Short-Term Biosolids Contingency Plan

Capital Regional District

April 2020

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SYLVIS DOCUMENT #1308-20

EXECUTIVE SUMMARY

This document, titled Short-Term Biosolids Contingency Plan, comprises the Contingency Plan requested by the British Columbia's Ministry of Environment and Climate Change Strategy (ENV) in a letter dated October 2019 conditionally approving the Capital Regional District's (CRD) Biosolids Beneficial Use Strategy - Definitive Plan. The Short-Term Biosolids Contingency Plan identifies contingency beneficial-use options for CRD biosolids as well as an implementation plan and schedule to ensure that contingency management strategies are proactively in place for scheduled, unscheduled, or emergency contingency needs due to maintenance and/or shutdowns at the cement plants.

To date, the CRD's wastewater has undergone preliminary screening before being discharged into the Strait of Juan de Fuca. Under the *Wastewater Systems Effluent Regulation*, the CRD is required to implement secondary treatment by December 31, 2020 (Environment and Climate Change Canada, 2012). A wastewater treatment plant at McLoughlin Point and a Residual Treatment Facility (RTF) at Hartland landfill are under construction under the *Core Area Liquid Waste Management Plan* (CALWMP). The RTF is anticipated to produce 7,000 bulk tonnes of biosolids annually which are expected to meet Class A biosolids standards as defined by the British Columbia's (BC) *Organic Matter Recycling Regulation* (OMRR). A sustainable and reliable biosolids management plan will be put in place for both short- and long-term management.

In preparation for the implementation of the new wastewater treatment system, the CRD has sought to determine a management method for biosolids that will be produced starting in 2020. The CRD submitted a Biosolids Beneficial Use Strategy - Definitive Plan summarizing applicable regulations, previous options assessments, a plan and schedule for short-term biosolids use, and a long-term biosolids use strategy and implementation schedule. The short-term plan detailed utilizing biosolids at cement plants in the BC lower mainland as an alternative fuel source and landfilling was defined as the contingency management option during scheduled and unscheduled cement plant maintenance and shutdowns. ENV conditionally approved the Biosolids Beneficial Use Strategy - Definitive Plan, requiring that the CRD submit a contingency plan outlining contingency beneficial-use options which do not include landfilling during both scheduled maintenance and unscheduled shutdowns at the cement plants by April 30, 2020.

Land application was not previously considered due to the CRD's biosolids land application ban. A biosolids land application ban in 2011 based on the concerns of agricultural advocacy groups and members of the public. On February 12, 2020, the Board carefully considered on-site land application of OMRR-compliant biosolids substantiated through many scientific studies and partially rescinded the land application ban to allow for biosolids to be land applied at Hartland landfill. Following this policy change, the CRD has evaluated biosolids land application options on-site at Hartland landfill.

On-site biosolids management options were developed through a technical assessment of Hartland landfill which identified areas that would benefit from various types of biosolids beneficial use. Areas totaling approximately 10 hectares have been identified throughout Hartland landfill which would benefit from the application of Biosolids Growing Medium (BGM) or biocover soil,

both products which are created using biosolids as one of several feedstocks. BGM is a soil fabricated from biosolids, a carbon-rich feedstock (typically clean wood waste), and a mineral feedstock (typically sand or poor topsoil), which contains optimum levels of nutrients and organic matter. The CRD intends to fabricate and use BGM as a topsoil alternative to establish vegetation to reclaim closed landfill cells and mitigate erosion on temporarily inactive landfill cells. BGM composition will be determined through feedstock analysis and bench-scale mixing. A ratio of feedstocks will be selected that maximizes soil nutrients and is compliant with OMRR requirements for BGM fabrication. BGM will be fabricated through mixing on-site at Hartland landfill.

Biocover systems are created by amending topsoil or fabricated soil (such as a BGM) with additional coarse, carbon-rich feedstocks to produce a material optimizing specific properties such as porosity and water-holding capacity. These biocover properties promote the growth of methanotrophic bacteria which metabolize methane by oxidizing it to carbon dioxide, resulting in a decrease in the global warming potential of the landfill-produced gases. Biocover systems are a cost-effective alternative to installing costly temporary landfill gas capture systems on temporarily inactive, but not yet closed, landfill cells or areas. The CRD intends to produce biocover soil by first fabricating OMRR-compliant BGM, and then fabricating biocover by amending the BGM with additional feedstocks to meet the specific needs for methanotrophic bacterial growth. Layers of sand and gravel will be established prior to the placement of the fabricated soil to allow for even landfill gas flow though the biocover. This will also enable easy removal when the landfill cell is to be reopened or the system is to be modified. When a landfill cell is reopened for receiving refuse, the biocover will be removed and amended with additional biosolids or other feedstocks before reuse elsewhere on-site.

