatment Plant, residual solids are removed from wastewater and conveyed to the RTF for further treatment. The residual solids undergo anaerobic digestion in which microorganisms break down biodegradable material in the absence of oxygen and produce biogas. The residual solids are then dewatered and heated at a very high temperature to create Class A biosolids.

In 2022, in support of the biosolids management program, the CRD collected and submitted samples of Class A biosolids being produced at the Residual Treatment Facility for high resolution analysis of a wide range of contaminants, including contaminants of emerging concern. The results are summarized in Appendix E.

Financial Implications

The proposed portfolio includes options with a range of costs per tonne. Land application and conventional thermal options are approximately the same, at less than $500 per tonne. Advanced thermal options are more expensive at up to $4,500 per tonne; there is significant uncertainty regarding capital and operating costs for a permanent advanced thermal facility at this time, as well as the potential for revenue generation from advanced thermal synthetic gas, bio-oil and biochar end-products and a current lack of demonstrated facilities for cost comparisons. However, this information will be ascertained through the development of the demonstration plant initiative.

Service Delivery Implications

A portfolio of options is required to ensure redundancy and resiliency of the biosolids management strategy. Previous experience with the CRD, as well as a jurisdictional review, has indicated that relying on a single or very few options and single contingency is not suitable to maintain service delivery and regulatory compliance. Based on the consultation feedback, as well as concerns raised previously by the Board, a portfolio of beneficial use options that includes reclamation of industrial lands and forest fertilization but excludes direct application to agricultural lands is considered prudent. Use of biosolids as an alternative fuel in the current short-term plan will also be carried over as an option in the long-term strategy.

Although the long-term strategy is to address biosolids produced by the Core Area wastewater service, the RTF was designed to receive and process residual solids from the Saanich Peninsula, Sooke and Gulf Island wastewater treatment plants. Once the RTF receiving station is operational, staff will work with the Saanich Peninsula Wastewater Commission to update the Saanich Peninsula Liquid Waste Management Plan accordingly.

Alignment with Board and Corporate Priorities

The recommended Long-Term Biosolids Management Strategy aligns with the 2023-2026 CRD Corporate Plan goal of *Management of wastewater and treatment residuals,* and the initiative to *Develop and implement a long-term Biosolids Management Plan*. The Strategy also supports the initiative under this goal to *Update the Liquid Waste Management Plans for the Saanich Peninsula and Core Area* with regards to complying with the commitment to beneficially use the biosolids generated from the wastewater treatment plants.

First Nations Implications

First Nations are seeking a more respectful, reciprocal government-to-government relationship with the CRD related to service delivery and service delivery impacts in their traditional territories. As described above, First Nations consultation on the Long-Term Biosolids Management Strategy is ongoing. The CRD will continue to explore beneficial use opportunities with those Nations that express interest. The CRD will also listen to any concerns Nations may have regarding the beneficial use options and is committed to working with individual Nations to address their concerns.

Intergovernmental Implications

As the strategy is implemented, CRD staff will provide advanced and regular communication to local governments in jurisdictions where out-of-region options are being contemplated or procured. Due to the nature of some of the beneficial use options and in order to have a portfolio of options that ensures redundancy and flexibility, it is not unusual for local governments to have biosolids management programs that extend beyond the jurisdictional boundaries of the local government in terms of processing and end use, particularly in areas that are more urban and those that produce larger volumes of biosolids.

Social Implications

Based on all public and TCAC engagement, there is majority support for prioritizing a range of beneficial use options, including advanced and conventional thermal options and land application options. Both the representative survey and TCAC recommendations were in close alignment, with industrial land reclamation and forest fertilization having the strongest support. However, the voluntary survey showed more support for advanced thermal options, although some forms of land application still had support. The differences between the representative and voluntary survey results were likely due to the advocacy and efforts of a few special interest groups that are known to be opposed to land application options. Moving forward, additional public and stakeholder consultation, as required by the provincial regulator on a project-by- project basis, will be conducted.

CONCLUSION

The CRD is required to provide a draft Long-Term Biosolids Management Strategy to the provincial regulator as part of the CRD's commitments under the Core Area Liquid Waste Management Plan. The recommended strategy was informed by:

- the Minister of Environment and Climate Change Strategy's direction and provincial requirements
- the CRD Board's ban of the land application of biosolids in the CRD
- the feedback received in the various public engagement processes detailed above
- the technical recommendations provided by GHD in order to develop a robust program that is flexible and provides redundancy in order to minimize operational and compliance risks,
- the CRD's goal to have a strategy that:
  (a) utilizes the existing RTF infrastructure and Class A biosolids already being produced but also prioritizes implementing advanced thermal technology infrastructure
  (b) minimizes negative impacts on the natural environment
  (c) protects the health and safety of the public and workers involved in biosolids operations
  (d) is cost effective, while balancing all of the above considerations,

The strategy consists of a portfolio of options to ensure maximum flexibility to address market, operational and logistical challenges, continuous beneficial use of biosolids and avoiding landfilling.

RECOMMENDATION

That the CRD Board:

1. Endorse the following portfolio of options in alignment with the Long-Term Biosolids Management Strategy (prepared by GHD, April 2024), utilizing each option under a prioritization structure, as follows:

   (a) **Tier 1**: **Advanced thermal option:** Constitutes the preferred long-term solution and will be pursued concurrently with options in other tiers. Current projects include:
   (i) Develop a demonstration facility for advanced thermal processing, as planned. Outcomes from the demonstration project will serve as the basis for a scaled, long-term solution.

   (b) **Tier 2**: **Out-of-region compliance options:** Constitute measures that the CRD will utilize to ensure regulatory compliance is continuously achieved while the Tier 1 thermal processing option is being implemented and when options in Tier 1 are unable to process the totality of biosolids produced in the region. These are (in priority order):
   (i) Industrial land reclamation such as mine and quarry sites (acknowledging that some reclaimed sites may eventually have a pasture land end use)
   (ii) Forest fertilization
   (iii) Production of biosolids growing medium and/or feedstock in soil production
   (iv) Partnerships with established biosolids programs
   (v) Continue alternative fuel combustion in the cement manufacturing facility in Richmond, BC. Prioritize this option when available.

   (c) **Tier 3: In-region contingency options**: Constitute contingency options to ensure compliance with regulatory requirements. The CRD would implement Tier 3 options on a contingency basis, only when options within the Tier 2 portfolio are unavailable. These include (in priority order):
   (i) Industrial land reclamation such as mine and quarry sites (acknowledging that some reclaimed sites may eventually have a pasture land end use)
   (ii) Forest fertilization
   (iii) Maintain the option of biosolids application in engineered cover systems at Hartland Landfill to act as an emergency support option; subject to space availability and cover needs of the Landfill;

2. Direct staff to continue to explore biosolids beneficial use opportunities with those First Nations that express interest both in-region and out-of-region, and to address any concerns First Nations may have regarding the beneficial use options;
3. Refer the Draft Long-Term Biosolids Management Strategy and portfolio of options to the TCAC for review and comment;
4. Post the Draft Long-Term Biosolids Management Strategy and portfolio of options on the CRD webpage for 21 days (May 13-June 3) for First Nations and public review and comment; and
5. Direct staff to bring back the comments received during the 21-day posting period from the TCAC, First Nations and public, along with a final Long-Term Biosolids Management Strategy and portfolio of options for the Board's consideration and approval at the June 12, 2024 Board meeting, for submission to the Province by June 18, 2024.

Submitted by:	Luisa Jones, MBA, General Manager, Parks, Recreation & Environmental Services
Concurrence:	Ted Robbins, B. Sc., C. Tech., Chief Administrative Officer

ATTACHMENTS

Appendix A: Long-term Options for the Beneficial Use of Biosolids – January-March 2024 – Tavola Strategy Group (March 2024)
Appendix B: Long-Term Biosolids Management Plan: First Nations Engagement – What We Heard Report
Appendix C: Technical and Community Advisory Committee – Long-term Biosolids Management Strategy Presentations
Appendix D: GHD Technical Memorandum: Long-term Biosolids Beneficial Use Strategy – April 23, 2024
Appendix E: Biosolids – Class A Biosolids Analysis – April 2024

TAVOLA
STRATEGY GROUP

CAPITAL REGIONAL DISTRICT SUMMARY CONSULTATION REPORT

Long-Term Options for the Beneficial Use of Biosolids January – March 2024

Submitted by:
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Tavola Strategy Group Ltd.
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March 2024

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PROJECT OVERVIEW

The purpose of the public consultation process was to engage the public in the development of a long-term biosolids management plan for the Capital Regional District.

The end by-product of the sewage treatment process, biosolids are a nutrient-rich resource that can benefit the community in several different ways. The Province of BC's Organic Matter Recycling Regulation sets the requirements for production of high-quality biosolids, and subsequent beneficial uses related to land application and composting. The CRD produces 3,300 tonnes annually of Class A biosolids, the highest quality category of biosolids.

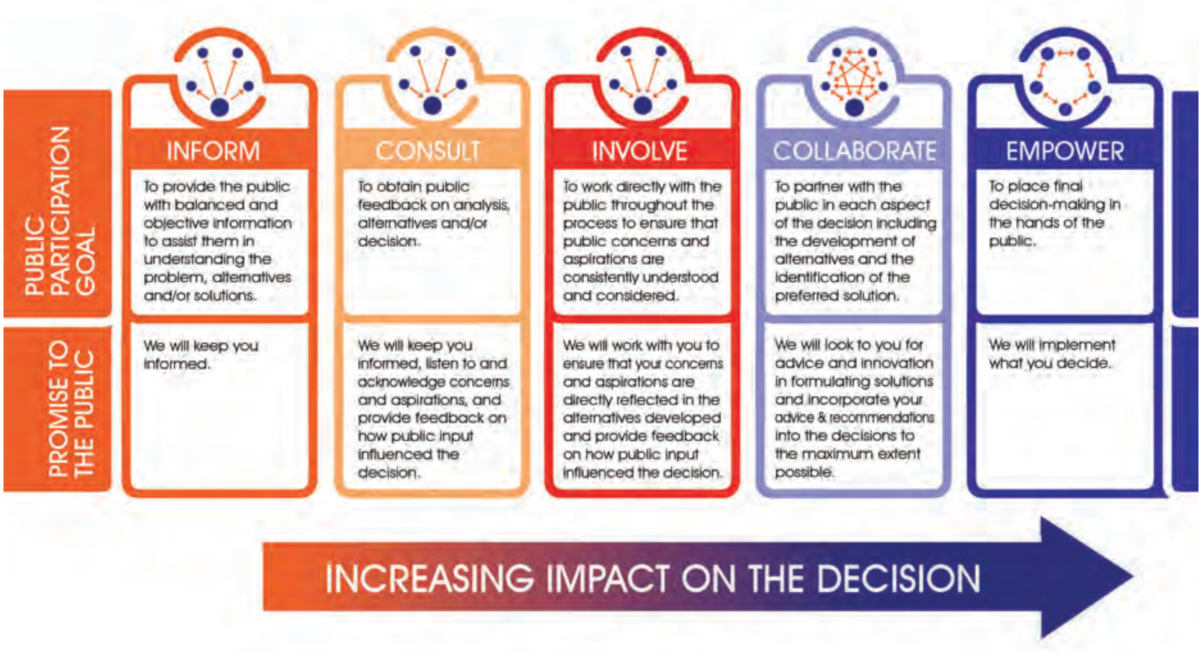
A Long-Term Biosolids Management plan must be submitted to the Province by June 2024. The Ministry of Environment and Climate Strategy requires that the long-term plan consider all potential beneficial uses, including land application. The Capital Regional District has had a policy banning land application in place since 2011. Broad public engagement about the long-term management of biosolids has not occurred in the Capital Region until now.

Seven biosolid management options were presented to the public for feedback.

The broad public engagement process occurred from January 11 to March 6, 2024. A representative sample survey of Capital Region adult residents was fielded by Ipsos from March 1 – March 11, 2024. The Ipsos data is weighted to ensure it reflects the gender/age and regional distribution of the CRD population according to the 2021 census data.

PUBLIC PARTICIPATION APPROACH

The consultation process was designed in alignment with the International Association of Public Participation (IAP2) spectrum and core values.



Communication & Engagement Objectives

1. ***Raise awareness of the need to develop a long-term biosolids management plan that outlines how the Capital Regional District will utilize the benefits of biosolids in-region.***
2. ***Provide multiple channels and opportunities for the community to learn more and provide input into the development of the definitive biosolids management plan.***
3. ***Seek to understand public awareness, perceptions, concerns and top of mind considerations for how biosolids should be managed in the Capital Region.***

Promise To The Public

The public consultation plan aimed to engage at the level of “consult”. The promise to the public is “we will keep you informed, listen to, and acknowledge concerns and provide feedback on how public input influenced the decision.” The Technical and Community Advisory Committee were engaged at the level of “involve”.

Public Consultation Process

On Thursday, January 11, 2024, the Capital Regional District launched the public consultation process to raise awareness of the need and opportunities for the community to provide input into the development of the definitive biosolids management plan. Greater understanding of public awareness, perceptions, concerns and top of mind considerations for how biosolids should be managed in the CRD will help inform options for CRD Board consideration.

The public consultation process ran in parallel to a separate First Nations engagement process led by other consultants.

Information was shared through a variety of channels to provide background on how biosolids have been managed since wastewater treatment was introduced in 2020, the options available to the CRD, including land application [as required by the Ministry of Environment and Climate Strategy], and the technical analysis and considerations associated with various options.

Consultation Activities & Timeline

- A detailed Long-Term Biosolids Management project webpage was developed on **www.GetInvolved.crd.bc.ca**
- Questions were submitted through the website and answers were posted for all web visitors
- Media releases was distributed on January 11 and February 7, 2024.
- Updates were emailed to project page subscribers.
- Several social media posts were shared on CRD social media channels: Facebook, Twitter, and Instagram throughout the process.
- Print ads appeared in the Times Colonist and BlackPress newspapers.
- Letters were sent to a variety of groups and organizations.
- Input was invited by email at **biosolids@crd.bc.ca**
- An online open house was hosted on Tuesday, February 20, 2024 where attendees could pose questions to Capital Regional District staff and GHD technical consultants.
- An online survey was hosted on the CRD's website.
- A statistically representative sample survey of Capital Region residents was conducted by Ipsos from March – March 11, 2024.

A Technical and Community Advisory Committee (LWMP Core Area) was reconstituted to inform the development of the long-term biosolids management plan. They held their first meeting in October 2023 and were presented the public consultation plan for feedback. The committee toured the Residual Treatment Facility in December and met several times in 2024.

Engagement by the numbers

569
Online survey participants

516
Representative survey of Capital Region residents

3,300
Unique web visitors

12
Questions and answers via website

56
Open house attendees

12
Subscribers to project updates

7
Emails to biosolids@crd.bc.ca

WHAT WE HEARD

Over-Arching Themes

- Respondents to both the Ipsos representative survey and the CRD survey indicated that "Environmental Impacts [air, water and soil contaminants]" were the most important consideration when planning for the beneficial use of biosolids. Costs, climate/ greenhouse gas emissions and community impacts (truck traffic, odour and noise emission, dust) were less important.
- The two surveys solicited very different results when it came to support for long-term biosolid management options.
    - *The Ipsos representative survey indicates strong majority support and low levels of opposition to all beneficial uses presented. Support is highest for forest fertilizer and industrial land reclamation. Respondents to the CRD survey indicate substantial levels of opposition to most options other than Advanced Thermal, with the least support for bagged fertilizer for residential use and agricultural fertilizer.*
    - *The most popular option (Advanced Thermal) in the CRD survey was the least popular for the broader general public in the Ipsos survey. The level of opposition to all options is much higher in the CRD survey.*

Comparison of survey results regarding options:

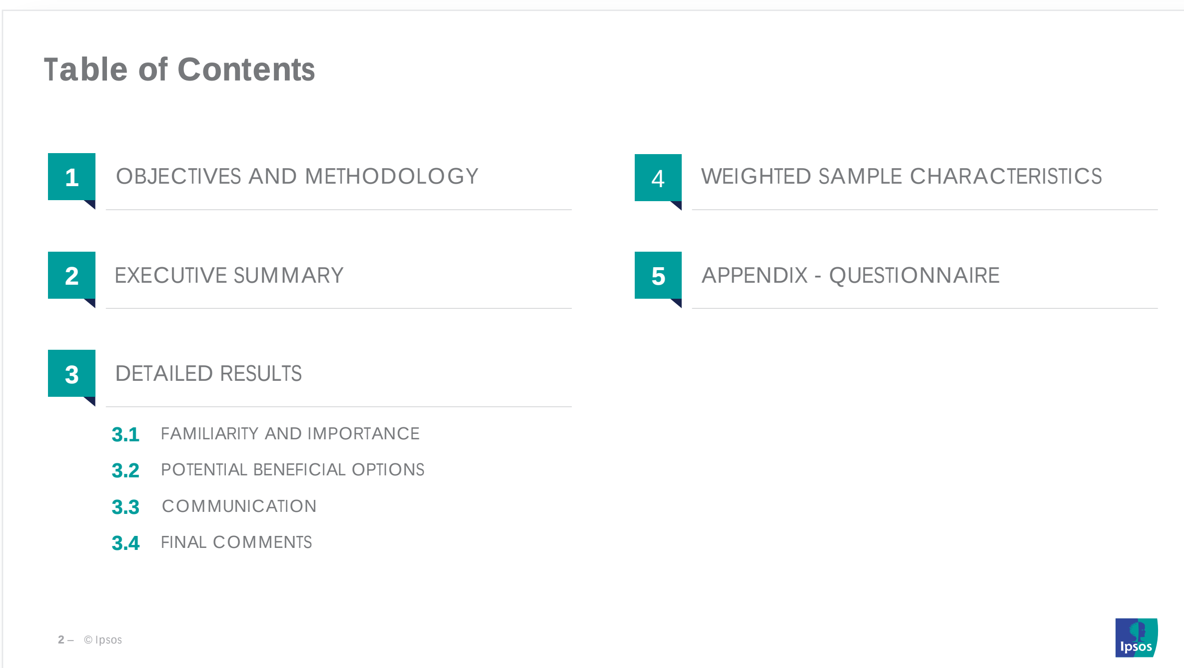
	IPSOS		CRD	
LONG-TERM BIOSOLIDS USE OPTION	***Support***	***Oppose***	***Support***	***Oppose***
Forest fertilizer	85%	4%	41%	51%
Industrial land reclamation (e.g. mine/quarry)	83%	6%	43%	45%
Wholesale fertilizer for landscaping	79%	5%	37%	54%
Agriculture fertilizer	78%	7%	34%	60%
Bagged fertilizer for low-cost residential use	77%	7%	33%	56%
Fuel for incineration/ combustion	66%	9%	49%	38%
Advanced thermal (gasification/pyrolysis technology)	56%	11%	66%	19%

**Numbers may not add to 100% due to summary reporting and rounding.*

- The concerns associated with various options varied depending on the survey. The level of opposition to all options and associated concerns were much greater in the voluntary CRD survey, than in the Ipsos representative survey. Many respondents to the CRD survey expressed concerns related to potential contaminants [e.g. toxicity, PFAS's] and health and environmental risks of land application and many indicated biochar is the only beneficial use.
- Many respondents in the CRD survey felt land application options are not a "beneficial-use" due to potential risks and advanced thermal/biochar options are the most-effective method to reduce risks of biosolids.
- Many respondents who submitted correspondence, attended the open house, and participated in the CRD survey would like more detail about plans, progress, and timelines towards piloting advanced thermal options, and more information about the testing, scientific research and risks associated with land applying biosolids. Some would also like to better understand the cost benefit analysis of options and the experience, feasibility, and case studies of various options in other jurisdictions.

IPSOS Representative Survey

516 people participated in a representative survey of Capital Region residents conducted by Ipsos between March 1 and March 11, 2024. The data is weighted to ensure it reflects the gender/age and regional distribution of the CRD population according to the 2021 census data.



Objectives and Methodology

These are the findings of an Ipsos survey conducted on behalf of the Capital Regional District.

The main objective of the survey is to obtain a representative sampling of residents' opinions about how to harness the benefits of biosolids from wastewater treatment. The results of the research will be used to inform the CRD's long-term plan outlining the beneficial use of biosolids.

For this research, Ipsos conducted an online panel survey of 516 adult (18+ years) CRD residents.

The survey was fielded from March 1 to 11, 2024.

The final data has been weighted to ensure that the gender/age and regional distribution reflects that of the actual population in the CRD according to 2021 Census data.

The precision of Ipsos online polls is measured using a credibility interval. In this case, the poll is accurate to within ±4.9 percentage points, 19 times out of 20, of what the results would have been had all adult CRD residents been polled. The credibility interval will be wider among subsets of the population.

Notes to Reader

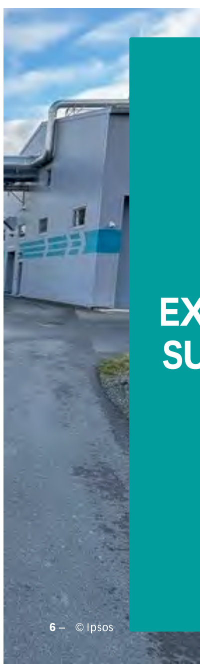
The Core Region is defined as Victoria, Saanich, Esquimalt, Oak Bay, Colwood, Langford and View Royal.

Prior to answering the questions, respondents were presented with a brief overview of the topic and invited to learn more by watching a short video and reading a list of Frequently Asked Questions. A copy of the survey questionnaire can be found in the report Appendix.

Some totals in the report may not add to 100%. Some summary statistics (e.g., total familiar) may not match their component parts. The numbers are correct, and the apparent errors are due to rounding.

The CRD also hosted a non-representative online survey on its website, the results of which have been reported separately.

4 – © Ipsos



EXECUTIVE SUMMARY

1. **Many residents are not familiar with the topics** of the CRD wastewater treatment system and biosolids. Overall, just less than four-in-ten residents say they are "extremely familiar" or "moderately familiar" with these topics.
2. **The topic is relevant to residents**, with six-in-ten saying it is "very important" or "important" to them how biosolids are maximized for community benefit.
3. When planning for the beneficial uses of biosolids, residents place the **greatest priority on environmental impacts** (air, water and soil contaminants) ahead of considerations like cost, climate/greenhouse gas emissions and community impacts (truck traffic, odour and noise emission, dust).
4. There is **strong majority support and low levels of opposition to all tested potential uses** of biosolids. Support is highest for forest fertilizer and industrial land reclamation. Support is lower for advanced thermal and fuel for incineration/combustion.
5. Residents say that that **TV news is the best way to keep them informed** on this topic, but many residents also want information via webpage, newspaper, CRD social media and radio.

6 – © Ipsos

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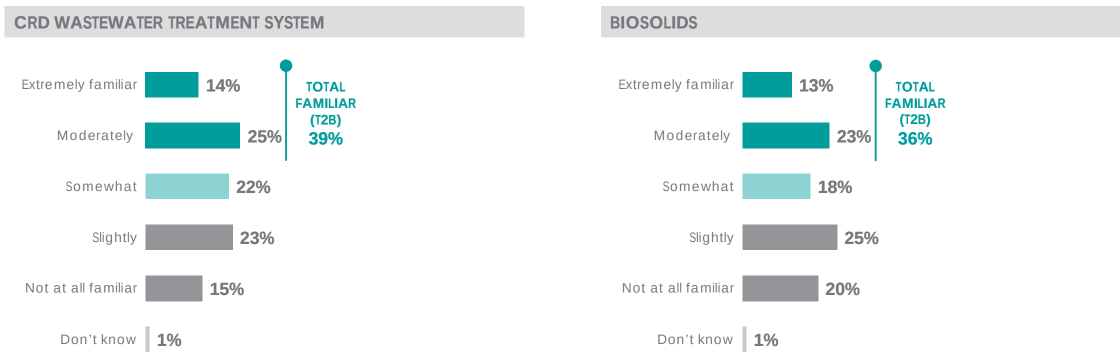
DETAILED RESULTS
3
WATER PUMP HOUSE
7 – © Ipsos
Ipsos


FAMILIARITY AND IMPORTANCE
3.1
8 – © Ipsos
Ipsos

Familiarity with Topics

- Close to four-in-ten residents say they are at least moderately familiar with the topics of the CRD wastewater treatment system and biosolids.



Base: All respondents (n=516)
Q1. How familiar are you with the following topics?

9 – © Ipsos

Familiarity with Topics (by Demos)

- Claimed familiarity with these topics is lower among older residents and women.

Total Important (Extremely + Moderately)

	Total	Region		Age			Sex	
		Core	Other	18-34	35-54	55+	Male	Female
Sample Size	516	408	108	99	171	246	237	276
CRD wastewater treatment system	39%	36%	45%	47%	43%	31%	52%	27%
Biosolids	36%	33%	43%	45%	40%	27%	49%	25%

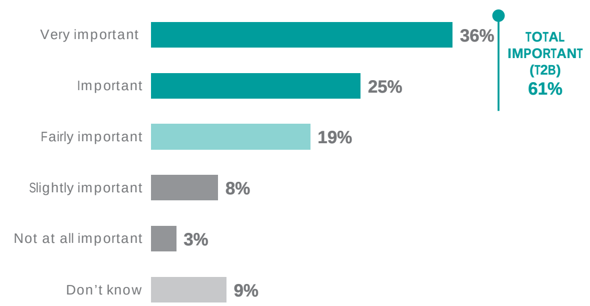
Statistically higher | Statistically lower

Base: All respondents (n=516)
Q1. How familiar are you with the following topics?

10 – © Ipsos

Importance of Maximizing Biosolids for Community Benefit

- Six-in-ten residents say it is important to them how biosolids are maximized for community benefit.



Base: All respondents (n=516)
Q2. How important is it to you how biosolids are maximized for community benefit?

11 – © Ipsos

Importance of Maximizing Biosolids for Community Benefit (by Demos)

- Older residents are more likely to place importance on how biosolids are maximized for community benefit.

Total Important (Very Important + Important)

	Total	Region		Age			Sex	
		Core	Other	18-34	35-54	55+	Male	Female
Sample Size	516	408	108	99	171	246	237	276
Total important	61%	61%	59%	61%	49%	68%	63%	59%

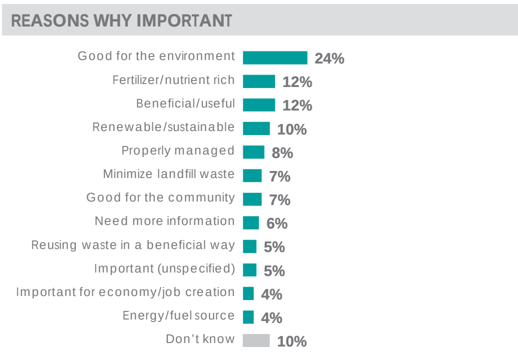
Statistically higher Statistically lower

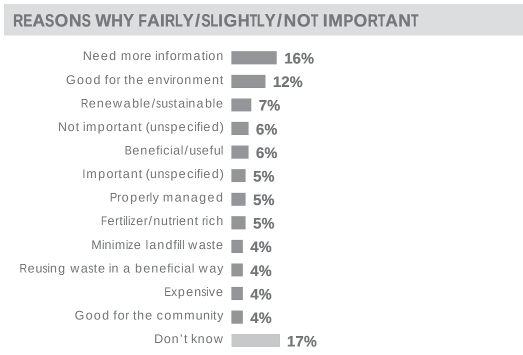
Base: All respondents (n=516)
Q2. How important is it to you how biosolids are maximized for community benefit?

12 – © Ipsos

Reasons why Important/Not Important

- Residents rate this topic as important because of reasons such as being good for the environment, providing nutrient rich fertilizer, being generally beneficial/useful and being renewable/sustainable.





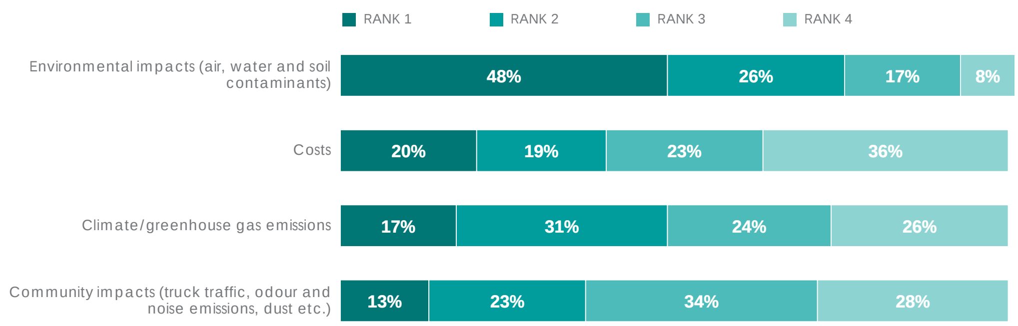
Mentions <4% not shown.
Base: Those rating very important or important (n=316)
Q3. Please explain why you chose that level of importance.

Mentions <4% not shown.
Base: Those rating fairly important, slightly important, or not at all important (n=159)
Q3. Please explain why you chose that level of importance.

13 – © Ipsos

Ranked Importance of Considerations when Planning Beneficial Uses of Biosolids

- Residents prioritize environmental impacts over costs, climate and community impacts.



Base: All respondents (n=516)
Q4. When planning for the beneficial uses of biosolids, how important are the following considerations to you? Please rank in order of importance (1 being most important – 4 being least important).

14 – © Ipsos

Ranked Importance of Considerations when Planning Beneficial Uses of Biosolids (by Demos)

- Older residents are more likely to prioritize environmental impacts and costs. Younger residents are more likely to prioritize community impacts and less likely to prioritize costs.
- Women are more likely to prioritize environmental impacts.

Ranked First (Most Important)

	Total	Region		Age			Sex	
		Core	Other	18-34	35-54	55+	Male	Female
Sample Size	516	408	108	99	171	246	237	276
Environmental impacts (air, water and soil contaminants)	48%	48%	50%	40%	45%	55%	43%	52%
Costs	20%	22%	16%	9%	22%	25%	21%	19%
Climate/greenhouse gas emissions	17%	18%	16%	24%	19%	12%	19%	16%
Community impacts (truck traffic, odour and noise emissions, dust etc.)	13%	12%	18%	25%	12%	7%	16%	11%

Statistically higher Statistically lower

Base: All respondents (n=516)
Q4. When planning for the beneficial uses of biosolids, how important are the following considerations to you? Please rank in order of importance (1 being most important – 4 being least important).

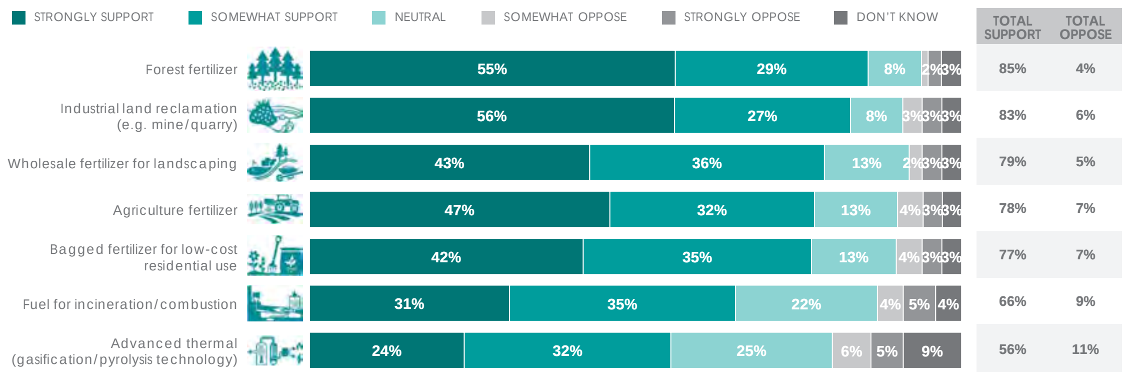
15 – © Ipsos

POTENTIAL BENEFICIAL OPTIONS 3.2

16 – © Ipsos

Support for Options

- There is majority support and low levels of opposition to all tested options. The greatest support is for forest fertilizer and industrial land reclamation. There is lower support for advanced thermal.



Data labels <2% not shown.
Base: All respondents (n=516)
Q5-Q11. Please indicate your level of support for…?

17 – © Ipsos

Support for Options (by Demos)

- Older residents are more supportive of using biosolids for wholesale fertilizer for landscaping and agricultural fertilizer. They are less supportive of advanced thermal.
- Residents aged 35-54 years are less supportive of using biosolids for wholesale fertilizer for landscaping and for bagged fertilizer for low-cost residential use.
- Younger residents are more supportive of using biosolids for advanced thermal.

Total Support (Strongly + Somewhat)

	Total	Region		Age			Sex	
		Core	Other	18-34	35-54	55+	Male	Female
Sample Size	516	408	108	99	171	246	237	276
Forest fertilizer	85%	87%	80%	81%	83%	88%	84%	86%
Industrial land reclamation (e.g. mine/quarry)	83%	82%	84%	79%	83%	85%	85%	81%
Wholesale fertilizer for landscaping	79%	78%	82%	76%	73%	84%	79%	79%
Agriculture fertilizer	78%	79%	77%	74%	73%	84%	74%	82%
Bagged fertilizer for low-cost residential use	77%	76%	81%	81%	69%	81%	76%	79%
Fuel for incineration/combustion	66%	66%	66%	67%	65%	66%	67%	65%
Advanced thermal (gasification/pyrolysis technology)	56%	56%	56%	70%	55%	48%	56%	55%

Statistically higher Statistically lower

Data labels <2% not shown.
Base: All respondents (n=516)
Q5-Q11. Please indicate your level of support for…?

18 – © Ipsos

Reasons Oppose Use of Biosolids for Forest Fertilizer
(verbatim comments)

- Verbatim comments provided by those opposed to the use of biosolids for **forest fertilizer** can be found below.

Pets.

Potential contamination of ground water.

The thought of animals eating the fertilizer.

Don't believe it is the safest procedure.

Toxicity.

Toxic sludge is not good for trees.

If biosolids are so good for the environment why was the ocean release not continued? Given the huge water exchange in Victoria's location on Juan de Fuca, and the lack of any deleterious effect, the decision to surround ourselves on land with our waste makes no sense at all.

Base: Sampling of those opposed
Q6A. What is the main reason why you oppose this use of biosolids?

19 – © Ipsos

Reasons Oppose Use of Biosolids for Industrial Land Reclamation
(verbatim comments)

- Verbatim comments provided by those opposed to the use of biosolids for **industrial land reclamation** can be found below.

I think that the use of biosolids in bad areas can affect the environment and eco systems.

Cost to me.

Are better things.

I don't believe it to be safe enough.

Toxic sludge is not appropriate for this use.

To save land.

Sounds like it will be bad for soil for vegetable growth.

I do not trust the treatment that is given.

Environment.

I worry that there will be health concerns to using biosolids.

Toxicity.

It is bad for climate change.

Expensive.

I'm unsure of the long term effects on the land and the water. We won't know the long term impacts on the environment for at least 10 years or so and by then it might be too late for intervention on the environment and we won't be able to make the necessary adjustments in time for our planet. I'm just very concerned about the world my son is going to be inheriting in the future and I'm praying we aren't too late already.

Base: Sampling of those opposed
Q7A. What is the main reason why you oppose this use of biosolids?

20 – © Ipsos

Reasons Oppose Use of Biosolids for Wholesale Fertilizer for Landscaping (verbatim comments)

- Verbatim comments provided by those opposed to the use of biosolids for **wholesale fertilizer for landscaping** can be found below.

Green.

Future use is unknown.

It's not bad, but I don't think manicured lawns should be the priority. Less water usage is great!

I don't want to consume foods grown by our waste.

I do not oppose I say for only landscape.

Human waste in your garden??

I am concerned about run off and contamination.

It is too close to city life.

Don't know if there may be harmful effects to humans and animals.

Beehives.

Would want to better understand heath implications.

Unless the biosolids (sewage waste) is treated in a Pyrolysis plant then the heavy metals, pharmaceuticals, chemicals etc. remain in the sewage & is detrimental to the environment with the ability to downstream into water flows eventually ending up in the ocean affecting wildlife & fish habitats.

Base: Sampling of those opposed
Q8A. What is the main reason why you oppose this use of biosolids?

21 – © Ipsos

Reasons Oppose Use of Biosolids for Agriculture Fertilizer (verbatim comments)

- Verbatim comments provided by those opposed to the use of biosolids for **agriculture fertilizer** can be found below.

Your Walmarts aren't very big like the U.S per say it seems like kind of a waste right now.

It could be bad.

Unproven.

I oppose the use of biosolids because it's not the right thing to use.

Because I believe eating natural food is always healthier.

Potential contamination of ground water.

Concerns that we may not have enough evidence that pharmaceutical and disease particles have all been removed and won't seep into the food.

Not certain of health implications - would need to understand more.

There isn't enough scientific evidence proving the safety of using biosolids as fertilizer for human food production.

Contaminants.

Concerned about cross contamination of agricultural products.

*Simple philosophy, don't s*** in your own nest.*

Endangered species honeybees.

Human waster should not be on our fields for growing food.

From experience biosolids are full of heavy metals and could contain pathogens if not properly sterilized. Proper testing is simply not done.

Base: Sampling of those opposed
Q5A. What is the main reason why you oppose this use of biosolids?

22 – © Ipsos

Reasons Oppose Use of Biosolids for Bagged Fertilizer for Low-Cost Residential Use (verbatim comments)

- Verbatim comments provided by those opposed to the use of biosolids for **bagged fertilizer for low-cost residential use** can be found below.

Unsure of impact.

Have honeybees and they are endangered.

I don't want people's poop in my garden.

At the residential level it may not be safely handled due to lack of complete knowledge.

Unsure.

I don't trust biosolids uses on private property.

Pathogens and heavy metals, not enough testing is done to ensure public safety.

Gross.

I just don't know enough about negatives.

Again, not sure if there may be harmful effects for humans and animals.

Bad for the environment.

*Again, same philosophy, don't s*** in your own nest.*

Human waste should not be use for growing food, or be around the population.

Even more expensive.

I don't like the idea of private people controlling this.

Base: Sampling of those opposed
Q10A. What is the main reason why you oppose this use of biosolids?

23 –

Reasons Oppose Use of Biosolids for Fuel for Incineration/Combustion (verbatim comments) (slide 1 of 3)

- Verbatim comments provided by those opposed to the use of biosolids for **fuel for incineration/combustion** can be found below.

Not enough facilities to use the product.

I feel it is detrimental to the environment.

Too much greenhouse gasses and it's already bad.

Gases.

CO_2 & CH_4 emissions increased with burning.

Prefer other options.

It goes into the air.

It is not a beneficial use. We should be using as fertilizer in appropriate areas.

It releases a lot of CO_2 emissions.

It seems like a waste and there are probably other things we can burn.

Burning and its impact on carbon emissions.

Not used locally.

I see this this as the worst option since it will produce emissions.

We should be sequestering, not combusting hydrocarbons.

The negative impact on the environment, we won't know the full results of our lack of action and on our stupidity and putting the dollar above our world. It just means that we have already lost this fight. How completely selfish and self absorbed are we to not have put things in place like, when deciding to create something, making it illegal to mass produce something that doesn't decompose within 20 years. It may take a bit longer than we would like to have certain things but at least we would have a world that's going to be here and have air for us to breathe and our children to breathe in the future.

Base: Sampling of those opposed
Q9A. What is the main reason why you oppose this use of biosolids?

24 –

Reasons Oppose Use of Biosolids for Fuel for Incineration/Combustion

(verbatim comments) (slide 2 of 3)

- Verbatim comments provided by those opposed to the use of biosolids for **fuel for incineration/combustion** can be found below.

Should be used in Victoria.

Impact on neighborhood.

Pointless.

The cost to transport, the inability to expect constant use of the solids in heat generation, and the inability to store the solids safely as a result make this a terrible idea.

I support them.

Damage to the environment.

I worry about the resulting air pollution and greenhouse gases.

It seems like a carbon emitting use.

Burning is pollution.

Trucking costs of the product seem unnecessary.

Inefficient--too much transport needed--fertilizer is better.

Concerns over potential contaminants.

There are enough power and fuel options, and we don't need more impacts to the environment.

Because of the pollution that gets put into the air with burning the biosolids.

The treated sewage (biosolids) were not produced suitable for the cement kilns to burn & the plants could not accept the total volume 100% of the time. The excess biosolid was applied to land.

Base: Sampling of those opposed
Q9A. What is the main reason why you oppose this use of biosolids?

25 – © Ipsos

Reasons Oppose Use of Biosolids for Fuel for Incineration/Combustion

(verbatim comments) (slide 3 of 3)

- Verbatim comments provided by those opposed to the use of biosolids for **fuel for incineration/combustion** can be found below.

This would create air born particles, and we need to reduce this.

It seems like there are better uses than burning it and releasing CO_2.

I am not sure what the impact is on the environment vis a vis carbon footprint.

Base: Sampling of those opposed
Q9A. What is the main reason why you oppose this use of biosolids?

26 – © Ipsos

Reasons Oppose Use of Biosolids for Advanced Thermal (Gasification/Pyrolysis Technology) **(verbatim comments) (slide 1 of 3)**

- Verbatim comments provided by those opposed to the use of biosolids for **advanced thermal (gasification/pyrolysis technology)** can be found below.

It is a solution which is going to take a long time with questionable benefits.

Cost, time, effect on neighbours.

Progress unknown.

I am already overburdened as a taxpayer. I cannot anymore "feel good" projects.

Prefer other options.

Costly and could make climate change worse.

I have concerns about the long timeline and costs associated with this use/application of biosolids.

If this is going to be similar to coal then you're getting negative emissions - not in favour of that at all. We're mostly away from coal and working to eradicate it, not find a new way to add it.

It is costly and not necessary. We should be selling as fertilizer.

They contain poop.

It doesn't sound super great for the environment.

Unproven technology that seems to carry a very high price tag.

It seems like just a different and possibly expensive way to produce another carbon emitting fuel source.

Not sure the process and all of its effects have been properly studied.

It takes too darn long to get there and too darn many money when compared to other options available, not to mention the fact that there is no experience in Canada using this. Plus, there may be other factors, like, where such a facility be build? I can see locals fighting against such a facility for various reasons.

Current level of use.

Base: Sampling of those opposed
Q11A. What is the main reason why you oppose this use of biosolids?

Reasons Oppose Use of Biosolids for Advanced Thermal (Gasification/Pyrolysis Technology) **(verbatim comments) (slide 2 of 3)**

- Verbatim comments provided by those opposed to the use of biosolids for **advanced thermal (gasification/pyrolysis technology)** can be found below.

Time and cost.

Unhealthy.

Too expensive if it reaches $4500.

Not cost-effective and requires too much resources for beneficial results.

This is the most expensive option so far. Whatever is the least cost is what I would prefer.

Too expensive.

Potential cost.

It seems like an expensive way to produce another carbon emitting fuel source.

Burning gas is still pollution.

Need more information and research.

It doesn't seem super environmentally friendly.

Seems costly compared to some of the other options.

Far too expensive.

COST!!

It is not good for plants and animals.

Cost and assumption that there are better uses.

Base: Sampling of those opposed
Q11A. What is the main reason why you oppose this use of biosolids?

Reasons Oppose Use of Biosolids for Advanced Thermal (Gasification/Pyrolysis Technology) (verbatim comments) (slide 3 of 3)

- Verbatim comments provided by those opposed to the use of biosolids for **advanced thermal (gasification/pyrolysis technology)** can be found below.

Unknown costs.

Cost, and availability of alternatives.

Cost/benefit bad.

Too much cost and investment, cost benefit analysis is not stated.

Cost and length of time to implement.

Cost and potential of going excessively over budget.

Contaminants.

If there are non carbon producing options, why make a polluting one.

Base: Sampling of those opposed
Q11A. What is the main reason why you oppose this use of biosolids?

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COMMUNICATION 3.3

30 – © Ipsos

Best Ways to Keep Informed about Topic

- TV news is the number one best way to keep residents informed about this topic, but several other methods are also desired by many residents.

56%	48%	45%	43%	35%	5%	4%
TV NEWS	WEBPAGE	NEWSPAPER	CRD SOCIAL MEDIA	RADIO	OTHER	DON'T KNOW

Base: All respondents (n=516)
Q12. What is the best way to keep you informed about this topic in future?

31 – © Ipsos

Best Ways to Keep Informed about Topic (by Demos)

- Older residents are less interested in keeping informed by CRD social media and radio.
- Core are residents and men are less interested in keeping informed by radio.

Total Familiar (Extremely + Moderately)

	Total	Region		Age			Sex	
		Core	Other	18-34	35-54	55+	Male	Female
Sample Size	516	348	168	99	171	246	237	276
TV news	56%	56%	57%	61%	52%	57%	58%	55%
Webpage	48%	47%	49%	52%	48%	45%	47%	47%
Newspaper	45%	46%	42%	43%	45%	46%	42%	47%
CRD social media	43%	42%	44%	54%	57%	26%	41%	44%
Radio	35%	31%	40%	39%	43%	27%	29%	41%

Statistically higher **Statistically lower**

Base: All respondents (n=516)
Q12. What is the best way to keep you informed about this topic in future?

32 – © Ipsos

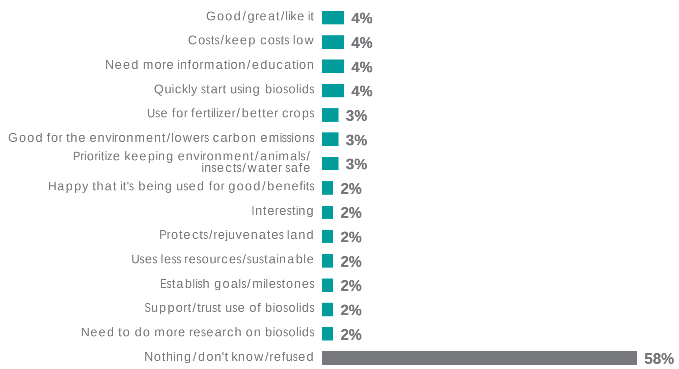
FINAL COMMENTS

3.4

33 – © Ipsos

Final Comments

- Most survey respondents had no final comments or suggestions for the CRD on this topic.



Mentions <2% not shown.
Base: All respondents (n=516)
Q13. Do you have any final comments about biosolids and the potential uses being considered by the CRD?

34 – © Ipsos

Weighted Sample Characteristics

GENDER	
Male	47%
Female	52%
Another gender	1%
AGE	
18-24	7%
25-34	19%
35-44	18%
45-54	13%
55-64	17%
65+	28%
OWN/RENT	
Yes	68%
No	31%
Prefer not to answer	2%
OWN BUSINESS	
Yes	11%
No	87%
Prefer not to answer	2%

COMMUNITY	
Central Saanich	6%
Colwood	4%
Esquimalt	3%
Highlands	2%
Juan de Fuca	0%
Langford	11%
Metchosin	2%
North Saanich	3%
Oak Bay	2%
Saanich	26%
Salt Spring Island	3%
Sidney	4%
Sooke	5%
Southern Gulf Islands	1%
Victoria	26%
View Royal	2%

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Ipsos

About Ipsos

Ipsos is the third largest market research company in the world, present in 90 markets and employing more than 18,000 people.

Our research professionals, analysts and scientists have built unique multi-specialist capabilities that provide powerful insights into the actions, opinions and motivations of citizens, consumers, patients, customers or employees. Our 75 business solutions are based on primary data coming from our surveys, social media monitoring, and qualitative or observational techniques.

"Game Changers" – our tagline – summarises our ambition to help our 5,000 clients to navigate more easily our deeply changing world.

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Game Changers

In our world of rapid change, the need for reliable information to make confident decisions has never been greater.

At Ipsos we believe our clients need more than a data supplier, they need a partner who can produce accurate and relevant information and turn it into actionable truth.

This is why our passionately curious experts not only provide the most precise measurement, but shape it to provide True Understanding of Society, Markets and People.

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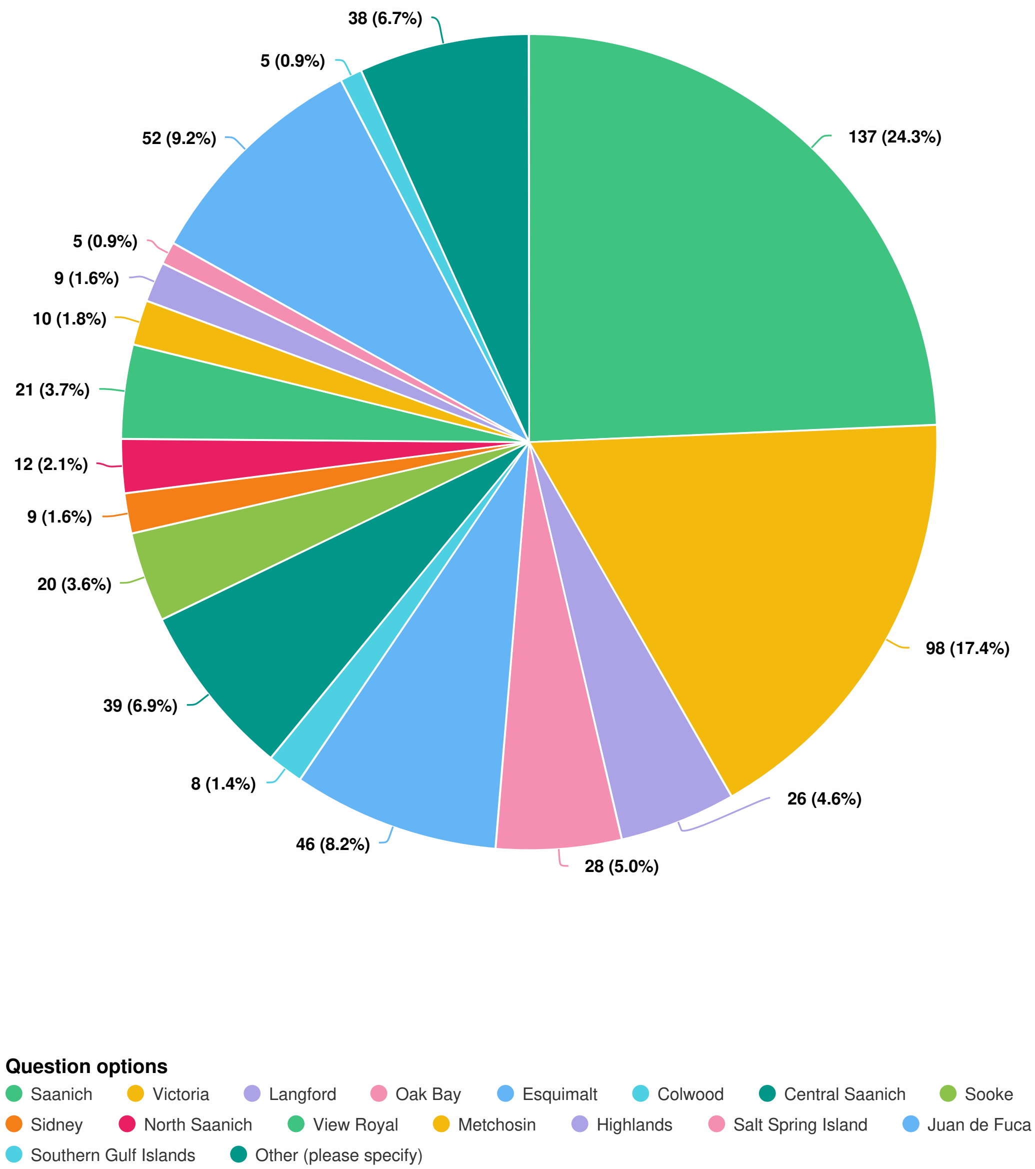
So that our clients can act faster, smarter and bolder. Ultimately, success comes down to a simple truth:
You act better when you are sure.

CRD Online Survey

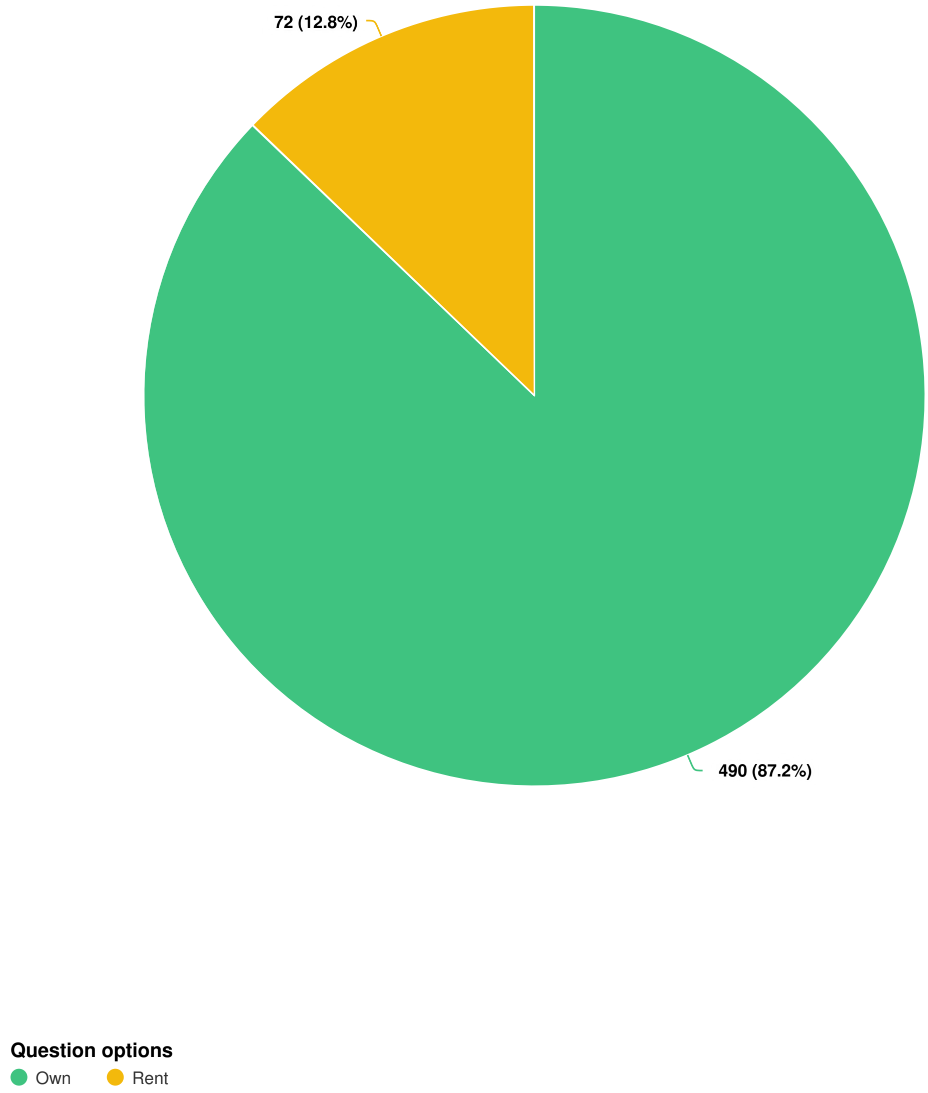
569 people participated in the online survey between January 11 and March 6, 2024. The survey was hosted on the CRD's ***www.GetInvolved.crd.bc.ca*** engagement platform. The highest participation was experienced timed with the survey launch, media coverage and promotion by a third-party non-profit organization, Creatively United.