In the short-term, the CRD has identified contingency uses for an estimated 7,900 to 19,000 bulk tonnes of biosolids over 10 hectares at Hartland landfill through the land application of biosolids as BGM or biocover. The tonnage of biosolids utilized will depend on CRD biosolids physicochemical parameters, application medium, and accessible area. Additional on-site biosolids contingency will become available as landfill cells are inactivated or undergo final closure requiring reclamation. It is likely that the available biosolids beneficial uses at Hartland landfill are sufficient to manage all anticipated short-term biosolids contingency requirements from 2020 through 2025. An unexpected increase of biosolids diverted to contingency uses due to unforeseen emergency cement plant shutdowns will ultimately shorten the lifespan of the contingency system and may impinge upon contingency management available for biosolids during the short-term period from 2020 to 2025. Nonetheless, the CRD will manage all scheduled maintenance, unscheduled, and emergency cement plant shutdowns through beneficial uses at Hartland landfill. If available contingency options become limited in the short-term, the CRD will explore additional beneficial use options. Long-term beneficial-use and contingency biosolids management will be determined in the long-term management strategy to be implemented no later than December 31, 2025.

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1 INTRODUCTION

The Capital Regional District (CRD) is currently constructing a wastewater treatment plant (WWTP) at McLoughlin Point to serve the core area municipalities, as well as the Esquimalt and Songhees Nations. By September 2020, wastewater treatment is scheduled to begin at the McLoughlin Point WWTP, with residual solids conveyed by force main pipeline to the Residuals Treatment Facility (RTF) at Hartland landfill for further treatment and dewatering. The RTF is under construction and is intended to produce Class A biosolids through mesophilic anaerobic digestion, and heat drying will be used to produce a 90-95% solids product. The RTF is scheduled to be commissioned in late 2020. The McLoughlin Point WWTP and Hartland RTF are being developed under the CRD's Core Area Liquid Waste Management Plan (CALWMP) (Capital Regional District, Parks & Environmental Services Department, 2015), which was approved by British Columbia's (BC) Ministry of Environment and Climate Change (ENV) in 2003. Since the approval of the CALWMP, several amendments initiated by ENV or the CRD have been made.

In 2016, the CRD proposed Amendment No. 11 to the CALWMP which updated the configuration of the wastewater treatment system, as well as the biosolids management plan proposed in previous amendments. As part of the conditional approval of Amendment No. 11, ENV required that by June 30, 2019 the CRD develop a plan defining a beneficial use for CRD biosolids (BC Ministry of Environment and Climate Change Strategy, 2016).

The CRD submitted the Biosolids Beneficial Use Strategy - Definitive Plan which summarized applicable regulations, previous options assessments, a short-term biosolids beneficial-use plan and schedule, and a long-term biosolids beneficial-use strategy and implementation schedule. The short-term plan detailed the use of CRD Class A biosolids as an alternative fuel source at cement plants in the BC lower mainland and landfilling of the biosolids during scheduled and unscheduled cement plant maintenance and shutdowns. Upon review, ENV conditionally approved the CRD's Biosolids Beneficial Use Strategy - Definitive Plan with several requirements. The overarching requirement was to remove landfilling for contingency biosolids management and determine alternate contingency uses that beneficially use biosolids during scheduled and unscheduled cement plant maintenance and shutdowns. ENV has required that by April 30, 2020, a short-term (2020-2025) contingency plan be submitted outlining contingency biosolids beneficial uses to be implemented during scheduled maintenance and unscheduled shutdowns cement plant.

The purpose of this document is to fulfill ENV's conditional approval requirement for a contingency plan by defining contingency beneficial uses of CRD biosolids and an implementation plan.

2 BACKGROUND

To date, wastewater in the CRD has undergone preliminary treatment (i.e. screening) before being discharged into the Strait of Juan de Fuca. The *Wastewater Systems Effluent Regulation* released in 2012 includes a risk rating system for wastewater treatment systems in Canada (Environment and Climate Change Canada, 2012). An assessment of the CRD's historical Core Area wastewater treatment system placed it in the highest risk category, requiring the CRD to achieve secondary treatment of its wastewater by December 31, 2020(Environment and Climate Change Canada, 2016).

The CRD assessed a variety of wastewater treatment technologies and biosolids beneficial use options to determine which systems would best align with their treatment and end-use goals. By September 2020, wastewater will undergo tertiary treatment at the McLoughlin Point WWTP, treated effluent will be discharged into the marine environment while residual solids are conveyed through an 18-kilometre force main pipeline to the RTF at Hartland landfill. At the RTF, residual solids will undergo mesophilic anaerobic digestion and drying to produce biogas and biosolids, both of which are intended to be collected and used beneficially. The RTF is anticipated to produce 7,000 bulk tonnes (bt) of biosolids annually at a moisture content of 5-10%. The biosolids are expected to meet Class A biosolids standards as defined in BC's *Organic Matter Recycling Regulation* (OMRR) (Province of British Columbia, 2002). The OMRR regulates the production, classification, and distribution of organic residual materials, including biosolids, compost, and biosolids growing medium (BGM), for the purposes of beneficial use with a strong focus on land application as the final use of the material. CRD biosolids will require ongoing management as biosolids will be produced on a daily basis.