Question #1 – *Where do you live?*



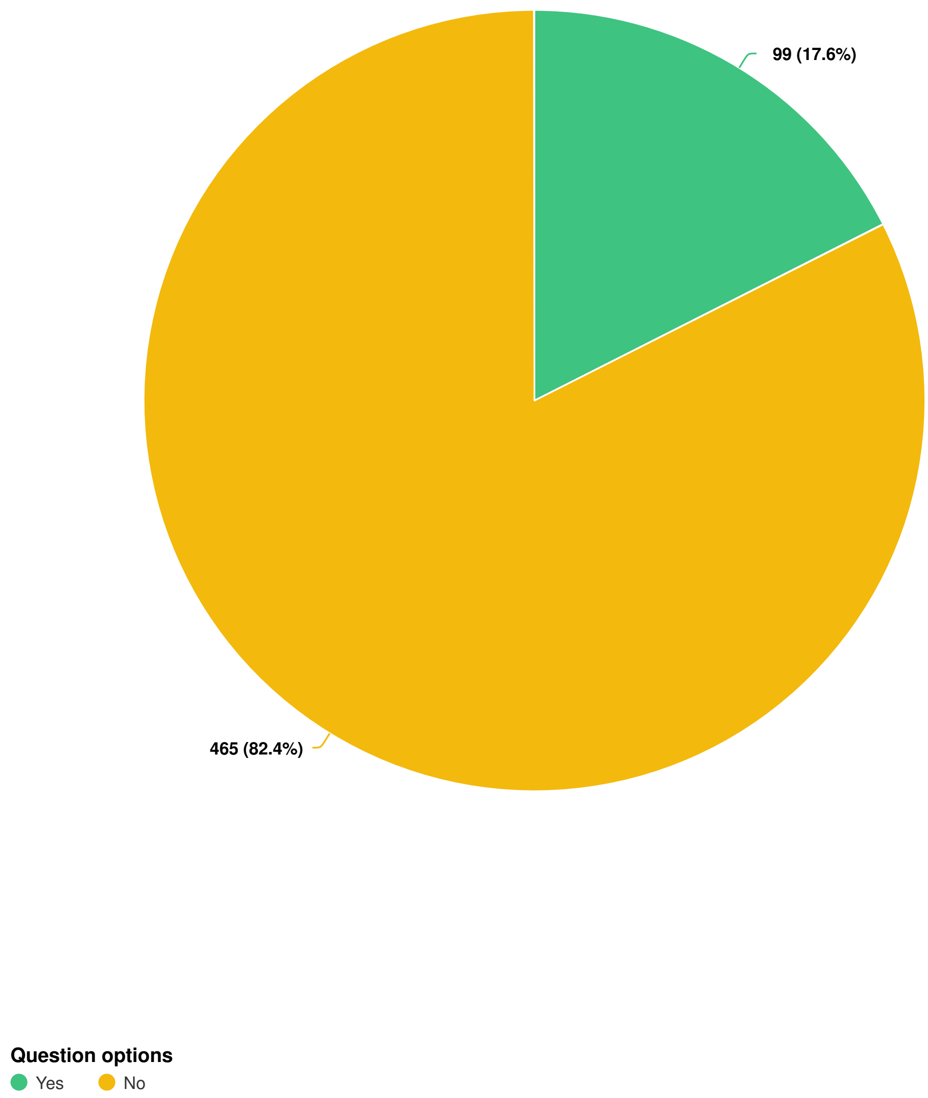
Optional question (562 response(s), 7 skipped)
Question type: Dropdown Question

Question #2 – *Do you own or rent your home?*



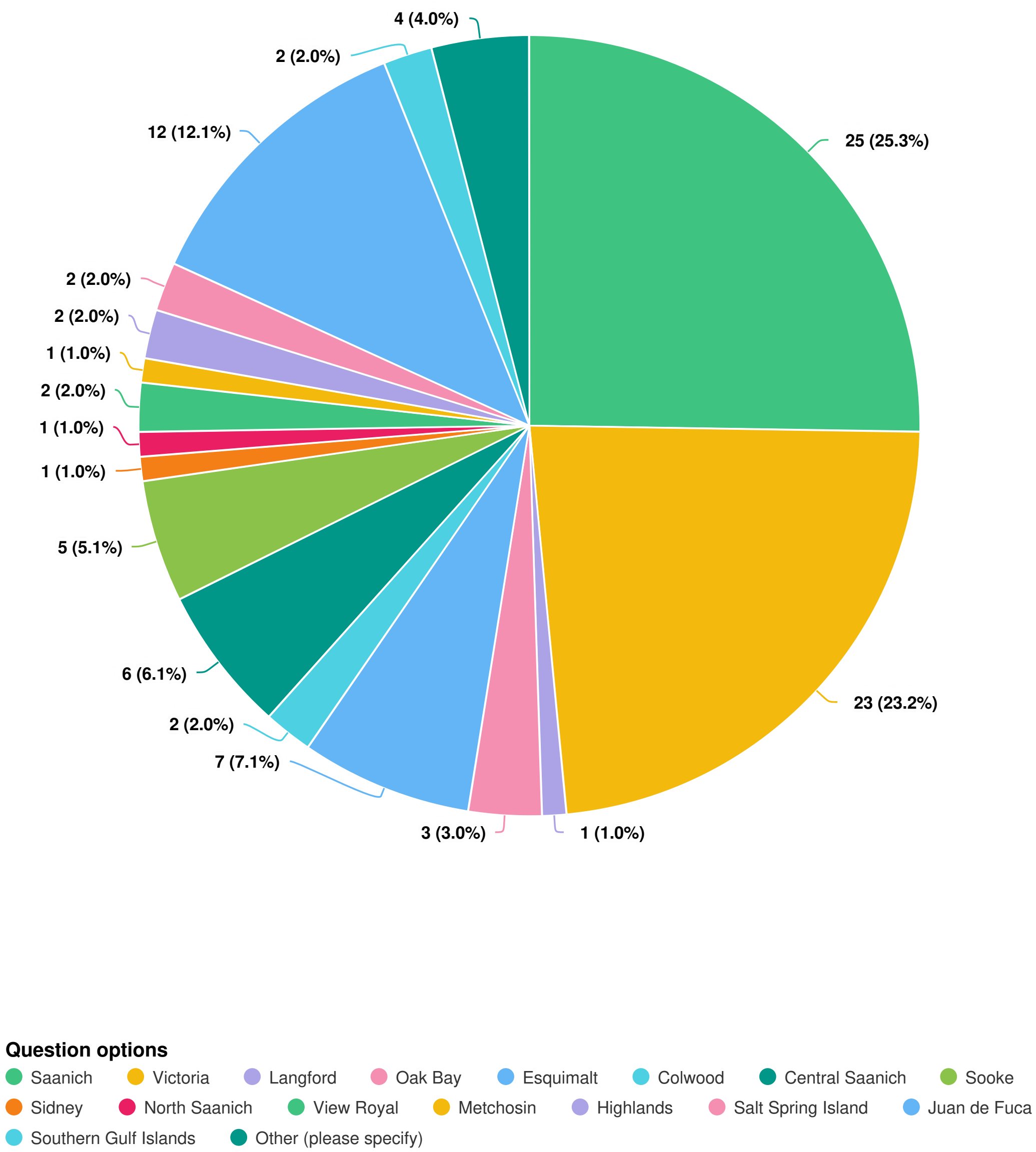
Optional question (561 response(s), 8 skipped)
Question type: Radio Button Question

Question #3 – *Do you own a business in the capital region?*



Optional question (563 response(s), 6 skipped)
Question type: Radio Button Question

Question #4 – *Where is your business located?*

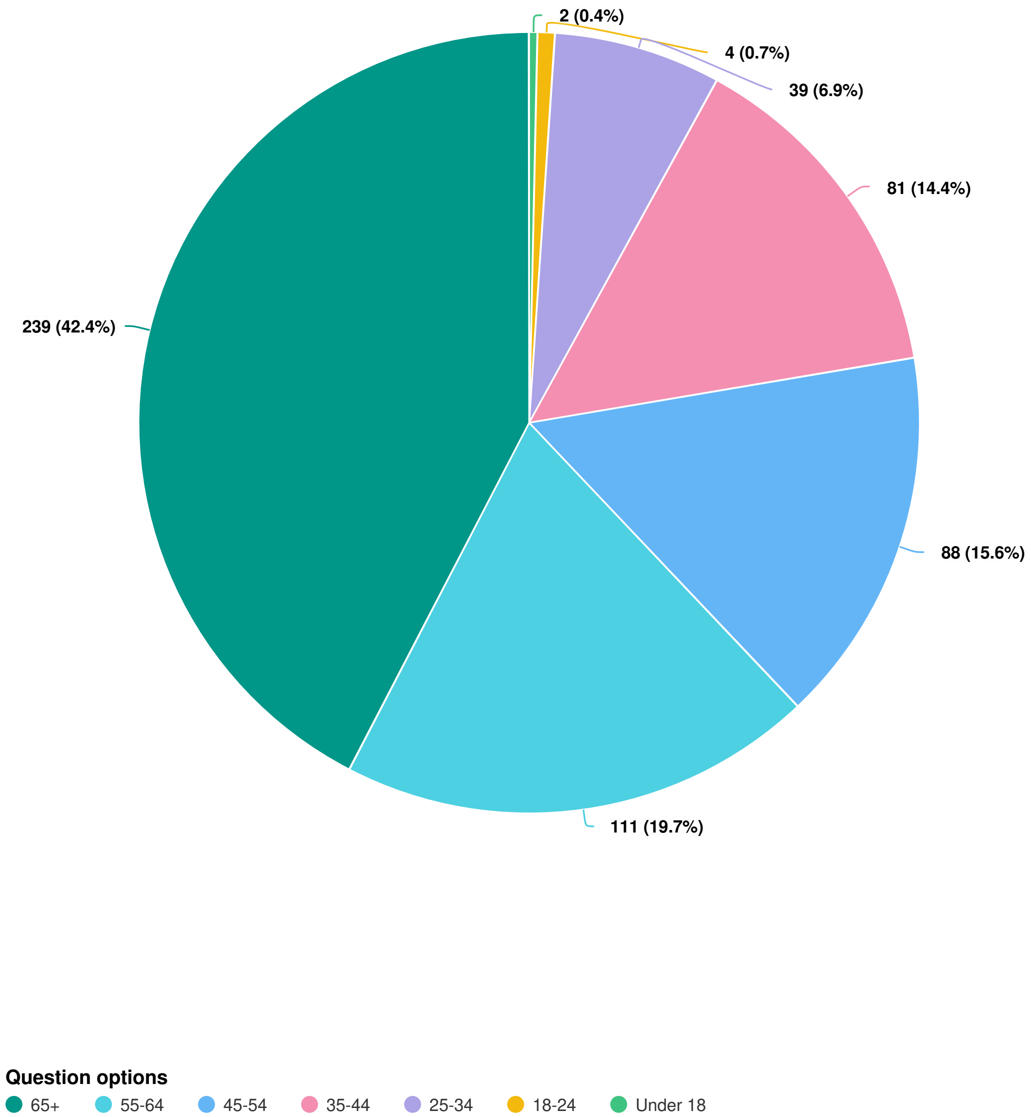


Optional question (99 response(s), 470 skipped)
Question type: Dropdown Question

Question #5 – ***How familiar are you with the following topics?***

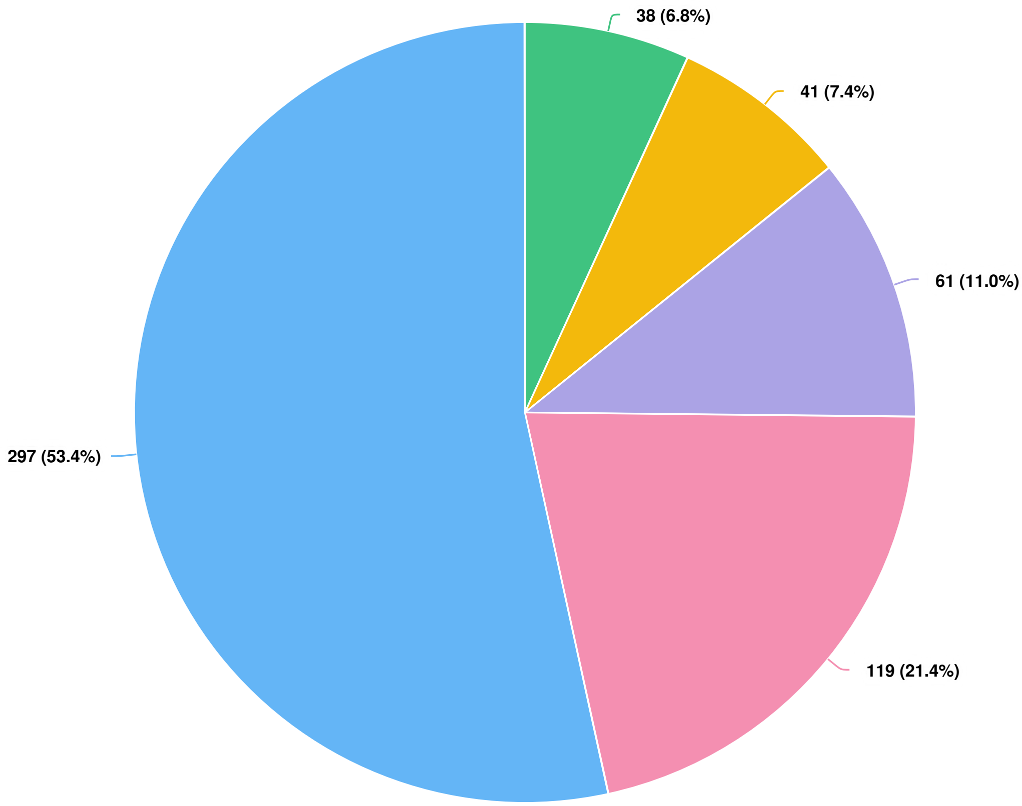
Optional question (562 response(s), 7 skipped)
Question type: Likert Question

Question #6 – *What is your age range?*



Optional question (563 response(s), 6 skipped)
Question type: Radio Button Question

Question #7 – ***How important is it to you how biosolids are maximized for community benefit?***



Question options

Very important · Important · Fairly important · Slightly important · Not at all important

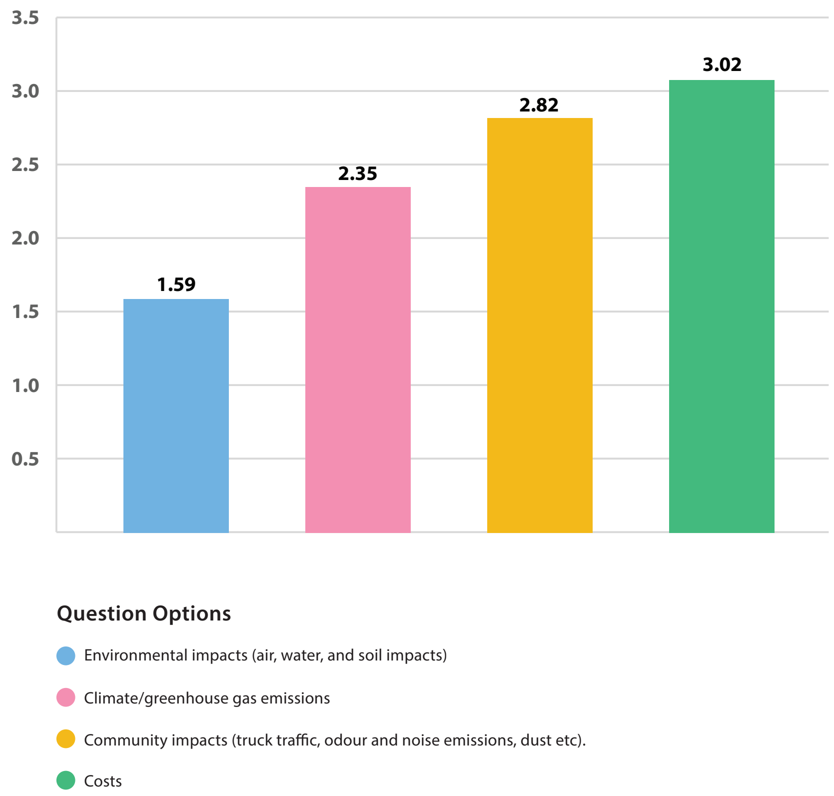
Optional question (555 response(s), 14 skipped)
Question type: Radio Button Question

Question #8 – *Please explain why you chose that level of importance.*

Top mentions included:

- Biosolids should be managed responsibly for the long-term, taking into consideration environment and health. Some respondents also noted costs.
- Land application options are not "beneficial" due to potential risks.
- Biochar/advanced thermal options are the most effective method to reduce risks of biosolids.
- Biosolids should not be landfilled/buried.
- Some respondents feel "beneficial use" is a subjective term.
- Some respondents who felt biosolids should be utilized as a resource mentioned circular economy.

Question #9 – *When planning for the beneficial uses of biosolids, how important are the following considerations to you? Please rank in order of importance (1 being most important – 4 being least important).*



Optional question (552 response(s), 17 skipped)
Question type: Ranking Question

Question #10 – ***Please indicate your level of support for the following potential uses.***

Optional question (563 response(s), 6 skipped)
Question type: Likert Question

Question #11 – *What specifically interests you about the potential benefits biosolids can offer?*

Top mentions include:

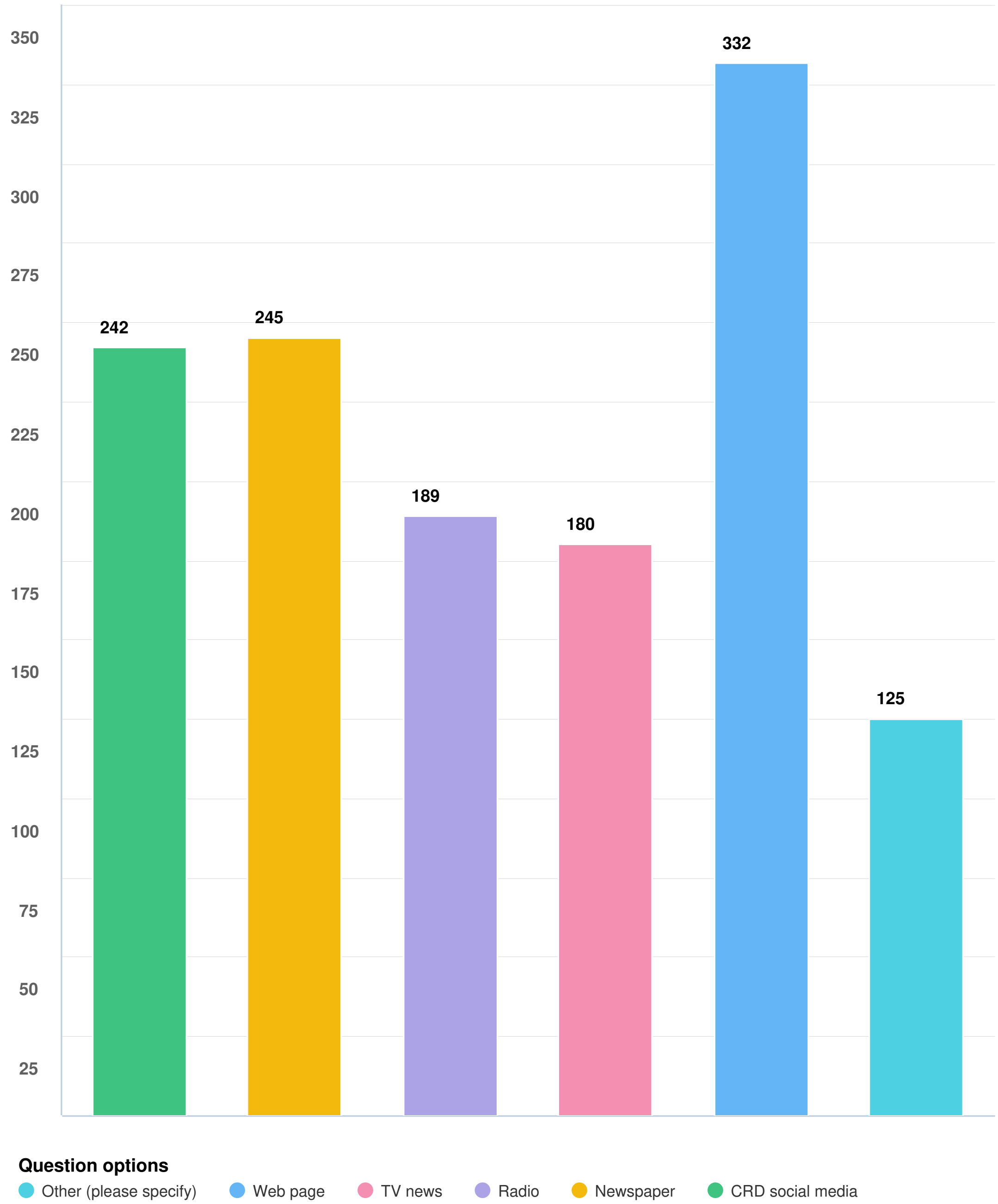
- Biosolids have no benefit unless converted to biochar.
- Some felt biosolids could benefit soils as various forms of fertilizer or soil amendment.
- Some felt it is important to reuse/reduce/recycle waste in a responsible manner.

Question #12 – *Do you have any specific concerns about the beneficial use of biosolids?*

Top mentions included:

- Concern about the toxicity, level of contaminants and specifically Per- and polyfluoroalkyl substances [PFSAs]/forever chemicals.
- Risk [of land application] to environment and plants.
- Biosolids need to be treated.
- Biochar/advanced thermal options are the only beneficial use.

Question #13 – ***What is the best way to keep you informed about this topic in future? Check all that apply.***



Optional question (558 response(s), 11 skipped)
Question type: Checkbox Question

Question #14 – ***Is there anything more you wish you knew about biosolids, and the options being considered? [n=325]***

Top mentions included:

- More detail about plans, progress, and timelines towards piloting advanced thermal options.
- More information about the testing, scientific research and risks associated with land applying biosolids.
- Costs benefit analysis of options.
- Feasibility, experience, and case studies of various options in other jurisdictions.

Open House – Tuesday, February 20, 2024

56 people [of 99 who RSVP'd] participated in the two-hour virtual open house. The open house was an opportunity for the CRD staff and technical consultants to present background information, outline the process and Provincial regulatory requirements for the beneficial use of biosolids, as well as the beneficial-use options being explored.

Attendees were invited to ask questions of the staff and consultants. Questions were moderated by communications consultant Jim Beatty and posed to the panel of Glenn Harris, Senior Manager, Environmental Protection, Peter Kickham, Manager, Regulatory Services, Environmental Protection Division, and GHD Technical Consultant Deacon Liddy. Over 100 questions were submitted during the two-hour session. Attendees were encouraged to provide feedback through the CRD's online survey or ***biosolids@crd.bc.ca***

Key themes:

- Many questions were related to the testing, regulations, and environmental and health risks associated with land application [e.g., metals, microplastics, Per- and polyfluoroalkyl substances] and whether the CRD has considered the associated scientific literature and experience of other jurisdictions.
- Some questions were related to legal liability of land application
- Some questions were about the open house format [e.g., virtual, moderated questions] and status of indigenous engagement.

Watch the recording of the Long-Term Biosolids Management Plan Open House held Tuesday, February 20, 2024: ***Harnessing the Benefits of Biosolids - Virtual Open House (youtube.com)***

Correspondence to the CRD Board of Directors – January 11 – March 6, 2024

24 letters were submitted to the CRD Board between January 11 and March 6, 2024.

Letters were received from individual residents and the following organizations:

- Biosolids Free BC
- Butchart Gardens
- Creatively United for Planet Society
- Friends of Tod Creek
- Mount Work Coalition
- Peninsula and Area Agricultural Commission
- Peninsula Biosolids Coalition
- Peninsula Streams
- Regional District of Nanaimo [RDN]
- Saanich Inlet Protection Society

The majority of correspondence noted risks associated with land application and encouraged the CRD Board to uphold the existing land application ban.

Many letters noted the need to refer to studies and literature about the risks of contaminants such as microplastics and PFAS in biosolids that should be considered.

Some letters noted concern with the consultation process and emphasized the need for greater emphasis on the risks associated with land application and the existing land application ban.

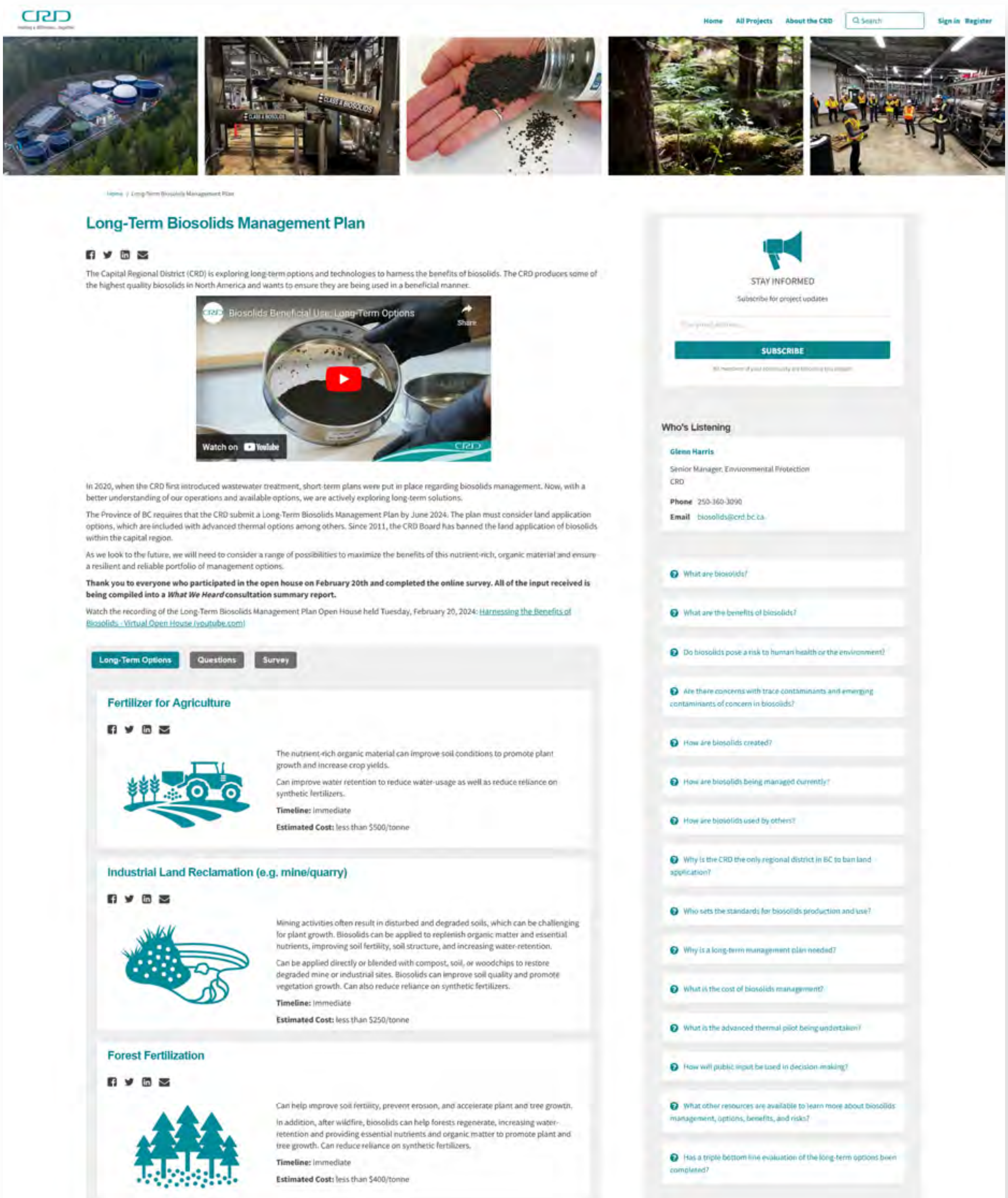
Some letters expressed support for thermal processing of biosolids.

NEXT STEPS

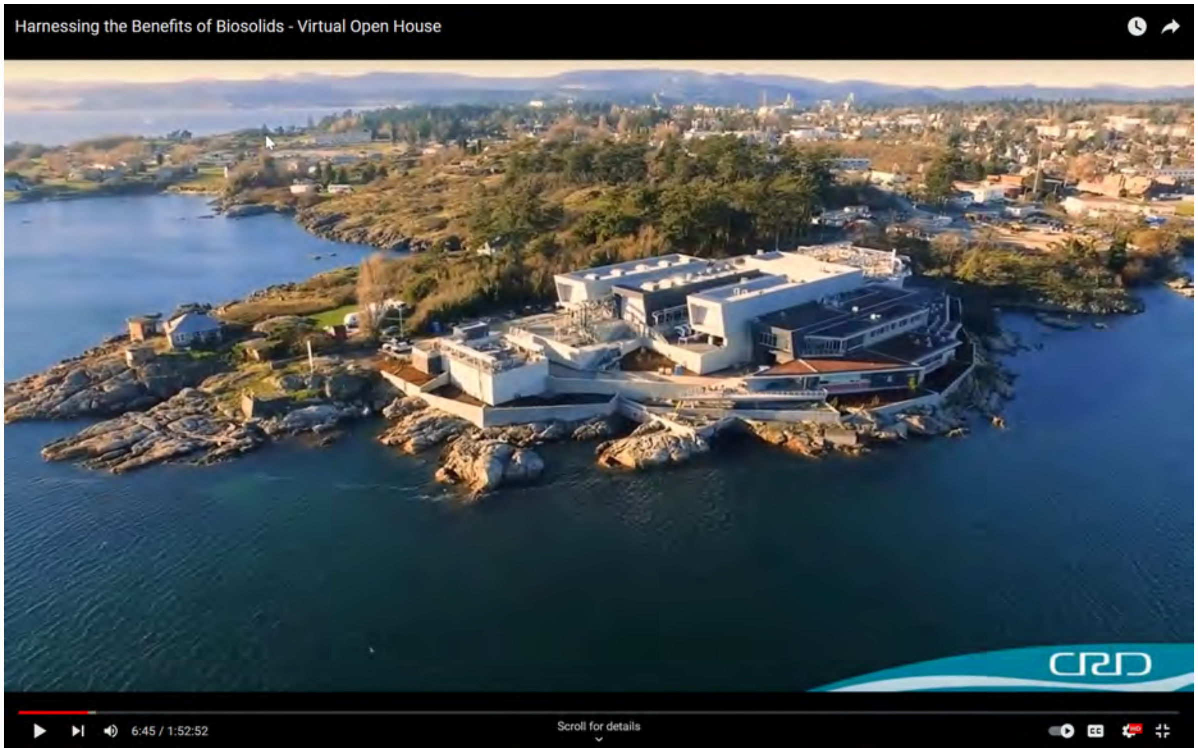
This ***What We Heard*** consultation summary report will be presented to the Technical and Community Advisory Committee [Core Area LWMP] and the CRD Board for Directors in Spring 2024 to inform the development of a long-term biosolids management plan that will be submitted to the Ministry of Environment and Climate Change Strategy. It will also be posted on the project website at ***getinvolved.crd.bc.ca***.

APPENDICES

Webpage Screenshot



Overview Video



Watch the overview video: ***Biosolids Beneficial Use: Long-Term Options (youtube.com)***

Media Release

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Media Release

For Immediate Release
January 11, 2024

Community consultation begins to determine best use for Biosolids

Victoria, BC- Public consultation is underway as the Capital Regional District (CRD) considers long-term options and technologies to harness the benefits of biosolids, the nutrient-rich by-product from wastewater treatment.

Currently, the region's biosolids are largely being landfilled under emergency measures, while some are beneficially used to offset fossil fuels or for mine reclamation. The CRD is obligated as part of regulatory commitments to find a long-term solution.

"Biosolids are a valuable resource which we must use to benefit our region," said CRD Board Chair Colin Plant. "Public and First Nations consultation will help us shape a sustainable, long-term solution for biosolids management that aligns with our regulatory requirements."

The provincial government requires the CRD to file a long-term plan outlining the beneficial uses for biosolids by Spring 2024.

Biosolids are the by-product of the region's wastewater treatment processes and must meet stringent environmental standards. The CRD produces the highest quality biosolids obtainable, known as "Class A" biosolids. They meet or exceed rigorous provincial standards regarding pathogens and heavy metals to ensure the protection of human and environmental health.

"It's not a topic most people are talking about around the water cooler but it's very important to our region," said CRD Director Barbara Desjardins, Chair of the CRD's Environmental Services Committee. "Our role is to determine how to best maximize the community benefits of this organic by-product. In 2011, prior to introducing wastewater treatment in the core area, the CRD Board of Directors passed a biosolids land application ban based on the concerns of members of the public. However, the province requires that land application options be considered along with the other options the CRD is exploring, including advanced thermal options."

Biosolids can help improve soil fertility, prevent erosion, and accelerate tree and plant growth. Some communities use biosolids as forest fertilizer or to reclaim industrial lands such as mines. Others use it on lawns, golf courses, municipal boulevards and in agriculture, such as orchards, to promote plant growth and reduce reliance on synthetic fertilizers.

Biosolids can also be thermally processed and used as fuel, reducing the requirement for non-renewable fuels such as coal or natural gas. A small percentage of CRD biosolids have been sent to a cement kiln in Richmond but this is not regarded as a reliable long-term option as the facility has had operational difficulties.

Biosolids are commonly used in beneficial ways in communities across North America. In British Columbia., nearly every large community uses biosolids as fertilizer or in compost and biosolids are commonly found in lawn products sold at local retailers.

The public consultation process includes educational videos and materials, an online open house, a statistically valid survey, and an online survey that is open until Friday, March 6, 2024. A Community and Technical Advisory Committee, which includes public representatives as well as those from each of the core municipalities, has been engaging on this topic since October 2023.

To learn more, the public can visit https://getinvolved.crd.bc.ca/biosolids or call Glenn Harris, Senior Manager of Environmental Protection, at 250-360-3090.

The CRD delivers regional, sub-regional and local services to 13 municipalities and three electoral areas on southern Vancouver Island and the Gulf Islands. Governed by a 24-member Board of Directors, the CRD works collaboratively with First Nations and government partners to enable sustainable growth, foster community well-being, and develop cost-effective infrastructure while continuing to provide core services to residents throughout the region. Visit us online at www.crd.bc.ca.

-30-

For media inquiries, please contact:
Andy Orr, Senior Manager
CRD Corporate Communications
Tel: 250.360.3229
Cell: 250.216.5492
Facebook | X | Instagram | LinkedIn | www.crd.bc.ca

Letter

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Parks & Environmental Services
625 Fisgard Street, PO Box 1000
Victoria, BC, Canada V8W 2S6

T: 250.360.3078
F: 250.360.3079
www.crd.bc.ca

February 15, 2024

File: 0220-20
Correspondence

RE: PUBLIC CONSULTATION TO SHAPE THE LONG-TERM BIOSOLIDS MANAGEMENT PLAN

The Capital Regional District (CRD) is actively exploring long-term options and technologies to harness the benefits of biosolids. The CRD produces high quality Class A biosolids and wants to ensure they are being used in a beneficial manner.

A Long-term Biosolids Management Plan is required by the Province of BC and must outline how biosolids generated in the capital region will be managed for community benefit. In 2020, when the CRD first introduced wastewater treatment, biosolids short-term management plans were put in place. Now, with a better understanding of our operations and available options, we are actively exploring long-term solutions.

The Province of BC requires that the CRD submit a Long-term Biosolids Management Plan by June 2024. The plan must consider land application options, as part of the beneficial use options analysis. Landfilling biosolids has been used as an emergency measure. However, it wastes valuable space in the landfill and does not meet provincial requirements for beneficial use of biosolids. It is not being considered as a long-term option. The CRD is moving ahead with a pilot of thermal technologies for managing biosolids. However, if successful, it will still be 7-10 years before it can be utilized as a long-term option. Since 2011, the CRD Board has banned the land application of biosolids within the capital region. In 2023, due to on-going challenges with existing options, the CRD Board amended the policy to allow for non-agricultural application of biosolids as a short-term contingency alternative. The Province of BC requires that the consultation process consider all options that meet beneficial use criteria as defined by regulatory guidance.

As we look to the future, we will need to explore a range of possibilities to maximize the benefits of biosolids. We invite you to learn more and share your ideas. Building on the involvement of the Technical and Community Advisory Committee since October 2023 and First Nations consultation, the public consultation process involves a range of opportunities from January to March 2024, including:

- Project Website: https://getinvolved.crd.bc.ca/biosolids
- Virtual Open House – Tuesday, February 20, 2024. Pre-registration required at https://us06web.zoom.us/webinar/register/WN_OJ4RQavWRZiEn8T3wS4K6g
- Provide written feedback by email: biosolids@crd.bc.ca
- Online Survey open until Friday, March 6, 2024 - Long-Term Biosolids Management Plan | Get Involved CRD

Learn more about biosolids and the different beneficial options being considered and opportunities to provide input at https://getinvolved.crd.bc.ca/biosolids. A Summary Consultation Report will capture "What We Heard" throughout the process and will be shared online.

ENVS-1852788916-307

We welcome your participation in this process and look forward to hearing from you. If you have any questions, please contact me at biosolids@crd.bc.ca.

Sincerely,

Glenn Harris, Ph.D., R.P.Bio.
Senior Manager, Environmental Protection

Attachment: Harnessing the Potential of Biosolids Fact Sheet

Social Media

Capital Regional District
February 29 at 8:00 AM

We appreciate the feedback we have received on the Long-Term Biosolids Management Plan thus far. If you have not shared your thoughts, remember you have until March 6th to complete our survey.

Share your input today and learn more about it by visiting getinvolved.crd.bc.ca/biosolids.

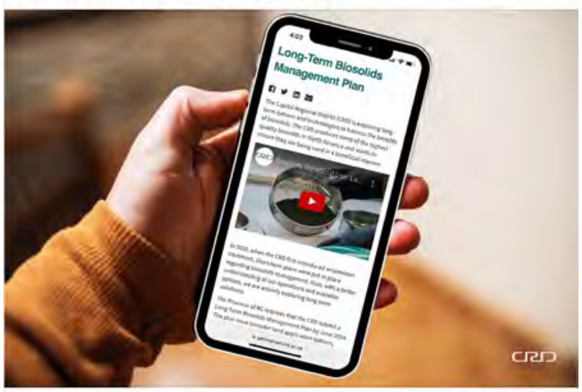
1 · 1 share

Capital Regional District
5d

Today is your last chance to provide your input on the Long-Term Biosolids Management Plan!

As we look to the future, we will need to consider a range of possibilities to maximize the benefits of this nutrient-rich, organic material and ensure a resilient and reliable portfolio of management options.

If you have not done it yet, take the survey by visiting getinvolved.crd.bc.ca/biosolids



1 share

CRD @crd_bc · Feb 20

🚨Don't forget to join us at Today 6PM for our virtual open house!

You'll learn more about the long-term options and technologies the CRD is exploring to harness the benefits of biosolids.

To register, visit getinvolved.crd.bc.ca/biosolids

1 · 1 · 1 · 370

CRD @crd_bc · Feb 16

Have you shared your thoughts on how we can harness the benefits of biosolids in the region?

Get involved today! getinvolved.crd.bc.ca/biosolids

📱Complete the Online Survey by March 6, 2024

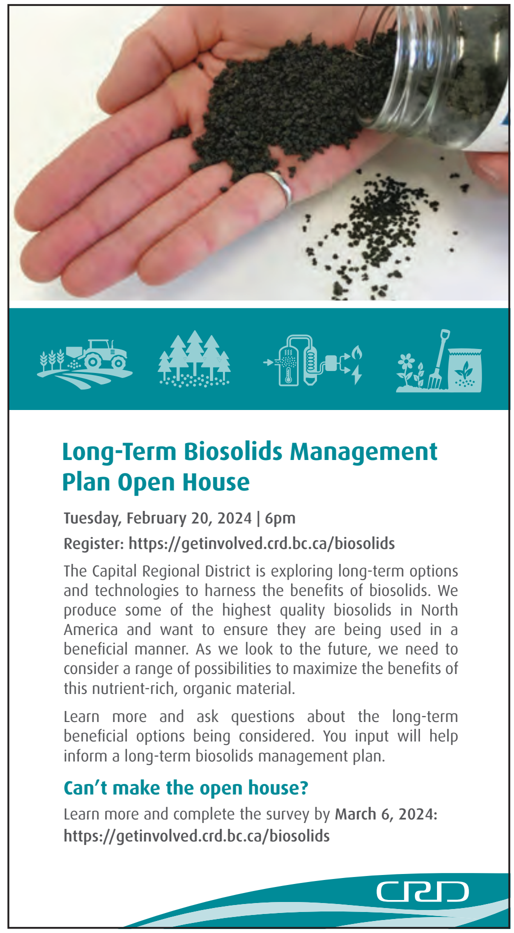
💻Join our Virtual Open House – Tuesday, February 20, 2024, 6pm, Pre-registration required.

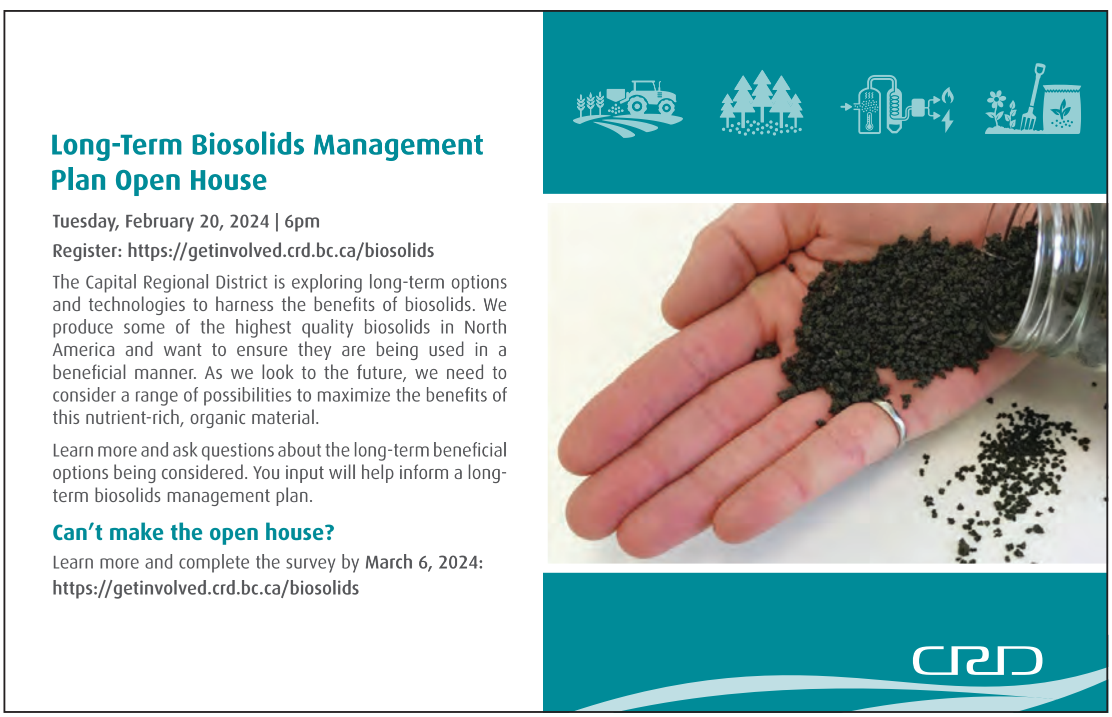
1 · 245

Print Advertising

Right: 3.8″ x 7″ ad that ran in Black Press: publications on Vancouver Island.

Below: 8.4″ x 5.4″ ad that ran in Victoria's Times Colonist.





Fact Sheet

Harnessing the Potential of Biosolids

CRD
Making a difference...together

Fact Sheet

Capital Regional District | **January 2024**

The CRD is exploring long term options and technologies to harness the benefits of biosolids. The CRD produces some of the highest quality biosolids in North America and wants to ensure they are being used in a beneficial manner.

In 2020, when the CRD introduced wastewater treatment for the core area municipalities and Songhees and Esquimalt First Nations, we implemented a 5-year, short-term plan. Now, with a better understanding of both our operations and available options, we are developing a long-term plan to move us forward into the future.

What Are Biosolids?

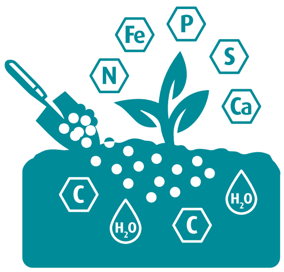
Biosolids are the nutrient-rich by-product of wastewater treatment. They contain nutrients, energy, and organic matter that can be recycled and used in various ways. The most common use is as fertilizer to promote tree and plant growth and as a soil additive to restore degraded industrial lands. Other emerging options may include harnessing energy contained in biosolids through thermal (heating) processes to use as an alternative fuel.

CRD biosolids are dark, dry granular pellets. Approximately 3,300 tonnes of Class A biosolids are generated in the CRD each year. CRD biosolids surpass all provincial standards. This is due to the limited heavy industry in Greater Victoria, the highest standards of sewage treatment, and robust source control programs that prevent metals and other contaminants from ever entering the wastewater system.

Benefits of Biosolids

Biosolids contain important nutrients such as nitrogen, phosphorus, calcium, sulphur, and iron. Benefits include:

- *Adds organic matter and plant nutrients to enrich soil*
- *A natural alternative to synthetic (chemical) fertilizers*
- *Stores carbon in soil and decrease greenhouse gas emissions*
- *Increases soil water retention*
- *Can be mixed with wood chips or yard waste to create compost*
- *Can be used to create alternate fuel*



For generations, biosolids have been safely used around the world by farmers, landscapers, and foresters. More recently in other countries, biosolids have been used in thermal (heating) processes to generate alternate energy sources. Biosolids are commonly used within communities across Canada. In fact, many common bagged fertilizers and soil products sold at local hardware stores and retailers contain biosolids.

How Are Biosolids Being Managed Currently?

Presently, the CRD's biosolids are largely being landfilled as an emergency measure, which does not meet provincial requirements. Further, it is exacerbating a capacity problem at the Hartland Landfill which is filling up at an accelerated rate. In 2011, prior to introducing wastewater treatment, the CRD Board passed a biosolids land application ban based on the concerns of members of the public. The ban remains in place today. Due to limited viable options, short-term exceptions were made for land cover application at Hartland Landfill in 2020 and for non-agricultural, out-of-region land application options in 2023.

Presently, the CRD's biosolids are mostly being landfilled because of challenges with the short-term options, which do not meet provincial requirements. The CRD is currently investigating a pilot study of thermal technologies for managing biosolids. However, if successful, it will still be 7-10 years before it can be utilized as a long-term option.

The Province of BC requires that the current consultation process consider land application options, which are included with advanced thermal options. Any options that don't meet beneficial use criteria will not be included. Landfilling biosolids has been used as an emergency measure. It wastes valuable space in the landfill and does not meet provincial requirements for beneficial use of biosolids.

Who Sets the Standard for How Biosolids Are Managed?

The BC Ministry of Environment and Climate Change Strategy and federal Environment and Climate Change Canada set the standards for wastewater treatment. Regional districts in BC are legally required by the Province to find beneficial uses for biosolids.

Class A biosolids must meet regulatory requirements under the Provincial Environmental Management Act and Organic Matter Recycling Regulation. These stringent requirements outline maximum allowable levels of pathogens and heavy metals to ensure protection of human health and the environment. They also provide strict controls on how and where biosolids may be used.

The Options

As we look to the future, a range of options must be explored. The CRD is exploring all options to use biosolids in ways that are increasingly beneficial for the environment. The CRD is committed to smart, innovative solutions that help reduce greenhouse gas emissions. We need to pursue a variety of options. The Province of BC requires that the CRD submit a Long-Term Biosolids Management Plan by June 2024. The plan must consider land application options, which are included with advanced thermal options among others.

OPTION	BENEFITS	TIMELINE	ESTIMATED COSTS *(per tonne)*	
Industrial Land Reclamation (e.g., mines or quarries) 	Mining activities often result in disturbed and degraded soils, which can be challenging for plant growth. Biosolids can be applied to replenish organic matter and essential nutrients, improving soil fertility, soil structure, and increasing water-retention. Can be applied directly or blended with compost, soil, or woodchips to restore degraded mine or industrial sites. Biosolids can improve soil quality and promote vegetation growth. Can also reduce reliance on synthetic fertilizers.	Immediate	<$250/tonne	LAND-BASED OPTION
Fuel for Incineration / Combustion (e.g., for cement kilns) 	Biosolids are burned or used as an alternative fuel to power facilities, such as cement kilns and pulp mills, reducing reliance on other non-renewable sources like coal or natural gas.	Limited facilities available. The CRD currently utilizes this technology at a plant in Richmond. In-region options are not available.	<$500/tonne	THERMAL OPTION
Forest Fertilization 	Can help improve soil fertility, prevent erosion, and accelerate plant and tree growth. In addition, after wildfire, biosolids can help forests regenerate, increasing water-retention and providing essential nutrients and organic matter to promote plant and tree growth. Can reduce reliance on synthetic fertilizers.	Immediate	<$400/tonne	LAND-BASED OPTION
Pyrolysis or Gasification Technology (to create biochar/gas) 	Biosolids are heated (using little or no oxygen) to make a gas or "biochar". The gas created can be used to produce heat or electricity. Biochar is a type of charcoal that is made from organic material. It can be used as a soil additive to improve soil fertility and enhance water retention.	7-10 years for permitting, siting and construction of a permanent facility. Advanced thermal technology is not currently used for processing biosolids in Canada.	$500-$4,500 /tonne	THERMAL OPTION

OPTION	BENEFITS	TIMELINE	ESTIMATED COSTS *(per tonne)*
Bagged Fertilizer for Residential Use 	The nutrient-rich organic material is bagged and distributed as fertilizer for residential use. Can also be blended with soil, compost or wood chips and made available for residential use. Can improve water retention to reduce water-usage as well as reduce reliance on synthetic fertilizers	Immediate	<$500/tonne
Fertilizer for Agriculture 	The nutrient-rich organic material can improve soil conditions to promote plant growth and increase crop yields. Can improve water retention to reduce water-usage, as well as reduce reliance on synthetic fertilizers.	Immediate	<$500/tonne
Wholesale Fertilizer for Landscaping (e.g., lawns, boulevards, golf courses) 	The nutrient-rich organic material can improve soil conditions to promote lawn and plant growth. Can improve water retention to reduce water-usage as well as reduce reliance on synthetic fertilizers.	Immediate	<$500/tonne

LAND-BASED OPTIONS

Timeline

2011
- CRD Policy – no land application

2020
- Short-term Biosolids Management plan developed in 2020
- Sewage treatment introduced in 2020

2021

2022
- Technical review of long-term options from 2022 to 2023

2023

2024
- Public Engagement from December 2023 to March 2024
  - Draft Long-term Biosolids Management Plan in June 2024

Share Your Thoughts!

Email: biosolids@crd.bc.ca

Online Open House: Date TBD

Website and Survey: www.getinvolved.crd.bc.ca Complete the online survey by Wednesday, March 6,2024

CRD
Making a difference...together

Capital Regional District
625 Fisgard Street, Victoria, BC V8W 1R7
250.360.3000 | www.crd.bc.ca

Open House Presentation by CRD

Long-term Biosolids Beneficial Use Open House

February 20, 2024

CRD
Making a difference...together

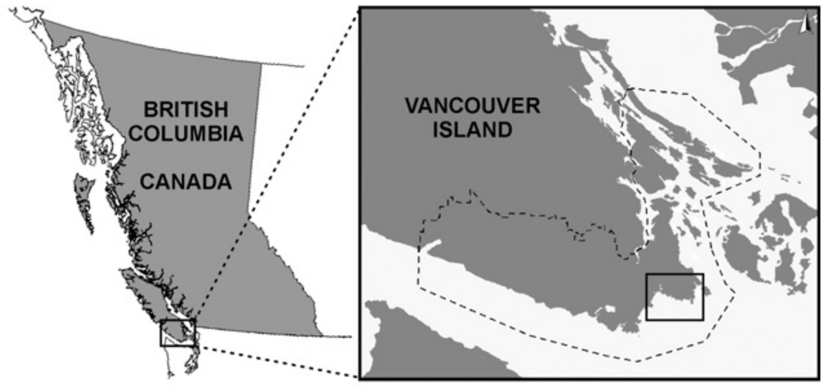
Management of Residual Wastewater Materials

CRD
Making a difference...together

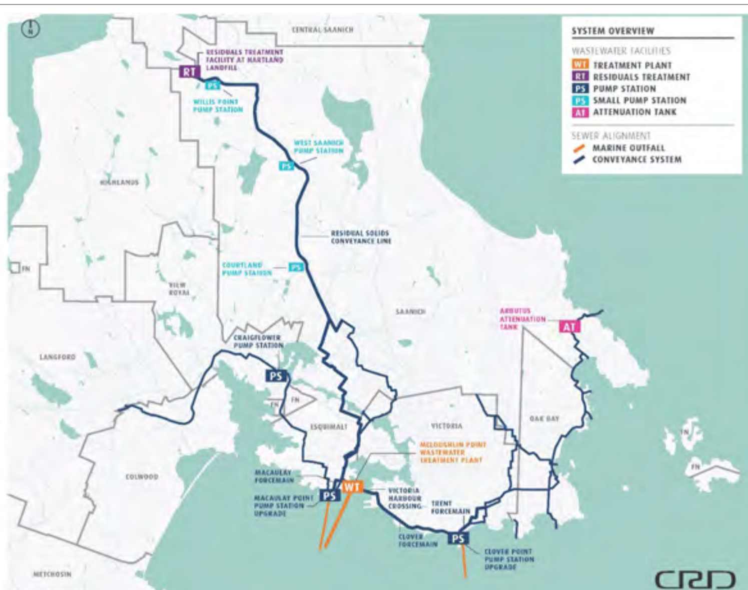
- Production and Management of Biosolids
- Status of Short-Term Biosolids Management Plan
- Technical Evaluation of Beneficial Use Options
- Development of a Long-Term Management Plan
- Questions and Answers

Capital Regional District

- The Capital Regional District (CRD) consists of 13 municipalities and 3 electoral areas.
- The CRD owns and operates seven wastewater treatment plants (WWTP), including the McLoughlin Point Wastewater Treatment Plant.



Core Area Wastewater Treatment



Regional Source Control Program

CRD
Making a difference...together

- Source control is the first step in wastewater treatment.
- Source control is about preventing and reducing contaminants at the source, before they enter the wastewater system.
- Municipal wastewater treatment plants receive discharges from households, industry and commercial sources. Our region has very minimal heavy industry.
- The CRD's source control program is designed to protect:
    1. Human (operator and public) health and safety
    1. Marine receiving environment
    2. Municipal infrastructure
    3. Treatment plants
    4. Biosolids quality

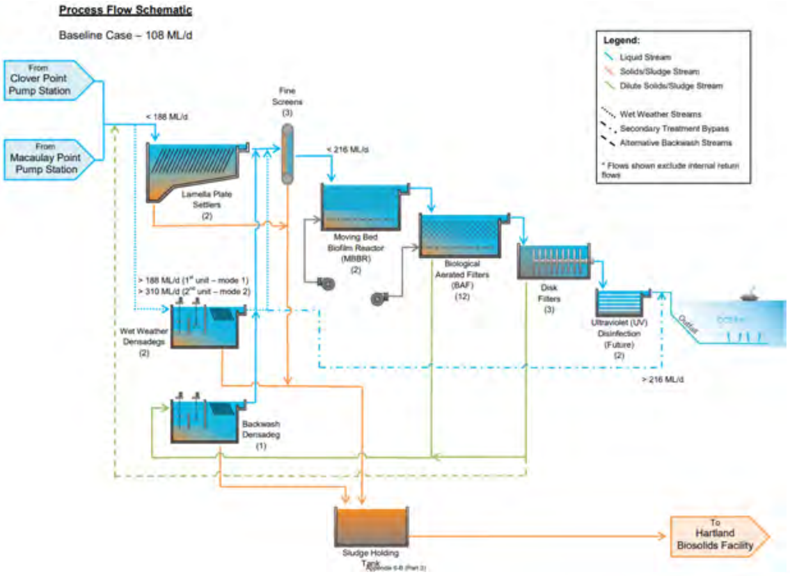
Regional Source Control Program

CRD
Making a difference...together

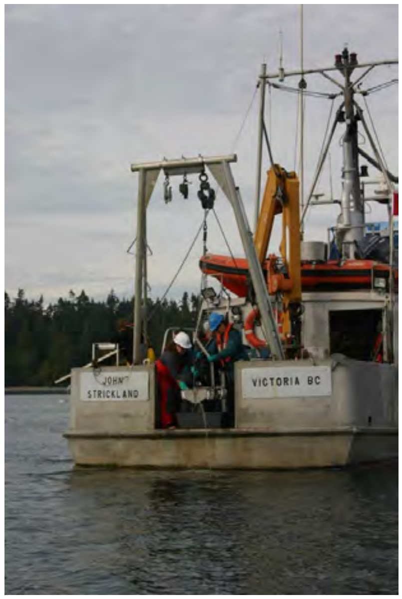
- Upstream elimination is more effective than downstream treatment.
- The CRD's source control program consists of:
    1. Regulatory inspections under the Sewer Use Bylaw for operations with potential to discharge high-strength wastewater, such as food service, breweries, dry cleaning and dental businesses.
    2. Requiring pre-treatment such as grease traps and amalgam separators.
    3. Public outreach campaigns encouraging the proper disposal of hazardous chemicals, medications, fats, oils, and greases (FOGs), and unflushable waste.

McLoughlin Point Wastewater Treatment Plant

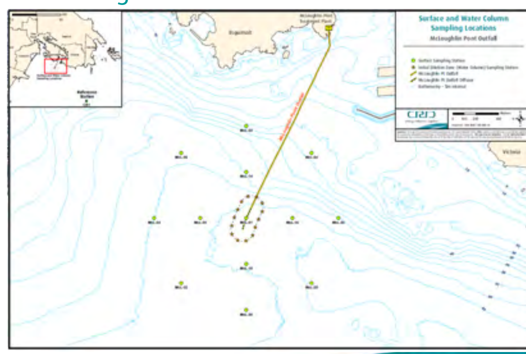
McLoughlin Point Wastewater Treatment Plant



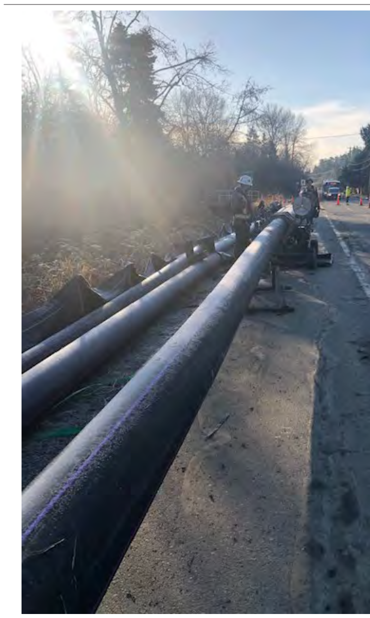
McLoughlin Point Outfall



- Effluent from the treatment plant is discharged into the ocean through a 2-kilometer-long outfall.
- The CRD regularly monitors the sediments around the outfall and the water quality both at the surface and throughout the water column.



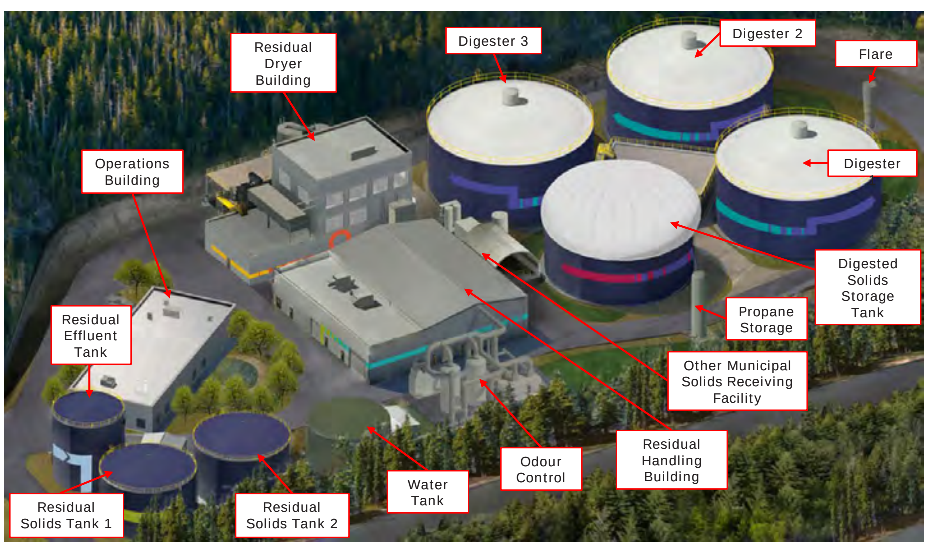
Residual Solids Conveyance Line



- The 18-kilometre RSCL brings residual solids from Mcloughlin Point to the Residuals Treatment Facility for further processing

Residuals Treatment Facility

Residuals Treatment Facility



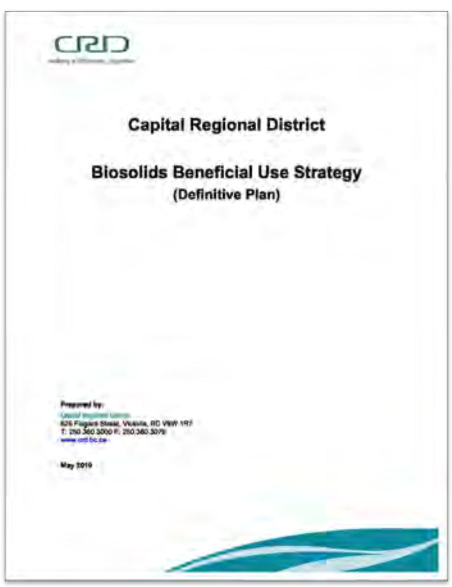
Class A Biosolids

CRD
Making a difference...together

- The RTF produces approximately 10 tonnes of dried (over 90% solids) Class A biosolids each day.
- Biosolids are tested regularly for metals and pathogens- results are posted on the CRD website.

Short-Term Biosolids Beneficial Use Strategy (2020-2025)

CRD
Making a difference...together



CRD

Capital Regional District

Biosolids Beneficial Use Strategy
(Definitive Plan)

May 2019

- Developed in early 2019, before wastewater treatment began.
- Strategy consistent with the CRD policy restricting land application of biosolids.
- Conditionally approved by the Ministry of Environment in October 2019.

Short-Term Plan: Alternative Fuel

- Biosolids are shipped to a cement kiln in Richmond, and used for energy, displacing fossil fuels.
- Regular shipment of biosolids has been challenging.

Contingency Plan: Biosolids Growing Medium at Hartland Landfill

- Biosolids are mixed with sand and wood chips and applied to closed areas of the landfill to support vegetation growth and reduce methane emissions.

Alternative Contingency Plan: Quarry Reclamation

- Biosolids are used at a gravel quarry near Nanaimo to re-establish vegetation on closed parts of the quarry.

Emergency Plan: Hartland Landfill

- Biosolids have been landfilled under emergency measures much of the time due to various challenges with the short-term and contingency plans.
- Landfilling is not a beneficial use and has been prohibited by the Province.

Long-Term Biosolids Beneficial Use Strategy (2025 onward)

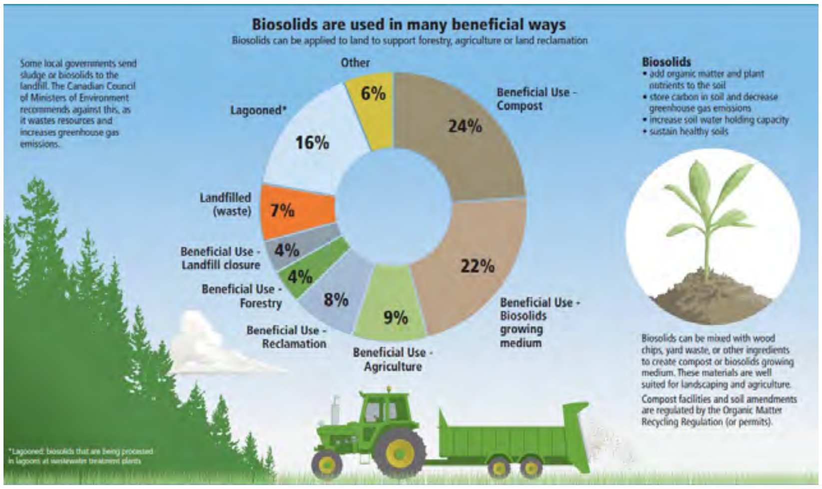
Making a difference...together

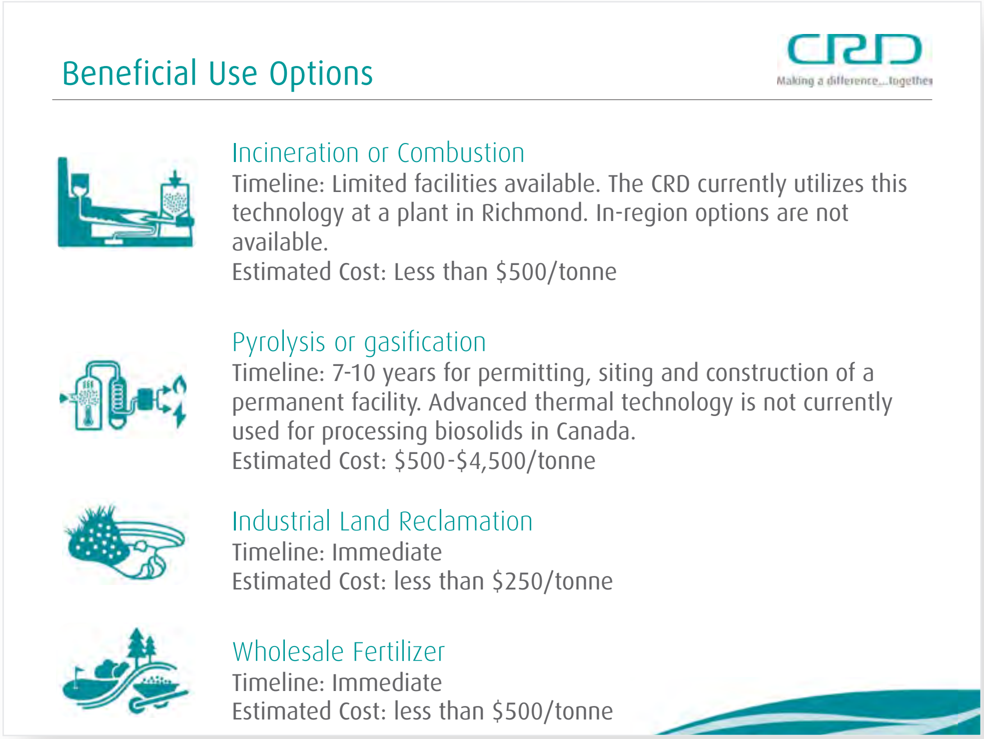
- Province required broad consultation.
- Must assess a range of beneficial use options including various types of land application.
- The consultation process must include citizens, local government and Indigenous Communities.