The CRD had not included land application of biosolids in previous assessments due to a land application ban put in place in 2011 based on the concerns of several advocacy groups and members of the public. The land application ban has been reviewed on several occasions and was partially rescinded by the CRD Board of Directors on February 12, 2020 allowing biosolids to be land applied at Hartland landfill for contingency biosolids management.

2.1 ENV Conditional Approval of Biosolids Beneficial Use Strategy - Definitive Plan

ENV reviewed the Biosolids Beneficial Use Strategy – Definitive Plan submitted by the CRD on June 21, 2019 and conditionally approved the plan with a number of conditions for short- and long-term biosolids use.

ENV expects that the CRD will look at alternate beneficial uses which may include increasing short-term storage or land applying biosolids but cannot include disposal or long-term storage in the landfill, known as a biocell. The CRD must prepare a Contingency Plan for short-term biosolids management that assesses beneficial use options for contingency management during scheduled and unscheduled cement plant maintenance and shutdowns that does not include landfilling. A Net Energy Balance Assessment and a Greenhouse Gas Emission Estimate evaluating the co-combustion of CRD biosolids at cement plants are required to be submitted by June 1, 2021. These documents will be submitted separately of this contingency plan. ENV requires that the CRD consider land application in the long-term biosolids management strategy and consult citizens, local government, and Indigenous communities on the long-term biosolids management approach. Robust consultation was identified of high importance in developing the contingency plan and long-term biosolids management strategy. ENV respects the CRD's authority to create a biosolids land application ban but maintains a position that land applying biosolids in accordance with the OMRR is beneficial to both the environment and taxpayers.

2.2 Hartland Landfill

Hartland Landfill is an engineered landfill facility designed to effectively contain and control leachate on-site and divert clean groundwater and surface water offsite. There are over 150 monitoring locations on-site for groundwater, and surface water and landfilling impacts have not been observed off the site. More information on monitoring and water quality evaluation is summarized in the Hartland Environmental Monitoring reports which are prepared annually as a requirement under the landfill Operational Certificate. The beneficial use of biosolids within the landfill footprint is not expected to impact environmental conditions on or off-site.

3 SHORT-TERM CONTINGENCY PLAN

Areas of the Hartland landfill have been identified for contingency management to beneficially utilize biosolids. Biosolids will be blended with additional feedstocks to create a nutrient-rich soil known as a biosolids growing medium (BGM) which can be used as a topsoil replacement in reclamation or to mitigate erosion through vegetation establishment. Biosolids can also be used to produce a fabricated soil for a biocover system which is implemented to promote oxidation of methane by methanotrophic bacteria to reduce the global warming potential of the fugitive landfill gases being emitted. BGM and biocover will be applied to inactive and closed areas of Hartland landfill. Precipitation falling on open, active areas is collected and managed as leachate. Precipitation falling on closed areas is managed as clean surface water and is diverted offsite. Application of BGM and biocover is not predicted or intended to have any adverse impacts on percolate or surface water.

3.1 Biosolids Growing Medium (BGM)

Biosolids Growing Medium (BGM) is a topsoil-alternative generated by mixing biosolids with a carbon-rich feedstock (typically clean wood waste) and a mineral feedstock (typically sand or subsoil). BGM is a nutrient-rich fabricated soil used in areas that may not otherwise have viable soil. BGM will be used to establish vegetation to reclaim closed landfill cells and to mitigate erosion on temporarily inactive landfill cells. In BC, BGM is regulated under the OMRR requiring physicochemical parameters and pathogen limits be met. Sampling will be carried out every 1,000 dry tonnes (dt) of biosolids, as per OMRR requirements, and results will be kept on-site. The CRD will notify ENV prior to transporting biosolids from the RTF to the mixing facility at Hartland landfill. Biosolids will be managed at Hartland landfill in compliance with OMRR requirements outlined in Part 3 – Divisions 2 and 4, as well as Schedules 4, 5, 6, and 11. A Land Application Plan (LAP) is not required for land applications of BGM under the current OMRR, a LAP will be prepared in the event that an OMRR amendment requires one.

The BGM feedstock composition will be determined through bench-scale mixing trials. Potential feedstocks will be sampled and submitted for laboratory analysis. Laboratory results will be used to calculate potential feedstock mixing ratios and bench-scale mixes will be produced and submitted for laboratory analysis. Trial BGM mixes will be removed from consideration if they do not meet OMRR-BGM requirements. A final mix will be chosen that optimizes nutrients and physicochemical parameters for vegetation growth.

The finalized feedstock ratio will be used to fabricate BGM on-site at Hartland landfill using heavy equipment, such as a front-end loader and tub soil mixer, in a covered mixing area. BGM placement thickness will depend on the nutrient needs of a given area and will range from 30 to 75 centimeters (cm). The BGM will be wetted during the mixing process and this will have the added benefit of mitigating dust during placement. Areas applied with BGM will be vegetated with grasses, shrubs, and/or trees, using native plants when practicable. Temporarily inactive, but not yet closed, areas of the landfill that do not require landfill gas management will be covered with BGM to prevent erosion and reduce the infiltration of precipitation. BGM placed on temporarily inactive, but not yet closed, landfill cells will be underlain with layers of sand and gravel to enable easy removal once the cell is to be reopened. The removed BGM can be amended with additional biosolids or other feedstocks for use elsewhere on-site for continued beneficial use of the biosolids. BGM used for final closure of a landfill cell will be left in place to reclaim the area.

Below are examples of BGM use at municipal parks, highway and commercial landscaping, and mine reclamation.

3.1.1 Case Study: Surrey Bend Regional Park Biosolids Growing Medium

The Surrey Bend Regional Park is located on the banks of the Fraser River in the City of Surrey. In 2015, Metro Vancouver requested a BGM be fabricated for use in the park's redevelopment. Local feedstocks were sourced to combine with Class A biosolids (5,800 m^3) provided by Metro Vancouver in order to fabricate two unique soil blends to be used in different planting areas of the park: a lawn and meadow mix, and a bioswale and wetland mix. The soil blends were designed to be weed-free and contain optimum nutrient concentrations in a slow-release organic formulation that would optimize plant establishment and growth for up to four years without supplemental fertilization.

The finished BGM blends were analyzed for compliance with the OMRR-BGM criteria and placed throughout the regional park in identified planting areas. This regional park, which reopened to the public in 2016, provides a diverse habitat for birds and wildlife as well as an opportunity for community members to explore the unique ecological environment the region has to offer.

3.1.2 Case Study: Vancouver International Airport Landscaping

The Vancouver International Airport (YVR) is committed to sustainability. As Canada's second busiest airport, YVR welcomes thousands of tourists and visitors to Vancouver and is the first representation of the city. In preparation for the 2010 Winter Olympics, significant landscaping was completed along the roadways and transit stations leading to YVR.

The existing soils on-site had low fertility, poor drainage, and were subject to periodic flooding. A custom blended soil was produced to complete extensive landscaping on slopes, low lying areas, and roadway corridors coupled with a diverse species composition of trees, shrubs, grasses, and annuals. The custom-blended BGM for use at YVR incorporated local feedstock materials including approximately 2,800 m^3 of Metro Vancouver biosolids. The fabricated BGM had a long-term, slow-release nutrient formulation with optimum plant macro- and micro-nutrients and a specific formulation to balance water holding capacity with soil aeration and drainage.

The finished BGM was analyzed to confirm compliance with the OMRR BGM criteria. The use of BGM not only increased the aesthetics of the areas surrounding YVR but also provided a beneficial use for locally generated residuals.

3.1.3 Case Study: Sea-to-Sky Highway Improvement Project

The Sea-to-Sky Highway winds its way along Howe Sound from Vancouver to Whistler. The Sea-to-Sky Highway Improvement Project was completed for the 2010 Winter Olympics and the landscaping portion of the project was undertaken to improve the visual quality of the corridor with thousands of plants in medians, highway slopes, and road edges.

A custom-blend BGM was fabricated using 430 m^3 biosolids to ensure optimum plant growth, performance, and sustainability. The soil was designed to resist slumping and to adhere to steep slopes – ideal for the steep and undulating terrain along the highway. Upon soil placement, the establishment of seeded grasses and planted trees and shrubs was rapid and vigorous, providing pleasing aesthetics to those traveling along the Sea-to-Sky Highway.

Fabricated BGM was routinely analyzed and maintained compliance with the OMRR BGM criteria. The project provided beneficial use for locally generated residuals in highly visible areas along the corridors on the Sea-to-Sky Highway leading up to Whistler, British Columbia.

3.1.4 Case Study: Producer's Pit Quarry Reclamation

Producer's Pit was a 250-hectare sand and gravel quarry located in Colwood, approximately 18 kilometers southwest of Victoria's city centre. Producer's Pit was approaching the end of its working life and was required to be reclaimed before implementing the final land use, the development of a new suburb, Royal Bay. A Comprehensive Community Plan was prepared that included a mixture of residential properties, greenway, community facilities, and a village centre developed on the close mine site over a 15-year period.

Reclamation activities were conducted from 2003 to 2007 in theme with the developer's requirements and objectives set forth in the Comprehensive Community Plan. Class A biosolids from the CRD's Saanich Peninsula Wastewater Treatment Plant (4,830 m^3) and the Regional District of Nanaimo's French Creek Pollution Control Centre (2,170m^3) were mixed with sand and woodchips to produce a BGM to be used in the reclamation activities. The final development plan outlined that reclaimed greenways and parks were to have a productivity equal to or greater than that prior to mining. Once the BGM was applied, plant establishment, ecosystem health, and site aesthetics improved dramatically. Site quality remained high even several years after initial topsoil placement.