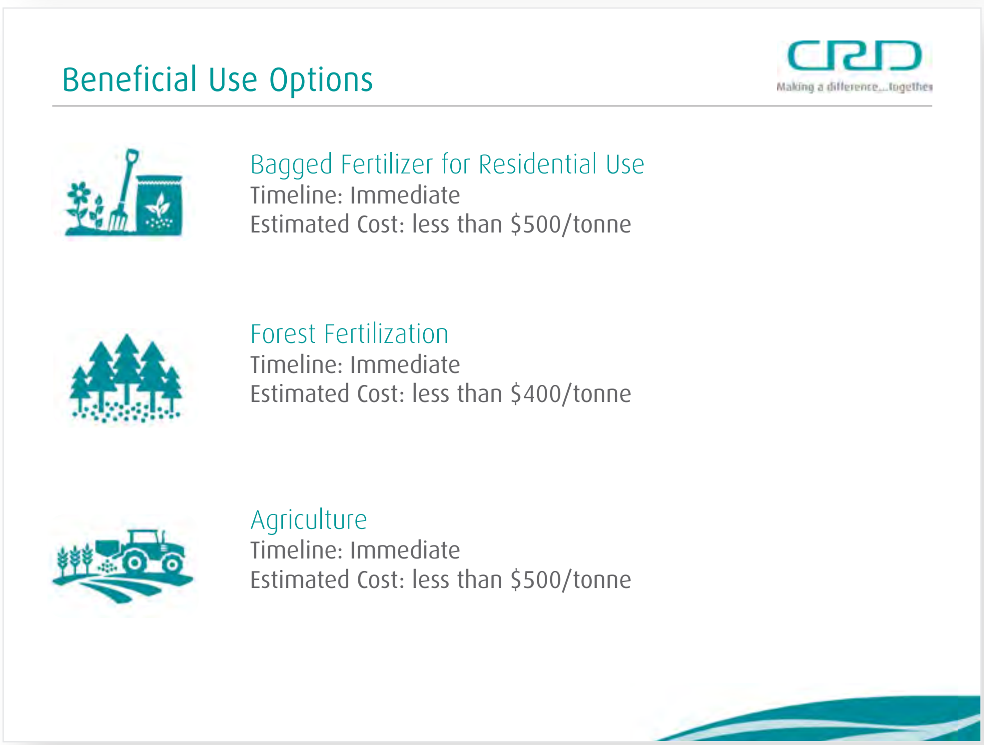
Organic Matter Recycling Regulation

Making a difference...together

British Columbia | Ministry of Environment




Beneficial Use Options
Making a difference...together
Incineration or Combustion
Timeline: Limited facilities available. The CRD currently utilizes this technology at a plant in Richmond. In-region options are not available.
Estimated Cost: Less than $500/tonne
Pyrolysis or gasification
Timeline: 7-10 years for permitting, siting and construction of a permanent facility. Advanced thermal technology is not currently used for processing biosolids in Canada.
Estimated Cost: $500-$4,500/tonne
Industrial Land Reclamation
Timeline: Immediate
Estimated Cost: less than $250/tonne
Wholesale Fertilizer
Timeline: Immediate
Estimated Cost: less than $500/tonne


Beneficial Use Options
Making a difference...together
Bagged Fertilizer for Residential Use
Timeline: Immediate
Estimated Cost: less than $500/tonne
Forest Fertilization
Timeline: Immediate
Estimated Cost: less than $400/tonne
Agriculture
Timeline: Immediate
Estimated Cost: less than $500/tonne

Advanced Thermal Pilot Programs and Demonstration Plant

- 2021 thermal pilot studies
- Procurement of an on-site trial is currently in development.
- Anticipated Cost: $10 million

Open House Presentation by GHD

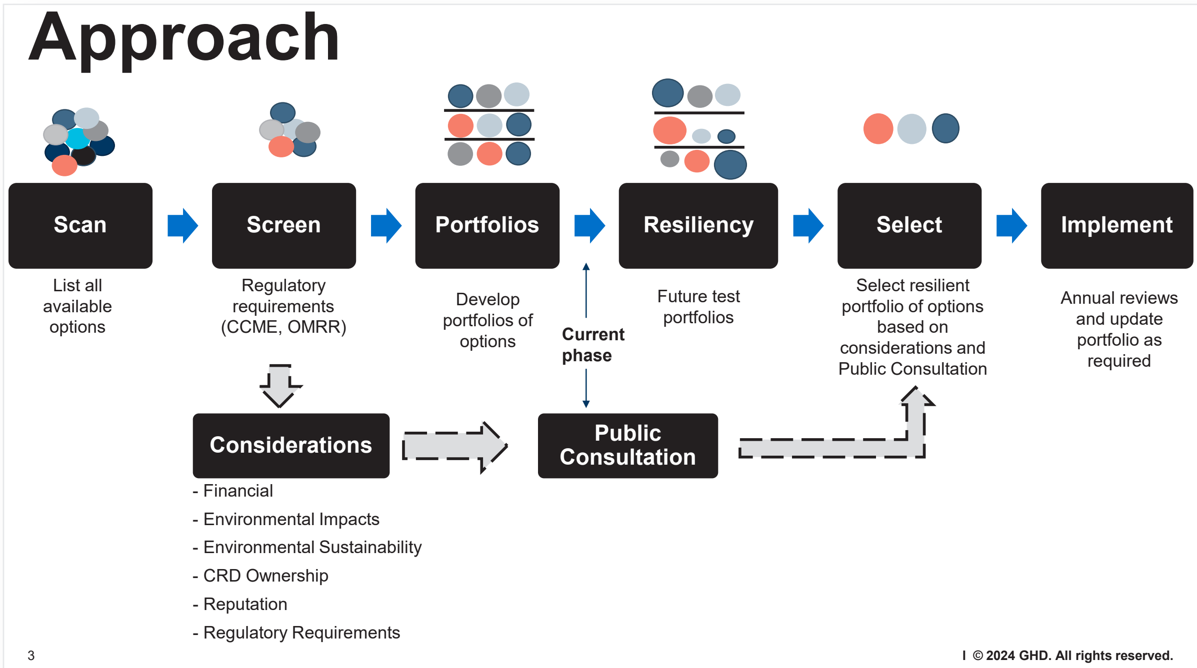
→ **Deacon Liddy, P.Eng., MBA**
Senior Engineer

CRD Biosolids
Long-Term Beneficial Use

Welcome

Introduction

- → **CRD Biosolids and GHD**
- → **What is beneficial use?**


Approach
Scan
List all available options
Screen
Regulatory requirements (CCME, OMRR)
Portfolios
Develop portfolios of options
Current phase
Resiliency
Future test portfolios
Select
Select resilient portfolio of options based on considerations and Public Consultation
Implement
Annual reviews and update portfolio as required
Considerations
- Financial
- Environmental Impacts
- Environmental Sustainability
- CRD Ownership
- Reputation
- Regulatory Requirements
Public Consultation
3
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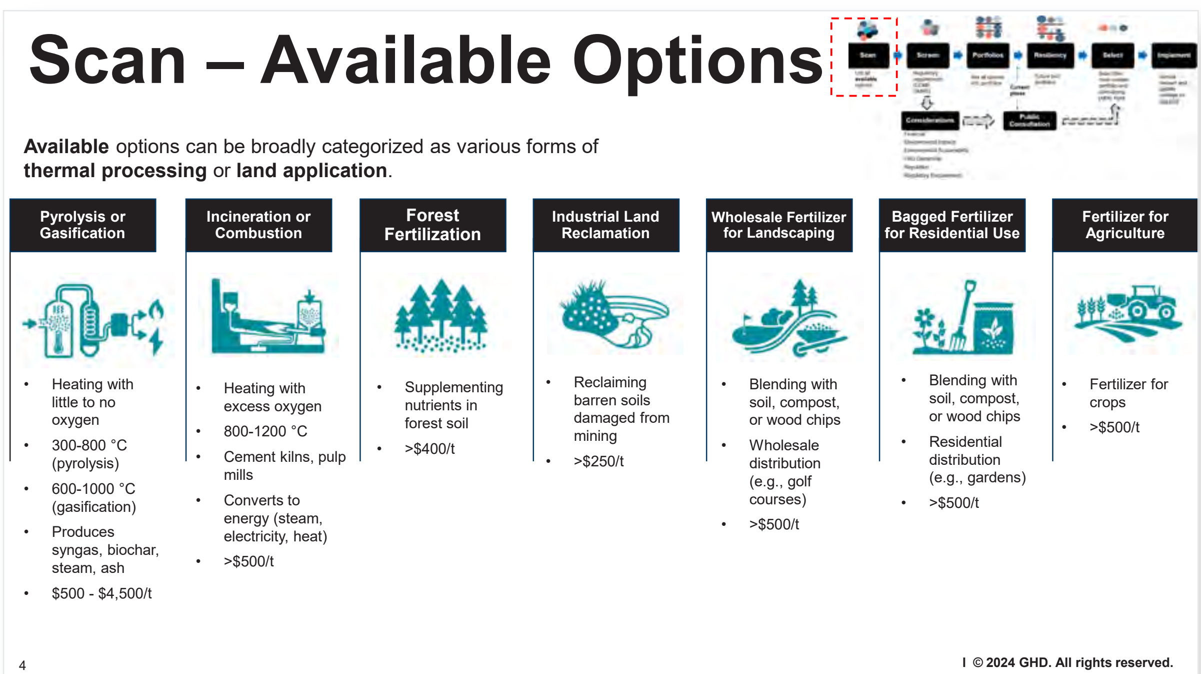
Scan – Available Options
Available options can be broadly categorized as various forms of thermal processing or land application.
Pyrolysis or Gasification
• Heating with little to no oxygen
• 300-800 °C (pyrolysis)
• 600-1000 °C (gasification)
• Produces syngas, biochar, steam, ash
• $500 - $4,500/t
Incineration or Combustion
• Heating with excess oxygen
• 800-1200 °C
• Cement kilns, pulp mills
• Converts to energy (steam, electricity, heat)
• >$500/t
Forest Fertilization
• Supplementing nutrients in forest soil
• >$400/t
Industrial Land Reclamation
• Reclaiming barren soils damaged from mining
• >$250/t
Wholesale Fertilizer for Landscaping
• Blending with soil, compost, or wood chips
• Wholesale distribution (e.g., golf courses)
• >$500/t
Bagged Fertilizer for Residential Use
• Blending with soil, compost, or wood chips
• Residential distribution (e.g., gardens)
• >$500/t
Fertilizer for Agriculture
• Fertilizer for crops
• >$500/t
4
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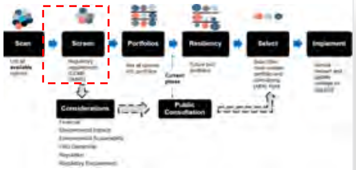
Screen – Regulatory Requirements



BRITISH COLUMBIA

Ministry of Environment

CCME

Canadian Council of Ministers of the Environment

Le Conseil canadien des ministres de l'environnement

From the BC MOE:

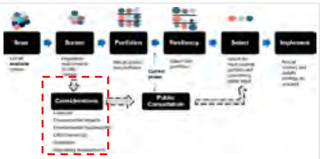
Biosolids are the stabilized products that are recovered at the end of the wastewater treatment process.

Biosolids are rich in nutrients that may be beneficially used to improve soil conditions and provide nutrition for plants. Because of the biological components of biosolids, proper management is important to control the impact on the environment and human health.

In B.C., the Organic Matter Recycling Regulation sets requirements for the production of high-quality biosolids and subsequent beneficial use in land application and composting.

5

Considerations



- Financial
  - Capital cost, operational cost, revenue potential, unit cost at varying scales
- Environmental Impacts
  - Emissions (odour, noise, air, dust), truck traffic, contaminant mass balance
- Environmental Sustainability
  - Value derived products, GHGs, energy recovery, waste co-processing, soil/groundwater
- CRD Ownership
  - CRD develops facility or third party provider
- Reputational Considerations
  - Technological maturity, perception
- Regulatory Requirements
  - Permitting schedule and defined process

6

Resiliency – Risks of Interruption

Consider risks to future operations resiliency of external partners:

- Insufficient capital - operational continuity
- Change in ownership
- Sustainable market for end-product
- Short-term shutdown
- New OMRR requirements
- Feedstock interruption, highway closure, wildfire
- Facility reputation – facility causing a nuisance
- Facility regulatory non-compliance
- Seasonality – fluctuations in capacity to receive and process biosolids
- Availability – option at capacity, not yet commercially operational
- Minimum tonnage – minimum contracted amount

Considerations

	Thermal Processing	Land Application
Financial	– High initial capital cost, low economies of scale – Potential for revenue to partially off-set processing costs	– Comparatively low capital cost. Additional investment into storage/transport infrastructure may be required. – No potential for revenue generation
Environmental Impacts	– Facility will have nuisance emission abatement systems (odour, noise, air/dust)	– Potential for nuisance odour, noise, air/dust emissions at application sites (far from population centers)
Environmental Sustainability	– Potential to recover energy from waste product – GHG emissions from transport (off-site combustion)	– Reduction of need for synthetic fertilizer – Potential for soil/groundwater impacts if OMRR not followed – GHG emissions from transport
Reputational	– Advanced thermal technology is emerging	– Demonstrated commercial implementation
CRD Ownership	– CRD would own advanced thermal facility or send biosolids to third-party for off-site combustion	– Biosolids would be sent to third-parties or be bagged by the CRD and sold commercially
Regulatory	– Facility permits required	– Land application plan required per OMRR
Potential Risks of Interruption	– Multiple years required to implement advanced thermal facility – Unknown market for biochar – Unscheduled shutdowns for operational maintenance/commissioning – Limited commercially operational biosolids thermal facilities in North America	– Fluctuations in need for biosolids (typically project-based, seasonal) – Unclear if market exists for bagged biosolids product

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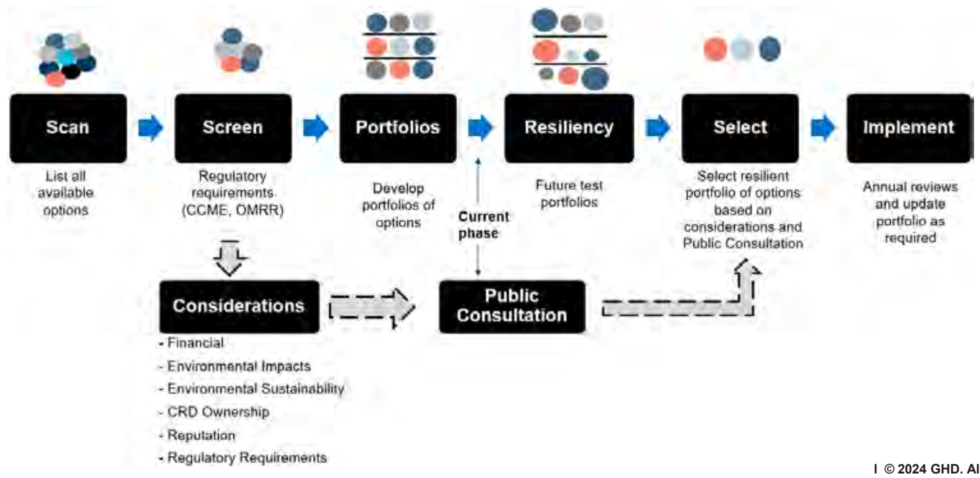
Portfolios

Risks of interruption may be mitigated through **redundancy of options,** achieved by **portfolios** composed of **multiple contingent options.**



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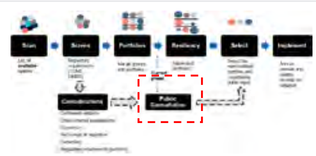
Additional Information



More information can be found at
getinvolved.crd.bc.ca/biosolids

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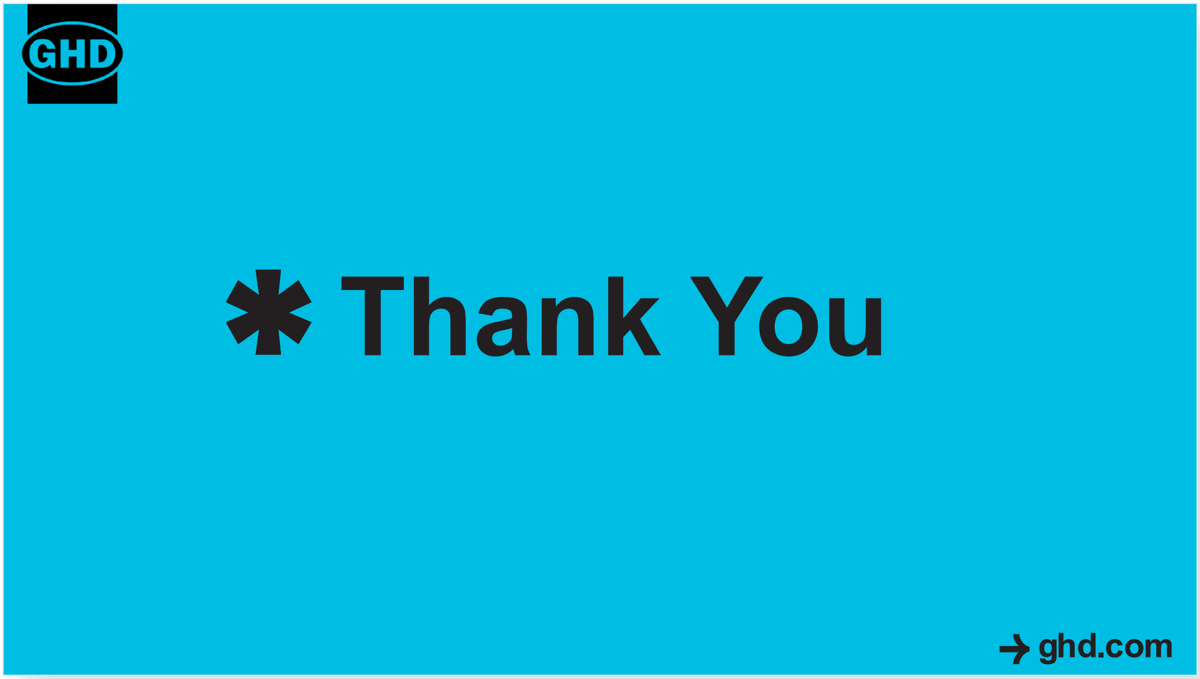

GHD
Thank You
ghd.com

Q&A Getinvolved.crd.bc.ca Q&A

1. I have a question about pharmaceuticals and other contaminants of emerging concern. Patients undergoing chemotherapy are advised to have their septic tanks pumped after chemo treatment and these chemicals are known to persist in sewage sludge. What, if any, methods are available to remove pharmaceuticals in the CRD wastewater processing options. The Organic Matter Recycling Regulations provide limits for heavy metal land application. Are there standards for land application of micro plastics found in many products entering the wastewater system? Will the high seasonal water table level at the Burgoyne Valley treatment plant prevent composting during the wet months. Can geotubes above grade work in wet conditions? I do hope that I will be able to see the answers to my questions and if possible view this important webinar.

2. Why are biosolids not used to create energy? Clearly our electrical grid cannot handle the demands of our governments “just transition” idea. It would horrify me to know that my garden is grown in the biosolids of human waste and potentially contaminate the water sheds in rural areas.

3. One thing to at hasn’t been addressed is the plan for application of the choices and desired/expected outcomes. Example. : if we vote for land reclamation, what land is being considered for it? How *much* of an effect are we expecting? Are there any reports on other similar projects that we can look at to evaluate potential issues or roi?

4. Gasification.. After construction of plant, what does a distribution plan look like. Do we have distribution infrastructure in place? Is this an extra cost and timeline. How does CRD raise money for this project. Does it affect other ongoing projects.

5. How can I be sure the soil amendment/fertilizer solution doesn’t contain dangerous drugs (fentanyl), heavy metals or a superbug?

6. Do the cost estimates include the expected financial value of all anticipated revenues and the co-benefits? For example, does the $500+ per tonne for pyrolysis include the sale of energy and biochar products? Is there a value attributed to the energy resilience benefits to the community in the event of a catastrophic earthquake or extreme weather that cuts off power supplies? Do the fertilizer options include a value for supporting a resilient agricultural sector? Indeed, the social values of these co-benefits are not in the jurisdiction of the CRD, but partnerships could avail financial value and compensation.

7. (1) Has the option of on-site creation of a series of “silting ponds” that the waste-water passes through slowly, and in lower stages can include marsh-like grasses or other plant and/or animal life so as to process at least part of the waste matter there on the spot? I saw such a facility at Esalen Institute in California that they called a “living machine”. (2) Same question but: if it’s been considered, why not adopted? (too costly? too small of a site? other reasons?). I’m not upset, but would love to understand why, or why not, if considered and rejected, so in future I’ll have a better grasp of the topic. THANK YOU!

Email Correspondence to *biosolids@crd.bc.ca*

1. With regards to the pyrolysis or gasification technology, to create biochar / gas option the estimated cost is a very wide range-- $500 to $4500 a ton. Will any more detailed information on the capital and operating costs of a plant be provided to the public , Environmental Service s Committee and Board in the next 2 -3 months so that such information can be included in the definitive plan being submitted to the Province in June?

2. Thank you for the opportunity to participate in last night's webinar on CRD biosolids management options. I have been following this issue closely including doing extensive reading and attending CRD committee and board meetings. Here is a quick summary of my input following the webinar. I have already filled out the survey.

   1) I believe there is an opportunity to learn from the Australian experience, which appears to be significantly more advanced on biogas production than the North American practices that staff tried to consult with. The Australian Renewable Energy Agency(Arena) continues to make progress e.g. the MALABAR plant in the Sydney suburbs and elsewhere. Perhaps an information sharing agreement could be reached with them on the biogas option. I think the BC and Canadian governments would both be interested in developing Canadian expertise in conjunction with Australian agencies and firms and companies such as Fortis, which has been promoting biogas. Atomic Energy Canada is a good example of Canada showing leadership and international consulting expertise.

   2) If not already known, it should be relatively easy to determine if Hartland site can accommodate the footprint of a biogas facility, or not. Also the costs can be estimated and the percentage cost recovery from sale of biogas / biochar can be determined , based on the Australian experience. If Hartland cannot accommodate the plant , then maybe Bamberton? Obviously not having to transport biosolids is advantageous. Perhaps some 'redundancy' can be built into the system so that production can be continued in part of the plant during maintenance or breakdown.

   3) The gasification option fits well with the regional district taking care of its waste, for the most part, within its borders. The airborne emissions can be minimized using state of the art technology and in my opinion is preferable to spreading more fertilizer over agricultural and forestry land within the region. Biochar can be transported to carefully controlled and monitored remediation sites inside and outside the region, possibly transported by the specialized trucks already developed with a First Nations company.

   4) Our lakes are productive recreational fisheries because they are moderately or more eutrophic already, than other areas. All the climate research shows trends to increasing eutrophication. We don't need to be spreading tons of biosolids around this region or anywhere else where it will inevitably end up in our streams, ponds and lakes and groundwater. Biogas is a beneficial use! The BC government already approved using biosolids as a fuel in the unfortunately failed situation in cement production.

   5) To reiterate, I believe the time is right to engage both Provincial and Federal governments in supporting an innovative biogas /biochar approach and possibly develop Canadian consulting expertise for export.

3. Why aren't these being used to produce heat at one of the current sites such as Commonwealth Rec Ctr or UVIC ?

4. I was dismayed to read the misleading information published in the public consultation materials on biosolids. The information is heavily biased to the supposed “benefits” of biosolid spread and for use as fertilizer yet provides precious little and vague, obscure information on the risks. There is plenty of easy to find information available on the risks, studies from well reputed organizations across Canada and the US that are concerned with the application of biosolids in/near our food and water systems. I have no doubt that our better informed agencies will contact you with links and copies of the information they have on the danger and concern of the practices that the CRD has suggested. Not to mention the ongoing lawsuits in other areas. It is shamefully misleading to exclude the risks and opposition viewpoints in the FAQs and other information. Please take down or delay the site and survey. Review the information that surely will be presented to you, learn about the risks and inform the public of all aspects.

5. Thank you for replying. You didn’t however explain why you have chosen to exclude informing the public of the risks. While you may be required to include it, it would be more responsible and transparent to also include the risks. Given that there have been so many leaks and problems with the poop pipeline, the stench, cost and time overrun, the inability to produce biosolids that the cement factory can use, how can you guarantee that you will not also bungle the testing and production of “safe” and “beneficial” biosolids for any other use? How will you address that? Thank you

6. I am very interested in receiving more details on the bio-solids complete analysis for large applications in agriculture. How do I get involved and where can I locate the details or even get a few samples for independent analysis.? Sorry for dropping this on you and please direct me in the correct direction for future inquiries.

7. My suggestion is to build a facility to turn plastic back into oil and the bio solids could be used as the heat source.

TAVOLA
STRATEGY GROUP

APPENDIX B

Making a difference...together

Long-Term Biosolids Management Plan

First Nations Engagement What We Heard Report

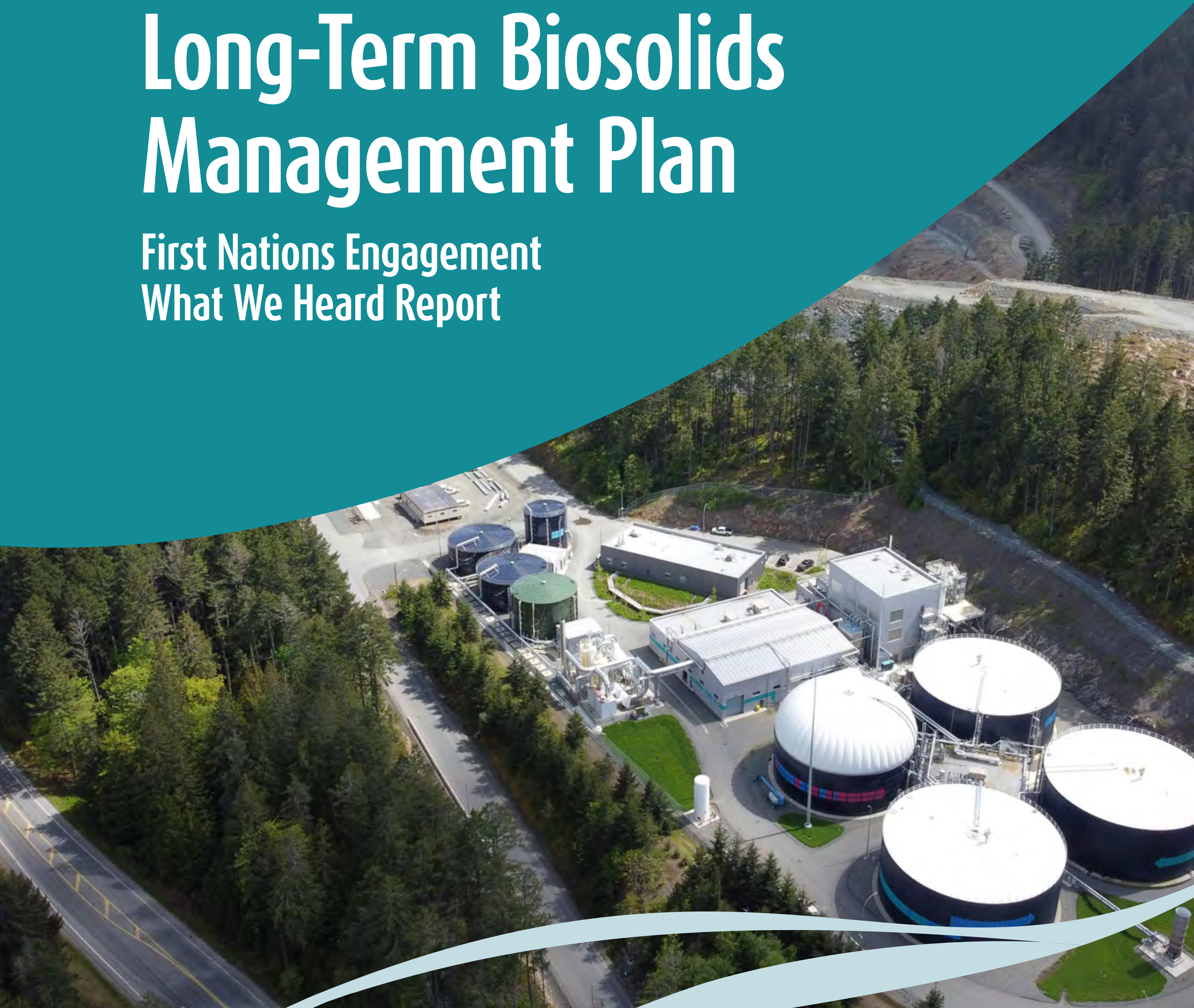
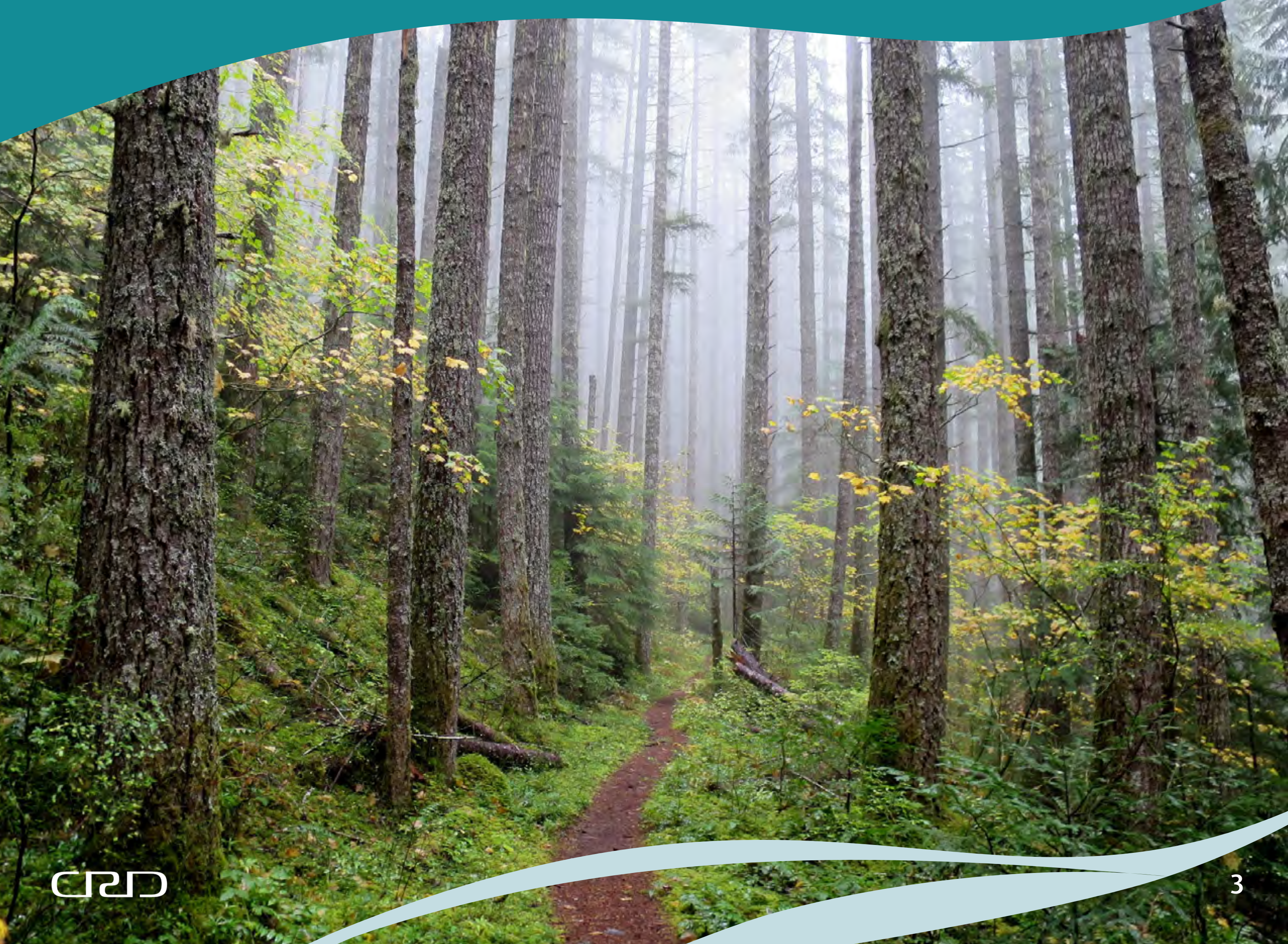


Table of Contents

Territorial Acknowledgement

The Capital Regional District conducts its business within the traditional territories of many First Nations, including but not limited to BOḰEĆEN (Pauquachin), MÁLEXEȽ (Malahat), Paaʔčiidʔatx̣ (Pacheedaht), Pune’laxutth’ (Penelekut), Sc’ianew (Beecher Bay), Songhees, SȾÁUTW̱ (Tsawout), T’Sou-ke, W̱JOȽEȽP (Tsartlip), W̱SIKEM (Tseycum) and xʷsepsəm (Esquimalt), all of whom have a long-standing relationship with the land and waters from time immemorial that continues to this day.



Executive Summary

The Capital Regional District (CRD) is exploring options and technologies to harness the benefits of biosolids, the by-product of wastewater treatment. Short-term plans regarding biosolids management were put in place when the CRD first introduced wastewater treatment in 2020. However, despite best efforts, the region's biosolids are largely being landfilled under emergency measures.

The Province of BC requires the CRD to submit a *Long-Term Biosolids Management Plan* by **June 2024**. This plan must consider a wide variety of management options, including various land application scenarios in addition to incineration and advanced thermal options. The long-term beneficial use options under consideration include: fertilizer for agriculture; industrial land reclamation; forest fertilization; wholesale fertilizer for landscaping; bagged fertilizer for residential use; fuel for incineration/combustion; and pyrolysis or gasification technology to create biochar/gas.

The purpose of this phase of the engagement process is to effectively communicate and engage with First Nations whose traditional territories span portions of the region in the development of a definitive (long-term) biosolids management plan for the Capital Regional District. From **February 28, 2024, to April 19, 2024**, the CRD sought feedback from First Nations leadership on the direction of which long-term uses of biosolids would best serve their Nation.

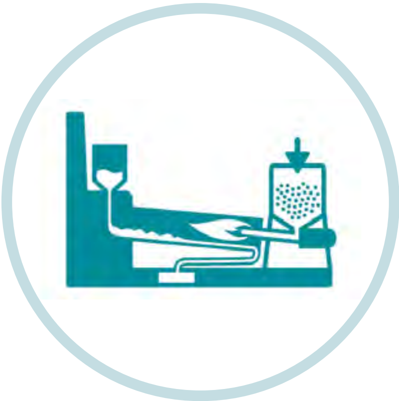
Introduction

Biosolids are the by-product of wastewater treatment, containing nutrients, such as nitrogen, phosphorus, calcium, sulphur and iron, energy and organic matter that can be recycled and used in various ways. The most common use of this material is as fertilizer to promote tree and plant growth and as a soil additive to restore degraded industrial lands. However, there are other options, such as harnessing energy through thermal (heating) processes to use as an alternative fuel.

During the treatment process, the liquids and solids are separated, and the solids are then treated to produce a dark coloured, dry granular pellet. Biosolids produced by the CRD surpass standards set out in the Organic Matter Recycling Regulation, due to the high quality of sewage treatment and robust source control programs aimed at preventing metals and other contaminants from entering the wastewater system.

Biosolids can be used as:

A nutrient-rich fertilizer. This organic material improves soil conditions, promotes plant growth, increases crop yields and improves water retention.



An alternative fuel source through burning biosolids to supply heat energy at incineration to facilities to reduce reliance on fossil fuels.

An alternative energy source through pyrolysis and gasification technologies, that creates biochar/synthetic gas, which is then burned to produce heat or electricity.

The CRD has been responsible for the beneficial use of Class A biosolids produced at the Residuals Treatment Facility since the commissioning of the core area wastewater treatment project in 2020.

Currently, the CRD is operating under a Short-term Biosolids Management Plan (2020-2025), with the primary beneficial use options being incineration as an alternative fuel in a cement manufacturing plant in Richmond, BC, and integration with landfill cover systems as contingencies. When neither of these options are available, landfilling biosolids at Hartland Landfill has been the only alternative.

In 2011, the CRD Board passed a resolution to ban the land application of biosolids from CRD facilities; however, in 2023, given the operational and logistical challenges with the short-term plan, the CRD Board amended its position to allow limited non-agricultural land application of biosolids as a contingency option. The CRD has secured the use of biosolids for industrial land reclamation at a quarry near Cassidy, BC, and continues to seek additional short-term beneficial use contingency options, in order to limit or avoid landfilling of biosolids when the other options are not available.

To support transportation, the CRD partnered with the W̱SÁNEĆ Leadership Council in the creation of K'ENES Transportation, a First Nation-owned and operated trucking company. However, regular shipments of biosolids to the cement plant have been challenged by a wide variety of logistical and operational issues.

Purpose of Engagement

This engagement process intends to gather feedback from local First Nations and ensure they are well-informed about the potential long-term uses of biosolids.

The responses received during this phase will inform the development of the *Long-Term Biosolids Management Plan* that will outline the CRD's approach to managing biosolids in the future. This report summarizes insights gained through an online survey and virtual engagement session with First Nation representatives.

Engagement Process and Activities

Committed to gathering diverse feedback, the CRD's objectives were as follows:

Gather feedback from First Nations with territory within the region to help inform the *Long-Term Biosolids Management Plan.*

Ensure that First Nations and all residents within the CRD are well-informed about the potential long-term uses of biosolids.

Seek to identify a long-term biosolids option that maximizes benefits for the communities in the CRD.

A number of resources were developed to support outreach and engagement.

A handout was created, providing frequently asked questions on one side and a description of the seven long-term use options on the other. Throughout the document, useful resources were accessible through a QR code, such as regulatory requirements, biosolids in BC and the CRD's Biosolids Beneficial Use Strategy. An online survey was also developed, asking respondents for their feedback about the use of biosolids in the region and how they want to see them utilized.

Long-term options for biosolid use in the CRD

Scan the QR code to view the biosolids fact sheet.

Fertilizer for Agriculture

The nutrient-rich organic material can improve soil conditions to promote plant growth and increase crop yields. It can also improve water retention to reduce water usage as well as reduce reliance on synthetic fertilizers.

Timeline: Immediate

Cost: Less than $500/tonne

Industrial Land Reclamation

Biosolids can be applied to disturbed and degraded soils to replenish organic matter and essential nutrients, improving soil fertility, soil structure and increasing water retention. They can be applied directly or blended with compost, soil or wood chips.

Timeline: Immediate

Cost: Less than $250/tonne

Forest Fertilization

Biosolids can help improve soil fertility, prevent erosion and accelerate plant and tree growth. After a wildfire, biosolids can help forests regenerate, increasing water retention and providing essential nutrients and organic matter to promote plant and tree growth.

Timeline: Immediate

Cost: Less than $400/tonne

Wholesale Fertilizer for Landscaping

The nutrient-rich organic material can improve soil conditions to promote lawn and plant growth. Uses include lawns, boulevards, golf courses.

Timeline: Immediate

Cost: Less than $500/tonne

Bagged Fertilizer for Residential Use

The nutrient-rich organic material is bagged and distributed as fertilizer or blended with soil, compost or wood chips and made available for residential use.

Timeline: Immediate

Cost: Less than $500/tonne

Fuel for Incineration/Combustion

Biosolids are burned or used as an alternative fuel to power facilities, such as cement kilns and pulp mills, reducing reliance on other non-renewable sources like coal or natural gas.

Timeline: CRD currently utilizes this technology in Richmond. In-region options not available.

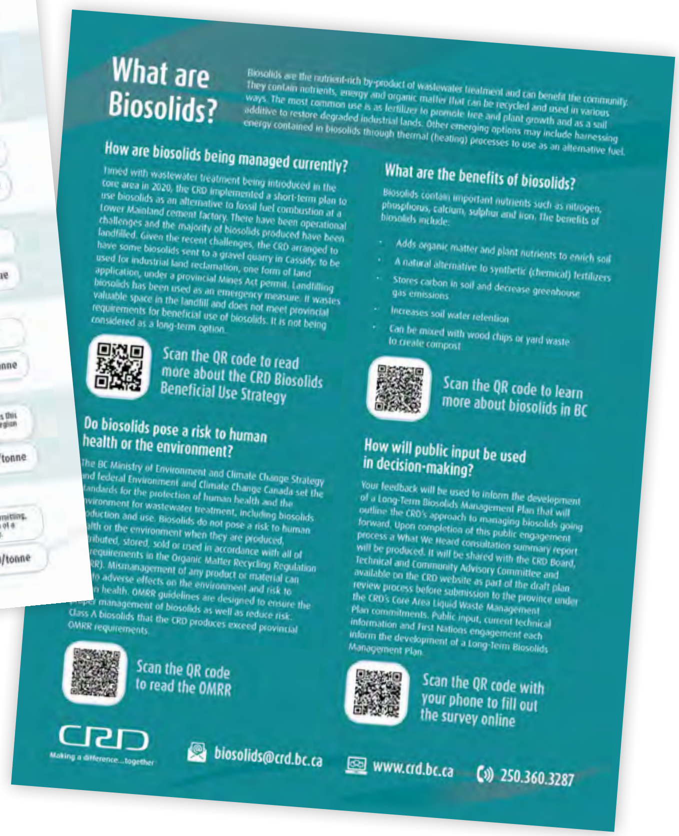
Cost: Less than $500/tonne

Pyrolysis or Gasification Technology to Create Biochar/Gas

Biosolids are heated to make a gas or "biochar," which can be used to produce heat or electricity. Biochar is a type of charcoal that is made from organic material. It can be used as a soil additive to improve soil fertility and enhance water retention.

Timeline: 7-10 years for permitting, siting and construction of a permanent facility.

Cost: $500-$4500/tonne



What are Biosolids?

Biosolids are the nutrient-rich by-product of wastewater treatment and can benefit the community. They contain nutrients, energy and organic matter that can be recycled and used in various ways. The most common use is as fertilizer to promote tree and plant growth and as a soil additive to restore degraded industrial lands. Other emerging options may include harnessing energy contained in biosolids through thermal (heating) processes to use as an alternative fuel.

How are biosolids being managed currently?

Timed with wastewater treatment being introduced in the core area in 2020, the CRD implemented a short-term plan to use biosolids as an alternative to fossil fuel combustion at a Lower Mainland cement factory. There have been operational challenges and the majority of biosolids produced have been landfilled. Given the recent challenges, the CRD arranged to have some biosolids sent to a gravel quarry in Cassidy, to be used for industrial land reclamation, one form of land application, under a provincial Mines Act permit. Landfilling biosolids has been used as an emergency measure. It wastes valuable space in the landfill and does not meet provincial requirements for beneficial use of biosolids. It is not being considered as a long-term option.

Scan the QR code to read more about the CRD Biosolids Beneficial Use Strategy

What are the benefits of biosolids?

Biosolids contain important nutrients such as nitrogen, phosphorus, calcium, sulphur and iron. The benefits of biosolids include:

- Adds organic matter and plant nutrients to enrich soil
- A natural alternative to synthetic (chemical) fertilizers
- Stores carbon in soil and decrease greenhouse gas emissions
- Increases soil water retention
- Can be mixed with wood chips or yard waste to create compost

Scan the QR code to learn more about biosolids in BC

Do biosolids pose a risk to human health or the environment?

The BC Ministry of Environment and Climate Change Strategy and federal Environment and Climate Change Canada set the [illegible] for the protection of human health and the [illegible] for wastewater treatment, including biosolids [illegible] and use. Biosolids do not pose a risk to human [illegible] or the environment when they are produced, [illegible], stored, sold or used in accordance with all of [illegible] requirements in the Organic Matter Recycling Regulation [illegible]. Mismanagement of any product or material can [illegible] adverse effects on the environment and risk to [illegible] health. OMRR guidelines are designed to ensure the [illegible] management of biosolids as well as reduce risk. Class A biosolids that the CRD produces exceed provincial OMRR requirements.

Scan the QR code to read the OMRR

How will public input be used in decision-making?

Your feedback will be used to inform the development of a Long-Term Biosolids Management Plan that will outline the CRD's approach to managing biosolids going forward. Upon completion of this public engagement process a What We Heard consultation summary report will be produced. It will be shared with the CRD Board, Technical and Community Advisory Committee and available on the CRD website as part of the draft plan review process before submission to the province under the CRD's Core Area Liquid Waste Management Plan commitments. Public input, current technical information and First Nations engagement each inform the development of a Long-Term Biosolids Management Plan.

Scan the QR code with your phone to fill out the survey online

CRD Making a difference...together

biosolids@crd.bc.ca www.crd.bc.ca 250.360.3287

The CRD scheduled two engagement sessions to hear feedback: an in-person gathering on **March 25, 2024**, in Victoria, and virtually on **March 27, 2024**.

An invitation to these sessions was distributed to an established contact list of people in leadership roles at 19 First Nations on **February 28, 2024**.

The contact list included:

- BOḰEĆEN (Pauquachin) First Nation
- MÁLEXEŁ (Malahat) Nation
- Paaʔčiidʔatx̣ (Pacheedaht) First Nation
- SȾÁUTW̱ (Tsawout) First Nation
- Scia'new (Beecher Bay) First Nation
- Songhees Nation
- Spune'luxutth (Penelakut) Tribe
- T'Sou-ke Nation
- W̱JOȽEȽP (Tsartlip) First Nation
- W̱SIḴEM (Tseycum) First Nation
- Xʷsepsum (Esquimalt) Nation
- Cowichan Tribes
- Halalt First Nation
- Lyackson First Nation
- sc̓əwaθən məsteyəxʷ (Tsawwassen) First Nation
- Semiahmoo First Nation
- Stz'uminus (Chemainus) First Nation
- Ts'uubaa-asatx Nation

There were no responses to the initial invitation so, on **March 19, 2024**, a personalized follow-up email was sent to each contact, inviting them to attend one of the two engagement sessions. The CRD then reached out by phone to each First Nation on the contact list to ensure they had received the invitation and to create an RSVP list for the in-person and online engagement sessions. There was some interest expressed, but no confirmations for the RSVP list.

March 19

On **March 25, 2024**, the CRD sent out a third email to the contact list as a reminder of the in-person engagement session that evening, as well as the virtual session two days later. An online survey was also linked in the email to invite feedback not only from those on the contact list, but also from their colleagues and those they might share it with. There were no participants in either session, despite initial interest in attending the virtual engagement session.

However, Paaʔčiidʔatx̣ (Pacheedaht) First Nation and T'Sou-ke Nation expressed interest in providing feedback to the CRD in the near future.

March 25

A final follow-up email was distributed to the First Nation contact list on **April 12, 2024**. In this email, the CRD provided the link to the online survey as well as a link to the district's "Get Involved" landing page that details the information about the long-term options for biosolid use.

April 12

It also noted the **April 19, 2024**, deadline to have feedback included in the report to the Province of BC.

April 19

What We Heard

From February 28, 2024, to April 19, 2024, the CRD sought feedback from First Nations leadership on the direction of which long-term uses of biosolids would best serve their Nation.

The CRD reached out to 19 First Nations, through email and phone calls, as well as provided an online survey as an alternative way to provide their comments or questions. The district hosted three virtual formal consultation meetings, with BOḰEĆEN (Pauquachin) First Nation, Paaʔčiidʔatx̣ (Pacheedaht) First Nation and T'Sou-ke First Nations staff, regarding the beneficial use of biosolids. Pacheedaht First Nation encouraged the CRD to continue consultation regarding the forestry fertilization management option and T'Sou-ke Nation would like to be consulted on the specific details on any project under consideration within its territory.

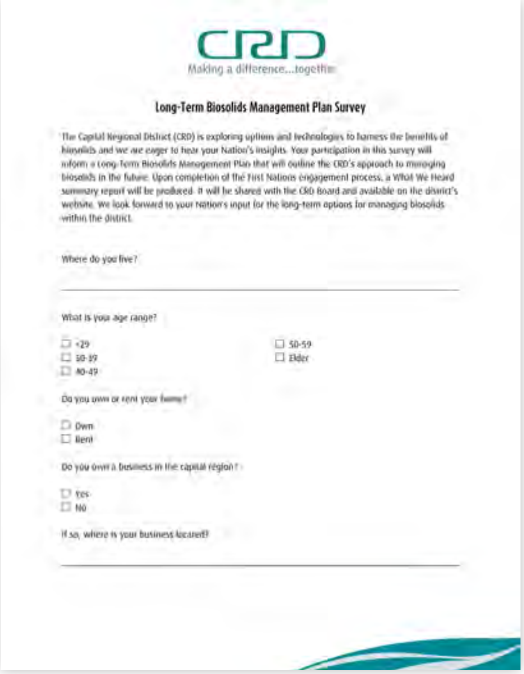
Summary

The CRD is exploring options and technologies to harness the benefits of biosolids, the by-product of wastewater treatment and sought the insight of First Nation leadership on the potential long-term uses available to the region.

The feedback gathered from this group would help to inform a Long-Term Biosolids Management Plan to fulfill provincial requirements. Over the course of two months, the CRD would take part in outreach to 19 First Nations that span portions of the region. While the CRD is required to submit a plan to the provincial government by June, the district will continue to receive feedback from First Nation leadership and will provide an update to the plan at a later date.

Appendix

Survey


Making a difference...together

Long-Term Biosolids Management Plan Survey

The Capital Regional District (CRD) is exploring options and technologies to harness the benefits of biosolids and we are eager to hear your Nation's insights. Your participation in this survey will inform a Long-Term Biosolids Management Plan that will outline the CRD's approach to managing biosolids in the future. Upon completion of the First Nations engagement process, a What We Heard summary report will be produced. It will be shared with the CRD Board and available on the district's website. We look forward to your Nation's input for the long-term options for managing biosolids within the district.

Where do you live?

____

What is your age range?

☐ <29
☐ 30-39
☐ 40-49
☐ 50-59
☐ Elder

Do you own or rent your home?

☐ Own
☐ Rent

Do you own a business in the capital region?

☐ Yes
☐ No

If so, where is your business located?

____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How familiar are you with the following topics?

CRD wastewater treatment system

☐ Very unfamiliar
☐ Unfamiliar
☐ Somewhat familiar
☐ Familiar
☐ Very familiar

Biosolids

☐ Very unfamiliar
☐ Unfamiliar
☐ Somewhat familiar
☐ Familiar
☐ Very familiar

How important is it to you how biosolids are maximized for community benefit?

☐ Not at all important
☐ Unimportant
☐ Neutral
☐ Important
☐ Very important

Please explain why you chose that level of importance.

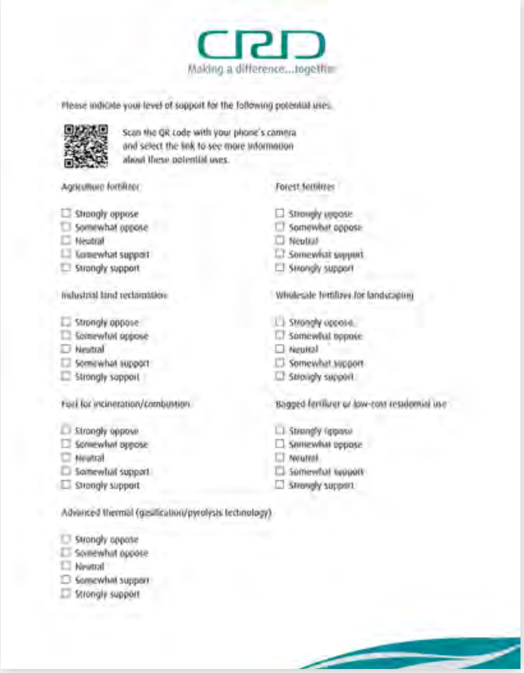
____

____

____

When planning for the beneficial uses of biosolids, how important are the following considerations to you? Please rank in order of importance
(1 being most important – 4 being least important).

_____ Costs
_____ Environmental impacts (air, water and soil contaminants)
_____ Climate/greenhouse gas emissions
_____ Community impacts (truck traffic, odour and noise emissions, dust, etc.)


Making a difference...together

Please indicate your level of support for the following potential uses.

Scan the QR code with your phone's camera and select the link to see more information about these potential uses.

Agriculture fertilizer

☐ Strongly oppose
☐ Somewhat oppose
☐ Neutral
☐ Somewhat support
☐ Strongly support

Forest fertilizer

☐ Strongly oppose
☐ Somewhat oppose
☐ Neutral
☐ Somewhat support
☐ Strongly support

Industrial land reclamation

☐ Strongly oppose
☐ Somewhat oppose
☐ Neutral
☐ Somewhat support
☐ Strongly support

Wholesale fertilizer for landscaping

☐ Strongly oppose
☐ Somewhat oppose
☐ Neutral
☐ Somewhat support
☐ Strongly support

Fuel for incineration/combustion

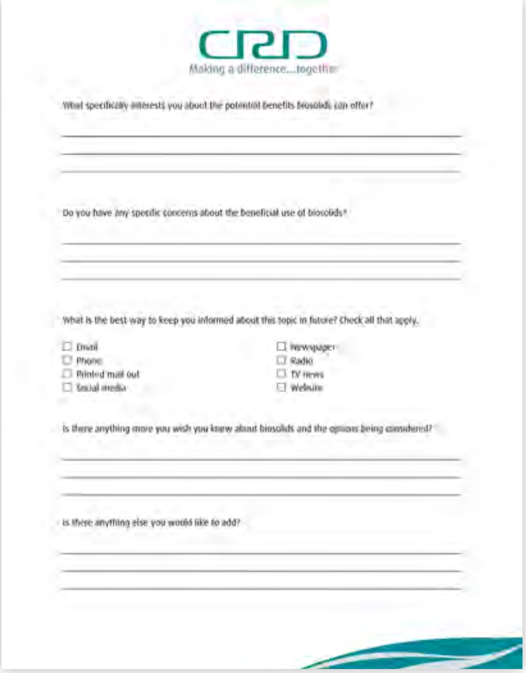
☐ Strongly oppose
☐ Somewhat oppose
☐ Neutral
☐ Somewhat support
☐ Strongly support

Bagged fertilizer or low-cost residential use

☐ Strongly oppose
☐ Somewhat oppose
☐ Neutral
☐ Somewhat support
☐ Strongly support

Advanced thermal (gasification/pyrolysis technology)

☐ Strongly oppose
☐ Somewhat oppose
☐ Neutral
☐ Somewhat support
☐ Strongly support


Making a difference...together

What specifically interests you about the potential benefits biosolids can offer?

____

____

____

Do you have any specific concerns about the beneficial use of biosolids?

____

____

____

What is the best way to keep you informed about this topic in future? Check all that apply.

☐ Email
☐ Phone
☐ Printed mail out
☐ Social media
☐ Newspaper
☐ Radio
☐ TV news
☐ Website

Is there anything more you wish you knew about biosolids and the options being considered?

____

____

____

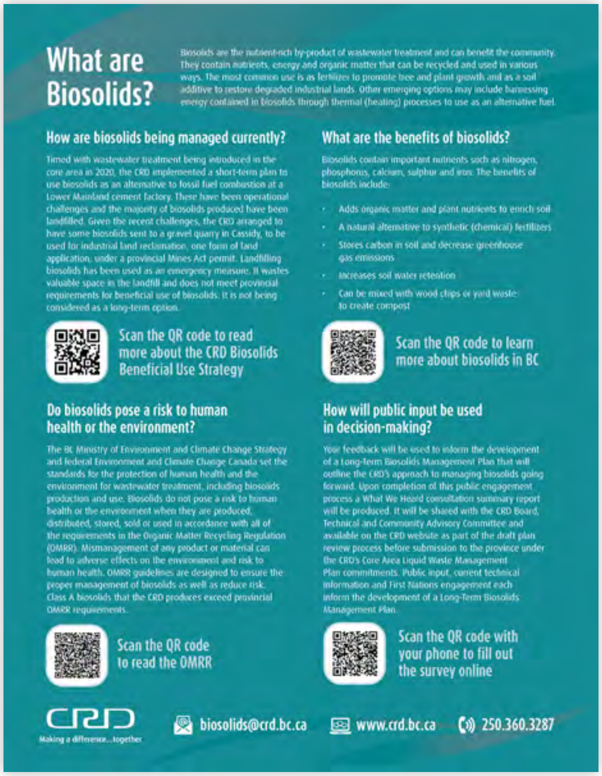
Is there anything else you would like to add?

____

____

____

Handout



What are Biosolids?

Biosolids are the nutrient-rich by-product of wastewater treatment and can benefit the community. They contain nutrients, energy and organic matter that can be recycled and used in various ways. The most common use is as fertilizer to promote tree and plant growth and as a soil additive to restore degraded industrial lands. Other emerging options may include harnessing energy contained in biosolids through thermal (heating) processes to use as an alternative fuel.

How are biosolids being managed currently?

Timed with wastewater treatment being introduced in the core area in 2020, the CRD implemented a short-term plan to use biosolids as an alternative to fossil fuel combustion at a Lower Mainland cement factory. There have been operational challenges and the majority of biosolids produced have been landfilled. Given the recent challenges, the CRD arranged to have some biosolids sent to a gravel quarry in Cassidy, to be used for industrial land reclamation, one form of land application, under a provincial Mines Act permit. Landfilling biosolids has been used as an emergency measure. It wastes valuable space in the landfill and does not meet provincial requirements for beneficial use of biosolids. It is not being considered as a long-term option.

Scan the QR code to read more about the CRD Biosolids Beneficial Use Strategy

What are the benefits of biosolids?

Biosolids contain important nutrients such as nitrogen, phosphorus, calcium, sulphur and iron. The benefits of biosolids include:

- Adds organic matter and plant nutrients to enrich soil
- A natural alternative to synthetic (chemical) fertilizers
- Stores carbon in soil and decrease greenhouse gas emissions
- Increases soil water retention
- Can be mixed with wood chips or yard waste to create compost

Scan the QR code to learn more about biosolids in BC

Do biosolids pose a risk to human health or the environment?

The BC Ministry of Environment and Climate Change Strategy and federal Environment and Climate Change Canada set the standards for the protection of human health and the environment for wastewater treatment, including biosolids production and use. Biosolids do not pose a risk to human health or the environment when they are produced, distributed, stored, sold or used in accordance with all of the requirements in the Organic Matter Recycling Regulation (OMRR). Mismanagement of any product or material can lead to adverse effects on the environment and risk to human health. OMRR guidelines are designed to ensure the proper management of biosolids as well as reduce risk. Class A biosolids that the CRD produces exceed provincial OMRR requirements.

Scan the QR code to read the OMRR

How will public input be used in decision-making?

Your feedback will be used to inform the development of a Long-Term Biosolids Management Plan that will outline the CRD's approach to managing biosolids going forward. Upon completion of this public engagement process a What We Heard consultation summary report will be produced. It will be shared with the CRD Board, Technical and Community Advisory Committee and available on the CRD website as part of the draft plan review process before submission to the province under the CRD's Core Area Liquid Waste Management Plan commitments. Public input, current technical information and First Nations engagement each inform the development of a Long-Term Biosolids Management Plan.

Scan the QR code with your phone to fill out the survey online

CRD
Making a difference...together

biosolids@crd.bc.ca www.crd.bc.ca 250.360.3287

Long-term options for biosolid use in the CRD

Scan the QR code to view the biosolids fact sheet.

Fertilizer for Agriculture

The nutrient-rich organic material can improve soil conditions to promote plant growth and increase crop yields. It can also improve water retention to reduce water usage as well as reduce reliance on synthetic fertilizers.

Timeline: Immediate

Cost: Less than $500/tonne

Industrial Land Reclamation

Biosolids can be applied to disturbed and degraded soils to replenish organic matter and essential nutrients, improving soil fertility, soil structure and increasing water retention. They can be applied directly or blended with compost, soil or wood chips.

Timeline: Immediate

Cost: Less than $250/tonne

Forest Fertilization

Biosolids can help improve soil fertility, prevent erosion and accelerate plant and tree growth. After a wildfire, biosolids can help forests regenerate, increasing water retention and providing essential nutrients and organic matter to promote plant and tree growth.

Timeline: Immediate

Cost: Less than $400/tonne

Wholesale Fertilizer for Landscaping

The nutrient-rich organic material can improve soil conditions to promote lawn and plant growth. Uses include lawns, boulevards, golf courses.

Timeline: Immediate

Cost: Less than $500/tonne

Bagged Fertilizer for Residential Use

The nutrient-rich organic material is bagged and distributed as fertilizer or blended with soil, compost or wood chips and made available for residential use.

Timeline: Immediate

Cost: Less than $500/tonne

Fuel for Incineration/Combustion

Biosolids are burned or used as an alternative fuel to power facilities, such as cement kilns and pulp mills, reducing reliance on other non-renewable sources like coal or natural gas.

Timeline: CRD currently utilizes this technology in Richmond, in-region options not available.

Cost: Less than $500/tonne

Pyrolysis or Gasification Technology to Create Biochar/Gas

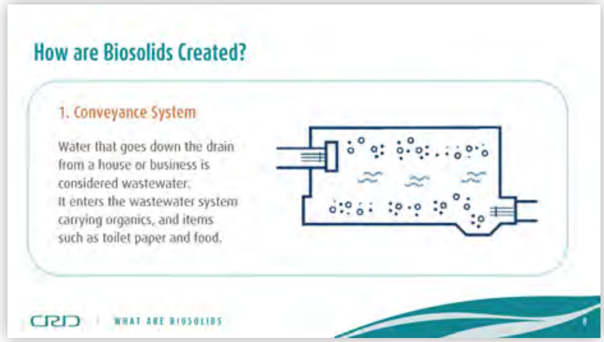
Biosolids are heated to make a gas or "biochar," which can be used to produce heat or electricity. Biochar is a type of charcoal that is made from organic material. It can be used as a soil additive to improve soil fertility and enhance water retention.

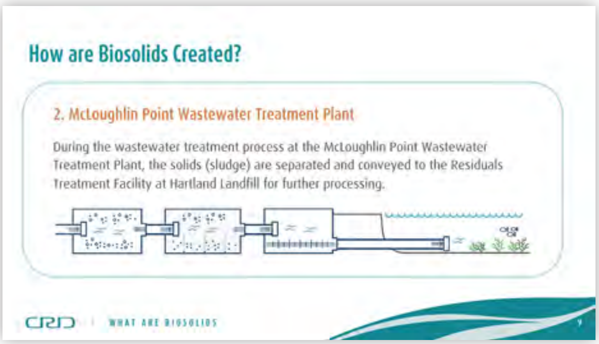
Timeline: 7-10 years for permitting, siting and construction of a permanent facility.

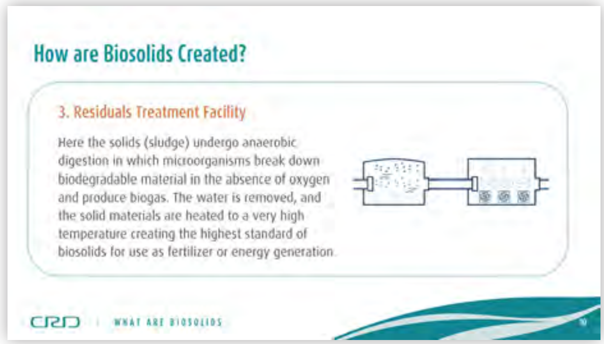
Cost: $500-$4500/tonne

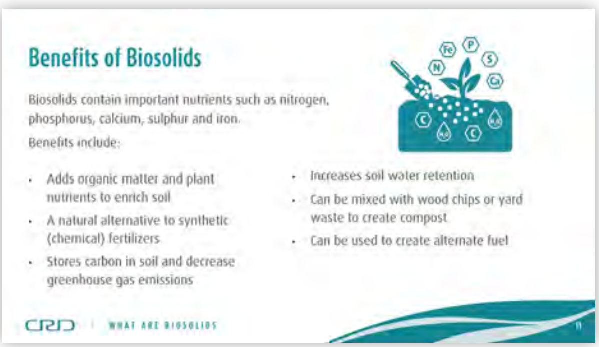
Presentation


What Are They?
Biosolids are the nutrient-rich by-product of wastewater treatment. They contain nutrients, energy and organic matter that can be recycled and used in various ways. Common uses include:
Commercial and residential fertilizer
Land reclamation
Alternative fuels
CRD | WHAT ARE BIOSOLIDS
7


How are Biosolids Created?
1. Conveyance System
Water that goes down the drain from a house or business is considered wastewater.
It enters the wastewater system carrying organics, and items such as toilet paper and food.
CRD | WHAT ARE BIOSOLIDS
8


How are Biosolids Created?
2. McLoughlin Point Wastewater Treatment Plant
During the wastewater treatment process at the McLoughlin Point Wastewater Treatment Plant, the solids (sludge) are separated and conveyed to the Residuals Treatment Facility at Hartland Landfill for further processing.
CRD | WHAT ARE BIOSOLIDS
9


How are Biosolids Created?
3. Residuals Treatment Facility
Here the solids (sludge) undergo anaerobic digestion in which microorganisms break down biodegradable material in the absence of oxygen and produce biogas. The water is removed, and the solid materials are heated to a very high temperature creating the highest standard of biosolids for use as fertilizer or energy generation.
CRD | WHAT ARE BIOSOLIDS
10


Benefits of Biosolids
Biosolids contain important nutrients such as nitrogen, phosphorus, calcium, sulphur and iron.
Benefits include:
• Adds organic matter and plant nutrients to enrich soil
• A natural alternative to synthetic (chemical) fertilizers
• Stores carbon in soil and decrease greenhouse gas emissions
• Increases soil water retention
• Can be mixed with wood chips or yard waste to create compost
• Can be used to create alternate fuel
CRD | WHAT ARE BIOSOLIDS
11


Do biosolids pose a risk to human health or the environment?
Biosolids do not pose a risk to human health or the environment when they are produced, distributed, stored, sold or used in accordance with all of the requirements in the Organic Matter Recycling Regulation.
CRD | WHAT ARE BIOSOLIDS
12


What is the Organic Matter Recycling Regulation?
The Organic Matter Recycling Regulation (OMRR) regulates the production and land application of compost and biosolids.
Class A biosolids that the CRD produces exceed provincial OMRR requirements.
CRD | WHAT ARE BIOSOLIDS
13


Short-Term Biosolids Beneficial Use Strategy
14

Definitive Plan

- Developed in early 2019, before wastewater treatment began.
- Strategy consistent with the CRD policy restricting land application of biosolids.
- Planned to ship biosolids to a cement plant in Richmond, BC, to be incinerated in their cement process.
- Conditionally approved by the Ministry of Environment in October 2019.

CRD | SHORT-TERM BIOSOLIDS BENEFICIAL USE STRATEGY 15

- The CRD partnered with W̱SÁNEĆ Leadership Council in the creation of K'ENES Transportation, a new First Nation-owned and operated trucking company.
- K'ENES Transportation transports all of the CRD's biosolids to their destinations.
- Regular shipments of biosolids has been challenging.