The BGM was analyzed and met the standards of the OMRR. The operational program was developed and implemented over a four-year period involving stakeholder consultation activities (i.e. open houses, tours, and presentations) and the installation of demonstration plots constructed with various soil amendments.

3.2 Biocover

Biocover systems, also known as methane oxidation beds, utilize fabricated soil made of organic residuals, such as biosolids and woodchips in composted or uncomposted form, to promote the growth of methanotrophic bacteria which aid in landfill gas management. Methanotrophic bacteria consume methane and oxidize it to carbon dioxide through metabolism. Given that methane has a global warming potential equal to 25 times that of carbon dioxide over 100 years (Government of Canada - Environment and Climate Change, 2010), the biological oxidation of fugitive methane significantly decreases the overall global warming potential of fugitive landfill-generated gases. Implementing a biocover system for methane oxidation is a cost-effective alternative to installing a costly, temporary landfill gas capture system on temporarily inactive cells of a landfill which will be reopened within a few years.

Soils fabricated for biocover systems are designed to optimize soil properties for methanotrophic bacteria growth. Biocover soils have high porosity to encourage even diffusion of landfill gases upward while enabling oxygen diffusion downward from the atmosphere through a thick, porous profile as methanotrophic bacteria require both methane and oxygen to carry out metabolism (Zeiss, 2006). Water-holding capacity is an important property as methanotrophic bacteria thrive in soils with relatively high moisture and allows methane to be dissolved in water as methanotrophs can only metabolize methane in solution (Humer and Lechner, 1999). Soils used for biocover are designed to have elevated organic matter as it has been shown to encourage methane oxidation by methanotrophs (Kettunen et al., 2006; Huber-Humer et al., 2009). Biocovers producing the greatest methane flux reduction are those with elevated organic matter and water-holding capacity with high porosity (Humer and Lechner, 2001). Methane flux reduction is dependent on atmospheric temperature and pressure.

The fabricated biocover system will be created on-site using BGM as a primary feedstock (as detailed in Section 3.1), supported with additional feedstocks, such as coarse woody debris or gravel, to achieve the desired soil density and porosity. The biocover fabricated soil composition will be determined through bench-scale mixing trials. Laboratory results from the finalized BGM composition will be used to calculate amendment additions that optimize soil characteristics for methanotrophic bacteria growth. Potential amendments may include clean wood waste or gravel. The final biocover fabricated soil is expected to be composed of approximately 20-35% biosolids by volume. Bench-scale biocover mixes will be prepared using BGM and additional feedstocks, and physical soil properties will be visually assessed. A final mix will be chosen that optimizes the desired physicochemical parameters such as soil texture, water-holding capacity, and organic matter. The determined amendment additions will be used to fabricate biocover soil on-site at Hartland landfill using heavy equipment in a covered mixing area. BGM will be created as per Section 3.1 and the additional feedstocks will be incorporated into the mix to create a biocover soil.

Biocover fabricated soil will be placed at a minimum thickness of 0.5 metres, and up to 2.5 metres at landfill gas hot spots, to optimize landfill gas and atmospheric gas diffusion for methanotrophic bacteria growth. If the biocover soil dries out following mixing, it will be re-wetted prior to placement to reduce the potential for dust. Biocover will be underlain with layers of sand and gravel to promote even gas diffusion and enable easy removal once the cell is to be reopened. The removed biocover can be amended with additional biosolids or other feedstocks and used elsewhere for continued methane oxidation and beneficial use of the biosolids. Areas applied with biocover will not be vegetated in order to maintain soil porosity but will be surrounded by vegetated berms, using native vegetation when practicable. This is intended to manage and mitigate the unlikely potential for material movement and/or runoff from the areas and is a precautionary measure. This will ultimately also make the biocover easier to modify and remove if necessary.

Biocover will be generated from a BGM which meets all applicable OMRR-BGM physicochemical parameters and pathogen limits requirements. BGM placement does not require a LAP to be prepared under the current OMRR, a LAP will be prepared should future OMRR amendments require one. Sampling will be carried out every 1,000 dt of biosolids used, as per the OMRR requirements, and sampling results will be kept on-site.

3.2.1 Case Study: Nanaimo Regional Landfill Biocover

The Nanaimo Regional Landfill located on Cedar Road is a 22.5 hectare residential and commercial waste landfill. In 2007, two soils fabricated from organic residuals, including biosolids, were mixed and placed as biocover mediums to evaluate their ability to mitigate fugitive methane emissions from an interim closure area of the landfill.

Methane emissions were quantified prior to the application of the biocovers. Methane emissions were then measured at monitoring locations on a section of the landfill which had been covered with 30 centimeters (cm) (15 cm of wood chips over 15 cm of silt/gravel mix) of interim closure material. Biocover soils were applied at a depth of 12-15 cm over a layer of medium-weight geotextile and 30 cm of compacted clay. Methane emissions were then measured five weeks after the application of the biocover and showed a significant reduction in the methane fluxes (90-100%).

Biosolids (560 m^3) were managed and applied to the site in accordance with OMRR requirements. The biocovers were compliant with trace element limits for Commercial Land as specified in the OMRR. A site inspection following the application of the biocover concluded that biosolids were managed in an environmentally protective manner.

3.2.2 Case Study: Thompson-Nicola Regional District Landfills

The Thompson-Nicola Regional District has multiple small rural landfills across its area. Small landfills like these do not generate large volumes of landfill gas to support traditional treatment methods like flaring or conversion to other sources of energy, however, when combined there is a considerable amount of potential methane generated that contribute to greenhouse gas impacts. Since 2014, the Thompson-Nicola Regional District has implemented the use of biocovers at these rural landfills as a way to reduce the environmental impact of landfill gas.

Dewatered biosolids from Metro Vancouver were used in the development and implementation of biocovers at six landfills throughout the Thompson-Nicola Regional District:

- Barriere Landfill
- Chase Landfill
- Logan Lake Landfill

- Clearwater Landfill
- Heffley Creek Landfill
- Lower Nicola Landfill

These landfills include both operating landfills and closed landfills. The biocovers were installed over methane hotspots in the landfills and have led to significant removal of fugitive landfill-generated methane due to the consumption by methanotrophic bacteria. In 2018, methane removal efficiency ranged from 72-100% in the various landfill areas (Abboud, 2018).

The Thompson-Nicola Regional District has been measuring and reporting their carbon emissions to the Climate Action Revenue Incentive Program and equates these methane oxidation beds as a key component in the Regional District's goal of achieving carbon neutrality.

4 SHORT-TERM CONTINGENCY PLAN IMPLEMENTATION AND TIMELINE

The CRD intends to manage heat-dried Class A biosolids through co-processing in kilns at cement plants in the BC lower mainland. Alternate management options have been identified for contingency use when the cement plants undergo scheduled and unscheduled cement plant maintenance and shutdowns. It is understood that the kilns typically undergo three scheduled shutdowns to complete maintenance each year: winter turnaround for the month of February, fall turnaround for two weeks in September, and one to two weeks in the late fall. Unscheduled shutdowns occur quite often however most are minor and last for a few hours to a full day. In rare cases, an unscheduled shutdown may last three to seven days if major repairs are required. There are intended to be approximately five days' worth of biosolids storage at the RTF and an additional five days of storage at the cement plants.

The CRD Board partially rescinded the biosolids land application ban on February 12, 2020 allowing biosolids to be land applied at Hartland landfill for contingency biosolids management. A technical assessment of Hartland landfill for biosolids applications was completed following the partial rescindment of the land application ban. An estimated 10 hectares (ha) were identified for land application of BGM or a biocover system, utilizing approximately 7,900 to 19,000 bt biosolids. Final biosolids tonnages managed through on-site land applications will be dependent on CRD biosolids' physicochemical parameters and safely accessible areas. CRD biosolids will be routinely monitored following the start-up of the RTF in September 2020 to evaluate the physicochemical composition and assess compliance with OMRR Class A biosolids requirements. Biosolids laboratory results will be reviewed regularly and used to adjust BGM and biocover mixing ratios if required.

Additional on-site biosolids contingency will become available as landfill cells are temporarily inactivated or undergo closure requiring reclamation. Biosolids land application options will be assessed and calculated under the processes identified in Sections 3.1 and 3.2 above. Long-term beneficial-use and contingency options for biosolids management will be determined through the long-term strategy identified in the Biosolids Beneficial Use Strategy – Definitive Plan (Capital Regional District, 2019) to commence no later than December 31, 2025.

4.1 Biosolids Growing Medium (BGM)

Fabricating BGM will reduce the need for imported topsoil to complete landfill cell closure and erosion mitigation on temporarily inactive landfill cells. Temporarily inactive, but not yet closed, areas of the landfill that do not require landfill gas management will be covered with BGM to prevent erosion and reduce the infiltration of precipitation. BGM placed on temporarily inactive, but not yet closed, areas of the landfill will be underlain with gravel and sand to enable easy removal and reuse once the landfill cell is to be reopened. BGM will be wetted prior to placement to reduce potential dust generation. Once BGM is placed, the area will be vegetated with a mixture of grasses, shrubs, and/or trees, using native vegetation where practicable.

The following areas have been identified for BGM placement as described in Section 3.1. Further details are provided in Table 1 (Appendix 1) and Figure 1 (Appendix 2).