CRD | SHORT-TERM BIOSOLIDS BENEFICIAL USE STRATEGY 16

Contingency Plan

- Staff recommended, and the Board approved, the use of biosolids at Hartland Landfill, being mixed with sand and wood chips and applied to closed areas of the landfill to support vegetation regrowth and reduce methane emissions.
- All available space was used in 2022.

CRD | SHORT-TERM BIOSOLIDS BENEFICIAL USE STRATEGY 17

Alternative Contingency Plan and Landfilling

- A new contingency plan was adopted to use biosolids at a gravel quarry near Nanaimo to re-establish vegetation on closed parts of the quarry.
- The quarry's immediate needs were met in 2023, but they will continue to accept biosolids in the future as new areas of the quarry are reclaimed.
- An emergency plan was implemented, landfilling biosolids.
- Landfilling is not a beneficial use and has been prohibited by the province.

CRD | SHORT-TERM BIOSOLIDS BENEFICIAL USE STRATEGY 18

Timeline

- 2011 – CRD Policy—no land application
- 2020 – Short-term Biosolids Management plan developed in 2020; Sewage treatment introduced in 2020
- 2021
- 2022 – Technical review of long-term options from 2022 to 2023
- 2023 – Public engagement from December 2023 to March 2024
- 2024 – Draft long-term Biosolids Management Plan in June 2024

19

Long-term Use Options

Land Based

20

Fertilizer for Agriculture

The nutrient-rich organic material can improve soil conditions to promote plant growth and increase crop yields. It can also improve water retention to reduce water usage as well as reduce reliance on synthetic fertilizers.

Timeline:	Cost:
Immediate	Less than $500/tonne

CRD | LAND BASED LONG-TERM USE OPTIONS 21

Industrial Land Reclamation

Biosolids can be applied to disturbed and degraded soils to replenish organic matter and essential nutrients, improving soil fertility, soil structure and increasing water retention. They can be applied directly or blended with compost, soil or wood chips.

Timeline:	Cost:
Immediate	Less than $250/tonne

CRD | LAND BASED LONG-TERM USE OPTIONS 22

Forest Fertilization

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Timeline:	Cost:
Immediate	Less than $400/tonne

Wholesale Fertilizer for Landscaping

The nutrient-rich organic material can improve soil conditions to promote lawn and plant growth. Uses include lawns, boulevards, golf courses. It can also improve water retention to reduce water usage as well as reduce reliance on synthetic fertilizers.

Timeline:	Cost:
Immediate	Less than $500/tonne

Bagged Fertilizer for Residential Use

The nutrient-rich organic material is bagged and distributed as fertilizer or blended with soil, compost or wood chips and made available for residential use. Biosolids can also be blended with soil, compost or wood chips and made available for residential use.

Timeline:	Cost:
Immediate	Less than $500/tonne

Long-term Use Options

Thermal Based

Fuel for Incineration/Combustion

Biosolids are burned or used as an alternative fuel to power facilities, such as cement kilns and pulp mills, reducing reliance on other non-renewable sources like coal or natural gas.

Timeline:	Cost:
Limited facilities available with no in-region options. The CRD currently utilizes this technology at a plant in Richmond.	Less than $500/tonne

Pyrolysis or Gasification Technology to Create Biochar/Gas

Biosolids are heated to make a gas or "biochar," which can be used to produce heat or electricity. Biochar is a type of charcoal that is made from organic material. It can be used as a soil additive to improve soil fertility and enhance water retention.

Timeline:	Cost:
7-10 years for permitting, siting and construction of a permanent facility. Advanced thermal technology is not currently used for processing biosolids in Canada.	$500-$4,500/tonne

How will public input be used in decision-making?

Your feedback will be used to inform:

- The development of a Long-Term Biosolids Management Plan
- A What We Heard consultation summary report

Are there any questions?

Additional Engagement Meeting Notes

Pacheedaht Meeting Notes

April 11, 2024

Kristine Pearson, Pacheedaht First Nation
Erin Bildfell, CRD
Glenn Harris, CRD
Peter Kickham, CRD
Hannah Keene, 50th Parallel PR

CRD staff met with a representative of the Pacheedaht First Nation and provided a brief presentation and overview of the wastewater treatment project and resulting requirement to beneficially use biosolids. Staff presented the full suite of available options for biosolids management including various land application scenarios, incineration, and advanced thermal treatment. Staff also highlighted the concern raised by several groups regarding land application of biosolids.

The Pacheedaht representative asked several questions, including:

- the CRD's current practices under the Short-term Biosolids Beneficial Use Strategy, and why the CRD has not been able to ship any significant amount of product to the cement kiln,
- How biosolids are used in mine/quarry reclamation projects,
- Whether wastewater residuals from Port Renfrew would or could be incorporated under the long-term strategy, and whether there is an opportunity to work with the CRD regarding wastewater treatment infrastructure upgrades.

The Pacheedaht representative also suggested the CRD approach their private forestry partner to discuss using biosolids for forest fertilization, however highlighted a need to explore this potential carefully. Concerns from members of the nation would have to be carefully considered, with an explanation of potential risk factors from working with biosolids in comparison to the synthetic fertilizer products currently in use.

T'Sou-ke Nation

T'Sou-ke Meeting Notes

April 26, 2024

Sam Coggins, T'Souke Nation
Erin Bildfell, CRD
Peter Kickham, CRD
Stephanie Hagenaars, 50th Parallel PR

CRD staff met with a representative of the T'Souke First Nation and provided a brief presentation and overview of the wastewater treatment project and resulting requirement to beneficially use biosolids. Staff presented the full suite of available options for biosolids management including various land application scenarios, incineration, and advanced thermal treatment. Staff also highlighted the concern raised by several groups regarding land application of biosolids.

The T'Souke representative asked several questions, including:

- What is the contaminant profile for CRD biosolids,
- Industrial inputs to the CRD wastewater system (e.g., biomedical waste from hospitals),
- Potential sites within the T'Souke traditional territory where the CRD is considering land application,
- How to manage potential overland flow and impact to aquatic receiving environment,
- Scenario of a motor vehicle accident resulting in a spill of biosolids into a creek,
- Availability of CRD monitoring reports on biosolids,
- How biosolids are managed in other jurisdictions, and where to find monitoring information from other regional districts.

The T'Souke representative did not have formal comments beyond setting an expectation that the T'Souke Nation be engaged further in the event the CRD considers land application (be it a pilot or full scale) of biosolids anywhere in their traditional territory.

Pauquachin First Nation Meeting Notes

April 29, 2024

Octavio Cruz, Pauquachin First Nation
Peter Kickham, CRD
Stephanie Hagenaars, 50th Parallel PR

CRD staff met with a representative of the Pauquachin First Nation and provided a brief presentation and overview of the wastewater treatment project and resulting requirement to beneficially use biosolids. Staff presented the full suite of available options for biosolids management including various land application scenarios, incineration, and advanced thermal treatment. Staff also highlighted the concern raised by several groups regarding land application of biosolids.

The Pauquachin representative asked several questions, including:

- Whether the CRD had received comments or feedback from other First Nations,
- Whether the CRD had considered export options out of the region or province (e.g., to an area where there is high agricultural output and need for fertilizer).

The Pauquachin representative stressed the importance of engagement on any specific (future) land application projects the CRD considers in the territory of the Pauquachin Nation. The concern is not only environmental, but also cultural, as potential impact to harvesting of traditional plants for food or medicinal use is of the utmost importance. They also recognized that potential application of biosolids is only one of many activities that may impact traditional harvesting activities.

250-360-3090

biosolids@crd.bc.ca

getinvolved.crd.bc.ca/biosolids

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APPENDIX C

Technical and Community Advisory Committee

Long-term Biosolids Management Strategy Presentations

Capital Regional District

Long-Term Biosolids Beneficial Use Strategy

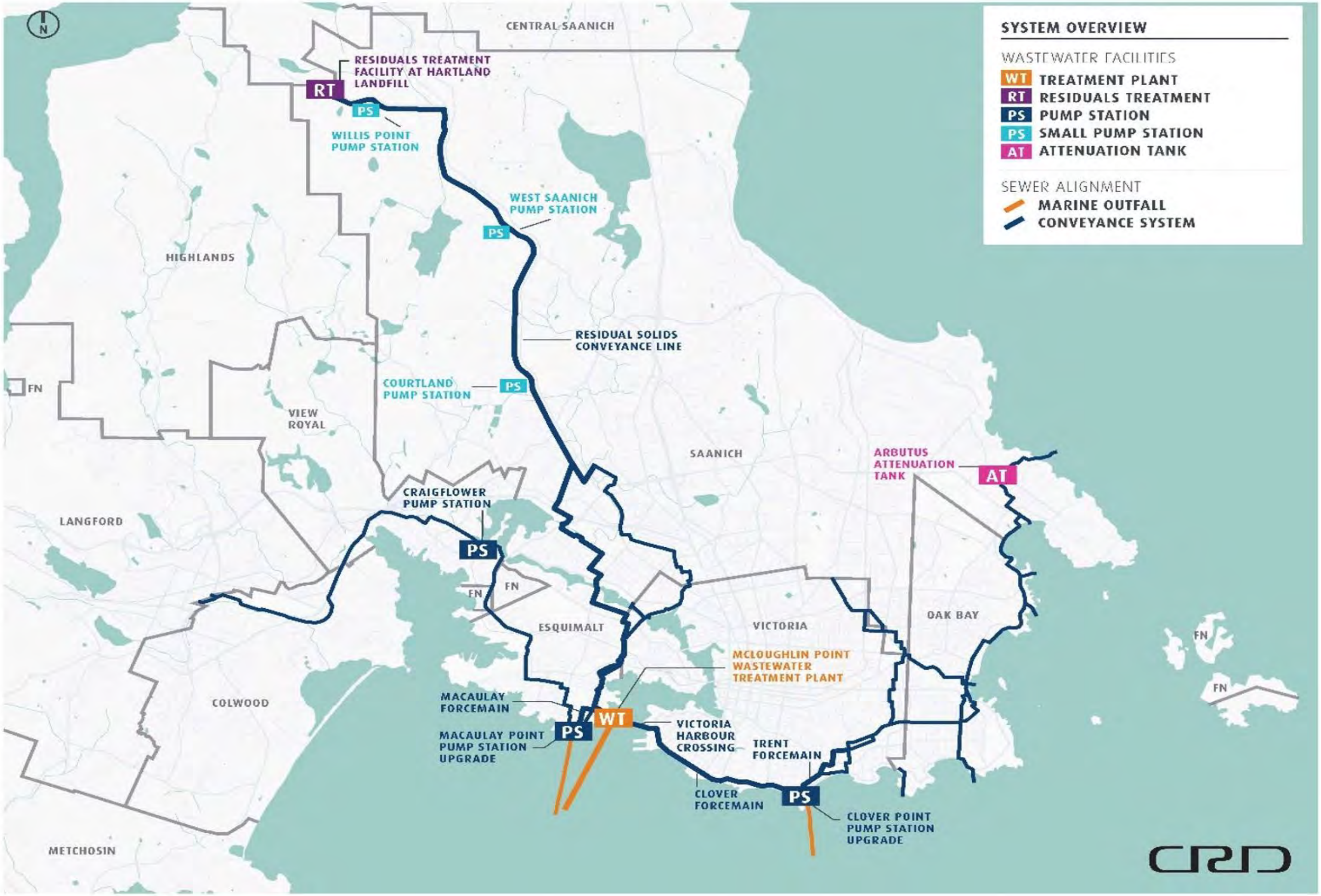
Peter Kickham, Manager, Regulatory Services, Environmental Protection

Technical And Community Advisory Committee

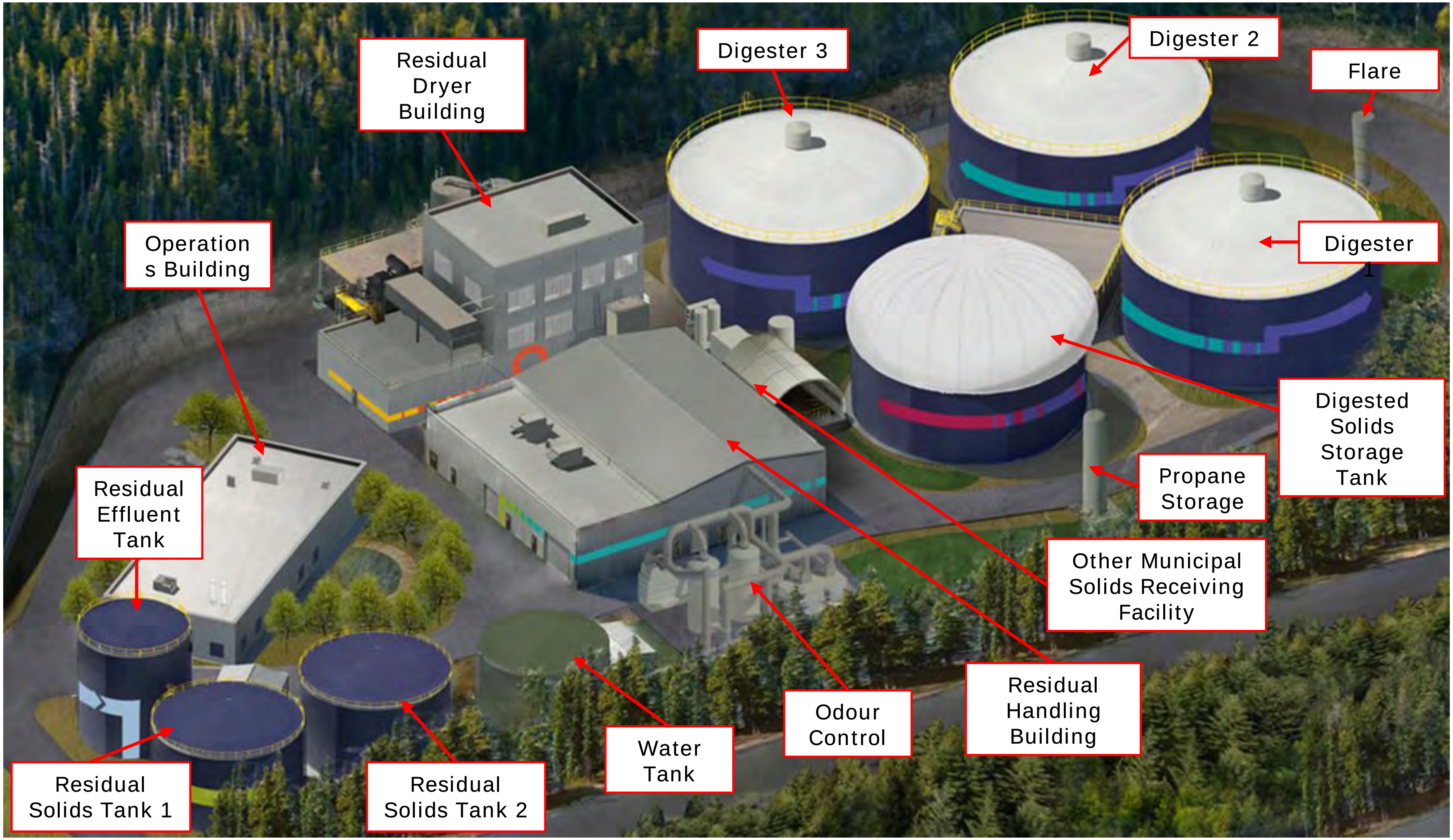
October 27, 2023

CRD Wastewater Treatment

Core Area Wastewater Treatment Overview Map



Residuals Treatment Facility



Dried Class A Biosolids

What is Beneficial Use?

Beneficial use is defined in the *Canadian Council for Ministry of the Environment* (CCME) *Canada-Wide Approach for the Management of Wastewater Biosolids.*

Beneficial use options capitalize on the nutrient and organic matter value and energy content of the municipal biosolids for use in:

- energy production (e.g. combustion)
- compost and soil products
- agricultural land application as a fertilizer or soil conditioner
- forestry application as a fertilizer or soil conditioner
- land reclamation.

When combustion is used for municipal sludge or municipal biosolids management, it may be considered a disposal option or a beneficial use option. To qualify as a beneficial use option, combustion must meet the following three criteria:

- result in a positive energy balance
- emit low levels of nitrous oxides
- recover a significant portion of ash or phosphorus.

Broadly, beneficial use options fit into two categories; land application or energy production.

Short Term Biosolids Beneficial Use Strategy (Definitive Plan): Alternative fuel in cement kiln

Short-Term Biosolids Contingency Plan: Engineered Cover at Hartland Landfill

Short Term Alternative Contingency Plan: Gravel Quarry Reclamation

As a condition to the Provincial approval of the short-term strategy, the CRD must:

a) Consult with the public on all available beneficial use options, and

b) Submit a long term biosolids management strategy by June 2024, to be implemented by January 2025.

Options Analysis

The CRD has hired an external consultant to act as a technical advisor for biosolids planning.

This consultant has completed an analysis of available beneficial use options, and after public and first nations engagement will be drafting the long-term strategy.


GHD

Long-Term Biosolids Beneficial Use Option Analysis

Capital Regional District

05 July 2023

→ The Power of Commitment

Thermal Options

Pyrolysis

- Absence of oxygen
- 300-800 °C
- Produces syngas, biochar, steam, ash

Gasification

- Limited oxygen
- 600-1000 °C
- Produces syngas, biochar, pyrolysis oil, ash

Incineration

- Excess oxygen
- 800-1200 °C
- Produces energy (steam, electricity, heat)

Land Application Options

Soil Products


(NW Biosolids, 2021)

- Mixing with soil/sand to create nutrient rich soil
- Mixing with organics for compost

Agricultural


(Metro Vancouver, 2023)

- Fertilizing for agricultural land
- Reduces use of synthetic fertilizers

Forest Fertilization


(Sylvis, 2013)

- Supplementing nutrients in forest soil
- Increases tree production

Mine Reclamation


(Sylvis, 2010)

- Reclaiming barren soils damaged from mining activity
- Minimizes impact of long-term effects of mining sites on ecosystem

Options Portfolios

Regardless of the type of management option selected, the CRD requires a combination of multiple options to ensure redundancy and resiliency as well as consistent service delivery and regulatory compliance.

1. Preferred Option

2. Support Option

3. Contingency Options

Public Engagement

Presented to TCAC by Katie Tavola, Tavola Strategy Group on October 27, 2023

CAPITAL REGIONAL DISTRICT

LONG TERM BIOSOLIDS MANAGEMENT PUBLIC ENGAGEMENT STRATEGY OCTOBER 2023

CRD Making a difference...together

TAVOLA STRATEGY GROUP

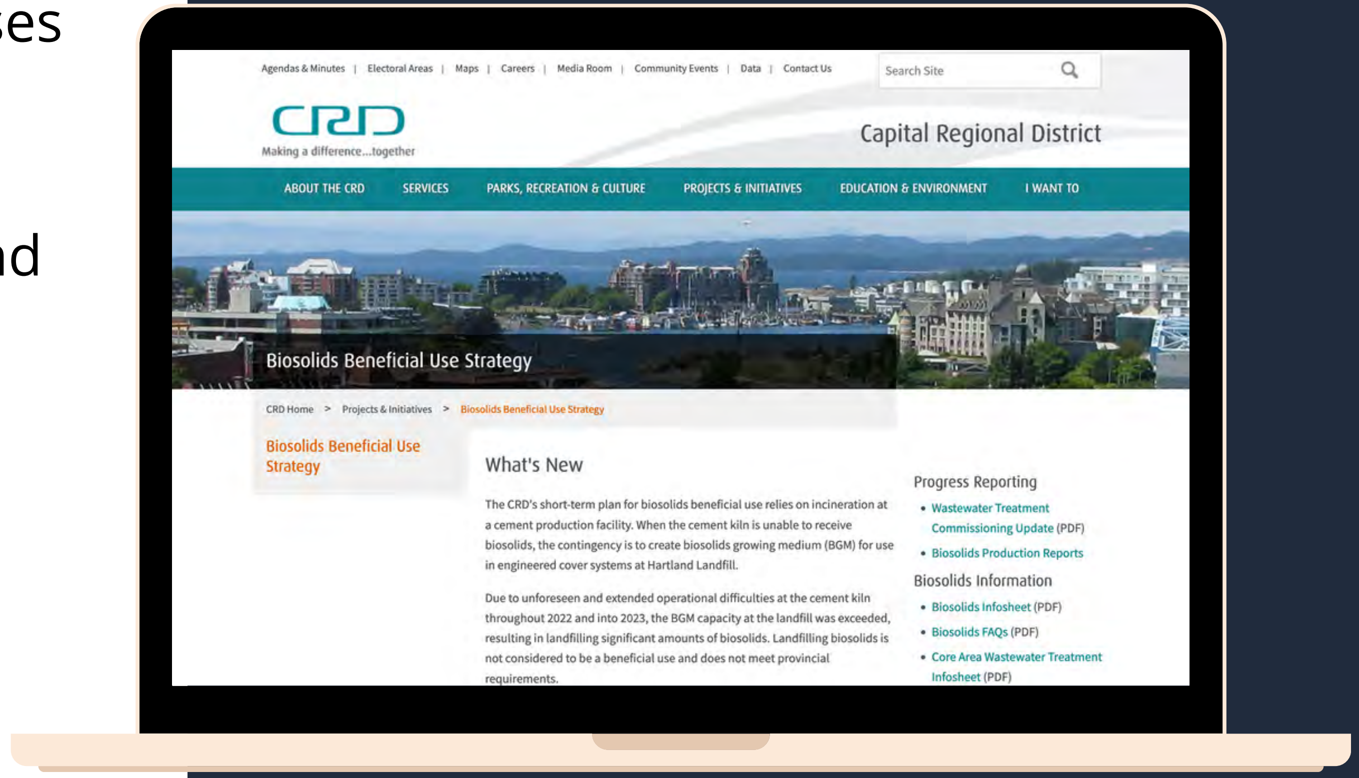
BACKGROUND

- The leftover material from the sewage treatment process, “biosolids” are a nutrient-rich resource that can benefit the community in a variety of different ways.

- The Province of BC’s Organic Matter Recycling Regulation sets the requirements for the production of high-quality biosolids and subsequent beneficial uses related to land application and composting. The CRD produces Class A biosolids, the highest quality category of biosolids.

- A Definitive (Long-term) Biosolids Management plan must be submitted to the Province by June 2024. The Province of BC has specific requirements for what must be included in the plan. It’s expected that a combination of beneficial uses may need to be considered within the long-term plan.

- Public consultation about the potential in-region beneficial uses, including land application, must be included in the plan.



COMMUNICATIONS AND CONSULTATION OBJECTIVES

1. Raise awareness of the need to develop a long-term biosolids management plan that outlines how the Capital Regional District will utilize the benefits of biosolids in-region.

2. Provide multiple channels and opportunities for the community to learn more and provide input into the development of the definitive biosolids management plan.

3. Seek to understand public awareness, perceptions, concerns and top-of-mind considerations for how biosolids should be managed in the Capital Region.

AUDIENCES

Residents and taxpayers of LWMP Core area
Residents of the Capital Region
CRD Board of Directors
Municipal Councils within the Capital Region
Technical and Community Advisory Committee (Core Area Liquid Waste Management)
News media
Various sectors/groups

a. Environmental organizations (non-profits, advocacy, volunteers)
b. General business
c. Agriculture (farmers, agricultural organizations)
d. Silviculture (forestry companies)
e. Mine reclamation (mining companies)
f. Construction industry
g. Industry and technology providers
h. Research institutions and individuals (universities, research groups, scientists)

AUDIENCES (CON'T)

Community members and groups

a. Biosolid Free BC, Peninsula Biosolids Coalition

Hartland landfill neighbours

a. Community Associations (e.g., Willis Point Community Association, Mount Work Coalition)

b. Local Stream keeper and Watershed Protection Community Groups

Other regional districts in the Province of BC

Communities outside of the Capital Region that are currently receiving CRD biosolids

Provincial Government

Ministry of Environment and Climate Change Strategy

**A parallel engagement effort will occur with Core Area and Regional First Nations.*

STRATEGIC CONSIDERATIONS

- The importance of plain language and visuals to make the topic of biosolids more accessible and ensure those who are less familiar aren't intimidated by the technical jargon or dialogue.
- Establishing a solid context of the need to plan for the long term and the many associated considerations is critical to community and stakeholder understanding and support.
- Recognize that there are different opinions and that all perspectives are welcome, including many less familiar with biosolids and their potential uses.
- Ensure all considerations associated with beneficial uses are presented (e.g. environmental, health, beneficial uses, costs, timelines, siting, etc.)
- Aside from levels of acceptance about various options, it is important to explore how biosolids can be an opportunity and resource, not merely a waste product/problem.
- Important to create a space where people can learn more and understand the community's values and top-of-mind considerations, concerns, and mitigations and avoid a debate over options.
- A transparent process with a detailed *What We Heard Consultation Summary report* will ensure participants to see their input and how it influenced the long-term plan.

KEY TOPICS

What are biosolids	Inform
Why is a long-term plan needed / provincial requirement	Inform
Engagement process and opportunities to provide input	Inform
Potential options for beneficial use of biosolids / and associated considerations	Inform
Level of acceptance for various options	Consult
Top of mind considerations associated with biosolids management and specific options	Consult
Perceived benefits with options	Consult
Perceived concerns and potential mitigations associated with options	Consult
How best to keep you informed about biosolids management	Consult
What we heard during engagement process	Inform

ENGAGEMENT METHODS

AWARENESS-RAISING

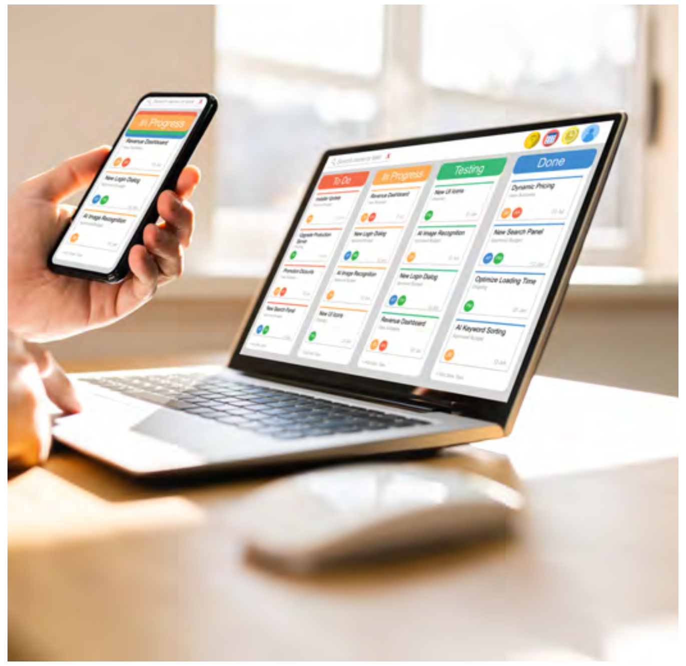
- “One-stop” project website with FAQ, videos, interactive features and technical documents
- Fact sheet/FAQ
- Videos
    - What are biosolids and “beneficial uses”, tour of facility
- Social media and digital advertising
- Earned media
- Letter to stakeholders
- Presentation materials

WAYS TO PROVIDE INPUT

- Online survey and interactive engagement platform
- Written submissions
- Online Open House
- Representative focus groups
- Facility Tour*
- Technical and Community Advisory Committee

STAGES IN THE PROCESS

A 3-month consultation process utilizing a variety of engagement methods.



Planning

October 2023

Public Consultation

November - February 2023

What We Heard

March 2024

Report to CRD Board

Spring 2024

QUESTIONS?

Presented to TCAC by Deacon Liddy, GHD on February 13, 2024

Approach

Scan → **Screen** → **Portfolios** → **Resiliency** → **Select** → **Implement**

Scan: List all available options

Screen: Regulatory requirements (CCME, OMRR)

Portfolios: Develop portfolios of options

Current phase

Resiliency: Future test portfolios

Select: Select resilient portfolio of options based on considerations and Public Consultation

Implement: Annual reviews and update portfolio as required

Considerations → **Public Consultation**

- Financial
- Environmental Impacts
- Environmental Sustainability
- CRD Ownership
- Reputation
- Regulatory Requirements

6.3 Options Evaluation

The results of the options evaluations using the proposed evaluation criteria are summarized in Table 6.4 below:

Table 6.4 General Option Pathway Evaluation Results

Evaluation Criteria	Description	Mine/Quarry Reclamation	Forest Fertilization	Land Improvement	Direct Land Application	BGM/Composting/Soil-Product	Fuel for Combustion/Incineration (Off-Site)	Pyrolysis (On-Site)	Gasification (On-Site)
Economic	CAPEX and OPEX	Low CAPEX given no investment for additional infrastructure. Medium OPEX due to labour, transport, materials handling, maintenance, storage, public outreach, etc.			Low CAPEX given no investment for additional infrastructure. Higher OPEX due to increased costs from bagging protocol and materials.	Low CAPEX given no investment for additional infrastructure. Medium OPEX due to labour, transport, materials handling, maintenance, storage, public outreach, etc.	Low to medium CAPEX depending on contract agreement. Some vendors may require investment for additional feedstock storage infrastructure. Medium OPEX due to labour, transport, materials handling, maintenance, storage, etc.	High CAPEX due to capital investment for on-site facility. OPEX induced from labour, utility demands (natural gas, electricity, and water), and the transport of biochar. In comparison to off-site alternatives, OPEX will be low in the long-term due to lack of tip-fees for biosolids. However, OPEX may be higher during the early commercial facility commissioning stage until the process becomes optimized.	
	Potential for revenue generation	Low potential for revenue generation as there are no residual products from this process.			Potential for revenue generation through the distribution of bagged biosolids fertilizer product to partially offset processing costs.	Low potential for revenue generation as CRD may not own the rights to the BGM/composting/soil-products.	Low potential for revenue generation as CRD may not own the rights to the value derived products (electricity, cement, heat, etc.).	Potential for revenue from value derived products (biochar, bio-oil) to partially off-set processing costs.	Potential for revenue from value derived product (biochar) to partially off-set processing costs.
	Estimated cost per tonne (CAPEX and OPEX estimate based on information available at the time of this report)	<$250/tonne	<$400/tonne	<$500/tonne	<$500/tonne	<$500/tonne	<$500/tonne	$500-4,500/tonne[1]	
Environmental Impacts	Odour	Potential for nuisance odour emissions at application site(s). May be mitigated via biosolids stabilization and mixing with soil. Application sites are generally far from population centres.					Minimal odour due to installation of an odour abatement system at the facility.		
	Noise	Noise emitted from land application equipment. However, mines/quarries are generally located far from population centres.			Noise potentially emitted from bagging equipment. However, site is located far from population centres	Noise emitted from land application equipment. However, application sites are generally	Minimal noise due to installation of noise abatement system at the facility.		

Evaluation Criteria	Description	Mine/Quarry Reclamation	Forest Fertilization	Land Improvement	Direct Land Application	BGM/Composting/Soil-Product	Fuel for Combustion/Incineration (Off-Site)	Pyrolysis (On-Site)	Gasification (On-Site)
					and a noise abatement system would be designed as the bagging protocol is developed.	located far from population centres.			
	Estimated Truck Traffic	Truck traffic associated with transport of biosolids from site: Approximately one truck every three days (122 trucks each year)						Truck traffic associated with transport of biochar from site: – Approximately one truck every nine days (41 trucks each year)	
	Air Emissions and Dust	Generally low potential for particulate air emissions/dust.					Minimal air emissions/dust due to installation of advanced capture and treatment systems at facility, though residues from these capture and treatment systems need to be disposed of.		
	Contaminant mass balance	Potential accumulation of contaminants. However, class A biosolids have undergone contaminant reduction processes as per OMRR quality standards.					Contaminants have shown to be reduced through thermal processing. However, the level of reduction and ultimate environmental fate are still under investigation.		
Environmental Sustainability	Production of value derived products e.g., biochar, biocrude, etc.	Biosolids may be considered a fertilizer product derived from a waste stream in the context of land-application, with the added benefit of reducing the need for energy-intensive synthetic fertilizer production.				Produces BGM, compost, soil-products which may be beneficially re-used in various applications and reduces the need for energy-intensive synthetic fertilizer production.	Produces energy which may be beneficially re-used for electricity/heating applications assuming nearby end-users.	Produces steam, syngas, , and bio-oil, which can be beneficially re-used in various applications such as heating, electricity, etc. Also produces biochar, however the potential beneficial applications of this product as a soil amendment are still under investigation.	Produces steam, syngas, and which can be beneficially re-used in various applications such as heating, electricity, etc. Also produces biochar, however the potential beneficial applications of this product as a soil amendment are still under investigation.
	GHG Emission Implications[2]	In comparison to landfilling, GHG emissions are significantly reduced due to lesser methane/nitrous-oxide emissions, carbon sequestration into soil, and an offset usage of synthetic fertilizers. In comparison to alternative beneficial use options, biosolids application to degraded areas (mines, quarries, forests, lands, etc.) presents the lowest potential for GHG emission reduction. Any off-site option will have higher GHG emission implications due to the transport distances and trucking frequency associated with the transport of			In comparison to landfilling, GHG emissions are significantly reduced due to lesser methane/nitrous-oxide emissions, carbon sequestration into soil, and offset usage of synthetic fertilizers. In comparison to alternative beneficial use options, the production and sale of biosolids as a soil fertilizer product through bagging, compost, or BGM, presents medium potential for GHG emission reduction, assuming it has greater potential to offset the usage of synthetic fertilizers.		In comparison to landfilling, GHG emissions are significantly reduced (lesser methane/nitrous-oxide emissions, non-renewable fuel usage offsets). Thermal processing options will have increased GHG implications from the oxidization of any gases produced.	In comparison to landfilling, GHG emissions are significantly reduced (lesser methane/nitrous-oxide emissions, non-renewable fuel usage offsets). Advanced thermal processing options will have increased GHG implications from the oxidization of any gases produced. Like combustion/incineration, pyrolysis and gasification present high potential for GHG emission reduction, if biosolids-derived energy (heat, syngas, or bio-oil from	

Evaluation Criteria	Description	Mine/Quarry Reclamation	Forest Fertilization	Land Improvement	Direct Land Application	BGM/Composting/Soil-Product	Fuel for Combustion/Incineration (Off-Site)	Pyrolysis (On-Site)	Gasification (On-Site)
		biosolids, resulting in increased non-renewable fuel usage.			Any off-site option will have higher GHG emission implications due to the transport distances and trucking frequency associated with the transport of biosolids, resulting in increased non-renewable fuel usage.		In comparison to land application options, utilizing biosolids as renewable fuel for cement combustion or energy production via incineration presents high potential for GHG emission reduction, assuming it offsets the usage of non-renewable fuel sources. Any off-site option will have higher GHG emission implications due to the transport distances and trucking frequency associated with the transport of biosolids, resulting in increased fuel usage.	pyrolysis) is beneficially used to offset the usage of non-renewable fuel sources. Depending on process design, this derived energy may not be reused or recycled, and may result in lower GHG emission reductions. On-site options will have lesser GHG emissions associated with transport, as the trucking frequency of hauling biochar will be less than that required of biosolids.	
	Potential to recover energy and reduce dependence on electric grid and natural gas	No potential to recover energy.					High potential to recover energy from products (steam, heat) to offset dependence on electric grid and natural gas. Fulsome energy recovery would depend on presence of nearby end-users.	High potential to recover energy from products (syngas, steam, heat) to offset dependence on electric grid and natural gas onsite. Fulsome energy recovery would depend on presence of nearby end-users.	
	Potential to co-process additional waste streams	No potential for co-processing.				Potential for co-processing via blending of biosolids with compost generated from organic waste streams.	Low potential to co-process mixed waste streams as CRD would not have control over off-site facility operations.	Potential to co-process mixed waste streams. However, co-processing may increase maintenance/operational costs due to added complexity of feedstock.	
	Soil/groundwater impacts	Supplementing soil cover and improving soil health via biosolids application reduces erosion into lakes and streams. Potential negative impact to soil/groundwater if application plan is not followed correctly as per OMRR.			Bagging process presents minimal impacts to soil/groundwater. End-use of the bagged product may present potential negative impact to soil/groundwater if applied in quantities greater than one bag ($5m^3$) per parcel of land. OMRR does not require a land application plan for application quantities less than or equal to $5m^3$ per parcel of land.	End-use of the products may present potential negative impact to soil/groundwater if application plan is not followed correctly as per OMRR.	Process presents minimal impact to soil/groundwater. End-use of the products (biochar, bio-oil, ash) may present potential negative impact to air/soil/groundwater if proper consideration not taken.		

Evaluation Criteria	Description	Mine/Quarry Reclamation	Forest Fertilization	Land Improvement	Direct Land Application	BGM/Composting/Soil-Product	Fuel for Combustion/Incineration (Off-Site)	Pyrolysis (On-Site)	Gasification (On-Site)
CRD Owned	Yes or no	No. Biosolids would be sent to vendors who would own risk and land application responsibility.			Yes.	No. Biosolids would be sent to vendors who would own risk and responsibility.	No. Biosolids would be sent to off-site facility.	Yes.	
Experience and Reputation	Type of application	Mines/quarries are required by the government to eventually reclaim and close to minimize the long-term environmental effects of operations. Biosolids have shown to be an effective measure in the restoration of former mines/quarries by adding nutrients to promote vegetation growth in their barren soils. However, general public acceptance regarding land application varies due to concerns on noise, odour, contaminants, etc.	Biosolids have shown to be an effective measure in the fertilization of forests to increase tree production, reduce soil erosion, and improve soil health. However, general public acceptance regarding land application varies due to concerns on noise, odour, contaminants, etc.	Land application has demonstrated commercial success and is one of the commonly used management options worldwide. However, general public acceptance regarding land application varies due to concerns on noise, odour, contaminants, etc.	It is unclear if there is a local market for bagged biosolids fertilizer product. A pilot trial would be required to assess demand and feasibility. Biosolids as a bagged product is allowed under OMRR in packages of <5m^3. However, general public acceptance regarding land application varies due to concerns on noise, odour, contaminants, etc.	Land application has demonstrated commercial success and is one of the commonly used management options worldwide. However, general public acceptance regarding land application varies due to concerns on noise, odour, contaminants, etc.	High technological readiness as combustion/incineration is a commercially proven and widely used biosolids management process. However, the market for biosolids as fuel does not currently exist. Additionally, public acceptance of waste incinerators varies due to concerns regarding intensive energy usage and potential for air pollutant emissions.	Reputation of pyrolysis is gaining interest as an innovative technology which produces value added products from waste streams, however it has demonstrated low technological readiness as there are a limited number of operational facilities which use biosolids as a sole feedstock. In North America, pyrolysis is ahead of gasification with regards to technological readiness based on the number of operational facilities.	Reputation of gasification is gaining interest as an innovative technology which produces value added products from waste streams, however it has demonstrated low technological readiness as there are a limited number of operational facilities which use biosolids as a sole feedstock. In North America, gasification is below pyrolysis with regards to technological readiness based on the number of operational facilities.

Evaluation Criteria	Description	Mine/Quarry Reclamation	Forest Fertilization	Land Improvement	Direct Land Application	BGM/Composting/Soil-Product	Fuel for Combustion/Incineration (Off-Site)	Pyrolysis (On-Site)	Gasification (On-Site)
Regulatory	New permitting requirements and impacts to existing permits	May require approvals from: - ENV to ensure land application is carried out safely and does not pose a risk to human health or the environment.					Changes to boiler air mass permits may be required. May require approval from Environmental Management Act Air Quality Permit for any emissions associated with thermal process.	May require approval from Environmental Management Act Air Quality Permit for any emissions associated with thermal process.	

1. Due to pyrolysis and gasification being considered emerging technologies in the biosolids industry there are a number of unknown risks associated with these technologies which have the potential of increasing both CPAEX and OPEX associated these types of projects.
2. GHG Emission Implications are based on the 2022 BEAM Model developed by the Northeast Biosolids and Residuals Association, Northwest Biosolids, Northern Tilth LLC.

Presented to TCAC by Peter Kickham on March 14, 2024

Portfolios

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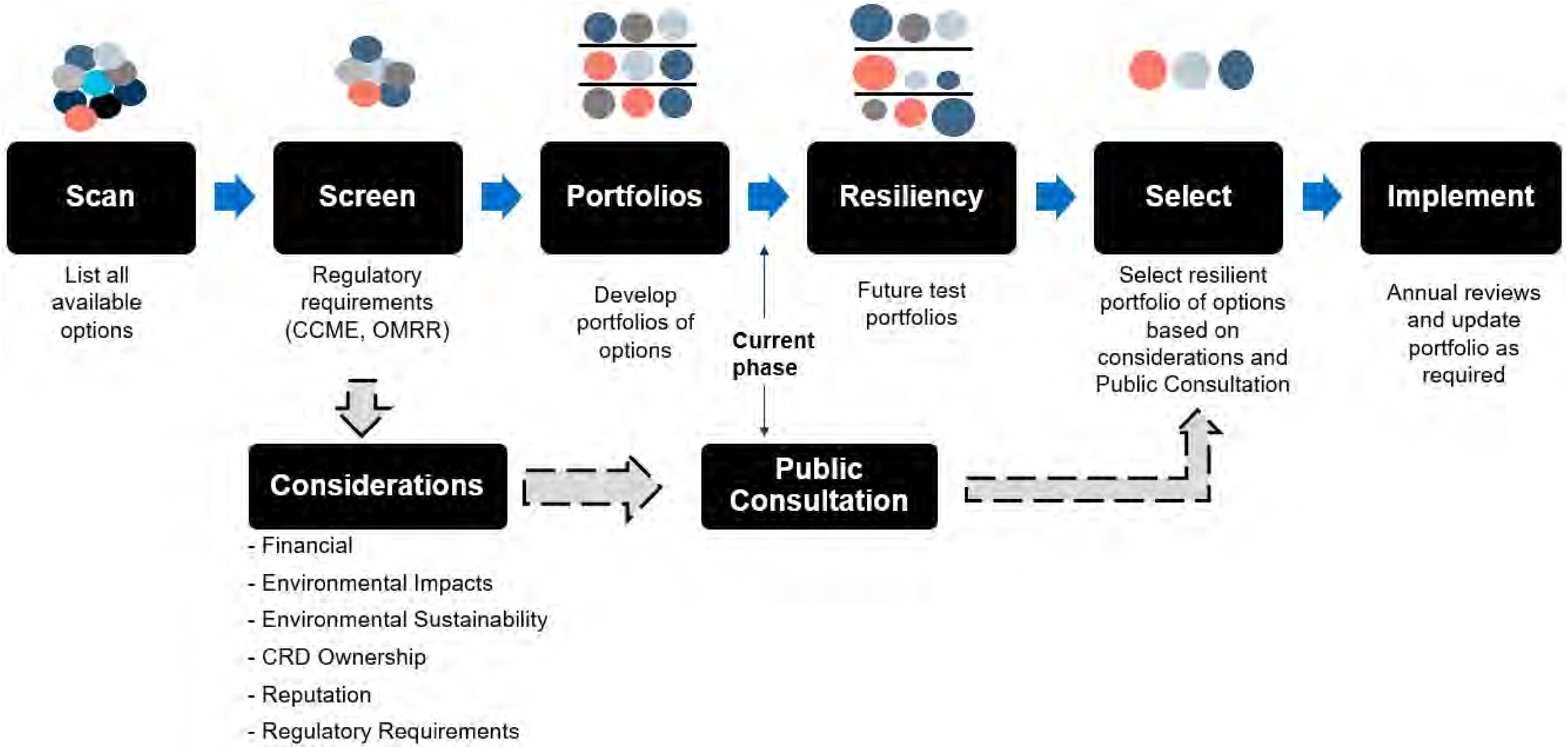
Risks of interruption may be mitigated through **redundancy of options,** achieved by **portfolios** composed of **multiple contingent options.**



Considerations

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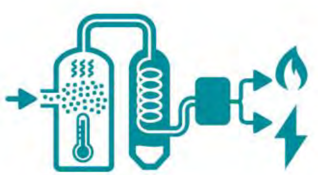
	Thermal Processing	Land Application
Financial	– High initial capital cost, low economies of scale – Potential for revenue to partially offset processing costs	– Comparatively low capital cost. Additional investment into storage/transport infrastructure may be required. – No potential for revenue generation
Environmental Impacts	– Facility will have nuisance emission abatement systems (odour, noise, air/dust)	– Potential for nuisance odour, noise, air/dust emissions at application sites (far from population centers)
Environmental Sustainability	– Potential to recover energy from waste product – GHG emissions from transport (off-site combustion)	– Reduction of need for synthetic fertilizer – Potential for soil/groundwater impacts if OMRR not followed – GHG emissions from transport
Experience and Reputational	– Advanced thermal technology is emerging – No advanced thermal plants using biosolids feedstock operating in North America	– Demonstrated commercial implementation
CRD Ownership	– CRD would own advanced thermal facility or send biosolids to third-party for off-site combustion	– Biosolids would be sent to third-parties or be bagged by the CRD and sold commercially
Regulatory	– Facility permits required	– Land application plan required per OMRR
Potential Risks of Interruption	– Multiple years required to implement advanced thermal facility – Unknown market for biochar – Unscheduled shutdowns for operational maintenance/commissioning – Limited commercially operational biosolids thermal facilities in North America	– Fluctuations in need for biosolids (typically project-based, seasonal) – Unclear if market exists for bagged biosolids product

Available Options

Available options can be broadly categorized as various forms of **thermal processing** or **land application**.

Pyrolysis or Gasification



- Heating with little to no oxygen
- 300-800 °C (pyrolysis)
- 600-1000 °C (gasification)
- Produces syngas, biochar, steam, ash
- $500 - $4,500/tonne

Incineration or Combustion

- Heating with excess oxygen
- 800-1200 °C cement kilns, pulp mills
- Converts to energy (steam, electricity, heat)
- >$500/tonne

Forest Fertilization

- Supplementing nutrients in forest soil
- >$400/tonne

Industrial Land Reclamation

- Reclaiming barren soils damaged from mining
- >$250/tonne

Wholesale Fertilizer for Landscaping

- Blending with soil, compost, or wood chips
- Wholesale distribution (e.g., golf courses)
- >$500/tonne

Bagged Fertilizer for Residential Use

- Blending with soil, compost, or wood chips
- Residential distribution (e.g., gardens)
- >$500/tonne

Fertilizer for Agriculture

- Fertilizer for crops
- >$500/tonne

Questions?

Long-Term Biosolids Management Strategy

April 23, 2024

Contents

Figure index

Appendices

1. Introduction

Under the Capital Regional District's (CRD) provincially approved Core Area Liquid Waste Management Plan (CALWMP) and its amendments, the CRD is obliged to manage wastewater treatment and biosolids in a beneficial manner. As part of the CALWMP, the CRD is required to submit a Long-Term Biosolids Management Strategy to the BC Ministry of Environment and Climate Change Strategy (ENV) by June 18, 2024 and have it implemented January 1, 2025. This technical memorandum is intended to meet the submission requirement.

This Long-Term Biosolids Management Strategy considers the full spectrum of available biosolids beneficial use options to inform biosolids management within the region for the next 5 to 20-years. This strategy includes a portfolio of biosolids beneficial use options for implementation by the CRD to ensure redundancy and resiliency of the management program.

2. Background

In 2011, the CRD Board of Directors passed a motion to restrict the land application of biosolids, the residual, treated solids resulting from typical wastewater treatment processes. In the following year, 2012, the CRD began planning for upgraded wastewater treatment within the region, as federal regulations had been introduced to require a minimum of secondary treatment for wastewater by the end of the decade.

The McLoughlin Point Wastewater Treatment Plant (WWTP) was implemented in 2020 to serve the CRD's core area municipalities, as well as the Esquimalt and Songhees Nations. Residual solids from the WWTP are conveyed by pipe, for further treatment and dewatering, to the Residuals Treatment Facility (RTF), which is located north of Hartland Landfill. The RTF uses mesophilic anaerobic digestion and fluidized bed drying to further treat and dewater the wastewater residual solids from the WWTP into approximately 3,500 tonnes of dried, pelletized Class A biosolids per year (approximately 10 tonnes per day).

The Class A biosolids produced by the RTF were intended to be managed through the CRD's *Biosolids Beneficial Use Strategy (Definitive Plan)* (2019) through 2020 to 2025, which involved the transport of Class A biosolids to a cement manufacturing facility in Richmond, BC, where the Class A biosolids could be beneficially used via thermal processing as an alternative fuel for combustion in the facility's cement kilns.

The ENV had conditionally approved the Definitive Plan on the basis that the CRD develop this Long-Term Biosolids Management Strategy (extended past 2025) that considers the full spectrum of biosolids management options available to the CRD and adheres to the beneficial use guidelines as defined in the *Canada-Wide Approach for the Management of Wastewater Biosolids* (2012) by the Canadian Council of Ministers of the Environment (CCME).

Beginning with the implementation of the Definitive Plan in 2020 to the present day, the CRD had executed several key initiatives to support the development of this Long-Term Biosolids Management Strategy.

These initiatives included but were not limited to:

- Conducting advanced thermal biosolids processing pilot trials with technology vendors
- Development of the *Long-Term Biosolids Beneficial Use Option Analysis* (2023)
- Forming and consulting with a Technical and Community Advisory Committee (TCAC)
- Engaging and consulting with the public and First Nations

Between January and March 2024, the CRD consulted with the public and TCAC, and solicited their feedback on the types of biosolids management options available for inclusion into this Long-Term Biosolids Management strategy. A separate engagement process with First Nations was also carried out, and reporting on public and First Nations engagement processes is included under separate cover.

2.1 Long-Term Biosolids Beneficial Use Options Analysis Report

On July 5, 2023, the CRD completed development of the *Long-Term Biosolids Beneficial Use Option Analysis* report (included as Appendix A). The report was presented at a CRD Board of Directors meeting on August 9, 2023 and has since been used as informational material in the CRD's engagement processes and the overall development of this Long-Term Biosolids Management Strategy.

The *Long-Term Biosolids Beneficial Use Option Analysis* report presents a full account of the regulatory requirements and historical background influencing this Long-Term Biosolids Management Strategy, a jurisdictional scan of biosolids management options used worldwide, an assessment of the advanced thermal pilot trials, an evaluation of long-term of biosolids management options available to the CRD, and potential risks of operational interruptions to biosolids management options as well as recommendations to mitigate them.

2.2 Existing Biosolids Management Plans

Existing biosolids management plans implemented by the CRD to date include the following:

- **Definitive Plan (enacted in 2020):** Alternative fuel for cement manufacturing combustion
- **Contingency Plan (enacted in 2020):** Biosolids Growing Medium (BGM) production for application in engineered cover systems at the Hartland Landfill
- **Short-Term Contingency Plan (enacted in 2023):** Mixing with sand for BGM production for future quarry reclamation

The historical background and details for these plans are discussed in further detail below.

As previously mentioned, upon the commissioning of the RTF, CRD's biosolids were originally intended to be managed under the Definitive Plan, which involved the transport and beneficial use of biosolids through thermal processing (i.e., combustion) at a cement manufacturing facility in Richmond, BC.

In addition, biosolids produced by the RTF were intended to be supplementally managed through the CRD's provincially approved *Contingency Plan* (2019). Under the Contingency Plan, whenever the cement manufacturing facility could not receive biosolids, the biosolids would be mixed with sand and ground wood to produce up to 38 m^3 of BGM for each tonne of biosolids to be beneficially used as final cover material at the Hartland Landfill. The amount of biosolids to be managed under the Contingency Plan was constrained up to 350 tonnes of biosolids per year due to space and storage limitations at the Hartland Landfill as well as only being able to apply BGM when final cover was required.

Due to prolonged, unforeseen operational interruptions at the cement manufacturing facility and malfunctions with the load-out systems at the RTF throughout the course of 2022 and 2023, the CRD could not manage their biosolids through the Definitive Plan and had exhausted the amount of biosolids which could be used under the Contingency Plan. This left the CRD with one remaining emergency option, which was to directly dispose the biosolids at Hartland Landfill until additional short-term management contingencies could be identified, developed, and approved. The landfilling of biosolids failed to utilize the inherent nutrients and energy potential within biosolids and did not meet the beneficial use requirements stipulated by the ENV.

In February 2023, to offset the landfilling of biosolids while the Definitive Plan and Contingency Plan were not available, the CRD Board of Directors amended its previous land-application restriction policy to the allow out-of-region, non-agricultural land application of biosolids as a short-term contingency management alternative.

Following this amendment, an additional Short-Term Contingency Plan was operationalized. The plan involved the mixing of CRD's biosolids with sand and transporting the mixture to a quarry in Cassidy, BC for temporary storage. Owners of the quarry planned to use the biosolids/sand mixture to produce BGM for future land application on closed sections of the quarry. Closed sections of the quarry were to be reclaimed under a provincial Mines Act permit. However, like the original Contingency Plan, only a portion of CRD's biosolids could be managed under the Short-Term Contingency Plan due to restrictions related to space and storage at the quarry. The remaining biosolids not managed under the Short-Term Contingency Plan were landfilled.

The CRD's experience with operational interruptions and limitations in the execution of the Definitive Plan, Contingency Plan, and Short-Term Contingency Plan demonstrated that this Long-Term Biosolids Management Plan requires a portfolio of management options, irrespective of the type of option selected. Through portfolios, when one option is interrupted, the beneficial use of biosolids can be managed under the next option, and if the next option is interrupted, another backup option will support. In addition, having a diversified portfolio of beneficial use options would further mitigate the potential of future interruption. The redundancy of a diversified portfolio-based strategy would ensure the resilient long-term beneficial use of CRD's biosolids.

3. Methodology

The methodology to developing this Long-Term Biosolids Management Strategy follows the same approach as outlined in the *Long-Term Biosolids Beneficial Use Option Analysis* report which is summarized below:

1. Identify all management options available to the CRD
2. Screen the management options against regulatory requirements
3. Curate portfolios of management options for resiliency
4. Future test the portfolios against potential risks of interruption
5. Select the most resilient portfolio that is consistent with feedback from the public, TCAC, and First Nations groups.

Figure 3.1 below presents a graphical summary of the recommended development approach.

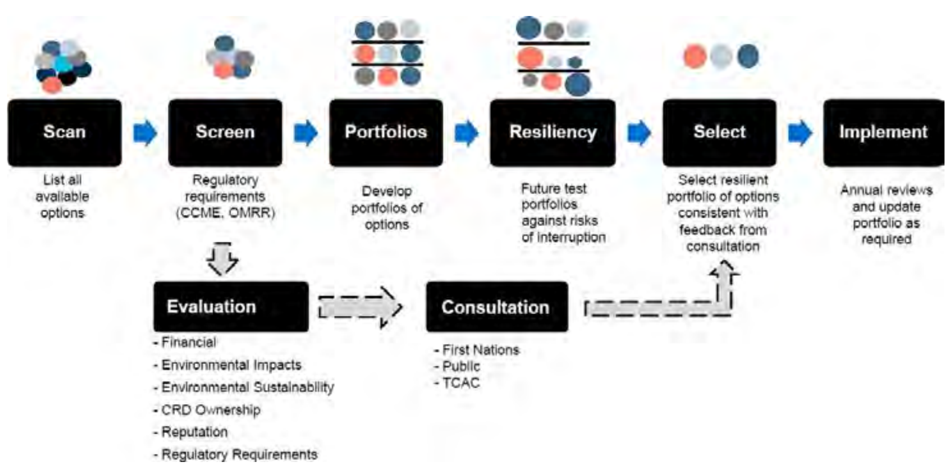


Figure 3.1 Outline of the Long-Term Biosolids Management Strategy Development Approach

4. Recommended Portfolio Framework

Given the management options currently available to the CRD which also meet the definition of beneficial use and regulatory requirements, GHD recommends that the CRD pursue the following portfolio as part of the Long-Term Biosolids Management Strategy:

- Maintain the option of biosolids thermal processing via alternative fuel combustion at the cement manufacturing facility in Richmond BC under the Definitive Plan, for as long as this option is available whenever the facility is operational.
- Procure multiple (ideally at least three) land-application options to act as additional biosolids management alternatives. These options must comply with the Organic Matter Recycling Regulation and should consider guaranteed minimum tonnages and proximity to the RTF to minimize transport distances and consequent greenhouse gas emissions.
- Maintain the option of biosolids application in engineered cover systems at Hartland Landfill under the Contingency Plan to act as an emergency support option; subject to space availability and cover needs of the Hartland Landfill.
- Continued monitoring of the market for potential market driven interruptions and additional available options for consideration to include in the portfolio. Routinely review and update the portfolio as needed.
- Develop a demonstration facility for the advanced thermal processing of biosolids on-site at Hartland Landfill. The implementation of an advanced thermal processing facility at Hartland would add to the robustness and diversification of this proposed portfolio. However, at this time, advanced thermal biosolids processing technologies such as gasification and pyrolysis are considered innovative and have yet to be commercially demonstrated in North America. Further, the expected timeframe to implement such a facility may take up to 7-10-years. As such, this option is not currently available to the CRD but should be explored in the future.

  As noted in the *Long-Term Biosolids Beneficial Use Option Analysis* report, to de-risk the significant capital investment required for such a facility, it is recommended that the CRD first explore the advanced thermal technological feasibility by implementing a smaller-scale demonstration facility before a making a decision to procure a permanent commercial facility.

  If biosolids processing from the demonstration plant proves successful in the future years, advanced thermal processing has the potential to be another important option for the beneficial use of CRD's biosolids. However, it would still be recommended to pursue a portfolio of management options, given the potential risks of interruption when operating major processing facilities due to down time for maintenance, or other operational or market driven interruptions.

Appendix A

Long-Term Biosolids Beneficial Use Option Analysis Report

Long-Term Biosolids Beneficial Use Option Analysis

Capital Regional District

05 July 2023

→ **The Power of Commitment**

Project name	TA - Biosolids and Resource Recovery
Document title	Long-Term Biosolids Beneficial Use Option Analysis
Project number	12590255
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Executive Summary

GHD has prepared this Long-Term Biosolids Beneficial Use Strategy report for the Capital Regional District (CRD) to support public and First Nations consultation regarding the beneficial long-term use of Class A biosolids produced by the Residual Treatment Facility (RTF) located adjacent to the Hartland Landfill.

The main purpose of this report is to identify and evaluate the full spectrum of beneficial biosolids management options potentially available to the CRD in preparation for consultation with the public and First Nations groups. To accomplish this, GHD evaluated land-application and thermal biosolids management options, conducted a jurisdictional scan of options used worldwide, evaluated ongoing CRD thermal technology pilot trials, as well as identified, screened, and evaluated all long-term options currently available to the CRD. With this information, GHD then generated long-term strategy portfolios for CRD's consideration which are recommended to provide necessary resilience and redundancy to ensure long term consistent biosolids beneficial use. This report also proposes an evaluation criteria and risk matrix to assist the CRD in implementing a step-by step long-term biosolids beneficial use strategy following the reception of feedback from public and First Nations engagement.

This report concluded the following:

Development and Evaluation of Land Application Options – There are various beneficial use land application methods which meet the Canadian Council Ministers of the Environment (CCME) beneficial use criteria in the form of mine/quarry reclamation, forest fertilization, land improvement, direct land application, biosolids growing medium (BGM), compost, and soil product production. There are various out-of-region land application programs available. There are currently no in-region land application options available at this time due to the long standing CRD policy banning land application. However, this policy was recently expanded to allow for non-agricultural land application as a contingency or emergency option. As such, a number of in-region land application options could be investigated for inclusion in potential long term management portfolios.

Evaluation of Thermal Options – Thermal biosolids management technologies are generally classified as pyrolysis, gasification, or incineration. Among the thermal technologies, incineration is the most commercially proven and widely used thermal treatment process for biosolids. However, incineration is energy intensive and does not result in the beneficial use of ash and as such may not be considered a beneficial use option by the CCME. Pyrolysis and gasification technologies are both still emerging in the biosolids processing space with slightly more pyrolysis facilities anticipated to move into operations in North America over the next few years.

Thermal technologies have the added benefits of generating potential revenue through biochar, syngas, heat recovery as well as the potential to co-process other mixed waste streams. However, there are challenges in thermal co-processing technologies, as mixing biosolids with other waste streams may increase maintenance and operational costs due to the added complexity of handling/treating mixed waste streams. Co-processing also presents challenges in meeting CCME criteria for the beneficial re-use of 25% of ash.

Contaminants of Emerging Concern - Community concerns around the land application of biosolids and its potential impacts to soil quality, surface water, and groundwater are largely based on the presence, or suspected presence, of unregulated CEC's. These potential impacts are the subject of ongoing scientific research. CCME's guidelines note that many CECs are found in low concentrations in biosolids, and that detection does not necessarily mean there is a risk to human health or the environment. Generally, risk assessments for each individual CEC have not been completed, but ecotoxicological testing, used to assess the toxicology of residuals holistically, did not detect significant negative impacts. The CCME is supportive of source control measures as an effective way to improve the quality of biosolids. CRD's biosolids have been treated to Class A standards as per the Organic Matter Recycling Regulation (OMRR).

The Canadian Food Inspection Agency (CFIA) proposed an interim standard for per - and polyfluoroalkyl substances (PFAS) in biosolids used in Canada as fertilizers at 50 ppb PFOS (one type of PFAS). The proposed standard aims to protect human health by preventing the small proportion of biosolids products that are heavily impacted by industrial inputs from being applied to agricultural land in Canada. The concentration of PFOS in CRD's biosolids is under the proposed standard at approximately 6 ppb (based on two samples).

The fate of CECs in advanced thermal processing of biosolids is still under investigation. While CECs appear to be reduced in biochar products, some can still be found in syngas and bio-oil products, but the concentrations and environmental fate still need to be confirmed.

Jurisdictional Scan – Globally, biosolids, are beneficially used primarily through land application or thermal treatment methods. The majority of countries assessed in the jurisdictional scan primarily land-apply their biosolids for beneficial use, except for Japan, who relies on incineration due to its high population density and limited areas for land application.

Across the world, the decision to beneficially use biosolids through land application or thermal processes is influenced by a range of factors: regulatory requirements, local infrastructure/resources, public perception, as well as the goals and priorities of local municipalities. Identifying and evaluating these factors are key to the implementation of an effective, long-term biosolids management strategy.

Evaluation of Thermal Pilots – In the evaluation of the Biosolids Thermal Pilot technologies/studies explored by the CRD, valuable insight was gained into the discrete operation of each of these technologies. However, the current pilot results alone may not be sufficient to confirm the feasibility of on-site thermal processing of CRD biosolids nor the potential for integration/beneficial use of by-products into other systems at Hartland at this time.

For the upcoming on-site thermal trial, GHD suggests that the CRD capture key operational criteria such as process reliability, operational costs, maintenance requirements, co-processing feasibility, residual product quality, biochar markets, carbon sequestration benefits, and long-term synergies at Hartland.

Long-Term Options & Portfolio Generation – A long-list of biosolids management options available to the CRD was identified and screened against CCME beneficial use criteria.

GHD recommends that the CRD develop of a combination of multiple options within a diverse portfolio to ensure resiliency in the form of strategy redundancy. In the unexpected event that a biosolids management option is interrupted, the inclusion of additional options within a portfolio will allow CRD's biosolids to still be beneficially used in the interim until the interruption is resolved.

General portfolios were generated using the long-list of options available to the CRD. A risk evaluation identified notable potential risk of interruption factors such as contingency option availability and facility ownership changes to consider in the development of the long-term biosolids beneficial use strategy. The risk evaluation also indicated that some form of land-application is likely required in all proposed portfolios to ensure resiliency.

Next Steps – Following public and First Nations consultation, the CRD may further refine the general portfolios outlined in this report. From the list of options approved by the public and First Nations groups, the CRD may develop portfolios using specific options and vendors and future test these portfolios for resiliency using the risk matrix outlined in Section 7. The risk analysis will help inform the selection of a resilient long-term portfolio for the long-term beneficial use of CRD's biosolids.

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1. Introduction

The Capital Regional District's (CRD) Core Area Wastewater Treatment Project included construction of a Residuals Treatment Facility (RTF) located north of Hartland landfill, which processes wastewater residual solids into approximately 3,650 tonnes of dried pelletized Class A biosolids per year using mesophilic anaerobic digestion and a fluidized bed dryer. The CRD has a provincially approved short-term (2021-2025) Biosolids Beneficial Use Strategy (Definitive Plan) that involves the transport of biosolids to the Lafarge cement manufacturing facility (Lafarge) in Richmond, BC where the biosolids are used as an alternative fuel in the plant's combustion processes. The CRD also has an approved Contingency Plan to manage biosolids when Lafarge has planned or unplanned shutdowns and cannot receive the biosolids, which was anticipated to be approximately 35-days per year. That plan involves the production of Biosolids Growing Medium (BGM), which is then beneficially used in final cover materials at the Hartland Landfill.

Over the course of 2022, disposal of biosolids at Lafarge was unavailable for approximately 10-months, due to both planned shutdowns and unplanned operational issues. As a result, CRD managed approximately 2,700 tonnes of biosolids at Hartland Landfill, 600 tonnes of which were used to produce BGM under the Contingency Plan and the remainder were landfilled. In 2022 the biosolids contingency management consumed more than two-years of the five-year Contingency Plan for beneficial use at Hartland Landfill as BGM, and a significant volume of landfill airspace that should be utilized for non-divertible solid waste. The Contingency Plan must also be aligned with landfill operations such as receiving and storing. Producing future biosolids needs to consider space constraints for temporary storage and application of BGM until final cover areas are ready. This constrains how much material can be used for BGM production in any given year. Given the challenges with biosolids management under the Definitive and Contingency Plans, the CRD is interested in investigating and developing alternative strategies for the short-term and long-term beneficial use of Class A biosolids generated through the RTF.

Under a separate cover 'Alternative Short-Term Contingency Biosolids Beneficial Use Options', GHD assessed responses from industry which were obtained during a previous RFEOI (No.40.20.01-02) issued by the CRD and followed up with various vendors to assess their interest, and ability to manage CRD biosolids in accordance with provincial requirements. GHD also assessed information obtained by CRD in their 2022 outreach to industry to identify additional Short-Term contingency options.

Following this report, the CRD will engage with the public and First Nations groups with regards to the biosolids beneficial use options available to the CRD and outlined in this report. Based on feedback from this consultation, the CRD will develop a strategy which will outline the steps required to implement a resilient portfolio for the beneficial use of biosolids.

1.1 Purpose of this Report

The purpose of this report is to identify and evaluate options to support consultation efforts for the beneficial long-term use of Class A biosolids produced by the RTF at the Hartland Landfill. The key objectives are to:

- Assess potential land application and thermal technology options.
- Conduct a jurisdictional scan of biosolids management options currently used worldwide.
- Evaluate and summarize the results from thermal technology pilots commissioned by the CRD.
- Evaluate the full spectrum of long-term options known to be available to the CRD that are permitted by Provincial regulations.
- Present proposed screening, evaluation, and resiliency criteria as well as methodology to be used to evaluate options and portfolios following the results of public and First Nations consultation.

1.2 Scope and Limitations

This technical memorandum has been prepared by GHD for the Capital Regional District. It is not prepared as, and is not represented to be, a deliverable suitable for reliance by any person for any purpose. It is not intended for circulation or incorporation into other documents. The matters discussed in this memorandum are limited to those specifically detailed in the memorandum and are subject to any limitations or assumptions specially set out.

2. Background

The CRD submitted Amendment No.11 to their Core Area Liquid Waste Management Plan (CALWMP) to the BC Ministry of Environment and Climate Change Strategy (ENV) in September 2016, committing to the determination of a long-term management option for the beneficial use of biosolids generated at the RTF. On November 18, 2016, ENV conditionally approved Amendment No.11, with the stipulation that the CRD must first develop a short-term Definitive Plan for utilization of CRD's biosolids which was to be submitted by June 30th, 2019. The Definitive Plan was also required to not include disposal or multi-year storage options at Hartland landfill. Additionally, ENV stipulated that the CRD develop a long-term management beneficial use strategy plan which considers and evaluates the entire spectrum of potential management options with a jurisdictional review of how different municipalities manage their biosolids. This letter of conditional approval can be found in Appendix A.

As of 2023, the RTF produces approximately 10 tonnes of dried biosolids per day, or 3,650 tonnes per year. Biosolids produced by the RTF are currently managed through the following options:

1. Transport to LaFarge for use as alternative cement kiln fuel under the approved Definitive Plan
2. Mix with sand and ground wood to produce BGM for use as a final cover at Hartland Landfill under the approved Contingency Plan
3. Blend with soil and directly landfill (not approved)

As indicated above, these biosolids are primarily transported to Lafarge under the approved Definitive Plan. When Lafarge is unable to accept biosolids, the biosolids are blended with sand and ground wood at a volumetric ratio of 1:5:13 to produce 38 m^3 of BGM for each tonne of biosolids, using up to an approved 350 tonnes of biosolids per year under the Contingency Plan. If the 350 tonnes of biosolids per year used to produce BGM has been exhausted and Lafarge is still unable to take biosolids, the CRD currently has only one remaining emergency option available, which is to blend the biosolids with soil and directly landfill. This process has no beneficial use, is not an approved Canadian Council of Ministers of the Environment (CCME) option and consumes landfill airspace.

The biosolids from the RTF are characterized as Class A, under the BC Organic Matter Recycling Regulation (OMMR). Accordingly, Class A biosolids must have undergone pathogen reduction treatment, vector attraction reduction, and specific sampling protocols. Class A biosolids also have specific limits on their heavy metal and coliform concentrations. The criteria and treatment protocols for Class A designation are outlined in Section 3.2.6. of the OMMR, which regulates the production and land application of compost and biosolids.

BGM must adhere to certain quality criteria outlined in Section 3.4.10 of the OMRR. Schedule 11 of the OMRR stipulates that BGM must be derived from either Class A or Class B biosolids.

The CCME provides guidelines on the beneficial management of biosolids from wastewater treatment plants.

In addition to the above, the CRD's Board currently restricts the land application of biosolids beyond contingency/emergency use at the Hartland Landfill and, more recently, for non-agricultural land application.

Additional information on OMRR requirements, CCME guidelines, CRD Board direction, CRD biosolid characteristics, and thermal processing pilot trials are described in more detail below.

2.1 OMRR Requirements

The production, distribution, storage, sale, and usage of biosolids are regulated under OMRR. OMRR also sets the minimum standards for biosolid product quality criteria in terms of pathogen reduction, vector attraction reduction, pathogen limits, and heavy metals limits.

An official plan must be prepared by a qualified professional for the land application of biosolids. Section 3.1.5 of the OMRR outlines all the requirements for a land application plan. The plan must designate each site where organic matter will be applied, and each scheduled occurrence of application. After each occurrence, the discharger must obtain written certification from a qualified professional that the application was done in accordance with the land application plan.

In terms of distribution requirements, Class A biosolids may only be distributed as follows:

a. In volumes that do not exceed 5 m^3 per vehicle per day.
b. In sealed bags for retail purposes, each not to exceed 5 m^3, with no restrictions on the number of bags distributed per vehicle per day.
c. In volumes greater than 5 m^3 to composting facilities or biosolids growing medium (BGM) facilities.

BGM application does not require a land application plan and may be distributed without volume restrictions as it is considered retail-grade organic matter.

2.2 CCME Beneficial Use Criteria Application

One of ENV's conditions of approval to the CRD's CALWMP was that the proposed long-term management plan for the biosolids generated at the RTF must comply with the requirements for beneficial use specified in the *Canada-Wide Approach for the Management of Wastewater Biosolids* (2012) by the CCME.

According to the CCME, beneficial use of biosolids is based on sound management that includes:

- Consideration of the utility and resource value (product performance).
- Strategies to minimize potential risks to the environment and health.
- Strategies to minimize greenhouse gas emissions and.
- Adherence to federal, provincial, territorial, and municipal standards and regulations.

The policy stated above is upheld by the following principles:

1. Municipal biosolids contain valuable nutrients and organic matter that can be recycled or recovered as energy.
2. Adequate source reduction and treatment of municipal sludge and septage should effectively reduce pathogens, trace metals, vector attraction, odours, and other substances of concern.
3. The beneficial use of municipal biosolids, municipal sludge, and treated septage should minimize the net GHG emissions.
4. Beneficial uses and sound management practices of municipal biosolids, municipal sludge, and treated septage must adhere to all applicable safety, quality, and management standards, requirements, and guidelines.

More details and examples of the beneficial use of biosolids are provided in the CCME supporting document, *Guidance Document for the Beneficial Use of Municipal Biosolids, Municipal Sludge and Treated Septage* (2012). There are opportunities for the beneficial use of biosolids through land application, value-added product development, energy recovery, and combustion. Landfilling is not considered a beneficial use option by the CCME since it results in the loss of nutrients and emits greenhouse gases. Any biosolids management option must be evaluated in accordance with the regulations stated in the OMRR, as well as supported by CCME guidelines and principles.

The CCME guidance document promotes the land application of Class A biosolids in support of its beneficial use guiding principles. In alignment with principle 1, the nutrient-rich concentration of biosolids allows direct land application to be a beneficial use option when properly managed as it enhances soil fertility, soil structure, and plant growth. Furthermore, land application supports principle 3 by reducing the need for energy intensive synthetic fertilizer production as well as increasing carbon storage into the soil, hence minimizing net GHG emissions.

Biosolids may also be thermally treated and pelletized to be used for land application or as a biofuel feedstock for combustion. However, for biofuel combustion to be considered as a beneficial use, per the CCME guidance document there are three requirements:

1. The net energy balance must show that the energy recovered exceeds the energy required to combust with dry matter composing >30% of the biosolids to allow for auto combustion and exothermic reaction.
2. >25% of ash or phosphorus generated from the combustion of biosolids must be recovered.
3. The process must emit low levels of nitrous oxides through continuous temperature monitoring with a minimal combustion temperature >880°C.

2.3 CRD Board Resolution on Land Application of Biosolids

On July 13, 2011 the CRD's Board moved to restrict the land application of biosolids within the CRD. These minutes can be found in Appendix B and the motion referenced below.

"*Be it so moved that the CRD will harmonize current and long-term practices at all CRD-owned regional facilities and parks with the approved policies of the regional treatment strategy, including ending the production, storage, and distribution of biosolids for land application at all CRD facilities and parks; and*

Be it further moved that the CRD does not support the application of biosolids on farmland in the CRD under any circumstances, and let this policy be reflected in the upcoming Regional Sustainability Strategy."

The provincial government conditionally approved the Definitive Plan with the condition that the CRD prepare beneficial use options, for use during Lafarge shutdowns, that did not include landfilling or long-term storage. To comply with these regulatory requirements, the CRD Board moved to partially rescind its land application restriction on February 12, 2020. The motion is referenced below.

"*That the Capital Regional District Board partially rescind its policy to prohibit land application as a beneficial use of biosolids at Hartland landfill only; and 2. That land application of biosolids be approved as a contingency plan for beneficial use at Hartland landfill."*

On February 8, 2023, the CRD board amended its policy to allow non-agricultural land application of biosolids as a short-term contingency alternative. These minutes can be found in Appendix C and the motion referenced below.

"*That the Capital Regional District (CRD) Board amend its policy to allow non-agricultural land application of biosolids as a short-term contingency alternative; and 2. That staff be directed to update the CRD's short-term biosolids contingency plan correspondingly*."

2.4 Short Term Memorandum

A short-term alternative contingency plan was developed to address the immediate challenges with biosolids management under the current Definitive and Contingency Plans.

In 2022, GHD prepared a memorandum which identified and evaluated additional contingency options for the beneficial short-term use of Class A biosolids produced by the RTF. These options included both non-land application and land application options which have the potential to be implemented within two-years. The memorandum concluded the following:

- There is no option currently available that meets the CCME criteria for beneficial use, meets OMRR criteria and meets the CRD Board restriction on land application other than Lafarge and BGM.
- Non-land application options could be developed in 24-months or greater that could partially meet the CCME criteria for beneficial use and CRD Board restriction on land application are presented below:
  - Off-Site Thermal Options – Thermal options in addition to Lafarge are possible in 24-months or greater working with existing facilities such as Envirogreen in Princeton, Lehigh Cement Plant, or the Metro Vancouver WTEF. Changes to ENV permits/approvals, consultation with stakeholders may be needed and biosolids receiving, handling and dust mitigation procedures and potentially equipment would need to be developed. The off-Site thermal options do not beneficially use the ash from the biosolids, and as such may not meet CCME guidelines.
  - On-Site Thermal Options – A pilot pyrolysis or gasification facility could be established at Hartland. This would require construction of the pilot facility, and an approval from ENV to operate the facility, which would require 24-months or greater to develop. During the pilot stage the syngas would be flared, and the pilot would be used to characterize the quantity and quality of the syngas to provide information towards the long-term beneficial use (e.g., as a fuel). The quality of the biochar produced would be evaluated and ultimately marketed as a biochar product if feasible. Fulsome GHG implications would also be determined.
- Land application options exist that meet CCME criteria and are used by other jurisdictions in many cases to cost effectively manage biosolids. If the CRD Board limitation on the land application of biosolids was beyond contingency use at the land fill and for non-agricultural land application, then these options could likely be implemented within 1 to 2-years, with some options being available immediately, and without additional infrastructure.

2.5 Biosolids Characteristics

A Safety Data Sheet (SDS) for the CRD’s Class A biosolids can be found in Appendix E.

2.6 Thermal Processing Pilot Trials

In July 2020 the CRD issued a Request for Expressions of Interest (RFEOI) (No.40.20.01-02) as part of the CRD’s long term plan to determine avenues for the beneficial use of Class A biosolids produced by the RTF. The intent of the RFEOI was twofold:

a. Understanding what technologies were available to beneficially use biosolids
b. Determine interest from proponents willing to undertake pilot trials

An evaluation of the results from the selected pilot trials has been summarized in Section 5.

Following the pilot trials, on March 29, 2023, the CRD board moved to initiate a Request for Proposals (RFP) for the development of a thermal processing trial on-site. These minutes can be found in Appendix D and the motion referenced below:

“Staff concurrently initiate a Request for Proposals process for a biosolids advanced thermal site trial; and that the RFP be scoped broadly to include potential for co-processing of municipal solids waste streams, and that submission be welcomed from both domestic and international vendors.”

The RFP process was initiated June 16, 2023, with a response closing date of July 14, 2023.

3. Biosolids Management Options

The beneficial use of biosolids includes various methods of both land application and thermal treatment, which are discussed in further detail below.

3.1 Land Application Options

Biosolids are rich in nutrients such as phosphorus and nitrogen and as a result can be directly applied to lands at an agronomic rate to promote vegetation growth. The land application of biosolids involves spreading biosolids on the soil surface or incorporating biosolids into the soil as soil amendment and fertilizer. Land application is the most common and cost-effective way to beneficially use biosolids and has been widely practiced for decades. Prior to land application, wastewater solids are required to undergo a stabilization process to minimize odour generation, destroy pathogens (disease causing organisms), and reduce vector attraction potential (potential to attract organisms capable of spreading the material) . Wastewater solids can be converted to stabilized biosolids through several methods including adjustment of pH (lime or alkaline stabilization), aerobic digestion, anaerobic digestion, composting, and heat drying.

The following sections outline the most common land application options for biosolids.

3.1.1 BGM, Compost, and Soil Products

Biosolids can be mixed with mineral feedstocks (typically sand or topsoil) to produce BGM, a nutrient rich soil with similar properties to other fabricated soils with respects to aesthetics, odour, consistency, and performance. BGM can promote vegetation growth when applied to lands. Currently, CRD's Class A biosolids are used to produce BGM under the approved Contingency Plan for use as final cover at Hartland Landfill.

Biosolids are a commonly used feedstock at many compost facilities. Biosolids can be combined with wood chips or green materials as bulk agents to produce a high-quality compost suitable for various land applications. However, composting generally requires a long residence time resulting in increased costs for this option. Wood waste can be mixed with biosolids and cured over time to create a Class A Compost, a nutrient-rich soil amendment which can be regularly tested to ensure it meets both OMRR and the Canadian Food Inspection Agency (CFIA) requirements for land application.

3.1.2 Agricultural Land

Biosolids can be recycled and used as a soil amendment or fertilizer on agricultural land to improve soil productivity, stimulate plant growth, and potentially reduce chemical fertilizer application. Biosolids have been widely applied on agricultural lands due to the cost-effectiveness of this option and its ease of use. Using biosolids on agricultural land has the potential for significant benefits in both the environment and the farming industry.

3.1.3 Forest Fertilization

Forest fertilization is another cost-effective and environmentally safe way to recycle biosolids. Forest soil is usually acidic and deficient in nutrients, thereby applying biosolids can significantly increase the forest lands fertility, total tree production, and build soil foundation for productive forest ecosystems, including wildlife habitat. Furthermore, forestry application can increase vegetation and result in healthier forest soils to improve soil tilth and reduce soil erosion into lakes and streams.

3.1.4 Mine/Quarry Reclamation

Damaged soils impacted by activities such as mining or quarrying can be reclaimed by applying biosolids. Mine/quarry reclamation involves the application of large quantities of biosolids at singular to infrequent periods. Biosolids are often mixed with other materials like wood waste and sand or mixed with stockpiled soil removed from a site prior to disturbance.

Biosolids can be effective in restoring former mines by improving soil conditions, revegetating extensive areas of piled rock and mine tailings and stabilizing slopes. Following biosolids application, the soil is more aerated and lighter, which increases the water infiltration to reduce soil erosion. Unlike nutrients in commercial fertilizers, nutrients added in the biosolids will stay in the topsoil over time and the restored ecosystem will continue to prosper.

The process of mine/quarry reclamation and closure is often required by government to ensure sustainable practices and minimize the long-term effects of mining/quarry operations on the surrounding ecosystems and communities. Ongoing monitoring and maintenance may be required to ensure the success of the reclamation efforts and the long-term stability of the reclaimed site.

3.1.5 Landfill Cover

Biosolids can be beneficially used as an amendment to final cover at landfills acting as a biofilter and mitigating greenhouse gas emissions. Landfills can also benefit from the application of BGM as a topsoil to improve vegetation and prevent erosion on temporarily or permanent closed landfill cells.

3.1.6 Biodiesel and Fuel Crop Production

Biodiesel is an environmentally friendly diesel fuel and renewable alternative to fossil fuels. It is produced from vegetable oils or animal fats through an esterification reaction. High oil seed crops (fuel crops) such as soy and canola and high biomass plants such as willow are considered as suitable feedstock for biodiesel production. Biosolids can be used as fertilizer in growing biodiesel crops and willow plants, in which the biodiesel produced can be beneficially used as fuel for vehicle fleets and farming equipment.

3.2 Knowledge Gaps and Limitations in Land Application

When considering the land application of Class A biosolids, it is important to recognize that knowledge gaps, as well as limitations and barriers to implementation exist. Some of these knowledge gaps and limitations are outlined below.

Nutrient Management: Effective nutrient management is crucial to prevent overapplication or imbalances in soil nutrient levels. Understanding the nutrient content and availability of biosolids is important for determining appropriate application rates and timing. Research can help optimize nutrient management strategies and guidelines specific to biosolids with consideration for the application site soil conditions.

Pathogen and Contaminant Monitoring: Assessing and monitoring the presence of pathogens, heavy metals, pharmaceuticals, and other contaminants of concern in biosolids is essential for reducing risks to public and environmental safety. The presence of ‘per’ and polyfluoroalkyl substances (PFAS) within biosolids has led to public concern regarding land application methods. The potential for groundwater contamination following land application of biosolids and subsequent leaching of PFAS through soil is one of several potential impacts that have generated discussions on banning land application methods. This risk is attributed to how PFAS does not easily decompose. Thermal treatment and destruction technologies at commercial scales are currently limited. Adhering to land application plans can reduce risk of broad environmental contamination.

Public Perception and Acceptance: Public acceptance and understanding of the land application of biosolids play a significant role in its successful implementation. Addressing concerns related to odour, visual appearance, and potential health risks through educational initiatives and public outreach can help foster acceptance and support for this practice.

Logistics and Operational Considerations: Conducting pilot programs and field trials can provide valuable insights into the logistical aspects of land application, such as transportation, storage, application methods, and equipment requirements. These pilot programs can help identify any challenges, evaluate the feasibility of large-scale implementation, and assess the associated costs.

Regulatory Framework and Compliance: Understanding and complying with the existing regulatory framework governing the land application of biosolids is crucial. Identifying any regulatory gaps or barriers can help inform policy development and ensure that appropriate guidelines and standards are in place to regulate the practice effectively.

3.3 Thermal Options

With an increasingly global focus on environmental responsibility, and contaminants of emerging concern (such as microplastics and PFAS), interest in the efficient, safe, and effective thermal processing of biosolids is growing. Employing thermal treatment technologies can produce renewable energy, reduce emissions associated with the transport of biosolids, and result in a higher-value final product.

The thermal management of biosolids refers to application of heat to reduce the volume, reduce contaminants, and utilize the calorific energy of biosolids as heat, steam, electrical power, or combustible material. There are many types of thermal conversion technologies available from many technology providers, however they generally fall into three broad categories: gasification, pyrolysis, and combustion/incineration. Combustion/incineration is the most widely used and commercially proven thermal treatment process for biosolids. Gasification and pyrolysis are innovative technologies gaining interest due to the potential of producing value added products such as syngas and biochar, however, they have limited commercial experience with biosolids as a sole feedstock.

3.3.1 Gasification

Gasification is a thermal treatment technology where any carbon-containing raw material, such as biosolids, can be converted into fuel gas (also known as synthesis gas or syngas) under conditions of high temperature and a highly controlled supply of partial oxygen and/or steam. Gasification can be used to significantly reduce the biosolids volume and produce syngas as a renewable source of energy. Gasification by-products (ash and biochar) can be applied as soil amendments or landfilled. Contaminant reduction also takes place, although the ultimate fate and level of reduction of various classes of organic contaminants is still under investigation.

Syngas can either be utilized as a low calorific gaseous fuel such as in an internal combustion engine (ICE) for cogeneration or can be thermally oxidized to produce heat for beneficial use. Gasification of biosolids typically requires dried biosolids (80% to 90%) as feed, which the RTF already produces. The thermal oxidation of syngas produces heat which can be used to dry biosolids and pre-condition them for gasification.

Close coupled drying with gasification, as shown in Figure 3.1, is an emerging commercial trend for biosolids thermal treatment. Conditioning of syngas for use as fuel in a cogeneration system such as an ICE is still under development. Cleaning of syngas to produce Renewable Natural Gas (RNG) is another avenue of energy recovery which is being explored, however the feasibility of this is still under development.

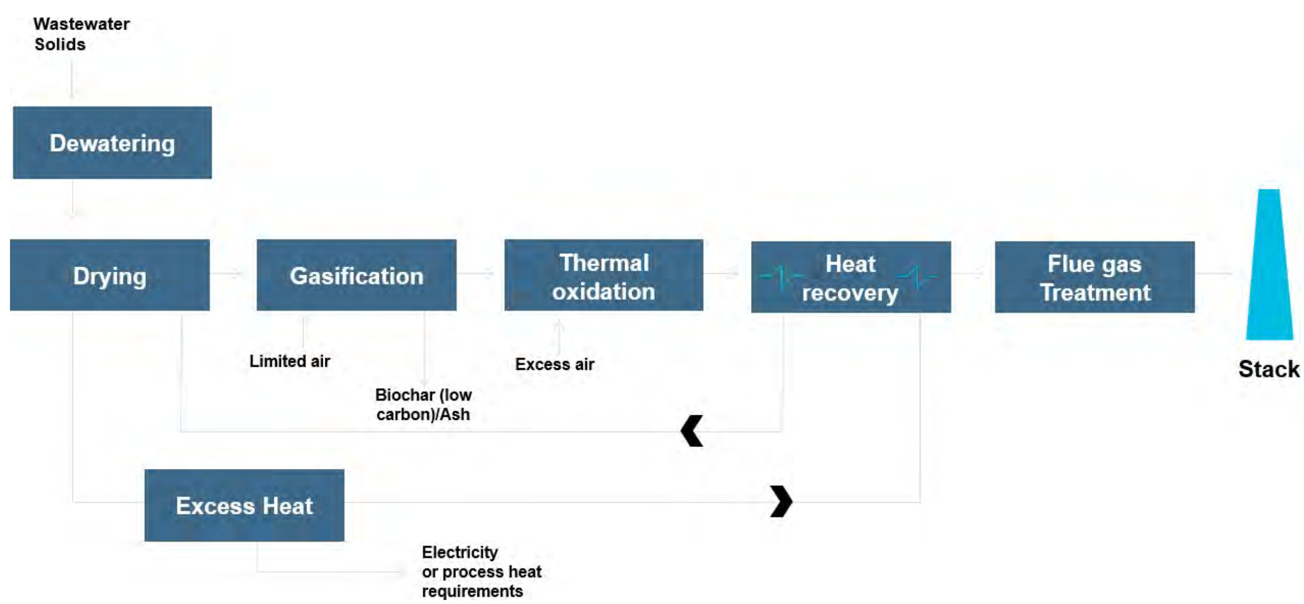

Figure 3.1 Close-Coupled Gasification Process Flow Diagram

3.3.2 Pyrolysis

Pyrolysis is a similar thermal treatment technology to gasification; however, it requires a lower temperature and is carried out without the presence of oxygen under an inert atmosphere (e.g., nitrogen or argon). Like gasification, pyrolysis can decompose and covert biosolids to useful products (syngas, bio-oil, and biochar) while minimizing air emissions and reducing pathogens/contaminants. Like gasification, some contaminant reduction does occur during pyrolysis. However, the contaminant partitioning between the biosolids feedstock and the residual pyrolysis products is yet to be fully understood, and more research is ongoing.

Depending on the temperature and heating rate, pyrolysis can be classified into slow and fast pyrolysis. In slow pyrolysis, known as carbonization, material is pyrolyzed at low to moderate temperatures (around 300 °C) and low heating rates or long reaction times (several hours). The goal of carbonization is to maximize charcoal product (biochar) and generate lower yields of bio-oil and syngas. Fast pyrolysis, carried out at intermediate temperatures (around 500 °C) and short reaction times (a few seconds), produces higher yields of bio-oil in addition to biochar and syngas.

The majority of pyrolysis technologies utilize a close-coupled configuration as shown in Figure 3.2. Syngas produced during pyrolysis is oxidized (combusted) in a thermal oxidizer, and the heat released from thermal oxidation of syngas is recovered and used for biosolids drying. Pyrolysis of biosolids typically requires dried biosolids (80%-90%) as feedstock, which the RTF already produces. A portion of thermal energy is recycled to the pyrolyzer to sustain pyrolysis, and the rest can be recycled to the dryer for beneficial use. Some of the newer pyrolysis technologies do not require continuous heat for their bio-drying process.

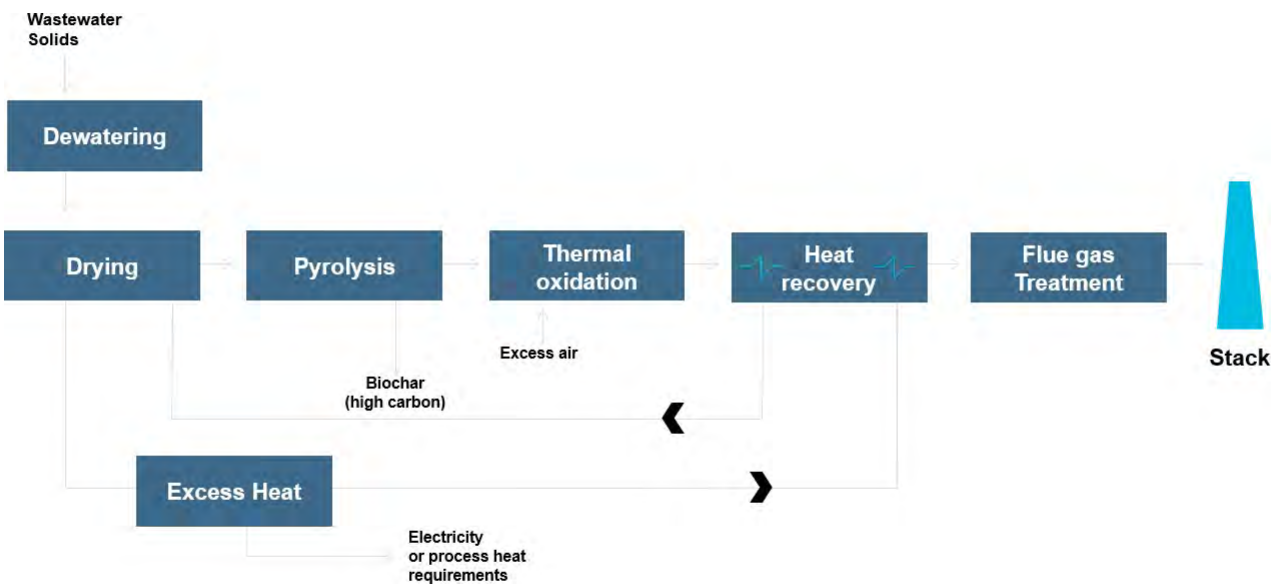

Figure 3.2 Closed Coupled Pyrolysis Process Flow Diagram

3.3.3 Combustion/Incineration

Combustion is a controlled reaction under high temperatures between a fuel and an oxidant that generates carbon dioxide, heat, and water. Incineration is another form of combustion which uses waste as the feedstock fuel material. The primary objective of incineration is feedstock volume reduction and energy recovery. Combustion/incineration residues generally consist of small quantities of HCl, S, volatile compounds, and ash which are typically landfilled. Some biosolids management options utilize biosolids as an alternative fuel for combustion in manufacturing processes such as cement kilns.

Using biosolids as a renewable fuel for combustion/incineration can offset the use of non-renewable fuels and reduce overall GHG emissions. Combustion/incineration without the production of value derived products or energy recovery is commonly not considered an environmentally friendly technology as it is energy intensive and generates a significant amount of greenhouse gas emissions. However, there is ongoing research and development in modern engineering and advanced air pollution control technologies to mitigate the environmental impacts and increase the energy efficiency of the process.

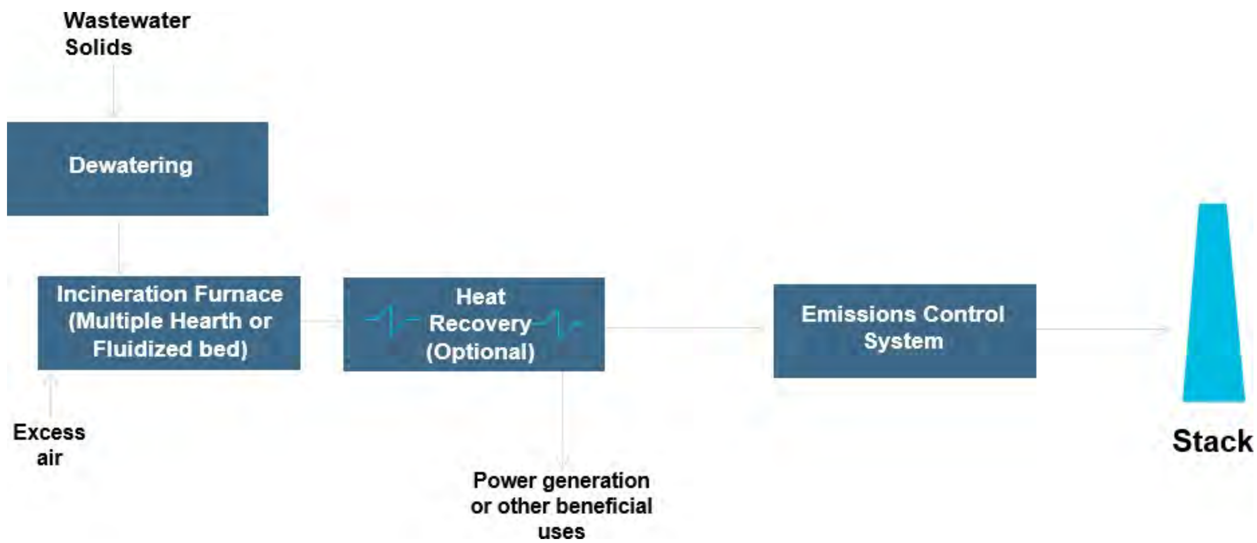

Figure 3.3 Incineration Process Flow Diagram

3.4 Thermal Processing Technologies Summary

Table 3.1 below highlights a few of the key characteristics of the three thermal processing technologies discussed above.

Table 3.1 Thermal Processing Technologies

Technology	Technology Description / Major Differentiators	Benefits	Challenges	End-Products & Utilization
Gasification	– Limited/controlled quantity of oxygen/air required – Temperature Range: 600-1000 °C	– Simplicity – Efficient process – Biochar production to be used as contaminant adsorbent or soil amendment – Can be autogenous – Significant volume reduction	– Syngas refinement for fuel generation is challenging – Gas treatment system usually involves scrubbing, which typically requires media that needs to be disposed of as hazardous waste – GHGs are emitted as part of process – Presence of particulate and tars in the produced gas – Low fixed carbon, high ash – Contaminant fate and destruction effectiveness still not fully understood	– Steam which can be converted to electricity – Syngas which can be used in boilers, gas turbines, internal combustion engines to generate electricity – Fly ash which would be disposed as hazardous waste residue – Biochar which may be beneficially used as a soil amendment, compost, biofilter, or as livestock bedding – Slag which may have to be disposed as hazardous waste residue
Pyrolysis	– Complete absence of oxygen required – Temperature Range: 600-1000 °C	– More energy placed into creating final char product – Lower temperature required than other thermal treatments – High fixed carbon, low ash – Significant volume reduction – Low operation energy consumption – Biochar production to be used as contaminant adsorbent or soil amendment	– Technical difficulties ranging from an inability to scale up to largescale production, and relatively poor heat transfer – Requires a constant supply of fuel – Gas treatment system usually involves scrubbing, which typically requires media that needs to be disposed of as hazardous waste – GHGs are emitted as part of process – Contaminant fate and destruction effectiveness still not fully understood	– Syngas which can be used in boilers, gas turbines, internal combustion engines to generate electricity – Biochar which may be beneficially used as a soil amendment, compost, biofilter, or as livestock bedding – Pyrolysis oil (bio-Oil) which can be used as fuel for engines and boilers, or used to produce electricity/heat via combined heat and power plants – Ash which will be disposed as residue, potentially as hazardous waste
Combustion/ Incineration	– Excess oxygen/air required for combustion of waste	– Significant volume reduction – Proven technology at commercial scale	– Poor public perception from historical plants (strict environmental regulations for	– Steam which can be converted to electricity – Heat which can be used for general heating, hot water supply, etc.

Technology	Technology Description / Major Differentiators	Benefits	Challenges	End-Products & Utilization
	– Temperature Range: 800-1200 °C	– Greater contaminant reduction at higher temperatures	emissions and combustion control) – Energy-intensive if process does not recover/recycle energy – Gas treatment system usually involves scrubbing, which typically requires media that needs to be disposed of as hazardous waste – GHGs are emitted as part of process – Mixing biosolids with wood chips was found to be necessary to prevent fouling and meet emission requirements – Requires emissions treatment systems to capture pollutants	– Bottom ash which will be disposed as hazardous waste residue

3.5 Thermal Co-Processing

Co-processing biosolids with other types of waste through thermal treatment, particularly in municipal waste-to-energy facilities has potential added benefits of reduced capital costs and increased efficiency in resource recovery. However mixing biosolids with other waste streams may also increase maintenance and operational costs due to the complexity of handling and treating mixed waste streams and their end products. In addition, co-processing presents challenges in meeting the requirement set by CCME for the beneficial re-use of 25% of ash.

A few examples of facilities that process, or have processed, biosolids with other types of waste are noted below:

- The Anaergia's Rialto Bioenergy Facility in California will use pyrolysis to process combination of food waste extracted from municipal waste streams, liquid waste, and municipal biosolids to produce carbon-negative RNG. The facility is currently under construction[1].
- The Covanta Huntsville WTE Facility in Huntsville, Alabama, uses incineration to process solid waste and sewage sludge, producing steam and ash. The facility is currently operational.
- The City of Lebanon, Tennessee, operates a gasification plant that utilized biosolids and wood waste as feedstock to produce syngas and biochar in the past. The facility is operational, however, currently only utilizes wood waste as feedstock.

3.6 Biochar Beneficial Use

Biochar is a type of charcoal produced from the pyrolysis or thermal decomposition of organic biomass materials, such as biosolids, agricultural waste, wood chips, or crop residues. Biochar has demonstrated potential to be used as a soil amendment to improve soil fertility, sequester carbon, and mitigate soil erosion.

Below is a summary of the potential beneficial use options for biochar:

- **Soil Amendment**: Biochar may be directly incorporated into the soil to improve its physical, chemical, and biological properties. Some cases have shown to enhance soil water retention, increase nutrient availability, and promote microbial activity, and consequently improve crop productivity.
- **Carbon Sequestration:** Research demonstrates that the use of biochar as a soil amendment has the added benefit of sequestering carbon for up to a mean residence time of 2,000 years. Biochar sequestration can remove carbon dioxide directly from the atmosphere through carbon uptake by plants, allowing, in principle, a reduction of atmospheric carbon dioxide levels[2].
- **Composting**: Biochar can be mixed with organic waste materials for composting. This can enhance the compost's nutrient content, reduce greenhouse gas emissions, and improve its stability. The resulting compost enriched with biochar can be used as a soil amendment or a growing medium in horticulture and landscaping.
- **Livestock Bedding**: Biochar can be used as bedding material in livestock operations. Its high absorbency helps in moisture management, odour control, and the reduction of pathogen build-up. Used biochar bedding can be further recycled as a soil amendment or added to composting systems.
- **Erosion Control**: Biochar can be applied to erosion-prone areas, such as slopes or mine reclamation sites, to stabilize the soil and prevent erosion. Its porous structure and high water-holding capacity can help retain moisture and promote plant establishment, making it beneficial for land reclamation projects.
- **Stormwater Filtration:** Biochar can be used in permeable reactive barriers or biofiltration systems to treat stormwater runoff. It can act as a filter medium, adsorbing and retaining contaminants such as heavy metals and organic pollutants, thereby improving water quality.

1 Rialto Bioenergy Facility | Anaergia
2 Biochar is carbon negative | Nature Geoscience

– **Activated Carbon Production**: Biochar can be upgraded to produce activated carbon via physical and chemical alteration. Biochar can be physically activated through heating under an oxidant environment in the temperature range of 700–900 °C. To chemically activate, biochar is subjected to activating agents such as $ZnCl_2$, H_3PO_4, NaOH, KOH and treated with heat between 300–500 °C.[3] Activated carbon can be utilized as an adsorbent, as it acts as a porous material to capture and retain various pollutants/contaminants in its structure. Its high surface area and porosity make it effective for adsorbing contaminants from water, air, and soil, offering potential environmental remediation, odour control, and purification applications. It is also intended for adsorption applications like gas masks and fixed-bed adsorbers.

Despite the many potential benefits of biochar, research related to the adverse effects of biochar on soil ecosystems and chemistry is still under investigation. There are growing concerns related to the effects of applied biochar soil physiochemical properties, interactions between biochar and other chemicals within the soil, contaminant accumulation, and its potential impact on soil organisms. A 2021 review of 259 studies related to biochar application to soil concluded that the findings on the effects of biochar soil application are often mixed[4]. Studies indicate that these effects, whether net negative, neutral, or beneficial, are dependent on factors such as feedstock, production process, application rate, soil type, environmental/climactic conditions, and therefore cannot be generalised.

Site-specific assessments and research are essential to determine the appropriate application methods and optimize the benefits of biochar in different contexts. It is crucial to assess the quality and safety of the biochar as well as its effect on the soil's microbiological properties and biota prior to application. Adequate testing and quality standards are important to verify that the biochar is free from contaminants (particularly metals) and meets the desired criteria for its intended use. Research and knowledge sharing in this field is currently ongoing to better understand biochar's potential and optimize its use in diverse agricultural and environmental settings.

3.7 Knowledge Gaps and Limitations in Thermal Treatment Technologies

Similar to the land application of biosolids, it is important to recognize that knowledge gaps and limitations exist in regards to biosolids thermal treatment technologies. Some of these gaps/limitations are outlined below:

Technical Limitations: Specific technical limitations can vary depending on the thermal treatment method employed. For example, incineration may have limitations related to the control of emissions and the need for air pollution control equipment. Pyrolysis and gasification may have limitations related to process efficiency, feedstock characteristics, and the quality of the end products.

Environmental Impacts: While thermal treatment can help reduce the volume of biosolids and recover energy, there may be environmental concerns associated with the process. These can include emissions of greenhouse gases, air pollutants, and the potential for the release of harmful compounds during the treatment process. An environmental impact assessment of any employed thermal treatment method is crucial.

Residuals Management: Thermal treatment processes typically generate residues such as ash or char. The management of these residuals can present challenges in regard to their safe disposal or beneficial reuse. Depending on the residue characteristics, there may be potential for contaminant leaching into the environment. Robust handling and storage protocols need to be established in consideration of the end-use of the residues.

Energy Efficiency: While thermal treatment can produce energy in the form of heat or electricity, the overall energy efficiency of the process is an important consideration. Achieving optimal energy recovery and maximizing the net energy output from the treatment process is a crucial consideration for its economic viability and environmental sustainability. Ensuring there is an end-user of the energy output is also critical to ensure beneficial reuse expectations are achieved.

3 Process Intensification: Activated Carbon Production from Biochar Produced by Gasification - technology.matthey.com
4 https://www.sciencedirect.com/science/article/pii/S0048969721038286

Impact on Nutrient Content: Thermal treatment methods can alter the chemical composition of biosolids, potentially affecting the availability and quality of nutrients. For example, high-temperature processes like incineration can result in the loss of certain nutrients, limiting their potential for use as fertilizer or soil amendment.

Cost Considerations: The economics of thermal treatment processes, including capital costs, operational costs, maintenance costs, and residual disposal costs can significantly impact their feasibility and implementation. Understanding the financial implications and comparing them to alternative treatment methods is important for the decision to invest in thermal treatment processes.

3.8 Contaminants of Emerging Concern

The CRD introduced a ban on the land application of biosolids produced at CRD facilities in 2011 based on the precautionary principle and concerns from the community. Community concerns around the land application of biosolids are largely based on the presence, or suspected presence, of unregulated organic chemical compounds, commonly referred to as “contaminants of emerging concern” (CEC’s), or persistent organic pollutants” (POPs). CECs include Volatile and Semi-Volatile Organic Compounds (VOCs & SVOCs), PFAS, polybrominated flame retardants (PBDE), dioxins, pharmaceuticals and personal care products (PPCPs) and microplastics. There is concern that biosolids with detectable levels of unregulated CEC’s could impact soil quality, surface water or groundwater.

In 2011, the CRD retained Stantec to undertake a literature review titled *Land Application of Wastewater Bio-solids, Concise Literature Review of Issues for CRD* on the risks of the land application of biosolids. The literature review assessed heavy metals, pathogens, and legal liability arising from the land application of biosolids. The review concluded “there is no scientific evidence indicating that the risks of environmental damage or public health concerns for either Class A or B bio-solids land application would be high”.

This risk assessment was updated by Golder in 2014 in their report *Biosolids Risk Assessment and Literature Review Update*. The intent of the report was to re-evaluate the previous analysis using recent information and case studies. The review found that Stantec “oversimplifies the risk and concerns associated with the land application of biosolids” and found that the current state of scientific knowledge does not allow us to fully quantify all risks. Despite this finding, the authors conclude that “no risks have been identified for emerging substances that presently warrant imposition of a land application ban”.

The CCME considered CEC’s when developing the beneficial use guidelines. The document notes that many CECs are found in low concentrations in biosolids, and that detection does not necessarily mean there is a risk to human health or the environment. Generally, risk assessments for each individual compound have not been completed, but ecotoxicological testing, used to assess the toxicology of residuals holistically, did not detect significant negative impacts. The CCME is supportive of source control measures as an effective way to improve the quality of biosolids.

In 2017, Metro Vancouver commissioned a risk assessment for their land application based biosolids management plans in a report titled *Biosolids Risk Assessment for Metro Vancouver*. The report looked at 11 different types of pharmaceuticals or organic compounds and concluded ”the results of this risk assessment indicate that the presence of these eleven CECs in biosolids is highly unlikely to result in adverse health effects for the four Metro Vancouver biosolids use exposure scenarios evaluated.”

In recent years, there has been an increased interest in PFAS and their effects on human and environmental health. PFAS are a class of over 4,700 substances that do not occur naturally. PFAS make products non-stick, water repellent and fire resistant, and are found in a wide range of consumer and industrial products, including cookware, food packaging, clothing, and firefighting foams. PFAS are sometimes referred to as “forever chemicals” because the molecules are characterized by a chain of strong fluorine-carbon bonds which result in highly stable and long persisting chemicals. Exposure to PFAS is associated with an increased risk of cancer, increased cholesterol levels, and can affect the immune system.

In June 2022, the ENV released the *Organic Matter Recycling Regulation Project Update*, which contained some discussion of CECs. “Due to advances in analytical chemistry, the ability to measure CECs has generally outpaced the ability to understand the impacts of CECs on human health and the environment. For this reason, the impacts of CECs in biosolids and wastewater treatment discharges is the subject of on-going scientific research.” The ENV intends to add the authority for a director to require the testing of biosolids for CECs but does not intend to regulate the concentration of CEC’s in biosolids. The ENV advocates for a prevention first approach to reducing CECs in biosolids, by implementing source control measures to discourage the discharge of certain wastes to the system. Regulatory amendments are targeted for 2023.

On May 19, 2023, The Canadian Food Inspection Agency (CFIA) proposed an interim standard for PFAS in biosolids used in Canada as fertilizers. The CFIA worked with Environment and Climate Change Canada, Health Canada and provincial partners to assess an appropriate standard for PFAS. The proposed standard will protect human health by preventing the small proportion of biosolids products that are heavily impacted by industrial inputs from being applied to agricultural land in Canada. The proposed standard is 50 ppb PFOS (one type of PFAS). The concentration of PFOS in CRD biosolids is under the proposed standard at approximately 6 ppb (based on two samples). For comparison, a 2020 study, found that the PFOS concentration in household dust was 100 ppb (100ng/g).[5]

3.9 Land Application vs Thermal Process Trends

Land application is a well-established practice in British Columbia and many other parts of the world. However, there has been a varied perception and increased regulation towards this practice due to growing concerns over potential environmental and public health risks, including the risk of pathogen regrowth, odours, heavy metals, and CEC’s. Scientific literature indicates that when biosolids are properly treated, monitored, and applied in accordance with regulations, the risks associated with contaminants and pathogens are typically low[6]. Land application remains a widely used and accepted approach in many jurisdictions, particularly in areas with access to agricultural land and a demand for fertilizer. Research indicates an increasing trend in the use of biosolids as a soil amendment to support sustainable agriculture and carbon sequestration goals.

Since 2017, there has been a trend towards increased use of thermal processes for biosolids management, particularly in areas where land application is restricted, challenging, or cost prohibitive. However, further research and investment are needed to optimize these technologies and ensure their long-term sustainability.

Overall, the choice between land application and thermal processes for biosolids management will depend on a range of factors, including regulatory requirements, local infrastructure and resources, public perception and acceptance, the need for end-use redundancy, and the specific goals and priorities of the community or organization managing the biosolids.

4. Biosolids Jurisdictional Review Update

Globally, biosolids are primarily managed in three ways, land application, incineration or landfilling. The decision to landfill biosolids rather than using them for beneficial purposes is influenced by several factors, such as:

- **Regulatory Constraints**: Some governments impose restrictions to the land application of biosolids due to concerns over potential environmental and public health risk.
- **Public Perception:** The acceptance of biosolid management options varies widely. In some communities, there persists public resistance to the beneficial use of biosolids based on concerns primarily regarding potential health, environment, and nuisance impacts.
- **Costs and Logistics:** <u>Local circumstances such as land availability, transportation distances, regulatory compliance, and the proximity of technology providers may make landfilling a more logistical and cost-effective option as compared to beneficial reuse.</u>

5 Per- and polyfluoroalkyl substances (PFAS) in dust collected from residential homes and fire stations in North America - PMC (nih.gov)
6 https://www.academia.edu/34682659/Chapter_6_The_environmental_impact_of_biosolids_land_application

The section below presents findings from literature on the reported biosolids management options used in jurisdictions across the globe. It should be noted that the examples presented are not an exhaustive list of all global biosolids management cases as the review is limited to data that is readily available.

4.1 Literature Review

4.1.1 Canada

In Canada, more than 660,000 dry tonnes of stabilized biosolids are produced annually. According to the CCME, land application and landfilling are the most common methods of biosolids management in Canada where approximately 50% of biosolids are applied to land, 41% landfilled and the remainder incinerated (9%) (CCME, 2012a).

In British Columbia, 38,000 dry tonnes of biosolids are produced every year, of which around 94% is beneficially applied to land to support forestry, agriculture, land reclamation and landfill cover, and approximately 6% is landfilled.[7]

In Quebec 49% and 34% of biosolids are incinerated and land applied respectively annually. In Ontario, 44% and 48% of biosolids are incinerated and land applied respectively annually. Both provinces are among the leading provinces in the beneficial use of biosolids[8].

Table 4.1 below summarizes biosolids management in some Canadian provinces in the year 2016. Since then, there has been a lack of available information regarding the current status of Canada's involvement in biosolids beneficial use.

Table 4.1 Biosolids Management in Canada (2016)[2]

Jurisdiction	Land Application	Incineration	Landfill	Percent Beneficial use
British Columbia	94%	0%	6%	94%
Manitoba	75%	0%	25%	75%
Ontario	48%	44%	8%	92%
Alberta	95%	0%	5%	95%
Quebec	34%	49%	17%	83%
Newfoundland/Labrador	0%	0%	100%	0%

4.1.1.1 Examples of Land Application Options in Canada

The CCME Guidance document provides several instances of municipalities across Canada that have beneficially used biosolids through land application. Some examples are:

– The JAMES wastewater plant in Abbotsford, British Columbia, holds a contract with a third party to use municipal biosolids resulting from wastewater treatment as a feedstock addition in the production of fabricated topsoil. The end product is marketed as Val-E-Gro™ and is used as a fertilizer for land application.

– The Lansdowne Wastewater Treatment Plant in Prince George, British Columbia and various treatment plants in the Regional District of Nanaimo, BC have used their biosolids for the fertilization of forests. The fertilization of forests through biosolids is of significant interest to the forest industry, as biosolids allow a slower release of nutrients (>5-years) as compared to the fast action of chemical alternatives (2-3-years). Further, biosolids applied to temporary roads and landings within forests can return these degraded areas into productive land bases quickly, thus resulting in a larger growing area and greater cutting allowance.

7 Biosolids-10 (gov.bc.ca)
8 biosolid_world_map.pdf (gov.bc.ca)

- The Halifax Regional Municipality has treated municipal biosolids with an alkaline stabilization process named N-ViroTM to produce class A biosolids for land application since 2008. The process recycles cement kiln dust as a second residual stream to provide alkalinity for the process. 100% of the biosolids produced have been beneficially used to fertilize sod and agricultural crops such as corn, soybeans, cereals, and forages.
- Locally generated municipal biosolids in Sechelt, British Columbia have been directly applied to barren soils at the Lehigh Materials mine. The community has been supportive of the successful program, and the mine was awarded for its achievements with the 2010 British Columbia Jake McDonald Mine Reclamation Award.

Table 4.2 below summarizes cases of land application of biosolids across Canada:

Table 4.2 Summary of Land Application in Biosolids Management in Canada

Jurisdiction	Product Name	Technology	Program Initiation	Beneficial Reuse of Biosolids
City of Kelowna, BC	Natures Gold	Aerobic composting	Undisclosed	Gardens and lawns fertilization, commercial landscaping and gardening (as mulch)
Metro Vancouver Regional District	Nutrifor	Thermophilic anaerobic digestion	1991	Mine reclamation, landfill closure and reclamation, regional reclamation projects, regional landscaping projects, forest fertilization, and ranch land fertilization
City of Kelowna/City of Vernon	Ogogrow	Aerated static pile composting	1995- 2006	Commercial landscaping, residential gardening, nurseries, orchards, and landfill closure.
Comox/Strathcona Regional District	SkyRocket	Aerated static pile composting	2007	Commercial landscaping, residential, gardening, nurseries and orchards, slope stabilization project, and local reclamation projects.
Regional District of Nanaimo	N/A	Mesophilic and Thermophilic anaerobic digestion	1991	Forest fertilization.
CRD	PenGrow	RDF lime- Pasteurization	2008-2011	Residential gardening and landscaping.
City of Edmonton, AB	N/A	Co-composting with residential organic waste	2002	Horticulture, agriculture, nurseries, commercial landscaping, residential gardening, city reclamation and enhancement projects.
Niagara Region, ON	Niagara N-Rich	N-Viro alkaline stabilization	2007	Agricultural fertilizer.
City of Toronto, ON	N/A	Thermal drying N-Viro alkaline stabilization	2007	Agricultural fertilizer, and mine reclamation.
Greater Moncton, NB	Gardener's Gold	Composting- Gore Cover system	2008	Commercial landscaping, municipal parks and horticultural activities, and residential gardening.
City of Halifax, NS	Halifax N-Rich	N-Viro alkaline stabilization	2007	Agricultural fertilizer, and municipal horticultural activities.

4.1.2 United States

In the US, based on 2018 data, approximately 54% of all biosolids were land applied, 15% were incinerated and 30% disposed of in landfills (excluding the use as daily cover which is considered a beneficial use option)[9]. According to reports from the US EPA in 2021, about 4.5 million dry metric tons of biosolids generated in the United States, of which approximately 43% were land applied, 14% incinerated, and 42% landfilled, which suggests a trend of decreasing land application and increasing landfilling in US over the past few years. This percentage may vary between state and region. For example, land application of biosolids is more common in the Mid-Atlantic and Northeast regions than in other parts of the country[10]. Figure 4.1 shows the latest status of biosolids management in the US.

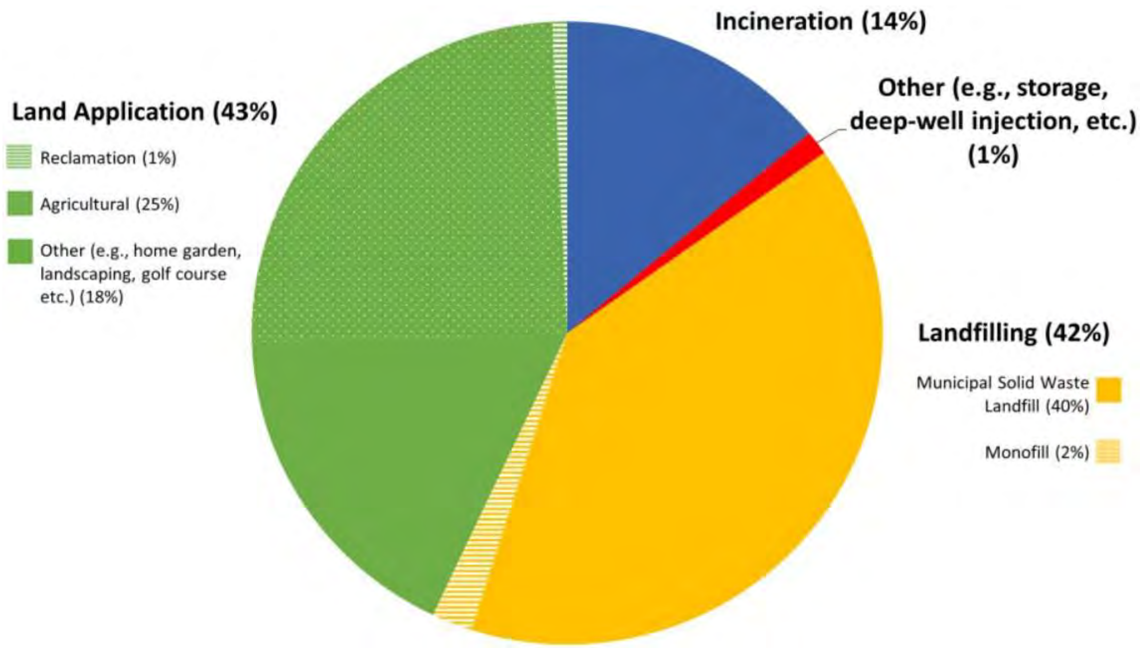

Figure 4.1 2021 Biosolids Management in the US[4]

4.1.3 Europe

In Europe there are rules around the use of sewage sludge as a fertilizer, the sampling and analysis of the sludge, record keeping and the type of treatments and end usages, similar to OMRR in BC. The European Union (EU) developed a Sewage Sludge Directive which aimed to increase the sewage sludge used in agriculture while ensuring heavy metals in soils and sewage sludge did not exceed set limits (also developed as part of the Directive). The Directive would ban the use of sewage sludge on agricultural soils if the concentration of metals in the soil exceeded pre-approved limits. In 2014, it was found that the Directive achieved is objective by increasing the amount of sewage sludge used in agriculture while reducing environmental harm. However, since then, a study was launched in 2020 to evaluate the effectiveness, efficiency, relevance, and coherence of the Directive in all EU countries. The study aimed to complement the results of the initial Directive and better understand the areas where the Directive was successful or challenged[11].

Figure 4.2 below illustrates the proportions of sewage sludge management technologies used by various EU countries:

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9 National Summary — National Biosolids Data Project
10 Basic Information about Biosolids | US EPA
11 https://environment.ec.europa.eu/topics/waste-and-recycling/sewage-sludge_en

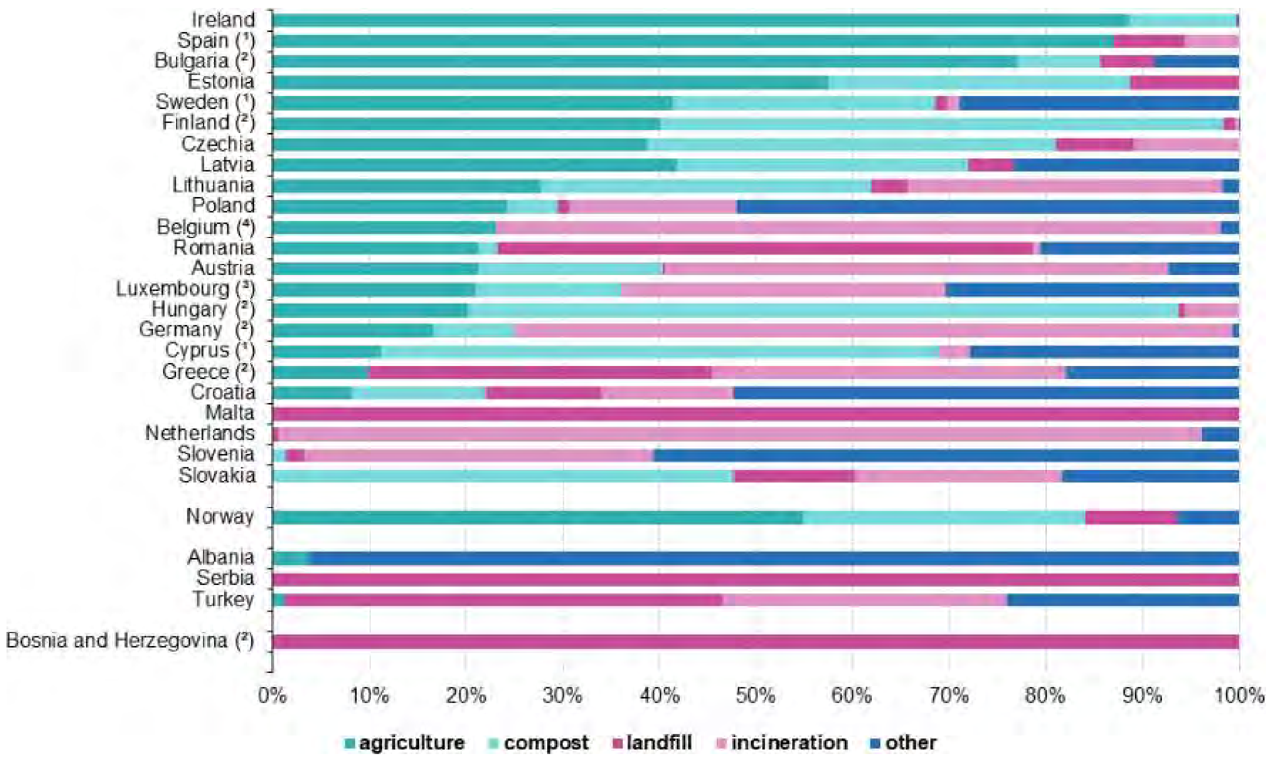

Figure 4.2 2020 European Sewage Sludge Disposal [7]

In Europe, land application of biosolids still constitutes the main method for biosolids management for many countries. In general, 50% of biosolids are land applied on agricultural land (marking an increase from 37% in 2017), 28% incinerated, and 18% landfilled. The remaining fraction is disposed through other methods such as pyrolysis, storage, reuse in green areas and forestry, and landfill cover. The percentage of biosolids managed through each practice may vary depending on factors such as location, available infrastructure, and local regulations. In countries such as Netherlands and Germany, incineration is the primary beneficial use for biosolids due to the low availability of land available for biosolids application. In the Netherlands (96%), Belgium (75%), Germany (74%) [12,13] the majority of biosolids are incinerated.

In France, 44% of biosolids are directly land applied, 29% are composted, 18% are incinerated and 9% are landfilled. In the United Kingdom (UK), approximately 3.6 million tonnes of biosolids are land applied for agricultural use annually and the UK has developed an Biosolids Assurance Scheme (BAS) to provide reassurance that certified biosolids can be safely used in agriculture. According to the UK's BAS, around 3-4 million tonnes of biosolids are applied annually to agricultural land in the UK, representing around 75% of sewage sludge production[14]. In Denmark, based on the 2010 data, 64% of biosolids were land applied, 29% incinerated and 2% of biosolids ended up in landfills. In Portugal, as per 2016 data, 5% of biosolids were disposed in landfills while the rest were used for land application and other uses including agriculture and composting. In Italy (2010), from all the biosolids produced, 34% are land applied, 4% are incinerated, and 49% are landfilled[6].