- Area 2 – Final closure of Phase 2 Cell planted with small poplar whips in 2020
  - Remove poplar whips, place BGM, and vegetate
- Area 3 – Active north rocky slope of Phase 2 Cell 3
  - Sand and gravel placed over slope, overlay with interim BGM, and vegetate
- Area 5 – Progressive closure of Phase 2 Cell 2 cell with poorly established cover
  - Place BGM over existing sparse ground cover and vegetate
- Area 6 – Progressive closure of cell with no established vegetative cover
  - Place BGM and vegetate
- Area 7 – Final closure of cell with poorly established new trees
  - Remove trees, place BGM, and vegetate
- Area 8 – Final closure of south cell with young, poorly established Douglas fir trees
  - Remove trees, place BGM, and vegetate
- Area 9 – Previous final closure of Phase 1 cell with mature well-established trees
  - Remove trees, place BGM, and vegetate

4.2 Biocover

Biocover will be placed on temporarily inactive landfill cells to mitigate fugitive methane emissions as landfill gases escape into the atmosphere. Biocover will be wetted prior to placement in order to provide an ideal media for methanotrophs. This will also aid to reduce the potential for dust generation. Biocover will be underlain with gravel and sand to encourage even gas diffusion and enable easy removal and reuse elsewhere on the landfill to continue beneficial use of the biosolids contained in the biocover. Areas applied with biocover will not be vegetated but will be surrounded by vegetated berms, using native vegetation when practicable.

The following areas have been identified for biocover placement as described in Section 3.2. Further details are provided in Table 1 (Appendix 1) and Figure 1 (Appendix 2).

- Area 1 – Active landfill cell covered in black tarp
  - Layers of sand and gravel placed over black tarps, overlay with biocover
- Area 4 – Active Phase 2 Cell 3 bedrock-refuse interface
  - Layers of sand and gravel placed over gas escape area, overlay with biocover

4.3 Environmental Controls and Monitoring

BGM is produced to emulate a natural soil and is utilized without restriction in British Columbia once it has been tested and certified to meet the criteria required for its production under OMRR. Environmental controls and monitoring are required under the Hartland landfill Operational Certificate and the Hartland Landfill Design, Operations and Closure Plan (BC Ministry of Environment and Climate Change Strategy, 2013; Capital Regional District, 2016). Under the current landfill Operational Certificate, Hartland staff must effectively minimize and control dust in all aspects of landfilling and site operations. To ensure compliance with the Hartland Landfill Operational Certificate, BGM and biocover fabrication will take place in a covered area and will be wetted to prevent dust generation and dispersion. BGM and biocover will be checked to ensure appropriate moisture, and if required, will be wetted prior to placement. BGM will be vegetated as soon as possible following placement.

Land application of BGM and biocover are not intended, nor expected, to impact surface water or groundwater on or off the landfill site. The BGM and biocover are expected to act as normal soils. Studies have demonstrated that biosolids applications, even those undertaken at rates greater than OMRR limits, do not cause an increase in groundwater microbiological concentrations, trace elements, or metals concentrations (Surampalli et al., 2008; McFarland et al., 2013). While the application of BGM as per the OMRR does not prescribe additional monitoring, Hartland staff are developing a surface water monitoring program to evaluate any impacts to surface water from the application of biosolids media. This program will supplement the quarterly surface water monitoring program that has been ongoing since 1987 and allow staff to effectively identify any surface water changes or trends.

4.4 Short-Term Contingency Plan Implementation Timeline

The CRD is committed to ensuring that contingency uses have been identified and are prepared for immediate implementation in the event of scheduled, unscheduled, or emergency contingency needs due to cement plant maintenance and/or shutdowns.

BGM and biocover require the process to begin well in advance of land application and therefore a schedule has been outlined to ensure the BGM and biocover compositions have been finalized and all regulatory requirements are met. Potential feedstock sampling will commence immediately following the Hartland RTF coming online and producing biosolids. Bench-scale mixing to determine an optimal BGM feedstock ratio will be completed within two months of initial biosolids production. The required OMRR notification will be submitted for BGM fabrication upon finalizing the BGM composition, preparing the CRD for contingency uses that can be implemented immediately in the event of scheduled, unscheduled, or emergency contingency needs due to cement plant maintenance and/or shutdowns.

A timeline to prepare for BGM and biocover applications and associated dates are included below.