Europe has been at the forefront of research and development of new thermal technologies for biosolids treatment, such as pyrolysis and gasification. Despite this, many European countries still primarily use land application as the most beneficial method for biosolids utilization. It is noteworthy that there are various approaches to managing PFAS across Europe, both in terms of the presence of regulations and how these regulations are established. Denmark, Germany, the Netherlands, and Sweden established national limits for PFAS in soil, while Germany also set a limit for PFAS in fertilizer, which also applies to biosolids used as fertilizer. As of September 2020, no European countries,

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12 https://www.mdpi.com/2071-1050/11/21/6015/htm
13 Water statistics - Statistics Explained (europa.eu)
14 Biosolids-Agric-Good-Practice-Guidance-January-2019.pdf (assuredbiosolids.co.uk)

except for several German states, had implemented specific rules or limitations regarding PFAS concentrations in biosolids for land application [15].

The EU has long been promoting the use of thermal technologies for waste management, including biosolids. The Waste Framework Directive (2008) recommends thermal treatment as a preferred method for waste management. While there are gasification and pyrolysis plants in Europe, they mainly process municipal solid waste. The Netherlands and Germany have the largest sewage sludge incineration capacity among European countries. In Finland, the Helsinki Regional Environmental Services Authority (HSY) implemented a sludge pyrolysis pilot plant with the capacity equivalent to treating wastewater sludge generated by a population of approximately 30,000 people during 2020. In August 2004, a fluidized-bed gasification plant, manufactured by Kopf was constructed at a WWTP in Balingen Germany for processing the digested biosolids and recovering energy. The Balingen plant processes about 230 kg of sewage sludge per hour[16].

4.1.4 Australia

In Australia, approximately 83% of biosolids were beneficially applied to land in 2021, with 72% of that being on agricultural land, which represents an 8% increase compared to the data from 2017. The remaining fraction was disposed of in landfills. Australia is making significant efforts to combat carbon emissions by pledging to reduce them by 43% from 2005 levels by 2030. A step towards this goal has been taken with the opening of Australia's first biosolids gasification plant at the Loganholme Wastewater Treatment Plant in Logan City, Queensland. To further explore the potential applications of the biochar product, the Logan City Council is collaborating with scientists from the Queensland University of Technology to uncover future possibilities for utilizing the biochar product in various ways[17].

4.1.5 New Zealand

In New Zealand, the total percentage of biosolids sent to landfill was 33% in 2021 (down from 38% in 2019). 43% of biosolids were used for land reclamation, 3% of biosolids were used for agricultural purposes, and 2% of biosolids were incinerated. The remaining fraction of biosolids were land applied for forestry, vermicomposting, landfill capping, stockpiling, and other uses.

4.1.6 Japan

Japan heavily relies on thermal processing methods for the management of biosolids. In particular, incineration is commonly used in Japan due to its high population density and limited opportunities for biosolids land application. Sewage sludge in Japan is treated according to regulations that require the removal of harmful substances and pathogens. The treated sludge or biosolids are then typically incinerated or applied to farmland as fertilizer. In 2016, 68% of were biosolids incinerated, 11% were land applied and the rest landfilled[18].

Literature also indicates an increasing trend in the gasification of biosolids in Japan as a means to reduce landfilling. The Kiyose Water Reclamation Center started using a gasification system in 2010 to treat 100 tonnes of dewatered sewage sludge each day[19]. A waste-to-hydrogen facility, located at the Sunamachi Water Reclamation Center near Tokyo Bay, is capable of processing 1 tonne of dried sewage sludge per day to generate 40-50 kg of hydrogen per day[20]. Japan Blue Energy Co., Ltd. (JBEC) has developed an Advanced Gasification Module (AGM), which is a small-scale 1 dry ton per day plant with a goal of producing between 20 and 50 kg of hydrogen per day depending on the system configuration and feedstock quality[21].

15 PFAS in biosolids: A review of international regulations (awa.asn.au)
16 Technology Assessment Report Aqueous Sludge Gasification Technologies (epa.gov)
17 Logan City Biosolids Gasification Project - Australian Renewable Energy Agency (ARENA)
18 biosolid_world_map.pdf (gov.bc.ca)
19 Kiyose Water Reclamation Center Starts Using Gasification System to Treat Sewage Sludge - Bureau of Sewerage Tokyo Metropolitan Government
20 Ways2H Shareholder Japan Blue Energy Launches Tokyo Waste-to-Hydrogen Facility - Hydrogen Central (hydrogen-central.com)
21 Japan Blue Energy – Renewable Hydrogen Production Technology (wipo.int)

4.2 Thermal Processing Facilities Scan

Table 4.3 below outlines some of the biosolids thermal processing facilities globally, the technology implemented, and the stage of the project.

Table 4.3 Thermal Processing Facilities

Location	Facility Name	Technology	End Products	Project Stage
Linden, New Jersey, USA	Aries Linden Biosolids Gasification Facility	Gasification	Syngas, Biochar	Commissioning
Sanford, Florida, USA	Fluidized Bed Biosolids Disposal Gasification Facility	Gasification	Thermal energy	Decommissioned
Kearny, New Jersey, USA	Aries Kearny Biochar Production Facility	Gasification	Biochar	Development
Taunton, Massachusetts, USA	Aries Taunton Biosolids Gasification Facility	Gasification	Biochar	Development
Edmonds, Washington, USA	Edmonds Wastewater Treatment Plant	Gasification	Ash Slurry[22]	Commissioning
Morrisville, Pennsylvania, USA	Ecoremedy Sludge Gasification Pilot Plant	Gasification	Biochar	a three-year pilot project (Decommissioned)
Derry Township, Pennsylvania, USA	Clearwater Road Wastewater Treatment Facility	Gasification	Renewable Thermal Energy, Biochar	Development
Silicon Valley Clean Water (SVCW), California, USA	SVCW Plant	Pyrolysis	Biochar	Operational
Rialto, California, USA	Rialto Bioenergy Facility	Pyrolysis	Biochar	Under construction
Ephrata, Pennsylvania, USA	Ephrata Bioforcetech Pyrolysis Facility	Pyrolysis	Energy, Biochar	Under construction
Niagara Falls, Ontario, Canada	CHAR Technologies' high temperature pyrolysis plant	High Temperature Pyrolysis (HTP)	Syngas, Biocarbon	Development (relocation from London Ontario)
Saint-Félicien, Quebec, Canada	Biomass Power Plant	High Temperature Pyrolysis (HTP)	RNG, Biocarbon	Development
Cuyahoga Heights, Ohio, USA	Southerly Wastewater Treatment Plant (WWTP)	Incineration	Heat and Steam to Energy, Ash	Operational
Los Angeles, California, USA	Biosolids Recovery Plant	Incineration	Steam, Ash	Operational
Pickering, Ontario, Canada	Duffin Creek Water Pollution Control Plant	Fluidized bed incineration	Heat and Steam to Energy, Ash	Operational
London, Ontario, Canada	Greenway Wastewater Treatment plant	Fluidized bed incineration	Heat to energy, Ash	Operational
Mississauga, Ontario, Canada	G.E. Boot Wastewater Treatment Plant	Incineration	Steam, Ash	Operational

22 FlexChar™ has properties similar to activated carbon and can be used as an alternative renewable fuel or a soil amendment.

Location	Facility Name	Technology	End Products	Project Stage
Pickering, Ontario, Canada	Duffin Creek Water Pollution Control Plant	Fluidized bed incineration	Steam, Ash	Development
Espoo, Finland	Pyrolysis Pilot Plant	Pyrolysis	Biochar	Pilot Program
Balingen, Germany	Kopf fluidized-bed Gasification Plant	Gasification	Syngas	Operational
Logan City, Australia	Loganholme Wastewater Treatment Plant	Gasification	Biochar	Operational
Tokyo, Japan	The Kiyose Water Reclamation Center	Gasification	Heat and Electricity	Operational
Tokyo, Japan	Sunamachi Water Reclamation Center	Gasification	Hydrogen	Operational
Japan	Blue Energy Advanced Gasification Module	Gasification	Hydrogen	Operational
Lesna, Poland	Budimex Drying and Incineration Plant	Incineration	Thermal Energy, Ash	Operational

It is important to note that information about advanced thermal facilities in Europe and Asia is limited. There is a lack of available data regarding the status of these facilities, technology providers, and if these providers sell their technology in North America.

In North America, pyrolysis is slightly ahead of gasification in terms of technological readiness with slightly more pyrolysis facilities in operation. Both technologies however are considered innovative and are still emerging in the biosolids processing space.

4.3 Global Trend Summary

Since 2017, the choice of biosolids beneficial reuse has varied across different countries and regions. In Canada, there has been a gradual increase in beneficial reuse, with a focus on land application, composting, and energy recovery. The United States has demonstrated a decrease in land application and an increase in landfilling over the since 2017. However, this trend may vary by state and region. Europe has established well-regulated and advanced biosolids management systems, utilizing land application, composting, and incineration. Australia and New Zealand have actively promoted land application, especially in agriculture, while complying with environmental regulations. In Japan, thermal processing methods such as incineration have been relied upon due to limited land availability stemming from high population density, although efforts are being made to explore alternative reuse options.

The most prevalent biosolid management option in many regions of the world, including North America, is land application (BCWWA 2016, EPA 2017).

The CCME has developed a comprehensive framework for managing wastewater biosolids, including the *Canada-Wide Approach for the Management of Wastewater Biosolids* (CCME, 2012a) and *Guidance Document for the Beneficial Use of Municipal Biosolids, Municipal Sludge and Treated Septage* (CCME, 2012b). This guidance covers biosolids quality, application rates, methods, setbacks, and monitoring. Quality standards are in place to ensure biosolids meet specific criteria, including limits on contaminants like heavy metals and pathogens to protect the environment and human health. Risk assessments are conducted before application to evaluate potential impacts on soil, water, and crops, determining appropriate rates and precautions. Biosolids are recognized for their benefits in improving soil fertility, organic matter, and crop productivity. Best management practices, such as proper storage, transportation, and application methods, are encouraged to ensure safe and effective land application. Compliance with setback distances from sensitive areas is also emphasized. Regular monitoring and reporting are required to assess the efficacy of biosolids management, including soil and crop testing, tracking application rates, and locations. These measures aim to ensure compliance with regulations and promote responsible biosolids land application.

Regulations for wastewater residuals, including biosolids, are implemented at the provincial and territorial levels with varying mechanisms to ensure environmental and public health protection. In Newfoundland and Labrador, the land application of biosolids is not permitted. In New Brunswick, only biosolids meeting Category A requirements outlined in the *Guidelines for Compost Quality* (2005) can be applied to land. Quebec prohibits the land application of biosolids for fruit, vegetables, pastureland, and home gardens unless certified by the Bureau de normalization du Quebec (BNQ). Alberta, British Columbia, Ontario, and Nova Scotia permit the land application of Class A and B biosolids and compost in accordance with regulations. Quebec imposes a green tax on sewage sludge/biosolids landfilled or incinerated, while Nova Scotia prohibits landfilling of organic material. Increasing landfill fees and recognition of the resource value in biosolids are reducing the acceptance of biosolids landfill disposal in Canada (CCME, 2012b).

The EPA and the National Academy of Sciences recognize the value of biosolids as a safe resource for soil conditioning and land reclamation. The EPA regulates biosolids under the Part 503 Biosolids Rule. In the US, approximately 43% of biosolids are land applied, 14% are incinerated and 42% are disposed of in landfills. Land application is supported at the federal level but faces restrictions in some counties. In Northern California, a significant portion of biosolids is used as alternative daily cover or disposed of in landfills due to local weather conditions and waste diversion requirements. Legal cases have upheld state regulations allowing land application over local regulations that try to limit land application in states such as California, Pennsylvania, Virginia, North Carolina, and Maryland. Legal cases in California, Pennsylvania, and Virginia have reinforced the safety and acceptance of land application of biosolids as a crucial recycling practice. In Kern County, California, a court ruling deemed the county's biosolids ban unconstitutional after a two-week trial which provided valuable resources for defending land application practices. The Pennsylvania Supreme Court also upheld the protection of biosolids farming under the state's Right to Farm Act, dismissing claims brought by plaintiffs in a long-running litigation. Additionally, the Richmond, Virginia, Circuit Court upheld regulations for land application, rejecting claims of insufficient protection and excessive phosphorus loading. (USEPA, 2017 and Slaughter, 2017)[23].

In Europe, the main method of reusing biosolids in recent years has been application on agricultural land. According to the European Commission, biosolids can be safely used as fertilizer on agricultural soils if they do not pose any environmental or health risks. However, there are variations in the regulations across member states, deviating from the European Commission directive. To improve policy decisions, actions such as sludge minimization, enhancing biosolids reuse, comprehensive monitoring, proper sludge characterization, and effective planning have been recommended. These measures will help ensure the quality of biosolids, protect the environment, and safeguard public health in sludge management practices.

Currently, within the 28 countries which form the European Union, the primary method of sewage sludge recovery is through land application. Approximately 50% of sewage sludge are spread on agricultural soils, 28% are incinerated, and 18% are disposed of in landfills. The decision-making regarding the alternative routes of sludge recovery/disposal, particularly land spreading, is greatly influenced by population density and the availability of agricultural lands. In regions with limited available land for biosolid spreading, northern European countries like the Netherlands and Germany have opted for incineration as the main recovery method. Additionally, despite the potential to apply all produced sludge to less than 5% of agricultural areas in most European Union Member States, the restricted use of biosolids in agriculture is attributed to low acceptance by farmers and the public. This factor also impacts policy decisions regarding sludge management, resulting in the implementation of national regulations by each Member State.

In Australia, approximately 83% of biosolids were beneficially applied to land in 2021, with 72% of that amount being utilized on agricultural land. In New Zealand, land reclamation accounted for 43% of biosolids utilization, while agricultural purposes comprised 3% of usage. Additionally, 2% of biosolids were subjected to incineration. The remaining portion of biosolids was allocated for forestry, vermicomposting, landfill capping, stockpiling, and various other applications.

On the other hand, Japan heavily relies on thermal processing methods, particularly incineration, for biosolids management. In 2016, 68% of were biosolids incinerated, 11% were land applied and the rest landfilled. Due to its

23 https://www.accesswater.org/publications/proceedings/-279639/biosolids-on-trial---recent-litigation-wins-for-land-application

dense population and limited opportunities for land application, Japan has prioritized the generation of energy as a beneficial use of biosolids processing.

5. Evaluation of Biosolids Thermal Pilots

In July 2020, the CRD issued a RFEOI to understand the advanced thermal technologies available and determine interest from the market to undertake pilot trials. The CRD evaluated the proponent submissions on the basis of adherence to CRD policy, beneficial use, project synergies, reputation/track-record, scalability, and the completeness of information in the proponents' responses. The CRD opted to select one pilot from each type of advanced thermal technology to better understand the respective process and by-product characteristics.

A description and the results to date of each selected pilot trial are outlined below.

5.1 Waste Management

Waste Management (WM) collaborated with the CRD to explore the management of CRD biosolids using pyrolysis technology. WM, through their partner BioForceTech (BFT) have a pyrolysis facility located at the Silicon Valley Clean Water Authority in Redwood, California. The BFT pyrolysis system includes three bio-dryers, a pyrolysis kiln, and a thermal oxidizer. This system dries biosolids, pyrolyzes into a pyrolysis gas and biochar, and oxidizes the pyrolysis gas, recovering heat for use in the pyrolysis kiln and biodryers.

The initial step in this pilot program was a desktop data review, to take advantage of results from previous trials at the facility, as well as other published research. WM engaged two external consultants, Northern Tilth and Brown & Caldwell to assist in this work. Northern Tilth gathered and analyzed relevant data sets from previously pyrolyzed biosolids and compared the quality characteristics to CRD biosolids. Brown & Caldwell conducted a literature review on biosolids pyrolysis air emissions, and reviewed air emission data available from the BFT facility.

Based on the review, which compared CRD biosolids against two North American biosolids samples, WM concluded the following:

- CRD biosolids are similar in quality to other anaerobically digested and thermally dried biosolids from similarly sized municipal wastewater treatment facilities in terms of commonly tested parameters such as nutrients and metals. Thus, the resulting biochar from CRD biosolids is also expected to be similar.
- CRD lacks baseline data on non-regulated compounds of concern, including PFAS, VOCs, SVOCs, pharmaceuticals, and personal care products. WM recommended that the CRD test its dried biosolids for these parameters, so that they can be compared to other biosolids. Samples were submitted to an analytical lab, and the analysis will be updated when results are received.
- A WM pyrolysis trial in 2019, and data from other trials globally, found that the concentration of compounds of concern, including PFAS, within the biosolids used in the trial (of similar quality to CRD biosolids) were significantly reduced in the biochar produced from pyrolysis.
- There is limited data on the fate of PFAS in pyrolysis gas before and after combustion. Bench scale testing has demonstrated that pyrolysis can remove specific PFAS compounds to below detection limits in pyrolysis gas, however, the transformation of PFOS (one type of PFAS) into a different type of PFAS was observed. More research, and the confirmation of bench-scale results in a commercial system is needed.
- The BFT Pyrolysis facility meets the requirements of its air permit. Available data suggests that coupling pyrolysis with appropriate emissions technology can lead to air emissions that comply with BC regulations.
- Currently, there is only one full-scale pyrolysis facility for dried biosolids operating in North America, and available air emissions data from that facility is limited to a few regulated parameters of concern, including NO_X and metals. Full-scale air emissions testing at an operational facility is needed to comprehensively understand the fate of both regulated parameters and compounds of concern, such as PFAS, in air emissions.

The second stage of this pilot project was to conduct additional testing, based on knowledge gaps identified during the first stage. The planned testing included participation in a comprehensive study backed by Water Environment Federation which aims to quantify the extent to which PFAS compounds are destroyed pyrolysis by analysing all inputs and outputs to the system, including the pyrolysis gas. All additional testing has been postponed until mid-2024, while the pyrolysis kiln is upgraded.

5.2 Char Technology

In February 2022, CHAR Technologies (CHAR) completed bench-scale laboratory testing of CRD biosolids. Afterward, they collaborated with the CRD to carry out a pilot-scale high temperature pyrolysis (HTP) test of 800 kilograms of CRD biosolids at CHAR's pilot facility in London, Ontario over two days in October 2022. The results of the pilot test were reported to CRD on March 3, 2023.

CRD provided biosolids for the pilot that had a moisture content of 5.3%, total solids (TS) content of 94.7%, and a particle size of approximately 1 mm. Two tests were performed using 398 kg of biosolids with identical operating conditions, in a HTP pilot test, at 850°C. The feed rate was 50 kg/h and the solids residence time was 1-hour, aimed at optimizing the destruction of PFAS components. Biochar was collected 1-hour after the first batch of biosolids entered the kiln.

CHAR used internally developed and proprietary modelling to predict HTP product yields based on previous test results. According to the results, HTP of biosolids at 850°C yielded 28% biochar, 60% syngas, and 12% condensate, a total solids mass reduction of 72%. The CRD biosolids had a carbon content of 8.26%, volatile matter of 62.35%, and ash of 19.55%. After HTP, volatile matter decreased and fixed carbon and ash increased, resulting in biochar with a fixed carbon content of 23.60%. This high fixed carbon content made the biochar eligible for carbon credits, with each tonne generating 0.7 credits according to Puro.earth, a voluntary market which determined carbon credits that can be allocated per tonne of biochar.

Pyrolysis typically increases the concentration of inorganic matter (including metals) due to the loss of volatile matter at high temperatures. As a result, concentrations of Molybdenum and Zinc in the resulting biochar exceeded limits set by the Fertilizer Act of Canada and BC Class A Biosolids standards. Further analysis is needed to determine how the biochar can be used, which may involve methods such as ash washing or compost blending. Phosphorous and potassium were present in the produced biochar in high concentrations of 54,000 mg/kg and 1,910 mg/kg respectively, making it a potentially valuable fertilizer. Nitrogen was detected in the form of nitrate and nitrite in the feedstock. This was an expected result, as volatile forms of nitrogen were lost during the pyrolysis process while phosphorous and potassium were concentrated in the resulting biochar.

Tests and analysis demonstrated that CHAR's HTP Technology was successful in removing PFAS components from the solid phase of CRD's biosolids feedstock at 850°C. The resulting biochar had PFAS components that were below detection limits and met Canada’s Agricultural Use standards.

However, PFAS was detected in the dirty syngas, both pre- and post- oxidizer. The samples were not taken simultaneously, thus leading to non-identical process conditions. The oxidizer operated at 850°C with a minimum residence time of 2-seconds. Volumetric flow rates of syngas could not be measured at the sampling locations, so only concentration data was provided. PFAS tests were conducted on the syngas and gas results for O_2, CO_2, CO, CH_4, N2, and H2 were provided for both pre- and post- oxidizer/combustor. The presence of oxygen in both pre- and post-oxidizer gas was identified and indicated air intrusion. Analysis of the syngas particulate matter suggested that more attention is needed when designing the oxidizer to ensure that the particulate matter emissions do not exceed the stack limits and sufficient destruction of any contaminants that are partitioned to the syngas like PFAS. Higher oxidizing temperatures may be necessary. Based on the presence of sulfur and nitrogen in the dirty syngas, the formation of NOx and SO_2 was anticipated.

The process of contaminant partitioning from biosolids feedstock to end products including biochar and syngas (post-oxidizer) is currently under investigation for a variety of organic and inorganic contaminants of concern. While the conversion process may lead to a reduction in contaminant levels, complete destruction of contaminants is still under investigation. Furthermore, careful consideration of the end-use of syngas is necessary to ensure potential risks are mitigated.

Overall, additional analysis is necessary to fully comprehend the properties of the syngas generated, as there were concerns that air intrusion may have adversely affected results. To obtain precise gas data and establish reliable emissions control for a commercial-scale system, CharTech suggested installation of an on-site HTP demonstration system with syngas cleaning at a CRD location for further testing.

5.3 CEM

The CRD discussed the opportunity to pelletize and combust biosolids with CEM. The objective was to have CEM complete a lab analysis on a sample of biosolids and provide a professional opinion of the combustion proprieties of the biosolids and comment on the opportunity to bind biosolids with wood waste for use as fuel in a boiler.

CEM retained a lab in Europe to test different mixtures of dried biosolids and wet Hartland Landfill woodchips at four different ratios:

– 100% biosolids
– 20% biosolids and 80% wood chips
– 10% biosolids and 90% wood chips
– 5% biosolids and 95% woodchips

The lab conducted a "BASIC" analysis on all four samples.

Results showed that the in the 100% biosolids test, the Ash Deformation Temperature (ADT) was at 1,000-1,100 °C, which was significantly higher than the minimum requirement of 800 °C based on the Best Demonstrated Practice (BDP). ADT refers to the temperature at which ash in a combustion chamber begins to soften and deform. This temperature is a critical parameter for combustion operations, as a low ADT can lead to slagging and fouling in the combustion chamber, reducing the efficiency and reliability of the process.

Since the biosolids had high ADT, they may be burned in a biomass boiler as-is using a fines burner or travelling grate. However, the biosolids contained a considerable amount of ash, approximately 24% on a dry basis. Also, burning biosolids produces high levels of NO_X, SO_X, and strong acids such as HCl and HF. NO_X and SO_X emissions may be reduced with Best Available Control Technology (BACT). Burning biosolids can also cause corrosion due to the production of strong acids, but this may be prevented by maintaining a flue gas temperature above 150°C. As per BACT, mixing biosolids with wood chips was found to be necessary to prevent fouling and meet emission requirements. A mixture of 85% wood chips and 15% biosolids was recommended by CEM to avoid fouling and reduce NOX/SOX emissions significantly, and to meet the BACT emission levels. CEM believed that this was an inefficient utilization of the biosolids. Additionally, the pellets produced would not be appropriate for pellet boilers intended for commercial or residential use as they would contain elevated levels of sulphur and chlorine.

The pelletization of biosolids was found to be unnecessary for their combustion due to their high ADT. The biosolids could be burned directly in a dedicated "fines" burner with wood chips or above the travelling grate along with the wood chips. This was a positive result because it simplified the combustion process and reduced the cost and complexity of preparing the fuel for combustion.

If 15% of the mix is biosolids at a rate of 3,600 tonnes per year and 85% is wood at 20,400 tonnes per year, the weighted average calorific value of the biosolids wood chip mixture would be 4,800 Btu/lb. The as-is calorific value of the biosolids is 17,250 kJ/kg and the as-is calorific value of the wood is 10,080 kJ/kg. The combustion of approximately 24,000 tonnes of the 15%/85% biosolids wood chip mixture would produce around 2,600 tonnes of ash per year, which could then be collected and utilized either in asphalt or land application.

CEM recommended that the CRD perform further proximate and ultimate analyses on their different types of wood chips, including the coastal-like, dirty, and Construction/Demolition (C&D) Waste wood chips, as well as any other sources of biomass they may have. It was recommended that the CRD prioritized assessing the ash content, chlorine, and fluorine levels in their wood chips to establish a hierarchy of fuel types based on their cleanliness, with the least contaminants of concern being the most favourable option.

CRD was advised to initiate discussions with Natural Resources Canada through their CanmetENERGY laboratory to explore the feasibility of conducting preliminary tests/work on pelletizing a fraction of their biosolids. In addition, it was suggested that CRD conduct an incremental cost/benefit analysis of pelletizing their biosolids (and wood chips) to assess if the additional CAPEX and OPEX involved in this process are worthwhile, considering that alternative, less expensive options may also be available.

Due to the ash content of the fines, CEM recommended the CRD seek out burner OEMs who have the capacity to burn biosolid fines. The OEMs should provide a summary of the advantages and disadvantages of the fines burner option compared to mixing the biosolids and wood chips together and burning them on a grate.

CEM suggested that the ideal location for a biosolids/wood chip combustor would be a thermal-intensive customer within CRD who has a consistent demand for steam, hot water, or hot oil and is interested in reducing their carbon footprint. A biomass combustion system can operate for 8,000-hours per year on 3 tonnes/hour of biosolids/wood chip mixture, resulting in 31.7 mmBtu per hour of heat and 27 mmBtu per hour of useful energy. Assuming an 85% high heat value (HHV) efficiency, this could result in a CO_2 savings of 11,000 tonnes CO_2 equivalent per year. Based on the amount of biosolids available and the recommended blend ratio of 15% biosolids to 85% wood chips, the host site/customer should have a thermal load of around 250,000 mmBtu per year (i.e., equivalent to 10,000 - 11,000 tonnes per year of CO_2 equivalent).

CEM identified at least five fossil fuel users on Vancouver Island with over 10,000 tonnes of CO2 emissions per year who could potentially use all of CRD's biosolids for heat and/or power. It is likely that these operations would require modifications to their systems before pelletized biosolids could be used.

5.4 Aries Clean Technologies

Aries Clean Technologies (Aries) is a US based company which uses Fluidized Bed Gasification technology and is commissioning a new facility in Linden, New Jersey which will operate solely on biosolids. CRD intended to collaborate with Aries to conduct a pilot gasification program of biosolids. However, due to commissioning issues at this new facility, Aries indicated that their facility will not be operational and unable to undergo performance testing until the last quarter of 2023. As such, the pilot trial has been delayed. Staff are currently maintaining communication with Aries Clean Technologies and will make efforts to carry out the pilot study when the facility becomes operational.

5.5 Summary of Thermal Pilot Results

The advanced thermal pilot outcomes/results to date have provided valuable insights into the discrete operation of these technologies and the quality of products that can be obtained from CRD's biosolids. However, the pilots were all completed over a discrete period of time and therefore may not be representative of the long-term day to day operating conditions of the various systems/technologies. In addition, the trials only allowed for limited data to be collected on the characteristics of by-products such as biochar, syngas and wastewater. As such, the current pilot results alone are insufficient to confirm the feasibility of on-site advanced thermal processing of CRD biosolids and the potential for integration/beneficial use of by-products into other systems at Hartland.

5.6 Thermal Pilot Next Steps

Following the pilot trials, on March 29, 2023, the CRD board moved to initiate a request for proposals (RFP) process for an advanced thermal processing trial on-site at Hartland.

GHD recommends the following key objectives for consideration as part of the on-site thermal processing trial:

– Confirm equipment/process reliability
– Determine operating costs and short- and long-term maintenance requirements

– Evaluating the magnitude and quality of flue gases from the process
– Confirm the quantity and quality of syngas, biochar, and liquids
– Identify opportunities for process optimization
– Evaluate the potential for co-processing of other materials arriving at the landfill and assess the effects of co-processing on the quantity and quality of products and waste streams
– Identify and develop local markets for biochar
– Assess carbon sequestration benefits
– Evaluate contaminant partitioning and fate
– Evaluate GHG implications of any oxidized syngas
– Assess potential long-term synergies at Hartland

As noted above, the RFP process was initiated June 16, 2023, with a response closing date of July 14, 2023.

6. Long Term Options

The following section outlines the long-term biosolids beneficial use management options currently available to the CRD at the time this report was developed, along with proposed screening and evaluation criteria used to differentiate between the various options.

6.1 Long-Term Options

As per provincial regulatory direction from ENV, the proposed long-term management plan for biosolids generated at the RTF must comply with the requirements for beneficial use specified by the CCME.

In the context of the CCME beneficial use criteria, the below Table 6.1 screens all known biosolids long-term options available to the CRD:

Table 6.1 Potential Biosolid Options available to the CRD

Type of Operation	Potential Options	Adheres to CCME Beneficial Use?
Land Application		
Mine/Quarry Reclamation	Three potential options: – Two options for quarry reclamation near Nanaimo, BC. – An option for mine reclamation on the mainland.	Yes
Forest Fertilization	Three potential options: – Options for forest fertilization within the CRD and near Nanaimo, BC.	Yes
Land Improvement	One potential option: – An option to land apply biosolids to promote grass growth, help manage invasive species, and develop the potential for land grazing near Courtenay, BC.	Yes

Type of Operation	Potential Options	Adheres to CCME Beneficial Use?
Land Application		
Direct Land Application	One potential option: – Biosolids could be bagged and distributed as a fertilizer product in packages of less than 5 m^3. A pilot project would be required to assess feasibility.	Yes
BGM/Composting/Soil-Product	Multiple potential options with several vendors: – Biosolids could be mixed into BGM and land applied. – Biosolids could be composted with other municipal organic waste and land applied.	Yes
Thermal		
Fuel for Combustion/Incineration	Four potential options: – Co-combustion at two lower mainland cement kilns – As fuel in biomass boilers, either directly or mixed/pelletized with wood. Although possible, a market does not currently exist for use of biosolids as fuel. Changes to air permits would be required, potentially with additional stack testing requirements. Use in traditional residential/commercial units is not recommended as per results of thermal pilot trials. A specially designed “fines” boiler, with emissions control technology, would be required. – Incineration at an off-site waste-to-energy facility. Material handling at the facility would need to be developed.	Potentially – not all options beneficially re-use ash.
Pyrolysis	Two potential options: – On-Site pilot facility - Pyrolysis gas would not be beneficially used in the pilot. – On-Site long-term facility	Partial – Pilot option may not capture energy. Biochar and bio-oil from pyrolysis may not be suitable for land application or combustion, respectively.
Gasification	Two potential options: – On-Site pilot facility - Syngas would not be beneficially used in the pilot. – On-Site long-term facility	Partial – Pilot option may not capture energy. Biochar from gasification may not be suitable for land application.

Options outlined in Table 6.1 may also benefit from the development of additional material handling and storage procedures which may result in increased flexibility for transportation and transportation logistics. Table 6.2 illustrates available materials handling and storage options which could be coupled with options in Table 6.1 above to provide increased flexibility for the CRD.

Table 6.2 Materials, Handling, and Storage Options

Material Handling & Storage	
Materials Handling	Two potential options: – Manually bag biosolids into bulk bags with bag liners for storage and transport. – Bagging for distribution- Class A biosolids can be distributed freely bagged in quantities of less than 5 m^3.
Storage	Two potential options: – Hartland Silo – construct additional silo(s) at Hartland. – Stockpile - stockpiling of biosolids will require blending 1:1 with sand to safely store. Blended biosolids will no longer be suitable for combustion. Stockpiled biosolids must meet OMRR storage requirements. Biosolids could be stockpiled at Hartland landfill or at land application site.

6.2 Proposed Evaluation Criteria

The following table describes a proposed evaluation criteria which could be used to distinguish and identify the benefits and challenges with each of the biosolid beneficial use options outlined above.

Table 6.3 Proposed Evaluation Criteria

Evaluation Criteria	Description
Economic	– Estimated CAPEX and OPEX e.g., cost of capital investment for additional infrastructure and cost of processing – Potential for revenue generation e.g., biochar, biofuel – Estimated cost per tonne e.g., CAPEX and OPEX to process tonne of biosolids; estimated based on information available at the time of this report
Environmental Impacts	– Odour – Noise – Truck Traffic – Air emissions and dust – Contaminant mass balance
Environmental Sustainability	– Production of value derived products e.g., biochar, biocrude, etc. Diversified beneficial use and marketability of products recovered – GHG Emission Implications – Potential to recover energy and reduce dependence on electric grid and natural gas – Potential to co-process additional waste streams – Soil/groundwater impacts
CRD Owned	Yes or no
Reputation	Type of application (thermal treatment, land reclamation, agricultural fertilizer etc.)
Regulatory	New permit requirements and impacts to existing operating permits

6.3 Options Evaluation

The results of the options evaluations using the proposed evaluation criteria are summarized in Table 6.4 below:

Table 6.4 General Option Pathway Evaluation Results

Evaluation Criteria	Description	Mine/Quarry Reclamation	Forest Fertilization	Land Improvement	Direct Land Application	BGM/Composting/Soil-Product	Fuel for Combustion/Incineration (Off-Site)	Pyrolysis (On-Site)	Gasification (On-Site)
Economic	CAPEX and OPEX	Low CAPEX given no investment for additional infrastructure. Medium OPEX due to labour, transport, materials handling, maintenance, storage, public outreach, etc.			Low CAPEX given no investment for additional infrastructure. Higher OPEX due to increased costs from bagging protocol and materials.	Low CAPEX given no investment for additional infrastructure. Medium OPEX due to labour, transport, materials handling, maintenance, storage, public outreach, etc.	Low to medium CAPEX depending on contract agreement. Some vendors may require investment for additional feedstock storage infrastructure. Medium OPEX due to labour, transport, materials handling, maintenance, storage, etc.	High CAPEX due to capital investment for on-site facility. OPEX induced from labour, utility demands (natural gas, electricity, and water), and the transport of biochar. In comparison to off-site alternatives, OPEX will be low in the long-term due to lack of tip-fees for biosolids. However, OPEX may be higher during the early commercial facility commissioning stage until the process becomes optimized.	
	Potential for revenue generation	Low potential for revenue generation as there are no residual products from this process.			Potential for revenue generation through the distribution of bagged biosolids fertilizer product to partially offset processing costs.	Low potential for revenue generation as CRD may not own the rights to the BGM/composting/soil-products.	Low potential for revenue generation as CRD may not own the rights to the value derived products (electricity, cement, heat, etc.).	Potential for revenue from value derived products (biochar, bio-oil) to partially off-set processing costs.	Potential for revenue from value derived product (biochar) to partially off-set processing costs.
	Estimated cost per tonne (CAPEX and OPEX estimate based on information available at the time of this report)	<$250/tonne	<$400/tonne	<$500/tonne	<$500/tonne	<$500/tonne	<$500/tonne	$500-4,500/tonne[1]	
Environmental Impacts	Odour	Potential for nuisance odour emissions at application site(s). May be mitigated via biosolids stabilization and mixing with soil. Application sites are generally far from population centres.					Minimal odour due to installation of an odour abatement system at the facility.		
	Noise	Noise emitted from land application equipment. However, mines/quarries are generally located far from population centres.			Noise potentially emitted from bagging equipment. However, site is located far from population centres	Noise emitted from land application equipment. However, application sites are generally	Minimal noise due to installation of noise abatement system at the facility.		

Evaluation Criteria	Description	Mine/Quarry Reclamation	Forest Fertilization	Land Improvement	Direct Land Application	BGM/Composting/Soil-Product	Fuel for Combustion/Incineration (Off-Site)	Pyrolysis (On-Site)	Gasification (On-Site)
					and a noise abatement system would be designed as the bagging protocol is developed.	located far from population centres.			
	Estimated Truck Traffic	Truck traffic associated with transport of biosolids from site: Approximately one truck every three days (122 trucks each year)						Truck traffic associated with transport of biochar from site: – Approximately one truck every nine days (41 trucks each year)	
	Air Emissions and Dust	Generally low potential for particulate air emissions/dust.					Minimal air emissions/dust due to installation of advanced capture and treatment systems at facility, though residues from these capture and treatment systems need to be disposed of.		
	Contaminant mass balance	Potential accumulation of contaminants. However, class A biosolids have undergone contaminant reduction processes as per OMRR quality standards.					Contaminants have shown to be reduced through thermal processing. However, the level of reduction and ultimate environmental fate are still under investigation.		
Environmental Sustainability	Production of value derived products e.g., biochar, biocrude, etc.	Biosolids may be considered a fertilizer product derived from a waste stream in the context of land-application, with the added benefit of reducing the need for energy-intensive synthetic fertilizer production.				Produces BGM, compost, soil-products which may be beneficially re-used in various applications and reduces the need for energy-intensive synthetic fertilizer production.	Produces energy which may be beneficially re-used for electricity/heating applications assuming nearby end-users.	Produces steam, syngas, , and bio-oil, which can be beneficially re-used in various applications such as heating, electricity, etc. Also produces biochar, however the potential beneficial applications of this product as a soil amendment are still under investigation.	Produces steam, syngas, and which can be beneficially re-used in various applications such as heating, electricity, etc. Also produces biochar, however the potential beneficial applications of this product as a soil amendment are still under investigation.
	GHG Emission Implications[2]	In comparison to landfilling, GHG emissions are significantly reduced due to lesser methane/nitrous-oxide emissions, carbon sequestration into soil, and an offset usage of synthetic fertilizers. In comparison to alternative beneficial use options, biosolids application to degraded areas (mines, quarries, forests, lands, etc.) presents the lowest potential for GHG emission reduction. Any off-site option will have higher GHG emission implications due to the transport distances and trucking frequency associated with the transport of			In comparison to landfilling, GHG emissions are significantly reduced due to lesser methane/nitrous-oxide emissions, carbon sequestration into soil, and offset usage of synthetic fertilizers. In comparison to alternative beneficial use options, the production and sale of biosolids as a soil fertilizer product through bagging, compost, or BGM, presents medium potential for GHG emission reduction, assuming it has greater potential to offset the usage of synthetic fertilizers.		In comparison to landfilling, GHG emissions are significantly reduced (lesser methane/nitrous-oxide emissions, non-renewable fuel usage offsets). Thermal processing options will have increased GHG implications from the oxidization of any gases produced.	In comparison to landfilling, GHG emissions are significantly reduced (lesser methane/nitrous-oxide emissions, non-renewable fuel usage offsets). Advanced thermal processing options will have increased GHG implications from the oxidization of any gases produced. Like combustion/incineration, pyrolysis and gasification present high potential for GHG emission reduction, if biosolids-derived energy (heat, syngas, or bio-oil from	

Evaluation Criteria	Description	Mine/Quarry Reclamation	Forest Fertilization	Land Improvement	Direct Land Application	BGM/Composting/Soil-Product	Fuel for Combustion/Incineration (Off-Site)	Pyrolysis (On-Site)	Gasification (On-Site)
		biosolids, resulting in increased non-renewable fuel usage.			Any off-site option will have higher GHG emission implications due to the transport distances and trucking frequency associated with the transport of biosolids, resulting in increased non-renewable fuel usage.		In comparison to land application options, utilizing biosolids as renewable fuel for cement combustion or energy production via incineration presents high potential for GHG emission reduction, assuming it offsets the usage of non-renewable fuel sources. Any off-site option will have higher GHG emission implications due to the transport distances and trucking frequency associated with the transport of biosolids, resulting in increased fuel usage.	pyrolysis) is beneficially used to offset the usage of non-renewable fuel sources. Depending on process design, this derived energy may not be reused or recycled, and may result in lower GHG emission reductions. On-site options will have lesser GHG emissions associated with transport, as the trucking frequency of hauling biochar will be less than that required of biosolids.	
	Potential to recover energy and reduce dependence on electric grid and natural gas	No potential to recover energy.					High potential to recover energy from products (steam, heat) to offset dependence on electric grid and natural gas. Fulsome energy recovery would depend on presence of nearby end-users.	High potential to recover energy from products (syngas, steam, heat) to offset dependence on electric grid and natural gas onsite. Fulsome energy recovery would depend on presence of nearby end-users.	
	Potential to co-process additional waste streams	No potential for co-processing.				Potential for co-processing via blending of biosolids with compost generated from organic waste streams.	Low potential to co-process mixed waste streams as CRD would not have control over off-site facility operations.	Potential to co-process mixed waste streams. However, co-processing may increase maintenance/operational costs due to added complexity of feedstock.	
	Soil/groundwater impacts	Supplementing soil cover and improving soil health via biosolids application reduces erosion into lakes and streams. Potential negative impact to soil/groundwater if application plan is not followed correctly as per OMRR.			Bagging process presents minimal impacts to soil/groundwater. End-use of the bagged product may present potential negative impact to soil/groundwater if applied in quantities greater than one bag ($5m^3$) per parcel of land. OMRR does not require a land application plan for application quantities less than or equal to $5m^3$ per parcel of land.	End-use of the products may present potential negative impact to soil/groundwater if application plan is not followed correctly as per OMRR.	Process presents minimal impact to soil/groundwater. End-use of the products (biochar, bio-oil, ash) may present potential negative impact to air/soil/groundwater if proper consideration not taken.		

Evaluation Criteria	Description	Mine/Quarry Reclamation	Forest Fertilization	Land Improvement	Direct Land Application	BGM/Composting/Soil-Product	Fuel for Combustion/Incineration (Off-Site)	Pyrolysis (On-Site)	Gasification (On-Site)
CRD Owned	Yes or no	No. Biosolids would be sent to vendors who would own risk and land application responsibility.			Yes.	No. Biosolids would be sent to vendors who would own risk and responsibility.	No. Biosolids would be sent to off-site facility.	Yes.	
Experience and Reputation	Type of application	Mines/quarries are required by the government to eventually reclaim and close to minimize the long-term environmental effects of operations. Biosolids have shown to be an effective measure in the restoration of former mines/quarries by adding nutrients to promote vegetation growth in their barren soils. However, general public acceptance regarding land application varies due to concerns on noise, odour, contaminants, etc.	Biosolids have shown to be an effective measure in the fertilization of forests to increase tree production, reduce soil erosion, and improve soil health. However, general public acceptance regarding land application varies due to concerns on noise, odour, contaminants, etc.	Land application has demonstrated commercial success and is one of the commonly used management options worldwide. However, general public acceptance regarding land application varies due to concerns on noise, odour, contaminants, etc.	It is unclear if there is a local market for bagged biosolids fertilizer product. A pilot trial would be required to assess demand and feasibility. Biosolids as a bagged product is allowed under OMRR in packages of <5m^3. However, general public acceptance regarding land application varies due to concerns on noise, odour, contaminants, etc.	Land application has demonstrated commercial success and is one of the commonly used management options worldwide. However, general public acceptance regarding land application varies due to concerns on noise, odour, contaminants, etc.	High technological readiness as combustion/incineration is a commercially proven and widely used biosolids management process. However, the market for biosolids as fuel does not currently exist. Additionally, public acceptance of waste incinerators varies due to concerns regarding intensive energy usage and potential for air pollutant emissions.	Reputation of pyrolysis is gaining interest as an innovative technology which produces value added products from waste streams, however it has demonstrated low technological readiness as there are a limited number of operational facilities which use biosolids as a sole feedstock. In North America, pyrolysis is ahead of gasification with regards to technological readiness based on the number of operational facilities.	Reputation of gasification is gaining interest as an innovative technology which produces value added products from waste streams, however it has demonstrated low technological readiness as there are a limited number of operational facilities which use biosolids as a sole feedstock. In North America, gasification is below pyrolysis with regards to technological readiness based on the number of operational facilities.

Evaluation Criteria	Description	Mine/Quarry Reclamation	Forest Fertilization	Land Improvement	Direct Land Application	BGM/Composting/Soil-Product	Fuel for Combustion/Incineration (Off-Site)	Pyrolysis (On-Site)	Gasification (On-Site)
Regulatory	New permitting requirements and impacts to existing permits	May require approvals from: - ENV to ensure land application is carried out safely and does not pose a risk to human health or the environment.					Changes to boiler air mass permits may be required. May require approval from Environmental Management Act Air Quality Permit for any emissions associated with thermal process.	May require approval from Environmental Management Act Air Quality Permit for any emissions associated with thermal process.	

1. Due to pyrolysis and gasification being considered emerging technologies in the biosolids industry there are a number of unknown risks associated with these technologies which have the potential of increasing both CPAEX and OPEX associated these types of projects.
2. GHG Emission Implications are based on the 2022 BEAM Model developed by the Northeast Biosolids and Residuals Association, Northwest Biosolids, Northern Tilth LLC.

6.4 General Option Pathways

The available option types outlined in Table 6.4 fall under four general pathways for CRD's consideration in the long-term:

– **On-Site Thermal:** The CRD invests in an on-site advanced thermal technology to process their biosolids. These processes would yield value-added products such as syngas, biochar, bio-oil, or energy that can be converted into heat/electricity. There is also potential to co-process other waste streams in addition to biosolids, such as municipal solid waste.
– **Off-Site Thermal:** Similar to on-site thermal, the CRD transports biosolids from Hartland to a different facility to process the biosolids via an advanced thermal technology. However, in this scenario there is no need to invest in additional infrastructure.
– **Cement Manufacturing:** The CRD transports biosolids from Hartland to off-site facilities for beneficial use as alternative fuel in cement kilns.
– **Land Application:** The CRD would utilize the biosolids for non-agricultural land-application purposes such as mine/quarry reclamation, forest fertilization, land improvement, direct land application, or the production of BGM/compost/soil-product.

7. Long-Term Portfolios

Irrespective of the type of management option selected for the long-term strategy, GHD recommends that the CRD develop a combination of multiple options within a diverse strategy portfolio to ensure resiliency and further protect the CRD against risks of interruption such as future market forces, regulatory changes, facility shutdowns, or other unplanned circumstances. In the unexpected event that a management option is interrupted due to these risks, the added benefit of strategy diversification in following the portfolio approach will allow CRD's biosolids to still be beneficially used in the interim until the interruption is resolved.

The following sections outline the process for developing biosolids beneficial use portfolios and provide a few general portfolios based on the four general pathways described in the previous section.

A portfolio may be made up of three of more biosolids beneficial use options in order to increase resiliency. These three options may be categorized as follows:

1. **Preferred Option** – This refers to the primary management option. For an option to be categorized as preferred, it should be able to accommodate all biosolids produced by the RTF. A preferred option may be made up of several smaller preferred options in order to meet this requirement.
2. **Support Option** – This refers to a secondary option which would be available to beneficial use biosolids if one or all the preferred options were not available. This option does not have to be capable of accommodating all biosolids produced by the RTF and as such may be seasonal and/or have minimum tonnages associated with it.
3. **Contingency Options** – This refers to options which would serve as back-up options for the beneficial use of biosolids in the unexpected event that the preferred and support options are not available. Contingency may not be as economically or environmentally attractive as the preferred of support options however would be available to accept biosolids on short notice.

7.1 General Portfolios

As noted above, portfolios made consist of the following general biosolids beneficial use option pathways:

– **On-Site Thermal**
– **Off-Site Thermal**

– **Cement Manufacturing**
– **Land Application**

Table 7.1 below outlines a few potential general portfolios. It is important to note that this is not an exhaustive list of all potential portfolios and that there may be additional possible combinations. Following consultation, the portfolios may be further refined to include the specific options approved by the public and First Nations groups.

Table 7.1 General Portfolios

Option Categories	Existing Scenario Portfolio	Short-Term Portfolio	On-Site Thermal Portfolio	Off-Site Thermal Portfolio	Land Application Portfolio
Preferred Option	Cement Manufacturing	Cement Manufacturing	Thermal/Fuel (on-site)	Thermal/Fuel (off-site)	Land Application
Support Option	N/A	Land Application	Land Application	Land Application	Land Application
Contingency Option	On-Site BGM	On-Site BGM	Cement Manufacturing (off-site)	Cement Manufacturing (off-site)	Cement Manufacturing (off-site)

7.1.1 General Portfolio Narratives

Existing Scenario Portfolio:

– This portfolio illustrates CRD's existing biosolids management strategy, in which the biosolids are transported off-site for use alternative fuel in cement manufacturing. As a contingency, 350 tonnes of biosolids are used to produce BGM under the Definitive Plan. This portfolio lacks a support option, and consequently does not have appropriate redundancy. This has led to significant operational challenges as off-site cement manufacturing has been interrupted. Although temporary, this portfolio is included as a comparison to the proposed portfolios.

Short-Term Portfolio:

– This portfolio depicts CRD's current short-term strategy, in which potential land-application options are being investigated to serve as additional support to the existing scenario for added resiliency.

On-Site Thermal Portfolio:

– This portfolio includes the investment and construction of an advanced thermal facility at Hartland Landfill. The potential to construct an on-site pilot facility is currently being investigated with pyrolysis and gasification technologies. Depending on the results and operations of the pilot, the on-site facility may be able to process and beneficially use CRD's biosolids for the long-term.
– During periods of planned shutdown, a portion of the biosolids could be transported to various land application programs. There are several potential land application options being explored by the CRD in the areas of mine/quarry reclamation, forest fertilization, land improvement, and BGM/composting/soil-product.
– In the unlikely event that both preferred and support options are interrupted, the CRD may send biosolids for use as alternative fuel in cement manufacturing. There are two off-site cement manufacturing options known to be available to the CRD which meet beneficial use criteria.

Off-Site Thermal Portfolio:

– This portfolio also considers the processing of biosolids via an advanced thermal treatment technology. However, in this scenario the biosolids would be transported to an off-site facility rather than investing in the construction of an on-site facility. Currently, there is one potential off-site thermal option available to the CRD in the form of incineration at a waste-to-energy facility.
– During periods of planned shutdown, a portion of the biosolids could be transported to various land application programs. There are multiple potential land application options being explored by the CRD.
– In the unlikely event that both preferred and support options are interrupted, the CRD may send biosolids for use as alternative fuel in cement manufacturing. There are two off-site cement manufacturing options known to be available to the CRD which meet beneficial use criteria.

Land Application Portfolio:

– This portfolio considers the transport of biosolids to one of the various potentially available land application programs.
– In the unlikely event that both preferred and support options are interrupted, the CRD may send biosolids for use as alternative fuel in cement manufacturing. There are two off-site cement manufacturing options known to be available to the CRD which meet beneficial use criteria.

7.2 Resiliency Evaluation

The following criteria in Table 7.2 was prepared to identify and evaluate the risk of interruption of potential portfolios:

Table 7.2 Resiliency Criteria and Factors

Resiliency Criteria	Factors
Preferred Option Sufficient Capital for Start-Up/ Operating/Refurbishment	Insufficient capital leading to potential shutdown or service interruptions.
Preferred Option Change in Ownership	New owner does not honour existing contracts (increase in tipping fees exponentially over short period of time).
Preferred Option Market for End-Product	Lack of market for end-product causes facility to turn away biosolids.
Preferred Option New OMRR Requirements	Updated OMRR with standards that current facility does not meet.
Preferred Option Short-term Shutdown	Short term shutdowns for various reasons - feedstock interruption, highway closure, wildfire, etc.
Preferred Option Facility Reputation	CRD being associated with a facility a causing a nuisance (haul route, odour, noise, etc.)
Preferred Option Facility Non-Compliance	Facility is not in compliance with permits or regulations.
Support Option Seasonality	Support option cannot accept biosolids on-demand due to winter, rain, etc.
Support Option Minimum Tonnage	CRD cannot produce/store enough biosolids to meet support or contingency option minimum tonnage requirements during periods of interruption of preferred option.
Contingency Option Unavailable	Support/Contingency option is unavailable (no longer open, at maximum capacity, etc.).

Each proposed portfolio was evaluated against the criteria noted in Table 7.2 using a risk-matrix per the following steps:

1. The probability of each criteria factor occurring was evaluated on a scale of rare (<3%), unlikely (3-10%), moderate (11-50%), likely (51-90%), to certain (>90%).
2. The consequence severity of the criteria factor occurring was evaluated on a scale of insignificant (easily mitigated by day-to-day process), minor (schedule delays up to 10% and CAPEX/OPEX increase up to 10%), moderate (schedule delays up to 50% and CAPEX/OPEX increase up to 50%), major (schedule delays up to 100% and CAPEX/OPEX increase up to 100%), to catastrophic (need to abandon the project).
3. The probability and consequence severity ratings for each criteria factor were correlated to find a risk of interruption value on a scale of negligible (level 1), low (levels 2-4), moderate (levels 5-10), high (levels 11-24), to extreme (level 25) using the risk matrix depicted in Table 7.3 below.
4. The resulting risk of interruption values for each criteria factor were averaged to generate a weighted risk of interruption rating and risk level for the overall portfolio.

Table 7.3 Risk Matrix

Consequence Severity	Probability: Rare (<3%)	Unlikely (3-10%)	Moderate (11-50%)	Likely (51-90%)	Certain (>90%)
Insignificant	Negligible (1)	Low (2)	Low (3)	Low (4)	Moderate (5)
Minor	Low (2)	Low (4)	Moderate (6)	Moderate (8)	Moderate (10)
Moderate	Low (3)	Moderate (6)	Moderate (9)	High (12)	High (15)
Major	Low (4)	Moderate (8)	High (12)	High (16)	High (20)
Catastrophic	Moderate (5)	Moderate (10)	High (15)	High (20)	Extreme (25)

The resulting risk of interruption and risk level for each portfolio is summarized in Table 7.4 below:

Table 7.4 Risk Resiliency Evaluation

General Portfolio	Average Portfolio Risk of Interruption Value Rating	Average Portfolio Risk Level	Comments
Existing Scenario	High	11	– Results in a high average portfolio risk of interruption rating (11) as the existing scenario portfolio does not include a support option for redundancy. – Preferred option availability (cement manufacturing) identified as a notable potential risk factor as this option has historically demonstrated operational challenges. – Contingency option availability (on-site BGM) identified as a notable potential risk factor as space for BGM cover at Hartland is limited and may eventually reach maximum capacity.
Short-Term	Moderate	9	– CRD is exploring land-application programs in the short-term to serve as a support option to the existing scenario. This has decreased the average portfolio risk of interruption rating from high (11) to low (9). – Contingency option availability (on-site BGM) identified as a notable potential risk factor as space for BGM cover at Hartland is limited and may eventually reach maximum capacity.

General Portfolio	Average Portfolio Risk of Interruption Value Rating	Average Portfolio Risk Level	Comments
On-Site Thermal	Moderate	7	– CRD ownership of preferred option (on-site thermal facility) decreases potential risk in multiple criteria factors: change in ownership, market for biosolids in-take, facility reputation, and facility non-compliance. – Contingency option availability (cement manufacturing) identified as a notable potential risk factor as this option has historically demonstrated operational challenges.
Off-Site Thermal	Moderate	8	– Contingency option availability (cement manufacturing) identified as a notable potential risk factor as this option has historically demonstrated operational challenges.
Land Application	Moderate	8	– Contingency option availability (cement manufacturing) identified as a notable potential risk factor as this option has historically demonstrated operational challenges.

It was found that the inclusion of some form of land-application reduced the overall risk of interruption within the generated portfolios due to the diversification of option types resulting in increased resiliency.

Based on feedback from the public and First Nations groups, the CRD may further refine the portfolios and conduct a similar risk matrix exercise on alternative portfolios. This will help the CRD identify notable potential risks of interruption and incorporate mitigation plans accordingly. Further, the risk evaluation will assist the CRD in selecting a single, resilient portfolio for the long-term beneficial use of biosolids.

8. Conclusions & Next Steps

8.1 Conclusions

Development and Evaluation of Land Application Options – There are various beneficial use land application methods which meet CCME beneficial use criteria in the form of mine/quarry reclamation, forest fertilization, land improvement, direct land application, BGM, compost, and soil product production. There are various out-of-region land application programs available. There are currently no in-region land application options available at this time due to the long standing CRD policy banning land application. However, this policy was recently expanded to allow for non-agricultural land application as a contingency or emergency option. As such, a number of in-region land application options could be investigated for inclusion in potential long term management portfolios.

Evaluation of Thermal Options – Thermal biosolids management technologies are generally classified as pyrolysis, gasification, or incineration. Among the thermal technologies, incineration is the most commercially proven and widely used thermal treatment process for biosolids. However, incineration is energy intensive and does not result in the beneficial use of ash and as such may not be considered a beneficial use option by the CCME. Pyrolysis and gasification technologies are both still emerging in the biosolids processing space with slightly more pyrolysis facilities anticipated to move into operations in North America over the next few years.

Thermal technologies have the added benefits of generating potential revenue through biochar, syngas, heat recovery as well as the potential to co-process other mixed waste streams. However, there are challenges in thermal co-processing technologies, as mixing biosolids with other waste streams may increase maintenance and operational costs due to the added complexity of handling/treating mixed waste streams. Co-processing also presents challenges in meeting CCME criteria for the beneficial re-use of 25% of ash.

Contaminants of Emerging Concern - Community concerns around the land application of biosolids and its potential impacts to soil quality, surface water, and groundwater are largely based on the presence, or suspected presence, of unregulated CEC's. These potential impacts are the subject of ongoing scientific research. CCME's guidelines note that many CECs are found in low concentrations in biosolids, and that detection does not necessarily mean there is a risk to human health or the environment. Generally, risk assessments for each individual CEC have not been completed, but ecotoxicological testing, used to assess the toxicology of residuals holistically, did not detect significant negative impacts. The CCME is supportive of source control measures as an effective way to improve the quality of biosolids. CRD's biosolids have been treated to Class A standards as per OMRR.

The CFIA proposed an interim standard for PFAS in biosolids used in Canada as fertilizers at 50 ppb PFOS (one type of PFAS). The proposed standard aims to protect human health by preventing the small proportion of biosolids products that are heavily impacted by industrial inputs from being applied to agricultural land in Canada. The concentration of PFOS in CRD's biosolids is under the proposed standard at approximately 6 ppb (based on two samples).

The fate of CECs in advanced thermal processing of biosolids is still under investigation. While CECs appear to be reduced in biochar products, some can still be found in syngas and bio-oil products, but the concentrations and environmental fate still need to be confirmed.

Jurisdictional Scan – Globally, biosolids, are beneficially used primarily through land application or thermal treatment methods. The majority of countries assessed in the jurisdictional scan primarily land-apply their biosolids for beneficial use, except for Japan, who relies on incineration due to its high population density and limited areas for land application.

Across the world, the decision to beneficially use biosolids through land application or thermal processes is influenced by a range of factors: regulatory requirements, local infrastructure/resources, public perception, as well as the goals and priorities of local municipalities. Identifying and evaluating these factors are key to the implementation of an effective, long-term biosolids management strategy.

Evaluation of Thermal Pilots – In the evaluation of the Biosolids Thermal Pilot technologies/studies explored by the CRD, valuable insight was gained into the discrete operation of each of these technologies. However, the current pilot results alone may not be sufficient to confirm the feasibility of on-site thermal processing of CRD biosolids or the potential for integration/beneficial use of by-products into other systems at Hartland at this time.

For the upcoming on-site thermal trial, GHD suggests that the CRD capture key operational criteria such as process reliability, operational costs, maintenance requirements, co-processing feasibility, residual product quality, biochar markets, carbon sequestration benefits, and long-term synergies at Hartland.

Long-Term Options & Portfolio Generation – A long-list of biosolids management options available to the CRD was identified and screened against CCME beneficial use criteria.

GHD recommends that the CRD develop of a combination of multiple options within a diverse portfolio to ensure resiliency in the form of strategy redundancy. In the unexpected event that a biosolids management option is interrupted, the inclusion of additional options within a portfolio will allow CRD's biosolids to still be beneficially used in the interim until the interruption is resolved.

General portfolios were generated using the long-list of options available to the CRD. A risk evaluation identified notable potential risk of interruption factors such as contingency option availability and facility ownership changes to consider in the development of the long-term biosolids beneficial use strategy. The risk evaluation also indicated that some form of land-application is likely required in all proposed portfolios to ensure resiliency.

8.2 Next Steps

Following public and First Nations consultation, the CRD may further refine the general portfolios outlined in this report. From the list of options approved by the public and First Nations groups, the CRD may develop portfolios using specific options and vendors and future test these portfolios for resiliency using the risk matrix outlined in Section 7. The risk analysis will help inform the selection of a resilient long-term portfolio for the long-term beneficial use of CRD's biosolids.

Appendices

Appendix A

Provincial Conditional Approval Letter

BRITISH
COLUMBIA

Reference: 305517

November 18, 2016

Jane Bird
Chair, Core Area Wastewater Treatment Project Board
Capital Regional District
PO Box 1000, 625 Fisgard Street
Victoria BC V8W 2S6

Dear Ms. Bird:

Thank you for your letter of November 17, 2016, regarding my conditional approval of Amendment No. 11 to the Core Area Liquid Waste Management Plan (CALWMP). As requested in your letter, I will clarify my conditional approval of Amendment No. 11 to the CALWMP and have also considered your request to modify my condition for Integrated Resource Management.

To address your concerns, I am revising my September 30, 2016, Conditional Approval of Amendment No. 11. This revised Conditional Approval of Amendment No. I I supersedes my September 30, 2016, decision.

To clarify, Amendment No. 11 includes, but is not limited to, the following:

1. A single 108 megalitre/day wastewater treatment plant located at McLaughlin Point within the Township of Esquimalt capable of tertiary treatment for flows up to 2 times Average Dry Weather Flow (ADWF) for the Core Area up to 2040. For flows that are greater than 2 times ADWF but not more than 3 times ADWF for the Clover Point catchment and up to 4 times ADWF for the Macaulay catchment, primary treatment will be guaranteed. Construction of the wastewater treatment plant will be completed by December 31, 2020.
2. Commitment to advance studies for a wastewater treatment proposal in Colwood, including up to $2 million to complete the required technical studies and environmental impact assessments.
3. Conveyance of sewage sludge to the Hartland landfill for processing into Class A biosolids, as defined under the Organic Matter Recycling Regulation, for beneficial use and optimization for potential opportunities for integrated resource management.

... 2

Ministry of Environment | Office of the Minister | Mailing Address: Parliament Buildings Victoria BC V8V 1X4 | Telephone: 250 387-1187 Facsimile: 250 387-1356

As a condition of my approval and in accordance with Section 24 (5) of the *Environmental Management Act,* I require the Capital Regional District (CRD) develop a definitive plan for the beneficial reuse ofbiosolids that does not incorporate multi-year storage of biosolids within a biocell. The Ministry of Environment understands that the plan may need to include short-term storage and/or management options as part of implementing the beneficial reuse plan, but the CRD is strongly encouraged to minimize the need for this. Further, I am amending the deadline for submission of the plan from December 31, 2017, to June 30, 2019, under the condition that the CRD submit, by May 31, 2017, a plan that outlines the procedural steps and schedule it will implement to achieve the definitive plan.

The CRD must ensure that the definitive plan for beneficial reuse of biosolids is supported by an assessment of the full spectrum of beneficial uses and integrated resource management options available for the proposed Class A biosolids produced at the Hartland Landfill, and incorporates a jurisdictional review of how similar-sized and larger municipalities within British Columbia, North America and further abroad, successfully and beneficially reuse biosolids. Ministry staff will assist as necessary and can share the ministry's jurisdictional review of how other similar-sized and larger municipalities reuse biosolids.

The beneficial reuse option selected for treated biosolids must meet the requirements for beneficial use specified in the Canadian Council of Ministers of the Environment *Canada-Wide Approach for the Management of Wastewater Biosolids* (October 11, 2012) and be based on scientific evidence. This definitive plan for the beneficial reuse of biosolids will replace the current proposal to use a biocell for storage.

Please continue to work with staff in the Environmental Protection Division of the Ministry of Environment to ensure that the proposed wastewater treatment facility is registered under the Municipal Wastewater Regulation prior to operation of the plant. Please also inform ministry staff of all beneficial uses of biosolids being considered, in order to ensure all necessary forms of authorization are obtained in advance of discharge.

Additionally, the CRD should continue to engage First Nations and the public on all aspects of theCALWMP.

Be advised that the ministry intends to publically post any reports or other documents received by the CRD on the ministry website related to this conditional approval, the CALWMP and this activity regulated under the *Environmental Management Act.*

Approval of Amendment No.11 to the CALWMP does not authorize entry upon, crossing over or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority shall rest with the local government. This amendment is approved pursuant to the provisions of the *Environmental Management Act,* which asserts it is an offence to discharge waste without proper authorization. It is also the regional district's responsibility to ensure that all activities conducted under this plan amendment are carried out with regard to the rights of third parties and comply with other applicable legislation that may be in force.

Sincerely,

11/cd_,

Mary Polak
Minister

cc: Honourable Peter Fassbender, Minister of Community, Sport and Cultural Development
AJ Downie, Director, Environmental Protection Division, Ministry of Environment
Robert Lapham, Chief Administrative Officer, Capital Regional District
Larisa Hutcheson, Interim Project Director, Core Area Wastewater Treatment Project, Capital Regional District
Sharon Singh, Associate, Bennett Jones Vancouver

Appendix B

CRD Board Minutes Land Application Restrictions July 13, 2011

Making a difference...together

MINUTES OF THE MEETING OF THE CAPITAL REGIONAL DISTRICT BOARD,
held Wednesday, July 13, 2011 in the Board Room, 625 Fisgard Street, Victoria, BC

PRESENT: **Directors:** G. Young (Chair), S. Brice, J. Brownoff, C. Causton, L. Cross, V. Derman, B. Desjardins, J. Evans, D. Fortin, C. Green (for A. Finall), K. Hancock, G. Hendren, M. Hicks (3:30 p.m.), G. Hill, P. Lucas, F. Leonard (2:37 p.m.), J. Mar, J. Mendum, J. Ranns (2:37 p.m.), D. Saunders, L. Seaton (for D. Blackwell), C. Thornton-Joe and L. Wergeland
Staff: K. Daniels, J. Hull, L. Hutcheson, B. Lapham, L. Rushton, S. Santarossa and N. More (Recorder)
Also Present: Kathryn Stuart, Staples McDannold Stewart, Board Solicitor

ABSENT: J. Brownoff, L. Cross and B. Desjardins,

The Chair called the meeting to order at 2:34 p.m.

1 APPROVAL OF THE AGENDA

MOVED by Director Lucas, **SECONDED** by Director Derman,
That the agenda and supplementary agenda be approved; and

That a Notice of Motion to be presented by Director Derman be added to the agenda under item 8 (New Business).

CARRIED

MOVED by Director Derman, **SECONDED** by Alternate Director Green,
That the late request to speak by C. Bannister (#19) be approved.

DEFEATED
Evans OPPOSED

2 ADOPTION OF MINUTES OF THE MEETING OF JUNE 15, 2011

MOVED by Lucas, **SECONDED** by Director Hancock,
That the minutes of the meeting of June 15, 2011 be adopted.

CARRIED

3 REPORT OF THE CHAIR

Chair Young acknowledged the passing of former Capital Regional District (CRD) Alternate Director Allan Cassidy, highlighting his service to the CRD Board from 1999–2002 and 2007, his role as a Royal and McPherson Theatre Society Board member, 2000–2004, and his involvement with the restoration of the Royal Theatre.

Directors Leonard and Ranns entered the meeting at 2:37 p.m.

4 PRESENTATIONS/DELEGATIONS

a) Canadian Association of Municipal Administrators (CAMA) 2011 Education Award – Bill Holtby

Bill Holtby, CAMA Board representative, recognized the CRD for its leadership in the education of its municipal employees because of the custom training program called iLead, developed in association with Royal Roads University (RRU), and presented the CRD with the 2011 National Municipal Education Award in the form of a plaque. Chair Young expressed appreciation on behalf of the CRD Board and thanked RRU for assisting in designing and implementing the iLead program.

b) Victoria Airport Authority 2010 Report to Nominators – Colin Smith, CRD Nominee and Geoff Dickson, President & CEO

Mr. Smith reported on the 2010 activities of the Victoria Airport Authority, using a PowerPoint presentation to illustrate main points, with the assistance of Mr. Dickson. He also provided an overview of the 2011 Capital Program.

c) Supplementary delegates

1. Ruby Commandeur re Item 5.3.1 – Director Lucas Motion re Biosolids—spoke in favour of the motion because of the toxicity of contaminants in biosolids, the pressures on the food supply due to climate change, how farmland is managed and the difficulty in regulating the use of biosolids on farmland. She urged the Board to think carefully on decisions about land use application of biosolids.
2. Marcie Zemluk re Item 5.3.1 – Director Lucas Motion re Biosolids—spoke about the legal liabilities in American case law and current cases before the Canadian courts on the issue of biosolids land application. She noted the importance of understanding the potential for contaminated sites, ongoing regulatory responsibility and liability for the Province and the CRD, and the hardship that an error in regulation or monitoring can have on farmland in the region.
3. Chloe Donatelli re Item 5.3.1 – Director Lucas Motion re Biosolids—Did not appear to speak when called.

Directors Cross and Mendum left the meeting at 3:10 p.m.

Director Mar excused himself from the meeting at 3:13 p.m., noting that he cannot be present to receive further input on the Peninsula Co-op development proposal as the public hearing has been held.

4. David Lawson re Item 5.8.1 – Response to Central Saanich Referral re Peninsula Co-op—spoke in favour of the response because the development proposal is inconsistent with the Central Saanich Official Community Plan (OCP) and the Regional Growth Strategy (RGS).

Director Desjardins left the meeting at 3:15 p.m.

5. Mike Achtem re Item 5.8.1 – Response to Central Saanich Referral re Peninsula Co-op—spoke in favour of the response because of economic impacts of concern related to the development proposal.
6. Jennifer Kay re Item 5.8.1 – Response to Central Saanich Referral re Peninsula Co-op—spoke in favour of the response because the development proposal is inconsistent with the OCP and the RGS.
7. Don & Shelly Bottrell re Item 5.8.1 – Response to Central Saanich Referral re Peninsula Co-op—spoke in favour of the response because the development proposal is inconsistent with the OCP.
8. Alexander Marr re Item 5.8.1 – Response to Central Saanich Referral re Peninsula Co-op—spoke in favour of the response because the development proposal is inconsistent with the RGS.

Director Hicks entered the meeting at 3:30 p.m.

9. David Wilson re Item 5.8.1 – Response to Central Saanich Referral re Peninsula Co-op—spoke in favour of the response because the development proposal is inconsistent with the OCP.
10. Tom Hall re Item 5.8.1 – Response to Central Saanich Referral re Peninsula Co-op—Did not appear to speak when called.
11. Michelle Passmore re Item 5.8.1 – Response to Central Saanich Referral re Peninsula Co-op—Did not appear to speak when called.
12. Hanne Kohout re Item 5.8.1 – Response to Central Saanich Referral re Peninsula Co-op—spoke in favour of the response because the development proposal is inconsistent with the RGS.
13. Carol Pickup re Item 5.8.1 – Response to Central Saanich Referral re Peninsula Co-op—withdrawn from agenda prior to the meeting.
14. Constance Christiansen re Item 5.8.1 – Response to Central Saanich Referral re Peninsula Co-op—Did not appear to speak when called.
15. Ryan Windsor re Item 5.8.1 – Response to Central Saanich Referral re Peninsula Co-op—spoke in favour of the response because the development proposal is inconsistent with the OCP and the RGS, and due to the importance of maintaining the integrity of the OCP and RGS.
16. Frances Pugh re Item 5.8.1 – Response to Central Saanich Referral re Peninsula Co-op—spoke in appreciation of the RGS and the response.
17. Jack Thornburg re Item 5.8.1 – Response to Central Saanich Referral re Peninsula Co-op—spoke of the interests of the larger community and the legacy to future generations in the thoughtful stewardship of land, air and water.
18. John Hannam re Item 5.8.1 – Response to Central Saanich Referral re Peninsula Co-op—spoke of stormwater management issues and inconsistencies with the OCP and the RGS.

Director Mar returned to the meeting at 3:45 p.m.
Directors Brownoff and Mendum left the meeting at 3:45 p.m.

5 REPORTS OF COMMITTEES

5.1 CORE AREA LIQUID WASTE MANAGEMENT COMMITTEE – June 29, 2011

1. Core Area Infrastructure Upgrade Projects for 2011

MOVED by Director Brice, **SECONDED** by Director Leonard,
That the CRD Board authorize proceeding with the infrastructure upgrading projects identified in Appendix A of the staff report, that costs be shared as outlined in Appendix B of the staff report, and that funding be provided by the trunk sewer reserve fund in the amount of $530,000.

CARRIED

5.2 ELECTORAL AREA SERVICES COMMITTEE – June 1, 2011

1. Galiano Island Community Use Building Service Establishment And Loan Authorization Bylaws

MOVED by Director Hancock, **SECONDED** by Director Hicks,
That a second referendum be held concurrently with the November 2011 BC civic election in order to confirm the proposed service area's position regarding the updated service establishment and loan authorization bylaws.

CARRIED

MOVED by Director Hancock, **SECONDED** by Director Hicks,
That Bylaw No. 3792, cited as "Galiano Island Community Use Building Service Establishment Bylaw No. 2, 2011", be introduced and read a first time and second time.

CARRIED

MOVED by Director Hancock, **SECONDED** by Director Hicks,
That Bylaw No. 3792 be read a third time.

CARRIED

Director Mendum returned to the meeting at 3:47 p.m.

MOVED by Director Hancock, **SECONDED** by Director Hicks,
That Bylaw No. 3793, cited as "Galiano Island Community Use Building Loan Authorization Bylaw No. 2, 2011", be introduced and read a first and second time.

CARRIED

MOVED by Director Hancock, **SECONDED** by Director Hicks,
That Bylaw No. 3793 be read a third time.

CARRIED

2. **Grants-In-Aid**

MOVED by Director Hancock, **SECONDED** by Director Hicks,
That the following grants-in-aid applications be approved for payment:

1. Juan de Fuca Grants-in-Aid as approved by Director Hicks
   a) Shirley Community Association $4,800
2. Salt Spring Island Grants-in-Aid as approved by Director Hendren
   a) Canadian Red Cross $5,014
3. Southern Gulf Islands Grants-in-Aid as approved by Director Hancock
   a) Mayne Island Integrated Water Systems Society $3,607
   b) Pender Community Transition Society $2,000
   c) Saturna Heritage Committee $2,000

CARRIED

5.3 ENVIRONMENTAL SUSTAINABILITY COMMITTEE – May 25, 2011

1. **Motion to Protect Local Farmland and to Harmonize Sewage Treatment Strategies within the CRD – Director Lucas**

MOVED by Director Lucas, **SECONDED** by Director Derman,
Whereas the CRD is committed to developing regional sewage treatment strategies that have the lowest impact on both the environment and public health, and the highest resource recovery potential;

And Whereas the Core Area Liquid Waste Management Committee has passed a motion banning the land application of biosolids in order to address legitimate public health and environmental concerns about the accumulation and dispersal of Polycyclic Aromatic Hydrocarbons, heavy metals, pharmaceuticals, and other Emerging Compounds of Concern (ECCs) on our land, in our food, and in the regional water table;

And Whereas protecting the "integrity of rural communities" and "regional green and blue spaces", and managing "natural resources and environmental sustainability" are important and explicit goals and responsibilities of the CRD as outlined in the Regional Growth Strategy (http://tinyurl.com/65wdd8p), and "improving population health and regional food security" are noted as Priority Actions in the Capital Region Food and Health Action Plan (http://tinyurl.com/4xetqbz);

Be it so moved that the CRD will harmonize current and long-term practices at all CRD-owned regional facilities and parks with the approved policies of the regional treatment strategy, including ending the production, storage and distribution of biosolids for land application at all CRD facilities and parks; and

Be it further moved that the CRD does not support the application of biosolids on farmland in the CRD under any circumstances, and let this policy be reflected in the upcoming Regional Sustainability Strategy.

MOVED by Director Hendren, **SECONDED** by Director Hancock,
That the motion **be amended** by adding the following:
"That it be further moved that the pasteurized, lime-stabilized Class A biosolids material produced at the Saanich Peninsula Wastewater Treatment Plant may be beneficially used by Hartland Landfill operations to replace chemical fertilizers as the soil amendment blended with soil and compost for use as the final cover material in the closure of Phase 2 Cell 1, in full compliance with all environmental and health regulations."

Concerns were raised that the amendment creates an exception and that other exemptions may need to be considered.

MOVED by Director Evans, **SECONDED** by Director Hill,
That the **amendment be referred** to the Environmental Sustainability Committee for consideration.

CARRIED

MOVED by Director Hendren, **SECONDED** by Director Hill,
That consideration of the main motion be postponed until the Environmental Sustainability Committee reports on exemptions.

DEFEATED
Hicks, Ranns, Evans, Seaton, Young, Brice, Causton and Wergeland IN FAVOUR

The question on the main motion was called. **CARRIED**
Evans, Seaton, Causton OPPOSED

Director Saunders left the meeting at 4:17 p.m.

5.4 ENVIRONMENTAL SUSTAINABILITY COMMITTEE – June 22, 2011

1. #EEP 11-44 Millstream Meadows 2011 Work Plan – Award of Project Management Consulting Contract

Director Causton and Alternate Director Green left the meeting at 4:19 p.m.

MOVED by Director Ranns, **SECONDED** by Director Derman,
That staff be directed to:
1) award a project management consulting contract to Golder Associates Ltd. at a cost of $265,000 excluding HST to implement the Stage 1 work;
2) undertake the design and tendering for the Stage 1 work; and
3) report to the Committee following completion of Stage 1 work.

CARRIED
Director Evans OPPOSED

5.5 FINANCE AND CORPORATE SERVICES COMMITTEE – July 6, 2011

1. Recreation Services and Facilities Fees and Charges 2011/2012

Director Causton and Alternate Director Green returned to the meeting at 4:20 p.m.

MOVED by Director Mar, **SECONDED** by Director Evans,
That Bylaw No. 3794, cited as "Capital Regional District Recreation Services and Facilities Fees and Charges Bylaw No. 1, 2009, Amendment Bylaw No. 2, 2011", be introduced and read a first and second time.

MOVED by Director Evans, **SECONDED** by Director Mar,
That consideration of Bylaw No. 3794, cited as "Capital Regional District Recreation Services and Facilities Fees and Charges Bylaw No. 1, 2009, Amendment Bylaw No. 2, 2011", **be postponed** until the SEAPARC Recreation Commission has reviewed the proposed fee changes.

CARRIED

2. Budget Direction for the Year 2012

MOVED by Director Causton, **SECONDED** by Director Evans,
That staff prepare the draft 2012 financial plan within the following guidelines:
1) no increase in service levels for existing services
2) new services only as previously approved by the Board
3) staff continue to explore innovative practices to absorb inflationary costs, benefits and utility/fuel costs within existing budgets as much as possible
4) the draft budget recognize provisions for new initiatives directly related to the Board's strategic priorities.

Staff noted that an interim budget report will be forwarded to the committee in October.

The question on the motion was called. **CARRIED**

5.6 JUAN DE FUCA LAND USE COMMITTEE – VOTING BLOCK A – June 21, 2011

1. Development Permit with Variance – DP-09-11 – Lot A, Section 74, Renfrew District, Plan VIP71883 (Lynge – 11237 West Coast Road)

MOVED by Director Hicks, **SECONDED** by Director Evans,
That the steep slopes, foreshore and marine shoreline and watercourses, wetlands and riparian areas development permit (DP-09-11) for Lot A, Section 74, Renfrew District, Plan VIP71883 and the request for:

a. Relaxation of the rear yard setback from 15m to 7.5m for the existing deck; and
b. Exemption from floodplain setback regulations of Part 5 of Bylaw No. 2040, as shown in Appendices 1 and 2, be approved subject to the following conditions:
   i. that the proposed development comply with the Steep Slope, Foreshore and Marine Shoreline and Watercourses, Wetlands and Riparian Areas Development Permit Guidelines outlined in the Shirley/Jordan River Official Community Plan, Bylaw No. 3352;

ii. that the driveway proposed to be constructed prior to subdivision comply with CRD Residential Driveway standards;
iii. that the proposed development comply with the recommendations outlined in the environmental report prepared by Brian Wilkes & Associates dated November 18, 2010; and
iv. that the geotechnical report prepared by Ryzuk Geotechnical dated December 15, 2010, as shown in Appendix 4, be recommended to be secured by the Approving Officer as a restrictive covenant as part of the subdivision process.

CARRIED

5.7 JUAN DE FUCA LAND USE COMMITTEE – VOTING BLOCK B – June 21, 2011

1. Development Permit with Variance – DP-08-11 – Block 352, Malahat District, Except Part in VIP84067 and Block 399 Malahat District (Isis Land Corporation/Hawes)

MOVED by Director Hicks, **SECONDED** by Director Mar,
That the steep slope and foreshore, wetland and riparian development permit (DP-08-11) for Block 352, Malahat District, Except Part in VIP84067 and Block 399 Malahat District District, and the request for an exemption of Section 944 of the Local Government Act to relax the requirement that the minimum frontage of a lot shall be one tenth of the perimeter of the lot that fronts on the highway, for the purposes of permitting a 86-lot subdivision, be approved subject to the following conditions:

a. That the proposed subdivision and development comply with the Development Permit Guidelines in the Malahat Official Community Plan, Bylaw No. 3228; and
b. That the geological reports prepared by Thurber Engineering Ltd. dated October 18, 2010, and April 18, 2011 as shown in Appendix 3, be secured by restrictive covenant as part of the building permit process; and
c. That the report prepared by PA Harder and Associates Ltd. dated March 31, 2011, be secured by restrictive covenant as part of the building permit process; and
d. That the applicant register a Statutory Right of Way to provide access to Regional Parks for access to and construction of the portion Trans Canada Trail through the property as shown on Appendix 2.

CARRIED
Leonard and Mendum OPPOSED

5.8 PLANNING, TRANSPORTATION AND PROTECTIVE SERVICES COMMITTEE – June 22, 2011

Director Hicks left the meeting at 4:45 p.m.

Staff reported on legal opinion about the potential for conflict of interest in regard to Directors and Co-op membership. Upon advice to Directors to seek legal advice or make their own decision on whether they have a conflict, it was determined there would not be quorum to hear the item.

MOVED by Director Fortin, **SECONDED** by Director Lucas,
That consideration of the agenda item "Response to Central Saanich Referral re Peninsula Co-op" be postponed until the next meeting to give Directors that are members of the Peninsula Co-op an opportunity to determine whether they have a conflict of interest.

CARRIED

Staff was requested to circulate the legal opinion prepared by Staples McDannold Stewart.

Staff was asked to close the item to further delegations, since it was a postponement on procedural grounds rather than for the addition of new information.

5.9 REGIONAL PARKS COMMITTEE – June 15, 2011

1. E&N Rail Trail Project – Intersection Improvements Esquimalt Road to Admirals/Colville

MOVED by Director Causton, **SECONDED** by Director Hill,
That the single source procurement of rail infrastructure improvements be approved for five intersections and one pedestrian crossing in the amount of $1,672,200 (not including HST) as per the letters from SVI dated May 17, 2011.

CARRIED

MOVED by Director Causton, **SECONDED** by Director Mar,
That commencement of the expenditure is conditional upon confirmation by the provincial and federal governments that they will financially support active use of the E&N rail line.

CARRIED

MOVED by Director Causton, **SECONDED** by Director Evans,
That this motion be included in the Board Chair's letters to the Minister of Transportation and Infrastructure and the federal government regarding rail investment.

CARRIED

2. Elk/Beaver Lake Recreational Use Advisory Group Revised Terms of Reference

MOVED by Director Evans, **SECONDED** by Director Lucas,
That the revised Terms of Reference for the Elk/Beaver Lake Recreational Use Advisory Group be approved.

CARRIED

6 ADMINISTRATION REPORTS

6.1 2011 GENERAL LOCAL ELECTION – APPOINTMENT OF CHIEF ELECTION OFFICER AND DEPUTY CHIEF ELECTION OFFICER – ELECTORAL AREA DIRECTORS

MOVED by Director Evans, **SECONDED** by Director Lucas,

1) That pursuant to Section 41 of the Local Government Act, Thomas F. Moore be appointed Chief Election Officer with the power to appoint such other assistance as may be required for the administration and conduct of the 2011 General Local Election of the Capital Regional District Electoral Area Directors; and

2) That Sonia Santarossa, Sheila Norton, Kerry Fedosenko, Mary Cooper and Anthony Kennedy be appointed Deputy Chief Election Officers

CARRIED

6.2 EXTENSION TO THE CONTRACT WITH LANGFORD FOR CALL RELAY SERVICES

MOVED by Director Seaton, **SECONDED** by Director Evans,
That an extension of the Call Relay Contract with the City of Langford from August 1, 2011 to May 31, 2012 in the amount of $364,574 be approved.

CARRIED

7 BYLAWS AND RESOLUTIONS

7.1 BYLAW NO. 3784, "SOUTHERN GULF ISLANDS ELECTORAL AREA FALSE ALARM REDUCTION BYLAW NO. 1, 2011"

MOVED by Director Hancock, **SECONDED** by Director Evans,
That Bylaw No. 3784 "Southern Gulf Islands Electoral Area False Alarm Reduction Bylaw No. 1, 2011" be adopted.

CARRIED

7.2 BYLAW NO. 3785, "ANIMAL REGULATION AND IMPOUNDING BYLAW NO. 1, 1986, AMENDMENT BYLAW NO. 8, 2011"

MOVED by Director Hancock, **SECONDED** by Director Evans,
That Bylaw No. 3785 "Animal Regulation and Impounding Bylaw No. 1, 1986, Amendment Bylaw No. 8, 2011" be adopted.

CARRIED

8 NEW BUSINESS

8.1 2011 GENERAL LOCAL ELECTION – APPOINTMENT OF CHIEF ELECTION OFFICER AND DEPUTY CHIEF ELECTION OFFICER (ISLANDS TRUST) & ISLANDS TRUST 2011 ELECTION SERVICES AGREEMENT

MOVED by Director Evans, **SECONDED** by Director Leonard,

a) That the Islands Trust 2011 Election Services Agreement between the CRD and the Islands Trust Council be approved and authorized for execution; and
b) That pursuant to Section 41 of the Local Government Act, Thomas F. Moore be appointed Chief Election Officer with the power to appoint such other assistance as may be required for the administration and conduct of the 2011 General Local Election of Island Trustees; and
c) That Sonia Santarossa, Sheila Norton, Kerry Fedosenko, Mary Cooper and Anthony Kennedy be appointed Deputy Chief Election Officers.

CARRIED

8.2 NOTICE OF MOTION – VIC DERMAN – MARINE TRAIL HOLDINGS

Director Derman gave notice of his intention to propose the following motion at the August Board meeting:

That the Board of the Capital Regional District determines that the Marine Trail Holdings Ltd. Rezoning application to build 257cabins, 6 caretaker residences, a resort lodge and two recreation centres in the Juan de Fuca Rural Resource lands is inconsistent with the Regional Growth Strategy and therefore shall not be permitted to proceed.

9 MOTION TO MOVE IN CAMERA

MOVED by Director Hill, **SECONDED** by Director Derman,
That the Board close the meeting and move in camera in accordance with the Community Charter, Part 4, Division 3, 90(1)(a) personal information about an identifiable individual who is being considered for a position appointed by the Board; (i) the receipt of advice that is subject to solicitor-client privilege, including communications necessary for that purpose.

CARRIED

The Board convened the in camera portion of the meeting at 5:00 p.m. and resumed in open meeting at 5:32 p.m. to rise and report.

10 RISE AND REPORT

- **Water Treatment Upgrade Project**
  That payment is authorized to Ridgeline Mechanical Ltd. in the amount of $190,000 from the Highland and Fernwood Water Treatment Upgrade Project funds to settle a claim related to CRD Contract No. 09-1645.

- **Appointment to Juan de Fuca Economic Development Commission**
  Ken Douch was appointed.

- **Appointment to Port Renfrew Utility Services Committee**
  Dorothy Hunt was appointed.

11 ADJOURNMENT

MOVED by Director Hill, **SECONDED** by Director Derman,
That the meeting be adjourned at 5:35 p.m.

CARRIED

CERTIFIED CORRECT:

CHAIR **CORPORATE OFFICER**

Appendix C

CRD Board Minutes Land Application

February 15, 2023

625 Fisgard St.,
Victoria, BC V8W 1R7

Capital Regional District

Notice of Meeting and Meeting Agenda
Environmental Services Committee

Wednesday, February 15, 2023 **1:30 PM** **6th Floor Boardroom**
625 Fisgard St.
Victoria, BC V8W 1R7

B. Desjardins (Chair), S. Tobias (Vice Chair), J. Brownoff, J. Caradonna, G. Holman, D. Kobayashi, D. Murdock, M. Tait, D. Thompson, A. Wickheim, C. Plant (Board Chair, ex-officio)

The Capital Regional District strives to be a place where inclusion is paramount and all people are treated with dignity. We pledge to make our meetings a place where all feel welcome and respected.

1. Territorial Acknowledgement

2. Approval of Agenda

3. Adoption of Minutes

3.1. 23-156 Minutes of the January 18, 2023 Environmental Services Committee Meeting

Recommendation: That the minutes of the Environmental Services Committee meeting of January 18, 2023 be adopted as circulated.

Attachments: Minutes - January 18, 2023

4. Chair's Remarks

5. Presentations/Delegations

The public are welcome to attend CRD Board meetings in-person.

Delegations will have the option to participate electronically. Please complete the online application at www.crd.bc.ca/address no later than 4:30 pm two days before the meeting and staff will respond with details.

Alternatively, you may email your comments on an agenda item to the CRD Board at crdboard@crd.bc.ca.

5.1. 23-166 Delegation - Dave Cowen; Representing Peninsula Biosolids Coalition: Re: Agenda Item 7.1.: Motion with Notice: Healthy Waters Project for Tod Creek on the Saanich Peninsula (Director Caradonna)

6. Committee Business

6.1. 23-103 2022 Solid Waste Stream Composition Study Results

Recommendation: There is no recommendation. This report is for information only.

Attachments: Staff Report: 2022 Solid Waste Stream Composition Study Results

Appendix A: CRD 2022 Solid Waste Stream Composition Study - Tetra Tech

6.2. 23-130 Recycle BC - Packaging and Printed Paper Product, Extended Producer Responsibility - Draft Program Plan

Recommendation: There is no recommendation. This report is for information only.

Attachments: Staff Report: Recycle BC - Packaging & Paper, EPR - Draft Program Plan

Appendix A: Cont'd Participation in EA Depot Recycling - SR - Feb 7/18

Appendix B: Depot Impacts Analysis

Appendix C: Consultation Feedback Ltr to Recycle BC from CRD (Jan 3/23)

6.3. 23-131 Central Saanich Request for CRD Carbon-based Budget Policy

Recommendation: The Environmental Services Committee recommends to the Capital Regional District Board:
That the CRD not adopt a policy of carbon budgeting as part of its budget cycle but continue to monitor progress in carbon budget methodologies and implications on CRD financial planning processes and share learnings with local governments through the CRD Inter-Municipal Working Group and Task Force, as appropriate.

Attachments: Staff Report: Central Saanich Request for CRD Carbon-based Budget Policy

Appendix A: Central Saanich Letter to CRD Board - November 8, 2022

Appendix B: Summary and History of Carbon Budgeting

6.4. 23-138 Bylaw No. 2922 - Sewer Use Bylaw Amendments

Recommendation: The Environmental Services Committee recommends to the Capital Regional District Board:
1. That Bylaw No. 4530, "Capital Regional District Sewer Use Bylaw No. 5, 2001, Amendment Bylaw No. 7, 2023", be introduced and read a first, second, and third time; and
2. That Bylaw No. 4530 be adopted.
3. That Bylaw No. 4531, "Capital Regional District Ticket Information Authorization Bylaw 1990, Amendment Bylaw No. 75, 2023", be introduced and read a first, second, and third time; and
4. That Bylaw No. 4531 be adopted.

Attachments: Staff Report: Bylaw No. 2922 - Sewer Use Bylaw Amendments

Appendix A: Bylaw No. 2922 - Unofficial Consolidated Bylaw with Amendments

Appendix B: Bylaw No. 4530

Appendix C: Bylaw No. 4531

7. Motions with Notice

7.1. 23-154 Motion with Notice: Healthy Waters Project for Tod Creek on the Saanich Peninsula (Director Caradonna)

Recommendation: That the Healthy Waters project proposal for Tod Creek watershed be referred to staff to report back, by end of March or within the span of two committee meetings, on project implications including resources, service mandate, and regulatory framework.

Attachments: Motion with Notice: Healthy Waters Project for Tod Creek

8. New Business

9. Adjournment

The next meeting is March 29, 2023 at 9:30 am (Special).

To ensure quorum, please advise Jessica Dorman (jdorman@crd.bc.ca) if you or your alternate cannot attend.

625 Fisgard St.,
Victoria, BC V8W 1R7

Capital Regional District

Meeting Minutes

Environmental Services Committee

Wednesday, January 18, 2023 **1:30 PM** **6th Floor Boardroom 625 Fisgard St. Victoria, BC V8W 1R7**

PRESENT
Directors: B. Desjardins (Chair), S. Tobias (Vice Chair), J. Brownoff, J. Caradonna, G. Holman (EP), D. Kobayashi, D. Murdock, M. Tait, D. Thompson

Staff: T. Robbins, Chief Administrative Officer; L. Hutcheson, General Manager, Parks and Environmental Services; G. Harris, Senior Manager, Environmental Protection; S. May, Senior Manager, Environmental Engineering; M. Lagoa, Deputy Corporate Officer; J. Dorman, Committee Clerk (Recorder)

EP - Electronic Participation

Regrets: Director(s) C. Plant, A. Wickheim

The meeting was called to order at 1:30 pm.

1. Territorial Acknowledgement

Vice Chair Tobias provided a Territorial Acknowledgement.

2. Approval of Agenda

MOVED by Director Caradonna, SECONDED by Director Kobayashi,
That the agenda for the January 18, 2023 Environmental Services Committee meeting be approved.
CARRIED

3. Adoption of Minutes

3.1. 23-065 Minutes of the June 15, 2022 and the minutes of the September 28, 2022 Environmental Services Committee Meeting.

MOVED by Director Tait, SECONDED by Director Murdock,
That the minutes of the Environmental Services Committee meeting of June 15, 2022 and September 28, 2022 be adopted as circulated.
CARRIED

4. Chair's Remarks

I am pleased to continue as the Chair of the Environmental Services Committee and looking forward to working with all of the committee members. We are in exciting times within the mandate and work of the Environmental Services Committee, we are on critical paths towards solutions for solid resources whether they be biosolids, wood solid, or organic resources. We are also coming through the pandemic time, where Hartland received a significant per capita increase, and that adds more pressure to make good decisions and set direction going forward. We need some good decision making for critical movement forward for our climate and solid waste targets.

5. Presentations/Delegations

There were no presentations.

5.1. 23-068 Delegation - Daniel Kenway; Representing Willis Point Community Association: Re: Agenda Item 6.3.: Evaluation of Passing Lane on Willis Point Road

D. Kenway spoke to item 6.3.

5.2. 23-071 Delegation - Philippe Lucas; Representing Biosolid Free BC: Re: Agenda Item 6.2.: Biosolids Short-term Contingency Beneficial Use Plan

P. Lucas spoke to Item 6.2.

5.3. 23-072 Delegation - Hugh Stephens; Representing Peninsula Biosolids Coalition: Re: Agenda Item 6.2.: Biosolids Short-term Contingency Beneficial Use Plan

H. Stephens spoke to Item 6.2.

6. Committee Business

6.1. 23-044 2023 Environmental Services Committee Terms of Reference

L. Hutcheson presented 6.1. for information.

Discussion ensued on clarification of corporate and community climate action.

There is no recommendation. This report is for information only.

6.2. **23-052** Biosolids Short-term Contingency Beneficial Use Plan

G. Harris spoke to Item 6.2.

Discussion ensued on the following:
- water quality testing and monitoring
- thermal process pilot studies and established programs
- consultation and engagement processes
- chemicals and contaminants testing
- contingency planning related to operational changes
- shipping and additional costs
- associated risks of the service
- land application in other jurisdictions
- regulatory process
- gasification or composting possibilities

MOVED by Director Holman, SECONDED by Director Tait,
That the Environmental Services Committee recommends to the Capital Regional District Board:
1. That the Capital Regional District (CRD) Board amend its policy to allow non-agricultural land application of biosolids as a short-term contingency alternative;
and
2. That staff be directed to update the CRD's short-term biosolids contingency plan correspondingly.
DEFEATED
OPPOSED: Caradonna, Desjardins, Kobayashi, Thompson, Tobias

MOVED by Director Caradonna, SECONDED by Director Thompson,
That we move to direct staff to look at alternative options and maintain the status quo for now.
CARRIED
OPPOSED: Brownoff, Holman, Murdock, Tait

6.3. 23-009 Evaluation of Passing Lane on Willis Point Road

S. May presented Item 6.3. for information.

Discussion ensued on the following:
- existing turn lanes off of Willis Point road
- jurisdiction and authority of road
- cost of passing lane

There is no recommendation. This report is for information only.

7. Notice(s) of Motion

Appendix D

CRD Board Minutes On-Site Thermal RFP

March 29, 2023

Capital Regional District

625 Fisgard St.,
Victoria, BC V8W 1R7

Meeting Minutes

Environmental Services Committee

Wednesday, March 29, 2023 | **9:30 AM** | **6th Floor Boardroom, 625 Fisgard St., Victoria, BC V8W 1R7**

Special Meeting

PRESENT
Directors: B. Desjardins (Chair), S. Tobias (Vice Chair), J. Brownoff, J. Caradonna, G. Holman (9:33 am) (EP), D. Kobayashi (EP), D. Murdock, M. Tait (9:43 am) (EP), D. Thompson (9:51 am) (EP), A. Wickheim, C. Plant (Board Chair, ex-officio)

Staff: T. Robbins, Chief Administrative Officer; L. Hutcheson, General Manager, Parks and Environmental Services; G. Harris, Senior Manager, Environmental Protection; R. Smith, Senior Manager, Environmental Resource Management; N. Elliott, Climate Action Program Coordinator, Environmental Protection; L. Ferris, Manager, Policy & Planning, Environmental Resource Management; M. Lagoa, Deputy Corporate Officer; J. Dorman, Committee Clerk (Recorder)

EP - Electronic Participation

The meeting was called to order at 9:30 am.

1. Territorial Acknowledgement

Vice Chair Tobias provided a Territorial Acknowledgement.

2. Approval of Agenda

MOVED by Director Caradonna, SECONDED by Director Wickheim,
That the agenda for the March 29, 2023 Environmental Services Committee meeting be approved.
CARRIED

3. Presentations/Delegations

3.1. 23-258 Delegation - Philippe Lucas; Representing Biosolid Free BC: Re: Agenda Item 4.1.: Long-term Biosolids Planning and Biosolids Thermal Plan Updates

P. Lucas spoke to Item 4.1.

3.2. 23-259 Delegation - Jonathan O'Riordan; Representing Peninsula Biosolids Coalition: Re: Agenda Item 4.1.: Long-term Biosolids Planning and Biosolids Thermal Plan Updates

J. O'Riordan spoke to Item 4.1.

4. Special Meeting Matters

4.1. 23-253 Long-term Biosolids Planning and Biosolids Thermal Plan Updates

L. Hutcheson spoke to Item 4.1.

Discussion ensued on the following:
- gasification and thermal processing of biosolids in North America
- international participation in RFP
- co-processing of municipal waste streams
- pyrolysis pilot study in Kelowna and pilot study in Esquimalt
- resource recovery and potential innovation grants
- funding for thermal processing pilot studies
- potential collaboration with other regional districts
- air quality and differentiating technologies
- timelines for consolidation, proposal call, and long term plan

Director Tait joined the meeting at 9:43 am.

Director Thompson joined the meeting at 9:51 am.

Director Murdock left the meeting at 9:53 am.

MOVED by Director Caradonna, SECONDED by Director Tobias,
The Environmental Services Committee recommends to the Capital Regional District Board:
1. That staff develop a consultation plan for long-term biosolids management for the July Environmental Services Committee meeting, to be implemented in the fall of 2023; and
2. That staff concurrently initiate a Request for Proposals process for a biosolids advanced thermal site trial.

Director Murdock returned to the meeting at 10:05 am.

Director Tait left the meeting at 10:16 am.

MOVED by Director Caradonna, SECONDED by Director Plant,
That the following words be added following" site trial"; “and that the RFP be scoped broadly to include potential for co-processing of municipal solid waste streams, and that submissions be welcomed from both domestic and international vendors”.
CARRIED

The question was called on the main motion as amended.
The Environmental Services Committee recommends to the Capital Regional District Board:
1. That staff develop a consultation plan for long-term biosolids management for the July Environmental Services Committee meeting, to be implemented in the fall of 2023; and
2. That staff concurrently initiate a Request for Proposals process for a biosolids advanced thermal site trial; and that the RFP be scoped broadly to include potential for co-processing of municipal solid waste streams, and that submissions be welcomed from both domestic and international vendors.
CARRIED

4.2. 23-239 Capital Regional District Climate Action Inter-Municipal Task Force

N. Elliott spoke to Item 4.2.

MOVED by Director Brownoff, SECONDED by Director Caradonna,
The Environmental Services Committee recommends to the Capital Regional District Board:
That the Terms of Reference for the Climate Action Inter-Municipal Task force, attached as Appendix A, be approved.
CARRIED

4.3. 23-131 Central Saanich Request for CRD Carbon-based Budget Policy

N. Elliott spoke to Item 4.3

Discussion ensued on the participants and outcomes of the workshop.

Motion Arising:
MOVED by Director Caradonna, SECONDED by Director Plant,
The Environmental Services Committee recommends to the Capital Regional District Board:
That CRD staff host a workshop on the concept of carbon budgeting with municipal and electoral area staff and elected officials.
CARRIED
OPPOSED: Holman

4.4. 23-236 Solid Waste Advisory Committee Motions of March 3, 2023

R. Smith presented Item 4.4. for information.

Discussion ensued on the following:
- organics processing and composting within the region
- current mandates on collection
- waste composition study
- Compost Education Centre

MOVED by Director Plant, SECONDED by Director Caradonna,
The Environmental Services Committee recommends to the Capital Regional District Board:
That staff be directed to explore mandatory curbside organics collection from the municipalities around the region.
CARRIED

4.5. 23-241 Previous Minutes of Other CRD Committees and Commissions for Information

The following minutes were received for information:
a) Climate Action Inter-Municipal Task Force - March 2, 2023
b) Solid Waste Advisory Committee Minutes - February 3 and March 3, 2023

5. Adjournment

MOVED by Director Murdock, SECONDED by Director Tobias,
That the March 29, 2023 Environmental Services Committee meeting be adjourned at 10:58 am.
CARRIED

____
CHAIR

____
RECORDER

Appendix E

CRD Class A Biosolids SDS

SAFETY DATA SHEET
Dried, Pelletized, Class A biosolids
(From the CRD Residuals Treatment Facility)

SECTION 1 – IDENTIFICATION

Material Name:	Biosolids from wastewater treatment
Other Designations:	RTF Biosolids, Class A Biosolids
Source:	CRD Residuals Treatment Facility, Saanich, BC
Product Use:	RTF biosolids are currently used at Hartland as a soil amendment (fertilizer) product after mixing with other carbon and nitrogen sources (wood waste/sand/soil). Off site, biosolids are used as an alternative fuel.

SECTION 2 – HAZARD IDENTIFICATION

DANGER: Biosolids may pose a flammability/explosion risk if handled contrary to safety procedures. See Section 16.

Hazard Statements:	Combustible solid – do not expose to moisture/precipitation (exothermic reaction) Combustible dust – dust dispersed in sufficient concentrations in confined spaces, or enclosed areas, may create an explosion hazard in the presence of ignition sources May cause respiratory irritation (dust) May cause eye irritation (dust) Symptoms may be delayed
Precautionary Statements:	No smoking, open flame, sources of heat or ignition. Do not expose to water/moisture unless the material is being blended/mixed with inert material. Do not store as a raw product in large piles for longer than 24 hours. Prompt mixing with inert material recommended.
Other Hazards:	Lung/eye irritant (dust)

SECTION 3 – COMPOSITION

Wastewater biosolids are regulated for use under the BC Organic Matter Recycling Regulation. At Hartland, biosolids are blended with sand, soil and wood waste into a biosolids growing medium (BGM) product and applied as a soil amendment for closure areas, or further blended and applied to open areas for landfill gas mitigation.

Biosolids are a brown/grey granular solids consisting of dried wastewater residuals from the CRD's tertiary wastewater treatment plant (McLoughlin Point). Please refer to Appendix 1 for lab results.

SECTION 4 – FIRST AID MEASURES

Inhalation:	Remove to fresh air. Check for clear airway, breathing, and presence of pulse. Provide cardiopulmonary resuscitation for person without pulse or respirations. Remove victim to fresh air, if safe to do so. Keep at rest and comfortably warm. Seek medical attention.
Skin Contact:	Wash with soap and water
Eye Contact:	Dust may cause eye irritation. Relocate to fresh air and flush with clean water.
Ingestion:	Not an expected route of exposure. If necessary, consult with a physician.

SECTION 5 – FIRE FIGHTING MEASURES

Call fire department immediately and follow site-specific fire safety/response procedures. Do not attempt to extinguish fire.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Avoid exposure to dust. Reload material into containment vessel/bin. Do not allow product to enter surface watercourses.

SECTION 7 – HANDLING AND STORAGE

Safe Storage:	Short-term (<24 hours) Store in cool, well-ventilated place. Do not store raw biosolids in ambient air, or expose to precipitation for more than 24 hours. For longer-term storage, store under controlled conditions in oxygen- reduced/free environment with inert gas (e.g. nitrogen or carbon dioxide blanket).
Safe Handling:	Wear full- or half-face respiratory (P100) protection when disturbing material. Avoid dust generation in enclosed areas/buildings.

SECTION 8 – EXPOSURE CONTROLS AND PERSONAL PROTECTION

Permissible Exposure Limits:	WorkSafeBC limit for Particles (Insoluble or Poorly Soluble) Not Otherwise Classified (PNOC) – 10 mg/m^3 8-hour average for total dust; and 3 mg/m^3 8-hour average for the respirable portion.
PPE:	Always wear chemical-/liquid-resistant gloves (butyl rubber, natural latex, nitrile rubber) and protective eyewear (goggles) when working around biosolids. Standard protective clothing is required at the landfill (follow all site PPE requirements – high visibility gear, steel-toed boots).
Respiratory Protection:	Use half- or full-face respirator equipped with P100 particulate filter when working in areas that have the potential to exceed WorkSafeBC thresholds.

Ensure adequate ventilation when disturbing the material.

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Physical State	solid (<10% total moisture)
Appearance	granular/pelletized, soil-like
Colour	brown
Odour	earthy, musty, compost
Odour Threshold	not applicable
Combustion/Explosion	See Section 10

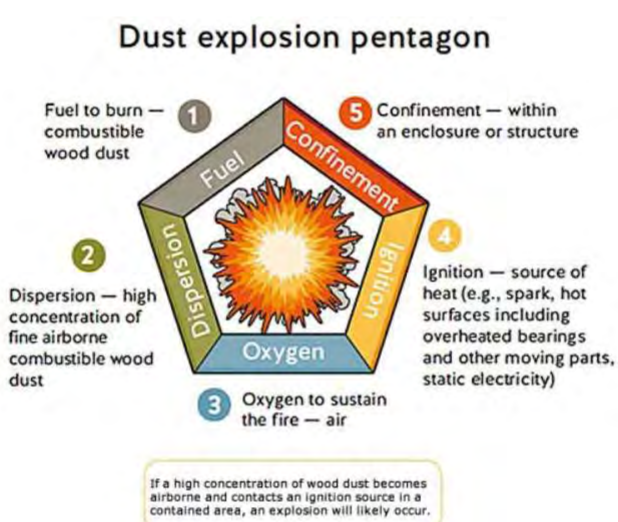
SECTION 10 – STABILITY AND REACTIVITY

Combustion:	Dried biosolids undergo slow exothermic oxidation in the presence of oxygen and water/moisture and can undergo combustion. Avoid prolonged exposure to ambient air and moisture in raw form.
Explosivity:	Explosibility testing was completed for the biosolids and results are provided below. At moisture contents less than 10%, the material is explosive as a dust cloud. This is similar to other operations that manage materials that create dust (e.g., flour/grain processing, sawmills, etc.).

Sample	Moisture content (wt.%)	Concentration (g/m^3)	Explosible
Biosolid dust	5.0	1000	Yes
Biosolid dust	10.0	1000	Yes
Biosolid dust	15.0	2000	No
Biosolid dust	20.0	2000	No

WorkSafeBC indicates: “many dusts are combustible, which means they can catch fire and burn. When fine dust particles catch fire while they’re suspended in the air, known as deflagration, fire can spread rapidly and sometimes leads to an explosion”.

When dust is exposed to enough heat or even a spark, it can ignite. When airborne dust is near a fire, it often results in an explosion. For an explosion to occur, the following five factors must be present.



SECTION 11 – TOXILOGICAL INFORMATION

Routes Of Exposure:	Inhalation, ingestion, skin and eye contact
Immediate Effects:	May cause irritation to skin or mucous membranes
Toxicity:	No acute toxicity

SECTION 12 – ECOLOGICAL INFORMATION

Aquatic Toxicity:	No additional information on aquatic toxicity available.
Additional Ecological Information:	Do not allow biosolids to enter watercourses. Product will cause harm to aquatic organisms (suspended solids/asphyxiation).

SECTION 13 – DISPOSAL CONSIDERATIONS

Do not landfill material (prohibited under provincially approved management plan).

SECTION 14 – TRANSPORT INFORMATION

UN Classification:	Non-regulated material
Other Transport Considerations:	Loads transported long distances (outside of Hartland) require a nitrogen or non-reactive gas blanket (oxygen free).

SECTION 15 – REGULATORY INFORMATION

BC Hazardous Waste Regulation:	Not a Hazardous Waste
Other Regulations:	Management and use of product is regulated under the BC Organic Matter Recycling Regulation.

SECTION 16 – OTHER INFORMATION

None.

APPENDIX 1 – BIOSOLIDS LAB DATA

Summary statistics: RTF biosolids, February 3 to April 26, 2021.

Substance	OMRR Limit * (mg/kg)	Biosolids Samples **		
		Avg ***	Min	Max
Arsenic (As)	75	2.4	1.7	3.7
Cadmium (Cd)	20	1.4	1.1	1.9
Chromium (Cr)	1060	33.2	26.4	45.2
Cobalt (Co)	151	3.0	2.3	3.9
Copper (Cu)	757	744	591	880
Mercury (Hg)	5	0.6	0.4	1.0
Molybdenum (Mo)	20	6.2	4.8	7.7
Nickel (Ni)	181	17.6	13.0	28.7
Lead (Pb)	505	31.5	25.0	39.0
Selenium (Se)	14	3.6	2.0	4.6
Thallium (Tl)	5	0.08	0.0	<0.5
Vanadium (V)	656	20.7	13.3	33.0
Zinc (Zn)	1868	713	576	826

Solids	n/a	96.9%	94.4%	98.4%
Chlorine	n/a	0.066%	0.061%	0.072%
Iron (Fe)	n/a	29363	23000	35100
Fecal Coliforms	n/a	1.9 MPN/g	<3.0 MPN/g	3.5 MPN/g
Acidity	n/a	5.7 pH	5.6 pH	5.8 pH

Note:
- Mercury: 11 samples.
- Arsenic, Cadmium, Chromium, Cobalt, Copper, Molybdenum, Nickel, Lead, Selenium, Thallium, Vanadium and Zinc: 10 samples.
- Solids and Iron: 8 samples.
- Fecal coliforms: 5 samples.
- Chlorine and pH: 2 samples.
** Based on a 4,400 kg/ha/year application rate.*
*** Values in mg/kg unless otherwise noted. Samples taken from February 3 to April 26, 2021.*
**** Values below the detection limit were replaced with values half the detection limit.*

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The Power of Commitment

Biosolids

Class A Biosolids Analysis
April 2024

Making a difference...together

Biosolids Beneficial Use Strategy

Biosolids Analysis

During the wastewater treatment process, residual solids are removed from wastewater and conveyed to the Residuals Treatment Facility for further treatment. The residual solids undergo anaerobic digestion in which microorganisms break down biodegradable material in the absence of oxygen and produce biogas. The residual solids are then dewatered and heated at a very high temperature to create Class A biosolids.

In 2022, in support of the biosolids management program under our core area wastewater service, the CRD collected and submitted samples of Class A biosolids being produced at the Residual Treatment Facility for high resolution analysis of a wide range of contaminants, including emerging contaminants of concern.

The classes of contaminants include:

- Pesticides
- Dioxins
- Polybrominated diphenyl ethers (PBDEs)
- Polychlorinated Biphenyls (PCBs)
- Pharmaceuticals and Personal Care Products (PPCPs)
- Per and poly fluorinated alkyl substances (PFAS)
- Volatile and Semi-volatile Organic Compounds (VOCs and SVOCs)

The results indicate low, detectable concentrations of several contaminants, typical of low-industrialized urban communities.

Note: there are no standards for these compounds in the BC Organic Matter Recycling Regulation. These compounds are considered in the provincial and federal regulatory frameworks but standards have not been developed at this time. The provincial government reviews available scientific information and updates the regulations on a regular basis.

Table 1: Pharmaceuticals and Personal Care Products (PPCP)

Parameter	Units	CRD Biosolids-2022-10-28	CRD Biosolids-2022-11-23
		28/10/2022	23/11/2022
Bisphenol A	ng/g	1820	1740
Furosemide	ng/g	30.1	26.8
Gemfibrozil	ng/g	8.50	5.16
Glipizide	ng/g	ND	ND
Glyburidea	ng/g	ND	ND
Hydrochlorothiazide	ng/g	ND	ND
2-Hydroxy-ibuprofen	ng/g	ND	78.7
Ibuprofen	ng/g	103	278
Naproxen	ng/g	16.8	12.9
Triclocarban	ng/g	161	151
Triclosan	ng/g	1870	1300
Warfarin	ng/g	ND	ND
Acetaminophen	ng/g	106	74.6
Azithromycin	ng/g	280	224
Caffeine	ng/g	64.4	44.6
Carbadox	ng/g	9.83	ND
Carbamazepine	ng/g	162	194
Cefotaxime	ng/g	ND	ND
Ciprofloxacin	ng/g	3030	2610
Clarithromycin	ng/g	14.0	19.5
Clinafloxacin	ng/g	ND	3.74
Cloxacillin	ng/g	ND	ND
Dehydronifedipine	ng/g	ND	ND
Diphenhydramine	ng/g	1890	1670
Diltiazem	ng/g	5.45	4.71
Digoxin	ng/g	ND	ND
Digoxigenin	ng/g	ND	ND
Enrofloxacin	ng/g	12.4	7.89
Erythromycin-H2O	ng/g	ND	ND
Flumequine	ng/g	ND	ND
Fluoxetine	ng/g	480	438
Lincomycin	ng/g	16.1	15.7
Lomefloxacin	ng/g	ND	ND
Miconazole	ng/g	561	400
Norfloxacin	ng/g	84.1	70.1
Norgestimate	ng/g	ND	ND
Ofloxacin	ng/g	315	274
Ormetoprim	ng/g	ND	ND
Oxacillin	ng/g	ND	ND
Oxolinic Acid	ng/g	ND	ND
Penicillin G	ng/g	ND	ND
Penicillin V	ng/g	ND	ND
Roxithromycin	ng/g	6.29	8.60
Sarafloxacin	ng/g	ND	ND
Sulfachloropyridazine	ng/g	ND	ND
Sulfadiazine	ng/g	ND	ND
Sulfadimethoxine	ng/g	ND	ND
Sulfamerazine	ng/g	ND	ND
Sulfamethazine	ng/g	ND	ND
Sulfamethizole	ng/g	13.7	ND
Sulfamethoxazole	ng/g	ND	ND
Sulfanilamide	ng/g	32.2	31.9
Sulfathiazole	ng/g	ND	ND
Thiabendazole	ng/g	44.5	32.8
Trimethoprim	ng/g	1.70	1.65
Tylosin	ng/g	ND	ND
Virginiamycin M1	ng/g	ND	ND
1,7-Dimethylxanthine	ng/g	99.4	75.5
ND - Below detection limit			

Table 2: Per- and polyfluoroalkyl substances (PFAS)

Parameter	Units	CRD Biosolids-2022-10-28	CRD Biosolids-2022-11-23
		28/10/2022	23/11/2022
11C1-PF3OUdS	ng/g	ND	ND
3:3 FTCA	ng/g	ND	ND
4:2 FTS	ng/g	ND	ND
5:3 FTCA	ng/g	26.0	26.4
6:2 FTS	ng/g	ND	ND
7:3 FTCA	ng/g	15.6	17.0
8:2 FTS	ng/g	ND	ND
9C1-PF3ONS	ng/g	ND	ND
ADONA	ng/g	ND	ND
EtFOSAA	ng/g	8.19	9.24
HFPO-DA	ng/g	ND	ND
MeFOSAA	ng/g	12.0	12.6
N-EtFOSA	ng/g	ND	ND
N-EtFOSE	ng/g	8.00	6.72
NFDHA	ng/g	ND	ND
N-MeFOSA	ng/g	NDR (1.21)	NDR (0.347)
N-MeFOSE	ng/g	12.4	12.0
PFBA	ng/g	ND	ND
PFBS	ng/g	ND	ND
PFDA	ng/g	1.80	1.89
PFDoA	ng/g	1.20	1.49
PFDoS	ng/g	ND	ND
PFDS	ng/g	ND	ND
PFEESA	ng/g	ND	ND
PFHpA	ng/g	NDR (1.19)	NDR (1.27)
PFHpS	ng/g	ND	ND
PFHxA	ng/g	2.07	2.06
PFHxS	ng/g	NDR (11.8)	NDR (11.3)
PFMBA	ng/g	ND	ND
PFMPA	ng/g	ND	ND
PFNA	ng/g	ND	ND
PFNS	ng/g	ND	ND
PFOA	ng/g	0.846	1.11
PFOS	ng/g	6.12	5.25
PFOSA	ng/g	0.76	0.778
PFPeA	ng/g	1.42	1.61
PFPeS	ng/g	ND	ND
PFTeDA	ng/g	ND	0.599
PFTrDA	ng/g	ND	ND
PFUnA	ng/g	0.739	0.869
ND - Below detection limit			
NDR- Detected, but not quantifiable. Estimated maximum concentration reported in parenthesis			

Table 3: Polychlorinated Biphenyls (PCBs)

Parameter	Units	CRD Biosolids-2022-10-28	CRD Biosolids-2022-11-23
		28/10/2022	23/11/2022
Total Monochloro Biphenyls	pg/g	320	276
Total Dichloro Biphenyls	pg/g	4460	4110
Total Trichloro Biphenyls	pg/g	5610	5740
Total Tetrachloro Biphenyls	pg/g	11200	10700
Total Pentachloro Biphenyls	pg/g	11900	10800
Total Hexochloro Biphenyls	pg/g	8530	8180
Total Heptochloro Biphenyls	pg/g	3540	3380
Total Octochloro Biphenyls	pg/g	840	837
Total Nonochloro Biphenyls	pg/g	258	260
Decachloro Biphenyl	pg/g	164	171
Total PCBs	pg/g	46800	44500

Table 4: Dioxins & Furans

Parameter	Units	CRD Biosolids-2022-10-28	CRD Biosolids-2022-11-23
		28/10/2022	23/11/2022
2,3,7,8-TCDD	pg/g	0.590	0.200
1,2,3,7,8-PECDD	pg/g	0.724	0.628
1,2,3,4,7,8-HXCDD	pg/g	0.839	0.935
1,2,3,6,7,8-HXCDD	pg/g	6.62	6.63
1,2,3,7,8,9-HXCDD	pg/g	3.73	3.65
1,2,3,4,6,7,8-HPCDD	pg/g	134	144
OCDD	pg/g	818	923
2,3,7,8-TCDF	pg/g	2.71	2.70
1,2,3,7,8-PECDF	pg/g	0.675	0.431
2,3,4,7,8-PECDF	pg/g	0.796	0.695
1,2,3,4,7,8-HXCDF	pg/g	1.13	1.16
1,2,3,6,7,8-HXCDF	pg/g	0.979	0.999
1,2,3,7,8,9-HXCDF	pg/g	0.225	0.142
2,3,4,6,7,8-HXCDF	pg/g	0.852	0.873
1,2,3,4,6,7,8-HPCDF	pg/g	9.82	11.3
1,2,3,4,7,8,9-HPCDF	pg/g	0.841	0.840
OCDF	pg/g	17.3	21.1
TOTAL TETRA-DIOXINS	pg/g	32.9	24.9
TOTAL PENTA-DIOXINS	pg/g	43.2	38.2
TOTAL HEXA-DIOXINS	pg/g	64.4	61.1
TOTAL HEPTA-DIOXINS	pg/g	258	278
TOTAL TETRA-FURANS	pg/g	16.7	17.4
TOTAL PENTA-FURANS	pg/g	15.0	14.4
TOTAL HEXA-FURANS	pg/g	15.8	18.1
TOTAL HEPTA-FURANS	pg/g	24.2	28.4
TOTAL TEQ		4.72	4.30
TEQ - Toxicity Equivalency Quotient			

Table 5: Pesticides

Parameter	Units	CRD Biosolids-2022-10-28	CRD Biosolids-2022-11-23
		28/10/2022	23/11/2022
1,3-Dichlorobenzene	ng/g	ND	ND
1,4-Dichlorobenzene	ng/g	58	50.3
1,2-Dichlorobenzene	ng/g	3.01	2.13
1,3,5-Trichlorobenzene	ng/g	0.182	0.157
1,2,4-Trichlorobenzene	ng/g	0.650	0.509
1,2,3-Trichlorobenzene	ng/g	0.131	0.116
1,2,4,5-/1,2,3,5-Tetrachlorobenzene	ng/g	0.154	0.121
1,2,3,4-Tetrachlorobenzene	ng/g	0.165	0.203
Pentachlorobenzene	ng/g	0.547	0.463
Hexachlorobutadiene	ng/g	0.247	0.057
Hexachlorobenzene	ng/g	1.34	1.11
HCH, alpha	ng/g	ND	ND
HCH, beta	ng/g	ND	NDR (0.010)
HCH, gamma	ng/g	ND	ND
HCH, delta	ng/g	ND	ND
Heptachlor	ng/g	ND	ND
Aldrin	ng/g	NDR (0.008)	ND
Octachlorostyrene	ng/g	NDR (0.021)	0.023
Chlordane, oxy-	ng/g	NDR (0.017)	0.021
Chlordane, gamma (trans)	ng/g	0.639	0.722
Chlordane, alpha (cis)	ng/g	0.660	0.695
Nonachlor, trans-	ng/g	0.433	0.482
Nonachlor, cis-	ng/g	0.145	0.156
2,4'-DDD	ng/g	36.6	28.6
4,4'-DDD	ng/g	0.294	0.310
2,4'-DDE	ng/g	0.192	0.158
4,4'-DDE	ng/g	7.55	6.86
2,4'-DDT	ng/g	ND	ND
4,4'-DDT	ng/g	ND	ND
Mirex	ng/g	0.025	0.026
Heptachlor Epoxide	ng/g	NDR (0.071)	NDR (0.167)
alpha-Endosulphan	ng/g	NDR (0.025)	ND
Dieldrin	ng/g	1.84	2.21
Endrin	ng/g	ND	ND
beta-Endosulphan	ng/g	NDR (0.074)	0.053
Endosulphan Sulphate	ng/g	ND	ND
Endrin Aldehyde	ng/g	NQ	NQ
Endrin Ketone	ng/g	ND	ND
Methoxychlor	ng/g	NDR (1.06)	0.522
ND - Below detection limit			
NQ - Data not quantifiable			
NDR- Detected, but not quantifiable. Estimated maximum concentration reported in parenthesis			

Table 6: Semi-Volatile Organic Compounds (SVOCs)