September 2020	Hartland RTF start-up
	Sample biosolids and submit for laboratory analysis
	Confirm compliance with OMRR Class A Biosolids requirements
October 2020	Sample potential BGM and biocover feedstocks and submit for laboratory analysis
	Complete BGM bench-scale mixing trials and submit for laboratory analysis
	Confirm compliance with OMRR BGM requirements
	Select final BGM feedstock mixing ratio
	Bench-scale biocover mixing and visual analysis
November 2020	Notify ENV of biosolids transport for BGM fabrication
	Prepare mixing pad
December 2020	Procure feedstocks required for fabricating BGM and biocover
	Mobilize equipment required for BGM and biocover mixing to Hartland landfill
	Fabricate BGM on-site
	Sample BGM to confirm compliance with OMRR-BGM requirements
	Amend BGM to create biocover
January 2021	Prepare BGM and biocover placement areas
	Place layers of sand and gravel in areas receiving biocover or interim BGM
	Place BGM and/or biocover
	Vegetate areas with BGM and/or biocover
ongoing	Sample BGM every 1,000 dt of biosolids used, or as directed by the OMRR, and submit for laboratory analysis

5 SUMMARY

This Short-Term Biosolids Contingency Plan details contingency options for the continuous beneficial use of CRD biosolids during scheduled and unscheduled cement plant maintenance and shutdowns. As per ENV requirements, biosolids will not be landfilled during scheduled and unscheduled cement plant maintenance and shutdowns.

ENV's conditional approval of Amendment No. 11 to the CALWMP required a Definitive Plan outlining the CRD's intended biosolids beneficial use plan be submitted prior to the Hartland RTF coming online in 2020. The Biosolids Beneficial Use Strategy – Definitive Plan reviewed options previously assessed and detailed a short-term plan and long-term strategy for the beneficial use of biosolids. The short-term plan detailed the use of CRD biosolids as an alternative fuel source at cement plants in the BC lower mainland and landfilling the biosolids during scheduled and unscheduled cement plant maintenance and shutdowns. Upon ENV's review, the Biosolids Beneficial Use Strategy – Definitive Plan was conditionally approved requiring that alternative beneficial use contingency options, not including landfilling or temporary storage in biocells, be identified for scheduled and unscheduled cement plant maintenance and shutdowns.

Previously the CRD had not included land application of biosolids as a management option due to the biosolids land application ban put in place in 2011 based on the concerns of several advocacy groups and members of the public. To support the beneficial reuse of biosolids the CRD Board partially rescinded the ban in February 2020 allowing biosolids to be land applied at

Hartland landfill for contingency management. A technical assessment of Hartland landfill identified an estimated 10 ha of land available to beneficially utilize 7,900 to 19,000 bt of biosolids as BGM and biocover. BGM will be fabricated for use as a topsoil alternative which will be used for cell closure reclamation or erosion mitigation on temporarily inactive landfill cells. Biocover will be used to promote methane oxidation by methanotrophic bacteria to decrease the overall global warming potential of the landfill gases. BGM and biocover feedstock ratios will be determined through bench-scale mixing trials and applicable regulatory bodies will be notified through the standard OMRR process. Completing BGM and biocover mixing trials early will ensure that the CRD has biosolids management contingency in place for immediate implementation in the event of scheduled, unscheduled, or emergency contingency needs due to cement plant maintenance and/or shutdowns. Additional areas at Hartland landfill will become available for beneficial use biosolids management through the use of BGM and biocover as landfill cells are inactivated, closed, or require fugitive landfill gas management.

The CRD will assess the long-term feasibility of utilizing biosolids for alternatives fuels, BGM, and biocover uses. The CRD is committed to implementing biosolids management solutions that employ the most reliable technologies, minimize environmental and human health risks, adhere to all relevant regulations and policies.

6 REFERENCES

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APPENDIX ONE – TABLES

Table 1: Areas identified for biosolids utilization at Hartland landfill.

Area #	Area Description	Estimated Area for Reclamation		Reclamation Method	Biosolids Use	
		Gross Area (m^2)	Available Area (m^2)		Low (t biosolids)	High (t biosolids)
1	Active landfill cell covered in black tarp	16,000	12,000	Biocover	3,680	3,680
2	Final closure of Phase 2 Cell 1 planted with poplar whips in 2020	33,300	24,980	Remove trees, add BGM	1,020	3,830
3	Active north rocky slope of Phase 2 Cell 3	20,100	15,080	Interim BGM	620	2,310
4	Active Phase 2 Cell 3 landfill gas escape area	470	350	Biocover	110	110
5	Progressive closure of Phase 2 Cell 2 cell with poorly established cover	10,300	7,730	BGM over	320	1,190
6	Progressive closure of cell with no established cover	875	660	BGM	30	100
7	Final closure of cell with poorly established new trees	6,340	4,760	Remove trees, add BGM	190	730
8	Final closure of south cell with young, poorly established Douglas fir	11,700	8,780	Remove trees, add BGM	360	1,350
9	Previous final closure of Phase 1 cell with mature well-established mixed trees	49,900	37,430	Remove trees, add BGM	1,530	5,740
	TOTALS	99,085	74,340		7,860	19,040

Note: Available area is 75% of the gross area available for biosolids use to account for reductions due to access and safety requirements.

APPENDIX TWO – FIGURES

Figure 1: Areas identified for biosolids use at Hartland landfill.