Parameter	Units	CRD Biosolids- 2022-11-23	CRD Biosolids - 2022-12-15
		23/11/2022	15/12/2022
N-Nitrosodimethylamine	ug/g	<200	<2000
2-chloronaphthalene	ug/g	<2.0	<20
Aniline	ug/g	<6.0	<60
1,2-dichlorobenzene	ug/g	<2.0	<20
1,3-dichlorobenzene	ug/g	<2.0	<20
1,4-dichlorobenzene	ug/g	<2.0	<20
Hexachlorobenzene	ug/g	<4.0	<40
1,2,4-trichlorobenzene	ug/g	<4.0	<40
2-chlorophenol	ug/g	<2.0	<20
4-chloro-3-methylphenol	ug/g	<2.0	<20
m,p-Cresol	ug/g	15	<40
o-Cresol	ug/g	<4.0	<40
2,4-dichlorophenol	ug/g	<2.0	<20
2,4-dimethylphenol	ug/g	<2.0	<20
2,4-dinitrophenol	ug/g	<20	<200
4,6-dinitro-2-methylphenol	ug/g	<10	<100
2-nitrophenol	ug/g	<10	<100
4-nitrophenol	ug/g	<10	<100
Pentachlorophenol	ug/g	<4.0	<40
Phenol	ug/g	<4.0	<40
2,4,5-trichlorophenol	ug/g	<2.0	<20
2,4,6-trichlorophenol	ug/g	<2.0	<20
Butyl benzyl phthalate	ug/g	<4.0	<40
Bis(2-chloroethoxy)methane	ug/g	<2.0	<20
Bis(2-chloroisopropyl)ether	ug/g	<2.0	<20
Bis(2-ethylhexyl)phthalate	ug/g	31	<100
4-bromophenyl phenyl ether	ug/g	<2.0	<20
p-Chloroaniline	ug/g	<4.0	<40
4-chlorophenyl phenyl ether	ug/g	<2.0	<20
3,3'-Dichlorobenzidine	ug/g	<10	<100
Diethyl phthalate	ug/g	<4.0	<40
Di-n-butyl phthalate	ug/g	<4.0	<40
Di-n-octyl phthalate	ug/g	<10	<100
2,4-Dinitrotoluene	ug/g	<2.0	<20
2,6-Dinitrotoluene	ug/g	<2.0	<20
Dimethyl phthalate	ug/g	<4.0	<40
Biphenyl	ug/g	<2.0	<20
Bis(2-chloroethyl)ether	ug/g	<4.0	<40
Hexachlorobutadiene	ug/g	<2.0	<20
Hexachlorocyclopentadiene	ug/g	<10	<100
Hexachloroethane	ug/g	<2.0	<20
Isophorone	ug/g	<2.0	<20
Nitrobenzene	ug/g	<2.0	<20
Nitrosodiphenylamine/Diphenylamine	ug/g	<4.0	<40
N-nitroso-di-n-propylamine	ug/g	<2.0	<20
Low Molecular Weight PAH`s	mg/kg	6.4	7.0
High Molecular Weight PAH`s	mg/kg	2.4	2.0
Total PAH	mg/kg	8.8	9.0
Naphthalene	mg/kg	0.74	0.69
1-Methylnaphthalene	mg/kg	0.75	0.70
2-Methylnaphthalene	mg/kg	2.1	1.9
Acenaphthylene	mg/kg	0.019	0.023
Acenaphthene	mg/kg	0.67	0.65
Fluorene	mg/kg	0.55	0.53
Phenanthrene	mg/kg	1.3	1.3
Anthracene	mg/kg	0.30	0.44
Fluoranthene	mg/kg	0.79	0.97
Pyrene	mg/kg	0.64	0.74
Benzo(a)anthracene	mg/kg	<0.10	0.30
Chrysene	mg/kg	<0.10	<0.20

Table 6: Semi-Volatile Organic Compounds (SVOCs) *(Continued)*

Parameter	Units	CRD Biosolids- 2022-11-23	CRD Biosolids - 2022-12-15
		23/11/2022	15/12/2022
Benzo(b)fluoranthene	mg/kg	<0.10	<0.20
Benzo(k)fluoranthene	mg/kg	0.21	<0.20
Benzo(a)pyrene	mg/kg	0.66	<0.20
Indeno(1,2,3-cd)pyrene	mg/kg	0.14	<0.20
Dibenz(a,h)anthracene	mg/kg	<0.10	<0.20
Benzo(g,h,i)perylene	mg/kg	<0.25	<0.50

Table 6: Volatile Organic Compounds (VOCs)

Parameter	Units	CRD Biosolids- 2022-11-23	CRD Biosolids - 2022-12-15
		23/11/2022	15/12/2022
1,1,1,2-tetrachloroethane	mg/kg	<0.020	<0.066
1,1,1-trichloroethane	mg/kg	<0.53	<0.066
1,1,2,2-tetrachloroethane	mg/kg	<0.97	<0.066
1,1,2-trichloroethane	mg/kg	<0.53	<0.066
1,1-dichloroethane	mg/kg	<0.66	<0.082
1,1-dichloroethene	mg/kg	<0.026	<0.082
1,1-dichloropropene	mg/kg	<400	<49
1,2,3-trichlorobenzene	mg/kg	2.3	<0.099
1,2,3-trichloropropane	mg/kg	1.1	<0.099
1,2,4-trichlorobenzene	mg/kg	0.89	<0.099
1,2,4-trimethylbenzene	mg/kg	11	1.1
1,2-dibromo-3-chloropropane	mg/kg	<26	<3.3
1,2-dibromoethane	mg/kg	<0.53	<0.066
1,2-dichlorobenzene	mg/kg	<0.53	<0.066
1,2-dichloroethane	mg/kg	<0.53	<0.066
1,2-dichloropropane	mg/kg	<0.53	<0.066
1,3,5-trimethylbenzene	mg/kg	<5.3	<0.66
1,3-dichlorobenzene	mg/kg	<0.53	<0.066
1,3-dichloropropane	mg/kg	<400	<49
1,4-dichlorobenzene	mg/kg	0.56	<0.066
2-chlorotoluene	mg/kg	<400	<49
2-Butanone (MEK)	mg/kg	<400	<49
4-chlorotoluene	mg/kg	<400	<49
4-Methyl-2-pentanone (MIBK)	mg/kg	<13	<1.6
Acetone	mg/kg	130	<17
Benzene	mg/kg	7.5	0.61
Bromobenzene	mg/kg	<5.3	<0.66
Bromodichloromethane	mg/kg	<1.3	<0.16
Bromoform	mg/kg	<1.3	<0.16
Bromomethane	mg/kg	<7.9	<0.99
Carbon tetrachloride	mg/kg	<0.53	<0.066
Chlorobenzene	mg/kg	<0.53	<0.066
Dibromochloromethane	mg/kg	<0.050	<0.16
Chloroethane	mg/kg	<2.6	<0.33
Chloroform	mg/kg	0.69	<0.066
Chloromethane	mg/kg	0.12	<0.16
cis-1,2-dichloroethene	mg/kg	<0.79	<0.099
cis-1,3-dichloropropene	mg/kg	<0.53	<0.066
Dibromomethane	mg/kg	<5.3	<0.66
Dichlorodifluoromethane	mg/kg	<5.3	<0.66
Ethylbenzene	mg/kg	0.69	0.062
Hexachlorobutadiene	mg/kg	<5.3	<0.66
Isopropylbenzene	mg/kg	<5.3	<0.66
Methyl-tert-butylether (MTBE)	mg/kg	<2.6	<0.33
n-Butylbenzene	mg/kg	<400	<49

Table 6: Volatile Organic Compounds (VOCs) *(Continued)*

Parameter	Units	CRD Biosolids- 2022-11-23	CRD Biosolids - 2022-12-15
		23/11/2022	15/12/2022
n-Propylbenzene	mg/kg	<400	<49
p-Isopropyltoluene	mg/kg	<400	<49
sec-Butylbenzene	mg/kg	<400	<49
tert-Butylbenzene	mg/kg	<400	<49
Styrene	mg/kg	3.1	0.18
Tetrachloroethene	mg/kg	<0.26	<0.033
Toluene	mg/kg	32	1.5
trans-1,2-dichloroethene	mg/kg	<0.79	<0.099
trans-1,3-dichloropropene	mg/kg	<0.53	<0.066
Trichloroethene	mg/kg	<0.009	<0.030
Trichlorofluoromethane	mg/kg	<5.3	<0.66
Vinyl chloride	mg/kg	<1.1	<0.13
m & p-Xylene	mg/kg	35	2.7
o-Xylene	mg/kg	<1.1	<0.13
Xylenes (Total)	mg/kg	35	2.7
Extractable (MeOH) 2-Hexanone	mg/kg	<260	<33
Extractable (MeOH) Acrylonitrile	mg/kg	<53	<6.6
Extractable (MeOH) Carbon disulfide	mg/kg	<400	<49
Extractable (MeOH) Ethyl ether	mg/kg	<260	<33
Extractable (MeOH) Tetrahydrofuran	mg/kg	<400	<49
Extractable (MeOH) Vinyl Acetate	mg/kg	<400	<49

Table 8: Polybrominated Diphenyl Ethers (PBDEs)

Parameter	Units	CRD Biosolids-2022-10-28	CRD Biosolids-2022-11-23
		28/10/2022	23/11/2022
2,4-DiBDE	pg/g	54.2	41.2
2,4'-DiBDE	pg/g	93.8	71.1
2,6-DiBDE	pg/g	ND	ND
3,3'-DiBDE	pg/g	NQ	NQ
3,4-DiBDE	pg/g	47.9	38.8
3,4'-DiBDE	pg/g	NQ	NQ
4,4'-DiBDE	pg/g	147	145
2,2',4-TriBDE	pg/g	1530	1280
2,3',4-TriBDE	pg/g	NQ	NQ
2,4,4'-TriBDE	pg/g	3020	2620
2,4,6-TriBDE	pg/g	ND	ND
2,4',6-TriBDE	pg/g	13.5	11.7
2',3,4-TriBDE	pg/g	NQ	NQ
3,3',4-TriBDE	pg/g	31.5	26.4
3,4,4'-TriBDE	pg/g	46.5	41
2,2',4,4'-TeBDE	pg/g	130000	106000
2,2',4,5'-TeBDE	pg/g	4170	3680
2,2',4,6'-TeBDE	pg/g	538	464
2,3',4,4'-TeBDE	pg/g	2730	2510
2,3',4',6-TeBDE	pg/g	392	383
2,4,4',6-TeBDE	pg/g	183	163
3,3',4,4'-TeBDE	pg/g	11.8	NDR (8.42)
3,3',4,5'-TeBDE	pg/g	78.3	NDR (48.7)
2,2',3,4,4'-PeBDE	pg/g	5850	5360
2,2',4,4',5-PeBDE	pg/g	107000	102000
2,2',4,4',6-PeBDE	pg/g	27800	25000
2,3,3',4,4'-PeBDE	pg/g	ND	ND
2,3,4,5,6-PeBDE	pg/g	ND	ND
2,3',4,4',6-PeBDE	pg/g	310	328
2,3',4,5,5'-PeBDE	pg/g	NQ	NQ
3,3',4,4',5-PeBDE	pg/g	ND	ND
2,2',3,3',4,4'-HxBDE	pg/g	NDR (87.3)	NDR (74.4)
2,2',3,4,4',5'-HxBDE	pg/g	1780	1320
2,2',3,4,4',6'-HxBDE	pg/g	528	508

Table 8: Polybrominated Diphenyl Ethers (PBDEs) *(Continued)*

Parameter	Units	CRD Biosolids-2022-10-28	CRD Biosolids-2022-11-23
		28/10/2022	23/11/2022
2,2',4,4',5,5'-HxBDE	pg/g	13600	12300
2,2',4,4',5,6'-HxBDE	pg/g	10300	9370
2,2',4,4',6,6'-HxBDE	pg/g	537	679
2,3,4,4',5,6-HxBDE	pg/g	NQ	NQ
2,2',3,4,4',5,6-HpBDE	pg/g	ND	ND
2,2',3,4,4',5',6-HpBDE	pg/g	2950	2360
2,3,3',4,4',5,6-HpBDE	pg/g	ND	ND
2,2',3,4,4',5,5',6-OcBDE	pg/g	3820	2820
2,2',3,3',4,4',5,5',6-NoBDE	pg/g	NDR (15600)	NDR (16400)
2,2',3,3',4,4',5,6,6'-NoBDE	pg/g	NDR (38000)	NDR (36100)
2,2',3,3',4,5,5',6,6'-NoBDE	pg/g	NDR (27400)	NDR (25300)
2,2',3,3',4,4',5,5',6,6'-DeBDE	pg/g	394000	447000
ND - Below detection limit			
NQ - Data not quantifiable			
NDR- Detected, but not quantifiable. Estimated maximum concentration reported in parenthesis			

Long-term Biosolids Management Strategy

CRD Board of Directors

May 8, 2024

Agenda

1. Regulatory Requirements
2. Long Term Biosolids Management Strategy
    a) Methodology
    b) Public Consultation
    c) Proposed Strategy
3. Next Steps

Regulatory Requirements

- Biosolids must meet regulatory requirements set by the Province of BC under the Environmental Management Act (EMA) and Organic Matter Recycling Regulation (OMRR).
- Ministry of Environment and Climate Change Strategy (ENV) requires that the CRD submit a Long-term Biosolids Management Strategy by June 2024.

Regulatory Requirements – Long Term Strategy

ENV required (in 2019) that CRD:

- Includes land application in the options analysis and consultation, including but not limited to:
    - forestry,
    - reclamation,
    - landfill closure, and
    - agriculture
- Consults with Citizens, local governments and indigenous communities

Long Term Biosolids Management Strategy

CRD

Methodology

The proposed Long Term Biosolids Management Strategy is based on:

1. ENV direction and regulatory requirements
2. CRD's ban on land application of biosolids
3. Public, First Nation and local government consultation processes
4. Technical recommendations that address operational compliance

Public Consultation

- First Nations Consultation: February to Present (Ongoing)
- Active Public Consultation: January to March, 2024
- Technical and Community Advisory Committee (TCAC): Reconstituted November, 2023

Public Consultation: Tavola Group

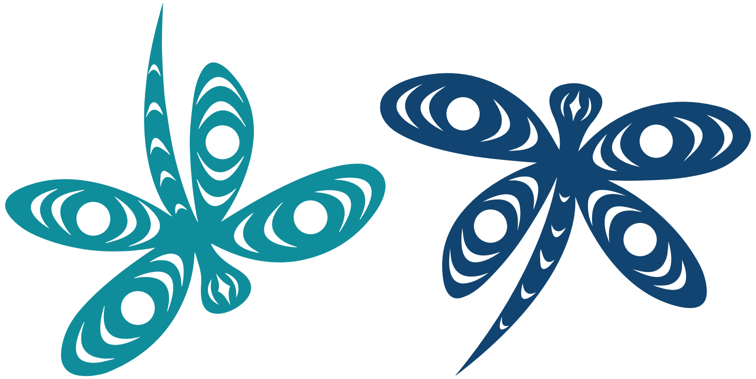
Presentation: Katie Hamilton, Tavola Strategy Group

Capital Regional District Summary Consultation Report

Public Consultation: IPSOS

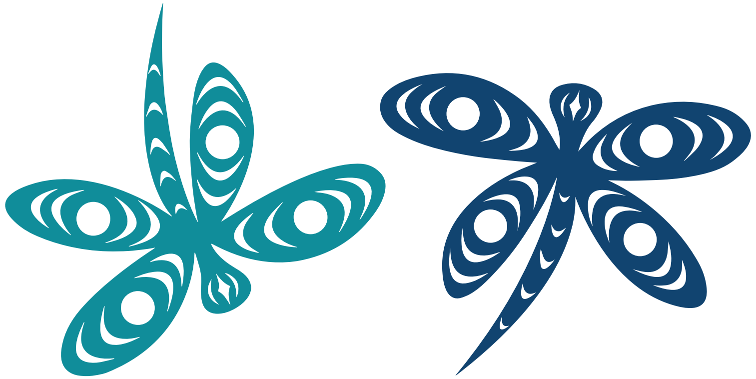
Presentation: Kyle Braid, IPSOS

Representative Survey



First Nations Consultation

- 19 First Nations were approached for input
- Conversations with Pacheedaht, T'Souke and Pauquachin Nations took place, overarching themes included:
  - Clear expectation of further consultation with First Nations for any in-region land application projects
  - Questions regarding scenarios specific to their traditional territories
  - General questions regarding biosolids management options



First Nations Consultation

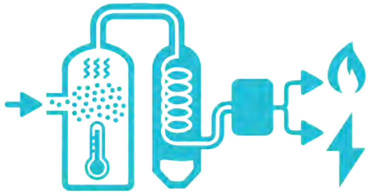
- Opportunities for further feedback are ongoing and will be incorporated in the Long Term Strategy Submission to ENV
- Following approval of the Long Term Strategy, further First Nation engagement will be pivotal as specific land application project are considered

Technical and Community Advisory Committee (TCAC)

- Assessed and ranked all beneficial use options. All options had majority support.
- Indicated that the nutritive value in biosolids outweighed the land contamination risks.
- Agricultural land application had the lowest level support due to these contaminant concerns, but still had majority support.
- Concerns were raised about the greenhouse gas implications, cost/benefit, and feasibility of the advanced thermal option.

Proposed Long Term Strategy

Procure a portfolio of options in alignment with the GHD Long Term Biosolids Strategy, and apply a prioritization structure.



2024 — 2021-2027 | 2027-2035+ — 2035

Phase 1 (Pilot)

Phase 2 (Full Scale - Subject to Pilot Outcome)

Tier 2: Out-of-Region Compliance Options

2024 — 2035

- i) Industrial Land Reclamation
- ii) Forest Fertilization
- iii) Creation of Biosolids Soil Products for Distribution
- iv) Partnerships With Established Biosolids Programs
- v)★ Continue Alternative Combustion in Richmond, BC.

Tier 3: In-Region Contingency Options

2024 — 2035

- i) Industrial Land Reclamation
- ii) Forest Fertilization
- iii) Emergency Hartland Landfill Engineered Cover Systems

★ *Fuel combustion in the manufacturing facility in Richmond, BC should be prioritized if option is available.*

Long-term Biosolids Beneficial Use Options

- The CRD will continue to explore beneficial use opportunities with those First Nations that express interest both in-region and out-of-region.
- The CRD will also listen to any concerns Nations may have regarding the beneficial use options and is committed to working with individual Nations to address their concerns.

Next Steps

- With Board endorsement, the draft Long-term Biosolids Management Strategy will be referred back to the TCAC for their final review and comment.
- Feedback can be provided from May 13- June 5 through an online comment form at https://getinvolved.crd.bc.ca/biosolids.
- A summary of the comments received along with the final Long-term Biosolids Management Strategy will be presented at the June 12, 2024 Board meeting for discussion, and with final Board approval, would be submitted to ENV by June 18, 2024.

CAPITAL REGIONAL DISTRICT

Long-Term Biosolids Management Plan

Summary of Public Input

May 2024

TAVOLA
STRATEGY GROUP

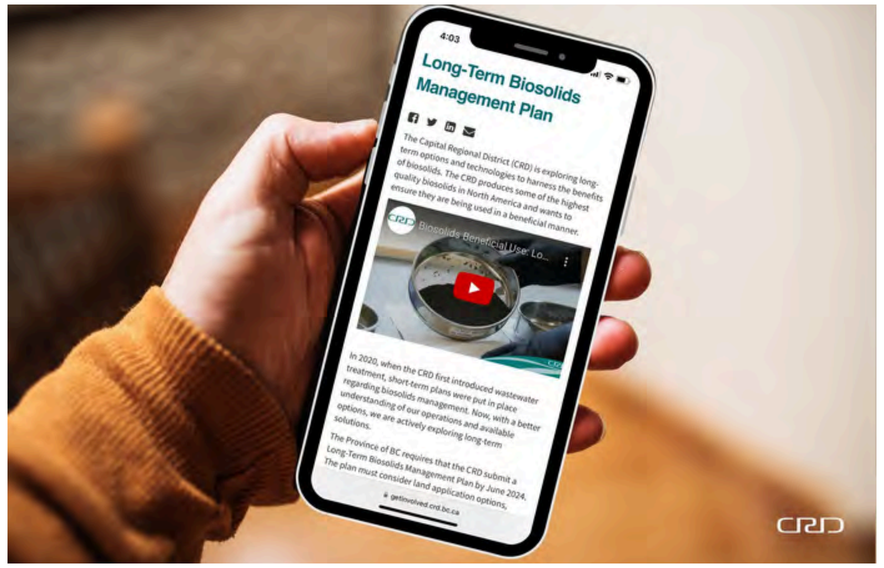
Today's Presentation

01

Process

02

What We Heard



We are grateful to live and do our work on the traditional territories of the Lekwungen people, known today as the Songhees and Esquimalt Nations.

Part 1:

Engagement Process

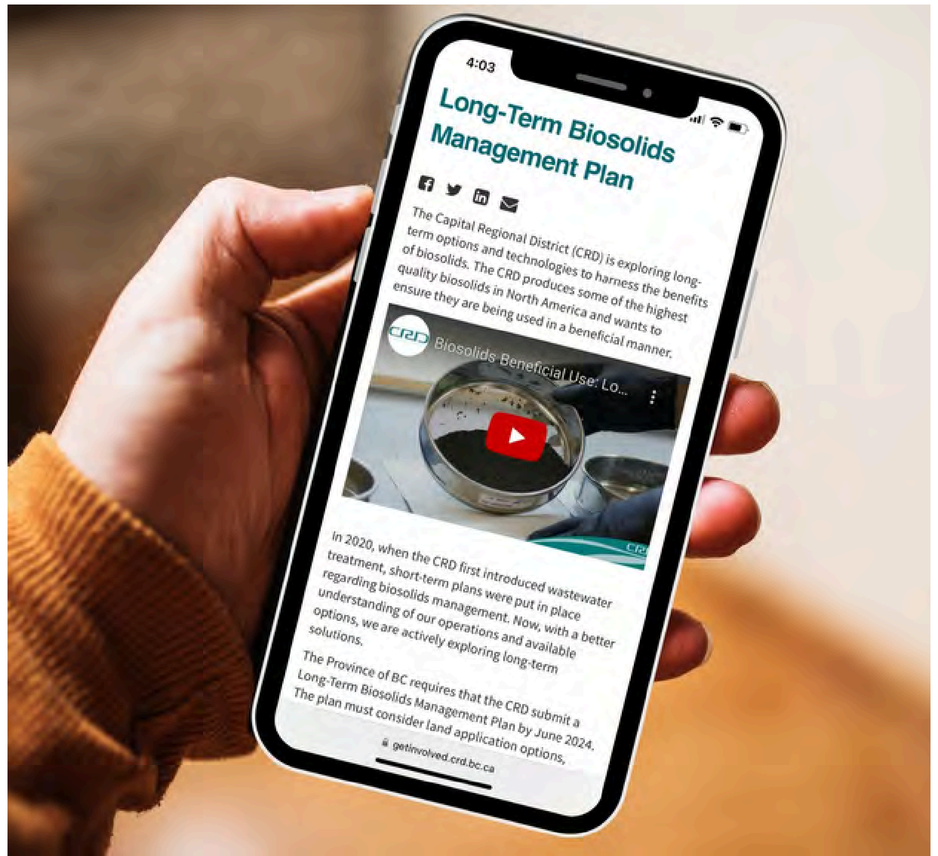
Engagement Process

IAP2 Informed Consultation Plan

Establish engagement objectives and methods.

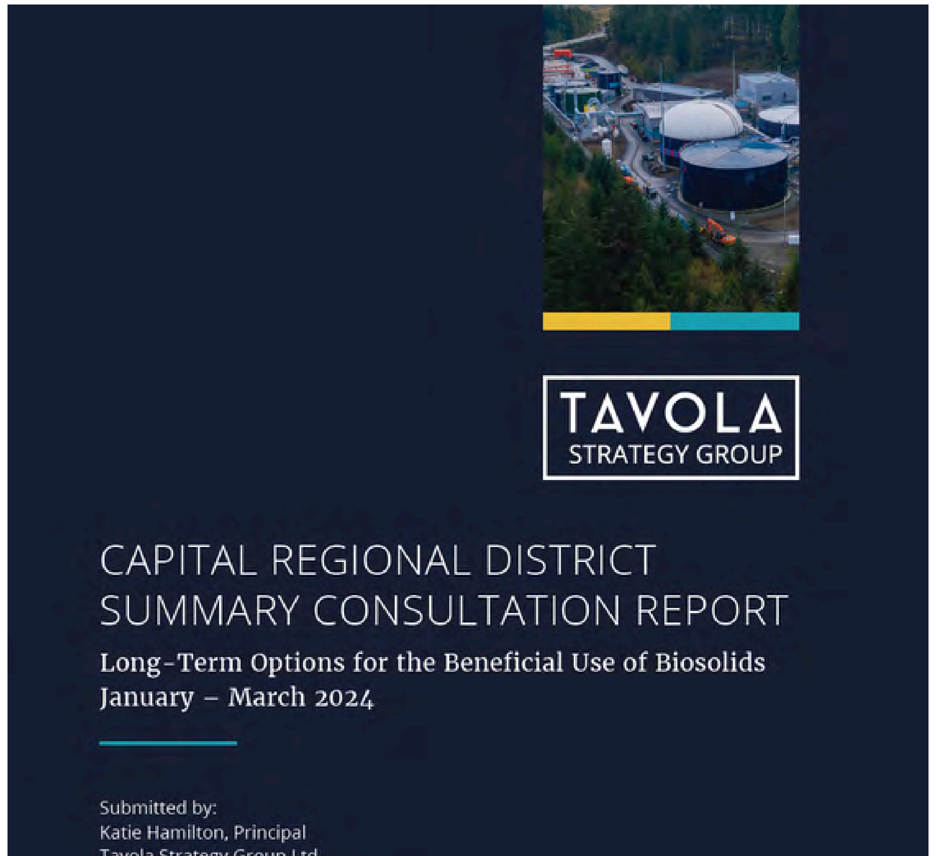
Active Engagement

Awareness-raising and variety of engagement activities to capture input.



Reporting and Closing the Loop

What We Heard report and communicating results to participants and community.



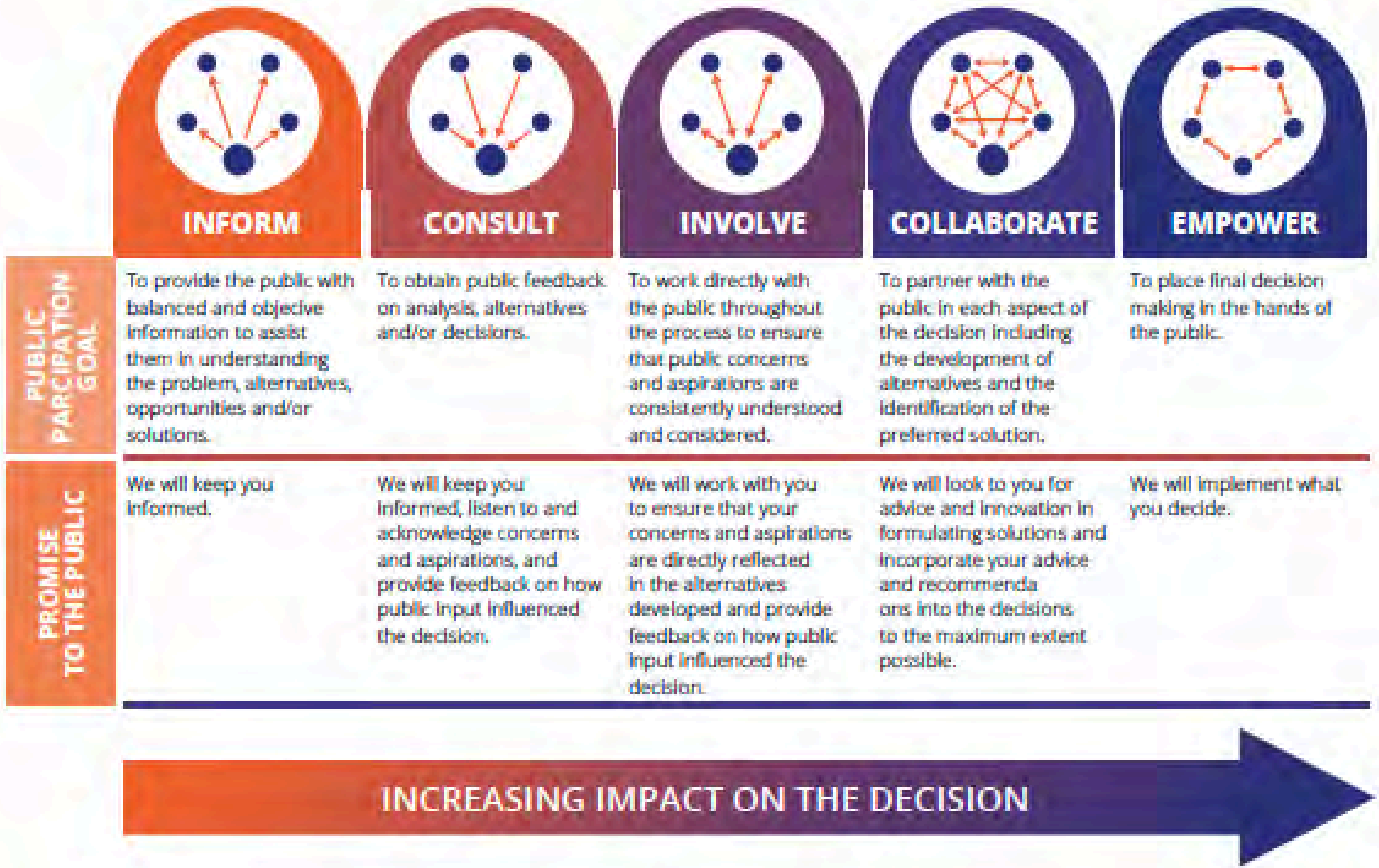
Communications and Consultation Objectives

1. **Raise awareness of the need to develop a long-term biosolids management plan that outlines how the Capital Regional District will utilize the benefits of biosolids in-region.**

2. **Provide multiple channels and opportunities for the community to learn more and provide input into the development of the definitive biosolids management plan.**

3. **Seek to understand public awareness, perceptions, concerns and top-of-mind considerations for how biosolids should be managed in the Capital Region.**

IAP2 Spectrum

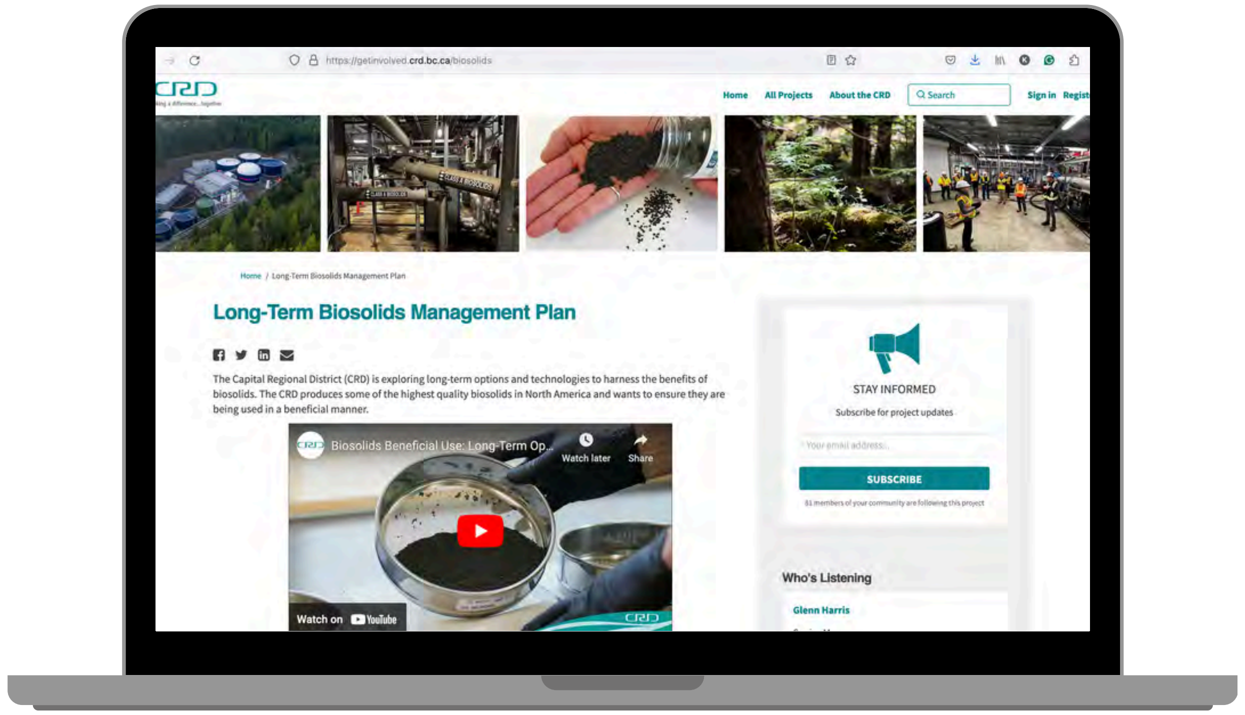


	INFORM	CONSULT	INVOLVE	COLLABORATE	EMPOWER
PUBLIC PARCIPATION GOAL	To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions.	To obtain public feedback on analysis, alternatives and/or decisions.	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision making in the hands of the public.
PROMISE TO THE PUBLIC	We will keep you informed.	We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision.	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommenda ons into the decisions to the maximum extent possible.	We will implement what you decide.

Awareness-Raising

- Project webpage www.getinvolved.crd.bc.ca
- Media releases were distributed on January 11 and February 7, 2024.
- Updates were emailed to project page subscribers.
- Social media posts were shared on CRD Facebook, Twitter, and Instagram
- Print ads appeared in the Times Colonist and BlackPress newspapers.
- Letters to a variety of groups and organizations.

Engagement Activities



CRD Online Survey
January 11 -
March 6, 2024

Virtual Open House
Tuesday, February 20, 2024

IPSOS Representative Survey
March 1 - March 11, 2024

Participation

569
Online survey participants

516
Representative survey of Capital Region residents

3,300
Unique web visitors

12
Questions and answers via website

56
Open house attendees

12
Subscribers to project updates

7
Emails to biosolids@crd.bc.ca

Part 2:

What We Heard

Over-Arching Themes

- Both surveys indicated “Environmental Impacts [air, water and soil contaminants]” were most important consideration.

- The 2 surveys solicited very different results in terms of options:
  - IPSOS representative survey indicates strong majority support and low levels of opposition to all beneficial uses presented. Support is highest for forest fertilizer and industrial land reclamation.
  - CRD survey indicates substantial opposition to most options other than Advanced Thermal, with least support for bagged residential and agricultural fertilizer.

- The most popular option (Advanced Thermal) in CRD survey was the least popular for the broader general public in the IPSOS survey.

- The level of opposition to all options and associated concerns were much higher in the CRD survey.

Over-Arching Themes

Comparison of survey results regarding options:

LONG-TERM BIOSOLIDS USE OPTION	IPSOS		CRD	
	Support	*Oppose*	*Support*	*Oppose*
Forest fertilizer	85%	4%	41%	51%
Industrial land reclamation (e.g. mine/quarry)	83%	6%	43%	45%
Wholesale fertilizer for landscaping	79%	5%	37%	54%
Agriculture fertilizer	78%	7%	34%	60%
Bagged fertilizer for low-cost residential use	77%	7%	33%	56%
Fuel for incineration/ combustion	66%	9%	49%	38%
Advanced thermal (gasification/pyrolysis technology)	56%	11%	66%	19%

**Numbers may not add to 100% due to summary reporting and rounding.*

Over-Arching Themes

- Many respondents to CRD survey noted concerns:
  - Potential contaminants [e.g. toxicity, PFAS's] and health and environmental risks of land application
  - Felt land application options are not a "beneficial use" due to potential risks.
  - Advanced thermal/biochar options are seen as the most effective method to reduce risks.

- Correspondence, open house, and CRD survey expressed need for more detail about:
  - Piloting advanced thermal options
  - Testing, scientific research and risks associated with land application.
  - Cost-benefit analysis of options and feasibility and case studies of in other jurisdictions.

- The majority of correspondence noted risks associated with land application and encouraged the CRD Board to uphold the existing land application ban.

Next Steps

The *What We Heard* consultation summary report will be submitted to the Ministry of Environment and Climate Change Strategy as part of the Long Term Biosolids Management Plan .

It will be posted on the project website:

www.getinvolved.crd.bc.ca

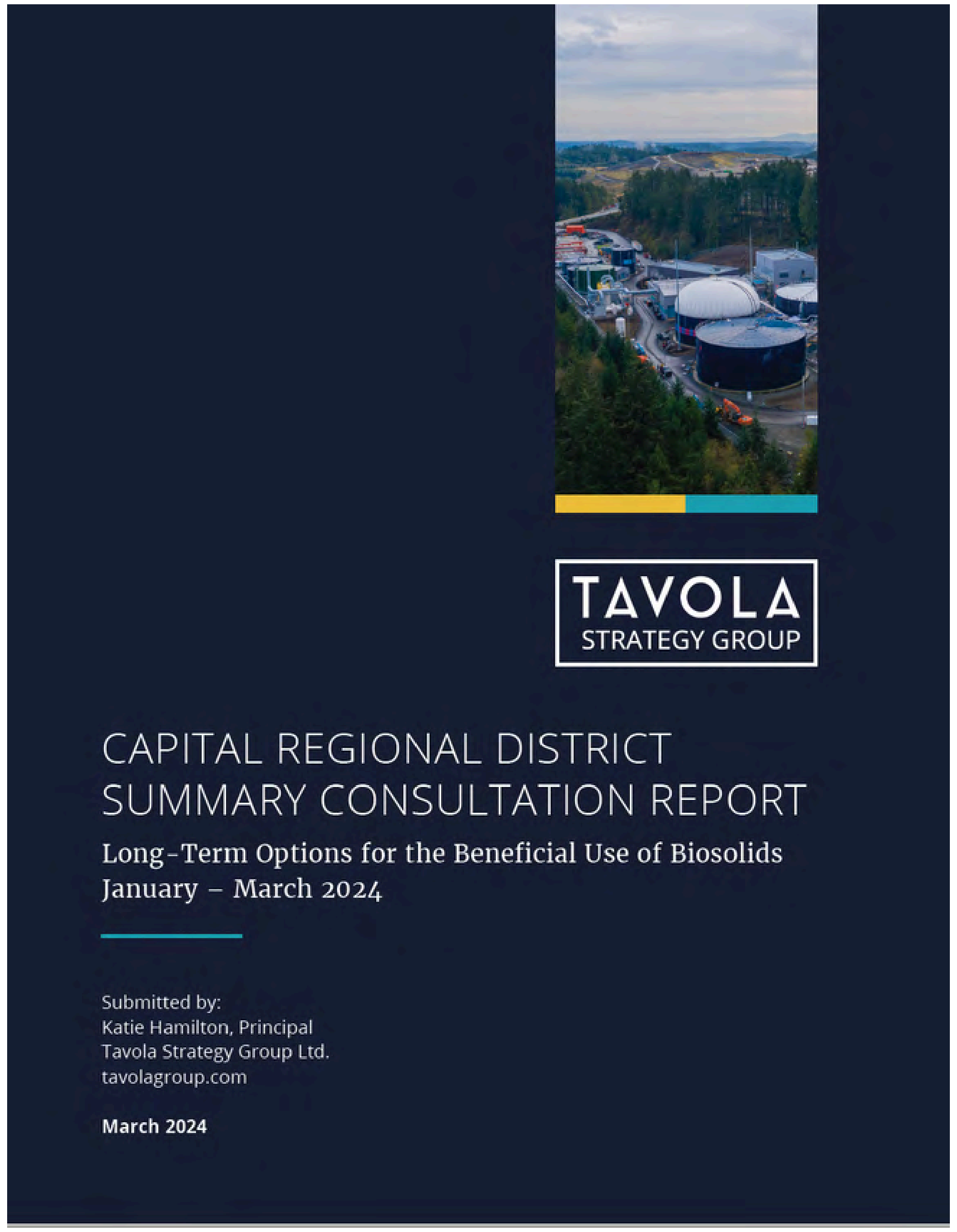


TAVOLA
STRATEGY GROUP

CAPITAL REGIONAL DISTRICT
SUMMARY CONSULTATION REPORT

Long-Term Options for the Beneficial Use of Biosolids
January – March 2024

Submitted by:
Katie Hamilton, Principal
Tavola Strategy Group Ltd.
tavolagroup.com

March 2024

TAVOLA
STRATEGY GROUP

Questions?

We are here to help.

www.tavolagroup.com

LONG-TERM BIOSOLIDS MANAGEMENT PLAN SURVEY

Capital Regional District

PRESENTED BY: Kyle Braid, Senior Vice President, Ipsos

May 8, 2024

OBJECTIVES

- Obtain a representative sampling of residents' opinions about how to harness the benefits of biosolids from wastewater treatment

METHODOLOGY

- Online panel survey of 516 adult (18+ years) CRD residents
- Fielded March 1 to 11, 2024
- Final data weighted by gender/age and region
- Credibility interval: ±4.9 percentage points, 19 times out of 20
- Note: Core Region is defined as Victoria, Saanich, Esquimalt, Oak Bay, Colwood, Langford and View Royal

Survey Preamble

In 2020, when the CRD first introduced wastewater treatment, short-term plans were put in place regarding biosolids management. Now, with a better understanding of their operations and available options, the CRD are actively exploring long-term solutions.

The Province of BC requires that the CRD submit a Long-Term Biosolids Management Plan by June 2024. The plan must consider land application options, which are included with advanced thermal options among others. Since 2011, the CRD Board has banned the land application of biosolids within the capital region.

This survey will be used as input as the CRD considers and implements long-term options. The CRD will need to consider a range of possibilities to maximize the benefits of this nutrient-rich, organic material and ensure a resilient and reliable portfolio of management options.

To learn more about biosolids before answering the questions, please click the links below:

- A short video: https://www.youtube.com/watch?v=COY592vpGPU
- FAQs: https://getinvolved.crd.bc.ca/biosolids/widgets/170487/faqs#34017

Option Information Example

Forest Fertilization

Can help improve soil fertility, prevent erosion, and accelerate plant and tree growth.

In addition, after wildfire, biosolids can help forests regenerate, increasing water-retention and providing essential nutrients and organic matter to promote plant and tree growth. Can reduce reliance on synthetic fertilizers.

Timeline: Immediate

Estimated Cost: less than $400/tonne

EXECUTIVE SUMMARY

1. Many residents are not familiar with the topics of the CRD wastewater treatment system and biosolids.

2. The topic is relevant to residents.

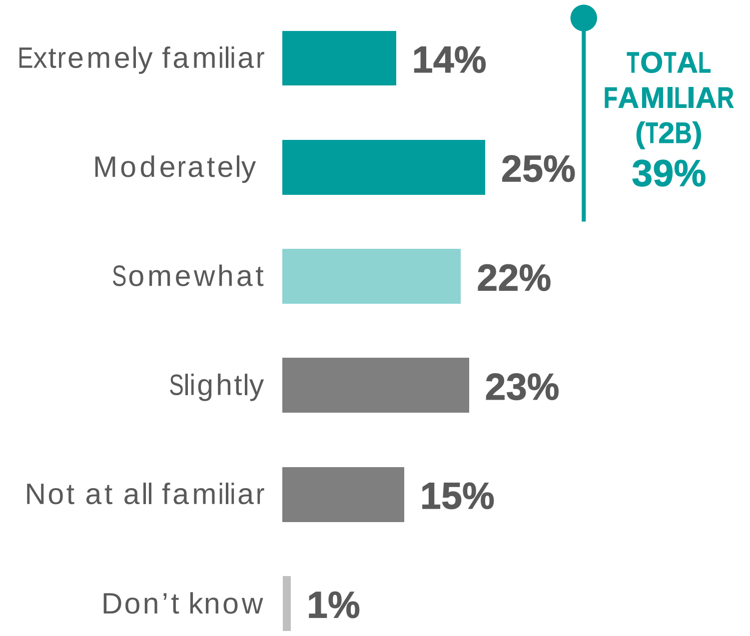
3. When planning for the beneficial uses of biosolids, residents place the greatest priority on environmental impacts.

4. There is strong majority support and low levels of opposition to all tested potential uses of biosolids.

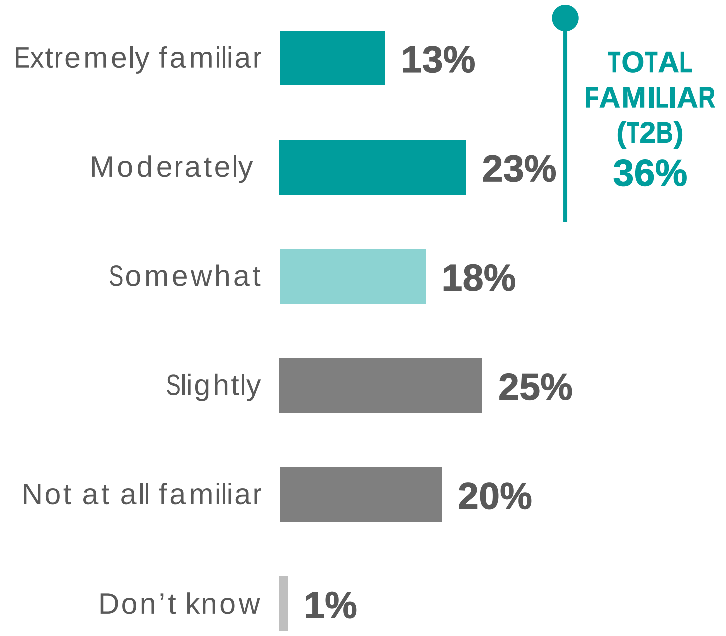
5. Residents say that TV news is the best way to keep them informed on this topic.

Familiarity with Topics

CRD WASTEWATER TREATMENT SYSTEM



BIOSOLIDS



Base: All respondents (n=516)
Q1. How familiar are you with the following topics?

Familiarity with Topics (by Demos)

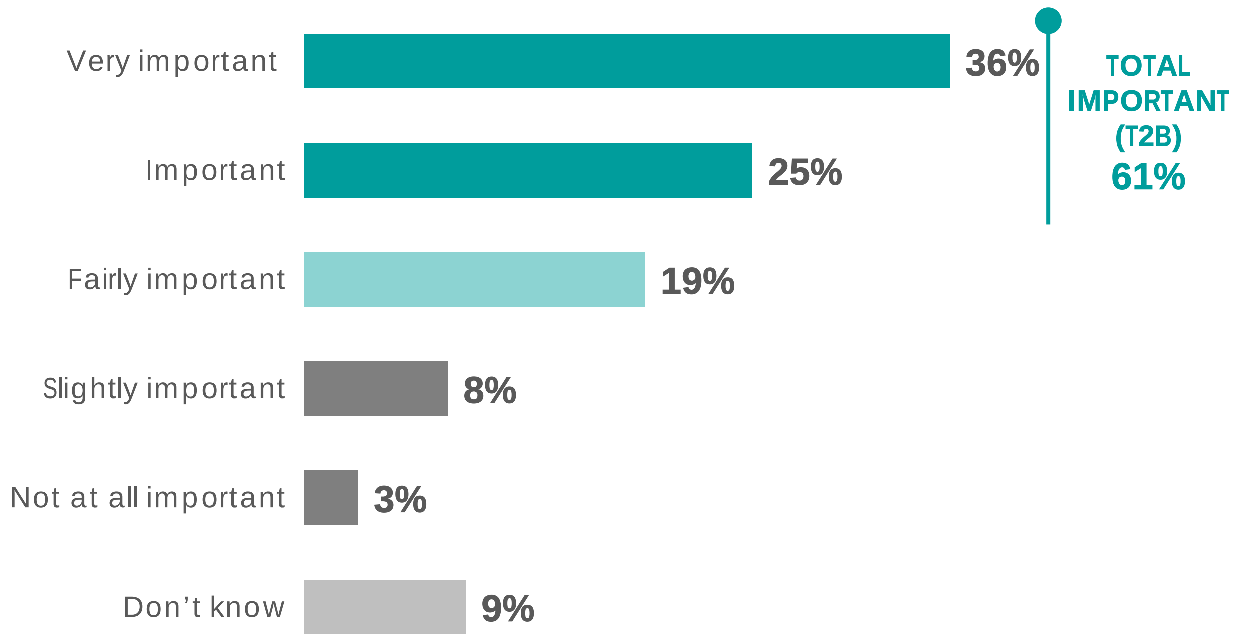
Total Important (Extremely + Moderately)

	Total	Region		Age			Sex	
		Core	Other	18-34	35-54	55+	Male	Female
Sample Size	516	408	108	99	171	246	237	276
CRD wastewater treatment system	39%	36%	45%	47%	43%	31%	52%	27%
Biosolids	36%	33%	43%	45%	40%	27%	49%	25%

Statistically higher Statistically lower

Base: All respondents (n=516)
Q1. How familiar are you with the following topics?

Importance of Maximizing Biosolids for Community Benefit



Base: All respondents (n=516)
Q2. How important is it to you how biosolids are maximized for community benefit?

Importance of Maximizing Biosolids for Community Benefit (by Demos)

Total Important (Very Important + Important)

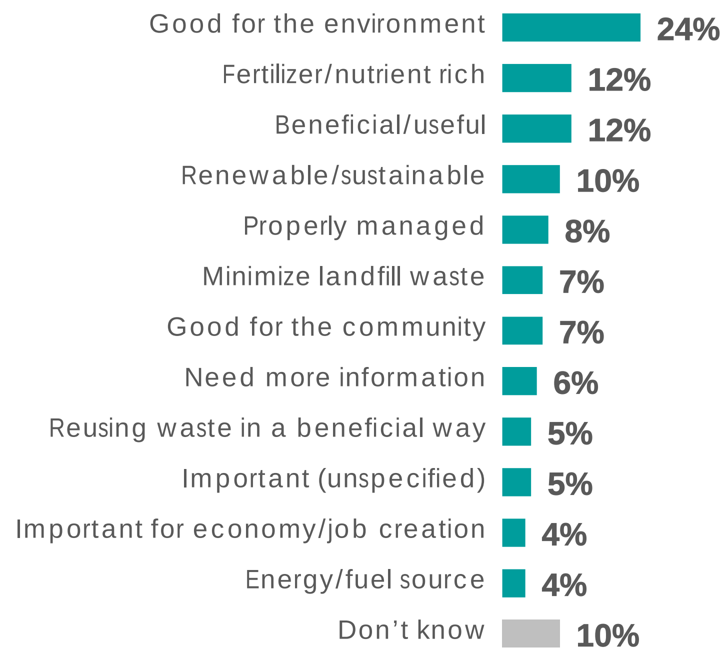
	Total	Region		Age			Sex	
		Core	Other	18-34	35-54	55+	Male	Female
Sample Size	516	408	108	99	171	246	237	276
Total important	61%	61%	59%	61%	49%	68%	63%	59%

Statistically higher | Statistically lower

Base: All respondents (n=516)
Q2. How important is it to you how biosolids are maximized for community benefit?

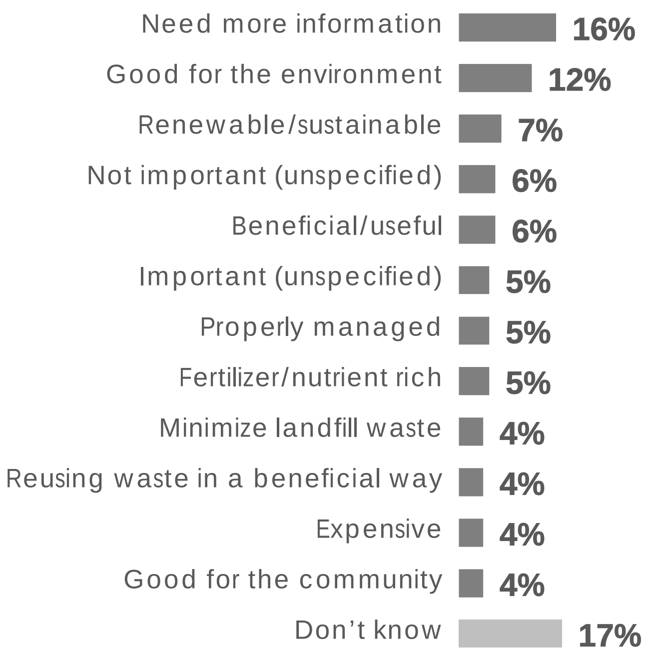
Reasons why Important/Not Important

REASONS WHY IMPORTANT



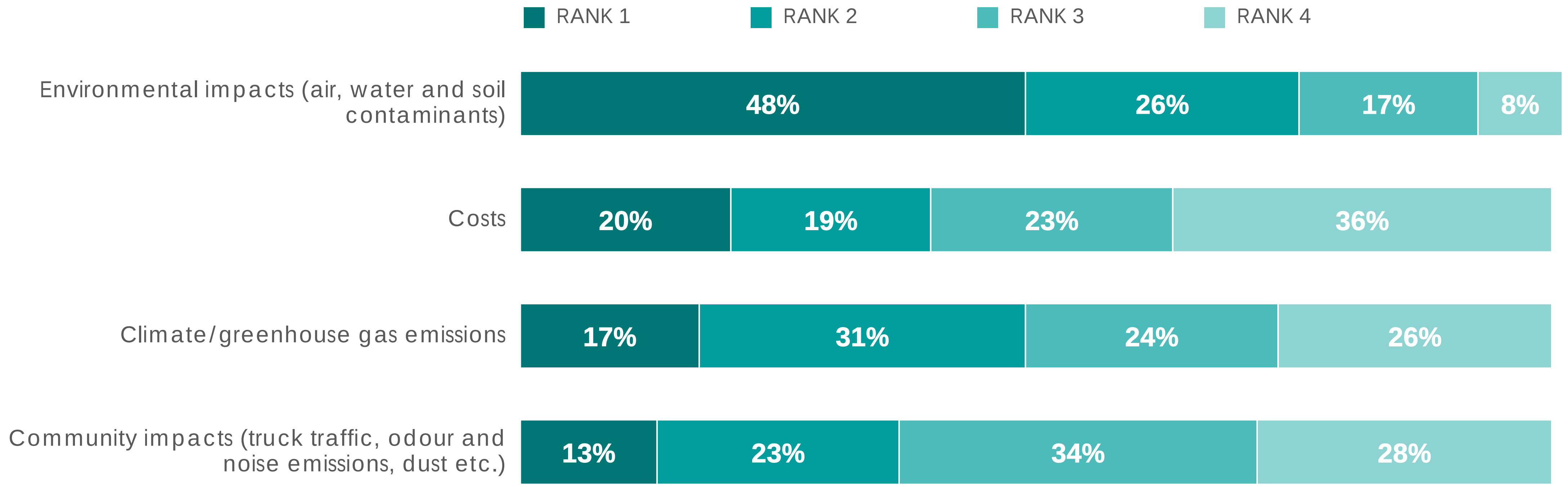
Mentions <4% not shown.
Base: Those rating very important or important (n=316)
Q3. Please explain why you chose that level of importance.

REASONS WHY FAIRLY/SLIGHTLY/NOT IMPORTANT



Mentions <4% not shown.
Base: Those rating fairly important, slightly important, or not at all important (n=159)
Q3. Please explain why you chose that level of importance.

Ranked Importance of Considerations when Planning Beneficial Uses of Biosolids



Base: All respondents (n=516)
Q4. When planning for the beneficial uses of biosolids, how important are the following considerations to you? Please rank in order of importance (1 being most important – 4 being least important).

Ranked Importance of Considerations when Planning Beneficial Uses of Biosolids (by Demos)

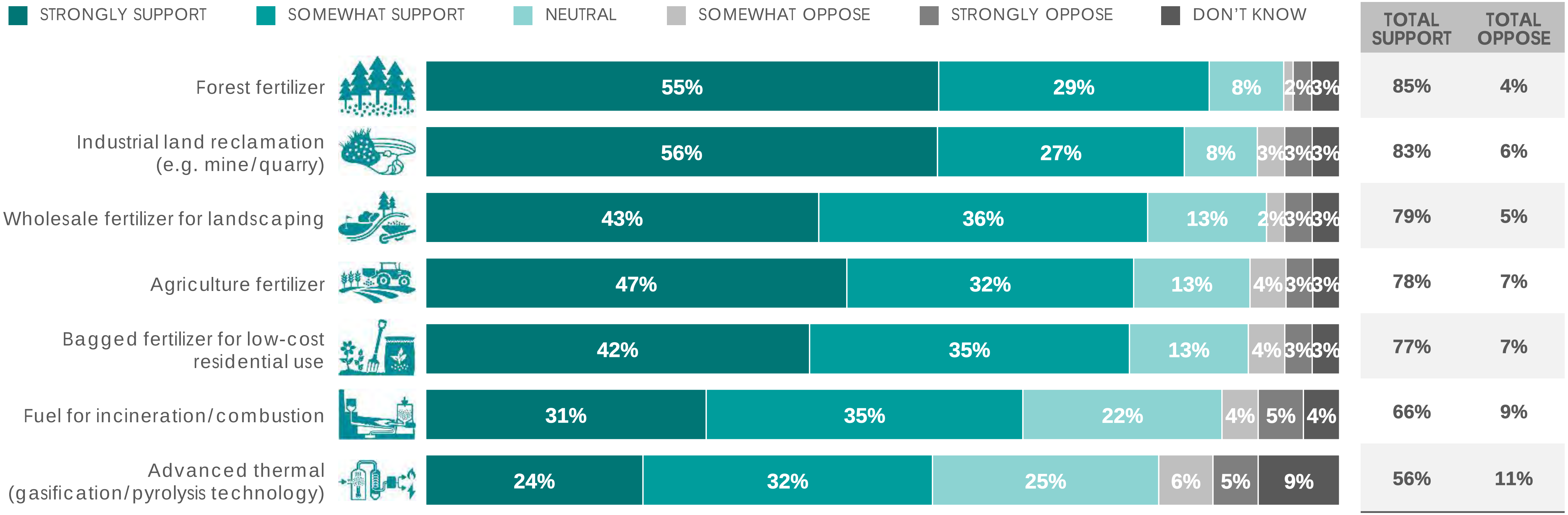
Ranked First (Most Important)

	Total	Region		Age			Sex	
		Core	Other	18-34	35-54	55+	Male	Female
Sample Size	516	408	108	99	171	246	237	276
Environmental impacts (air, water and soil contaminants)	48%	48%	50%	40%	45%	55%	43%	52%
Costs	20%	22%	16%	9%	22%	25%	21%	19%
Climate/greenhouse gas emissions	17%	18%	16%	24%	19%	12%	19%	16%
Community impacts (truck traffic, odour and noise emissions, dust etc.)	13%	12%	18%	25%	12%	7%	16%	11%

Statistically higher | Statistically lower

Base: All respondents (n=516)
Q4. When planning for the beneficial uses of biosolids, how important are the following considerations to you? Please rank in order of importance (1 being most important – 4 being least important).

Support for Options



Data labels <2% not shown.
Base: All respondents (n=516)
Q5-Q11. Please indicate your level of support for...?

Support for Options (by Demos)

Total Support (Strongly + Somewhat)

	Total	Region		Age			Sex	
		Core	Other	18-34	35-54	55+	Male	Female
Sample Size	516	408	108	99	171	246	237	276
Forest fertilizer	85%	87%	80%	81%	83%	88%	84%	86%
Industrial land reclamation (e.g. mine/quarry)	83%	82%	84%	79%	83%	85%	85%	81%
Wholesale fertilizer for landscaping	79%	78%	82%	76%	73%	84%	79%	79%
Agriculture fertilizer	78%	79%	77%	74%	73%	84%	74%	82%
Bagged fertilizer for low-cost residential use	77%	76%	81%	81%	69%	81%	76%	79%
Fuel for incineration/combustion	66%	66%	66%	67%	65%	66%	67%	65%
Advanced thermal (gasification/pyrolysis technology)	56%	56%	56%	70%	55%	48%	56%	55%

Statistically higher Statistically lower

Data labels <2% not shown.
Base: All respondents (n=516)
Q5-Q11. Please indicate your level of support for...?

Best Ways to Keep Informed about Topic

56%
TV NEWS

48%
WEBPAGE

45%
NEWSPAPER

43%
CRD SOCIAL MEDIA

35%
RADIO

5%
OTHER

4%
DON'T KNOW

Base: All respondents (n=516)
Q12. What is the best way to keep you informed about this topic in future?

Best Ways to Keep Informed about Topic (by Demos)

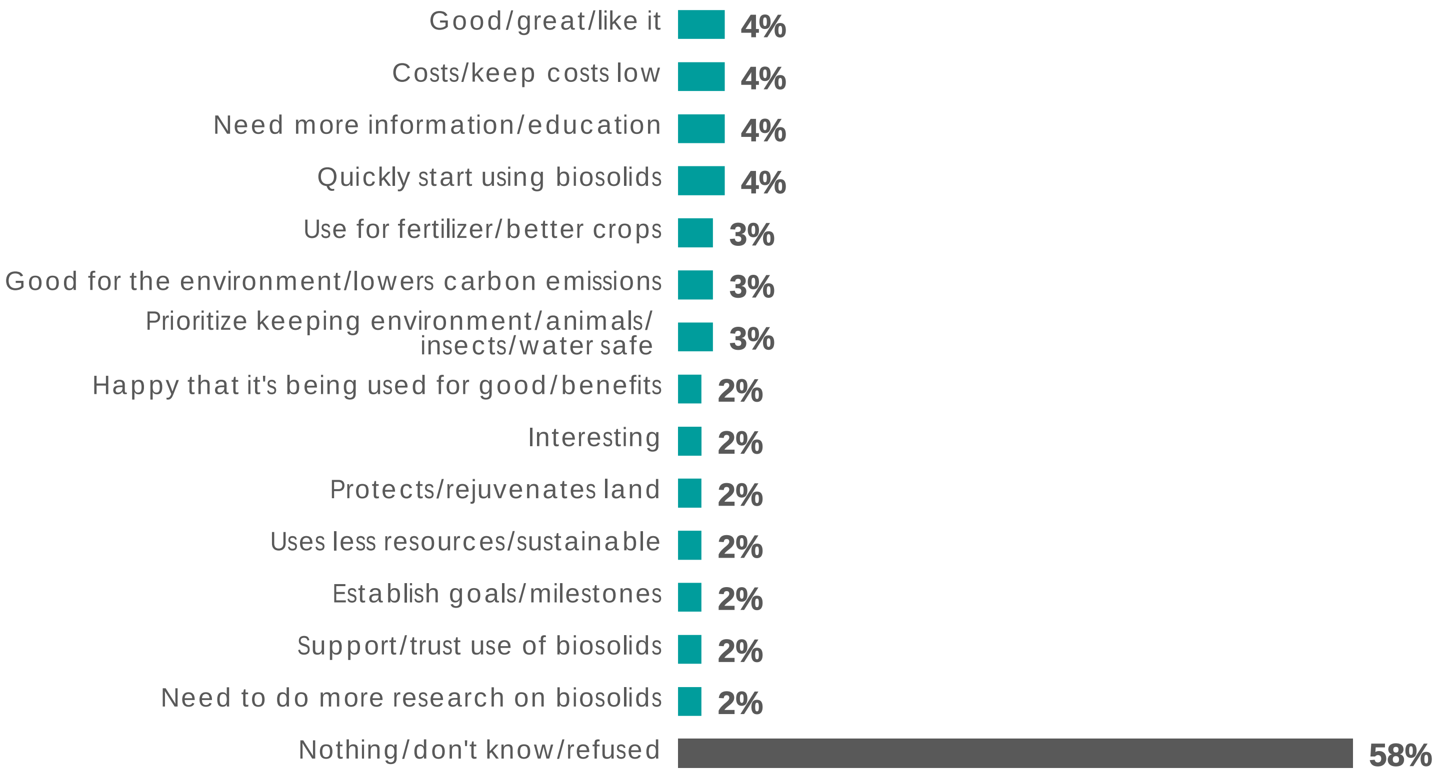
Total Familiar (Extremely + Moderately)

	Total	Region		Age			Sex	
		Core	Other	18-34	35-54	55+	Male	Female
Sample Size	516	408	108	99	171	246	237	276
TV news	56%	55%	59%	61%	52%	57%	58%	55%
Webpage	48%	49%	45%	52%	48%	45%	47%	47%
Newspaper	45%	43%	50%	43%	45%	46%	42%	47%
CRD social media	43%	44%	38%	54%	57%	26%	41%	44%
Radio	35%	33%	41%	39%	43%	27%	29%	41%

Statistically higher | Statistically lower

Base: All respondents (n=516)
Q12. What is the best way to keep you informed about this topic in future?

Final Comments



Mentions <2% not shown.
Base: All respondents (n=516)
Q13. Do you have any final comments about biosolids and the potential uses being considered by the CRD?

