Hartland Landfill Operating & Environmental Monitoring 2025/2026 Report

Operational Certificate 12659

Capital Regional District | Parks, Recreation & Environmental Services, Environmental Protection



Prepared by:

GeoEnvironmental Programs

Capital Regional District

625 Fisgard Street, Victoria, BC V8W 2S6

T: 250.360.3000 F: 250.360.3079

www.crd.ca

November 2026

HARTLAND LANDFILL
OPERATING & ENVIRONMENTAL MONITORING
2025/2026 REPORT

EXECUTIVE SUMMARY

Hartland Landfill is owned and operated by the Capital Regional District (CRD) and is the only municipal solid waste landfill in the capital region. The multi-purpose facility provides recycling, household hazardous waste collection, a salvage area, yard and garden waste collection and processing, controlled waste disposal and landfill services to commercial and residential customers. The facility is also authorized to accept waste asbestos.

The facility operates in accordance with an approved Solid Waste Management Plan and Operational Certificate #12659 issued by the BC Ministry of Environment and Parks (ENV). An annual operations report is required under the current landfill authorization and must detail waste tonnages, landfill lifespan, closure funding, and operational and construction-related activities. This report also summarizes findings from the environmental monitoring and landfill gas reports. Operational activities and landfill gas findings cover the period of January 1 to December 31, 2025. Environmental monitoring data is reported for the period of April 1, 2025 to March 31, 2026, to encompass a full wet season.

Surface water quality data collected in 2025/2026 indicates that surface water quality is generally consistent with natural water quality surrounding the site except for: aggregate runoff impacts (nitrate and sulphate) observed north of the site in Durrance and Todd Creek; and road salt impacts (chloride) observed south of the site. Several trace metal BC Approved Water Quality Guidelines for Freshwater Aquatic Life Long-Term Chronic (BCWQG LTC) exceedances (e.g., aluminum, iron, dissolved copper) likely reflect turbid and/or low-flow conditions at the time of sampling.

Groundwater quality in 2025/2026 met the applicable BC Contaminated Sites Regulation (CSR) groundwater standards at all boundary compliance locations except for two antimony results at GW-112-1-1 (downgradient of the Northeast Stockpile). Overall water quality results from 2025/2026 indicate that the landfill is functioning as intended and landfill leachate was contained within the property boundary.

The Biogas Upgrading Facility (BUF) started producing Renewable Natural Gas (RNG) for sale to FortisBC in 2025. This facility uses proprietary technologies and has a complex design. A high-level process is indicated in Figure 5; and a detailed process flow diagram is included in Figure 6. As the raw biogas enters the system it is directed to the upgrading system (WAGABOX) where the carbon dioxide and other impurities are filtered out by membranes followed by secondary treatment where the methane is separated from other gases like oxygen and nitrogen through cryogenic distillation. The BUF maximum design capacity is approximately 2,000 scfm (3,398 Nm^3/hour) and the output is delivered to the Fortis Injection Station for distribution as RNG into the Fortis Intermediate Pressure piping network.

In 2025, the gas extraction network consisted of 155 wells that captured an average of 1,672 Nm^3/hour of landfill gas (LFG). Well field balancing was completed at least monthly to optimize collection. Well field monitoring and balancing should continue at least monthly, as recommended by the BC Landfill Gas Management Facilities Design Guidelines.

At the end of 2025, landfill gas collection efficiency was estimated at 61% using the ENV Model and 71% using the ECCC Model. According to the ENV Model, collection efficiency increased significantly from 43% in 2024 to 61% and similarly from 50% to 71% according to ECCC Model in 2025. The primary factor contributing to this improvement was the connection of multiple gas extraction wells on the south slope of Phase 2, Cell 3 in early 2025, which enhanced gas capture across the landfill.

In 2025, Hartland Landfill received 175,748 tonnes of waste which included 152,447 tonnes of general refuse, 20,540 tonnes of controlled waste, and 2,761 tonnes of asbestos. Additionally, in 2025, 2,703 tonnes of wood waste, construction and demolition, and bulky wastes were beneficially reused for side and controlled waste cover.

The detailed Phase 2 cell design and filling plan optimization resulted in an estimated remaining capacity of 6,641,338 m^3 compared to that reported at the end of 2024 (6,926,635 m^3). The estimated landfill capacity will be reached in approximately 25 years (approximately 2050), assuming current rates of waste disposal.

Hartland Landfill has a normal annual capital budget of approximately $2.5 million. However, construction of Cells 4, 5A and 5B in 2023-2027 has increased the average annual capital budget to approximately $15-20 million annually through 2027 to ensure the cells are ready for filling. This budget also supports many other projects focused on improving landfill operations, health and safety, waste diversion infrastructure, and environmental protection. Operations and capital projects that occurred in 2025 include:

- Capital project completion
  - Cell 5A completion, and design procurement for Cell 5B
  - Commissioning of the Biogas Upgrading Facility
- Landfill operations and infrastructure
  - Electrical enhancements, seasonal bird control and litter control
  - Household hazardous waste management
- Environmental and waste diversion programs
  - Recycling and beneficial use stewardship, residential renovation waste management
  - Yard and garden, wood waste and asphalt roofing diversion
  - Invasive species control
  - Ongoing Aggregate Management Plan
- Landfill gas optimization
  - Pilot project testing the feasibility of automated well head tuning devices
- Landfill gas capture
  - Devices for continuous monitoring of methane surface emissions

In 2025, Hartland Landfill continued to operate in accordance with regulatory requirements while supporting the capital region's long term waste management needs. The landfill received approximately 175,748 tonnes of waste and consumed 266,971 m^3 of air space. At the current disposal rate, it is estimated that Hartland Landfill's current capacity will be reached in approximately 2050. Key achievements included completion of Cell 5 A, procurement of the Cell 5B design, and successful commissioning of the Biogas Upgrading Facility which began producing Renewable Natural Gas for delivery to the FortisBC network.

Environmental monitoring results indicate that leachate and landfill gas were managed effectively and in accordance with regulatory requirements. Groundwater quality met applicable BC CSR standards at all boundary compliance locations except for two antimony exceedances at GW-112-1-1, located approximately 182 m from the property boundary, while surface water quality remained generally consistent with natural background conditions apart from localized influences from aggregate runoff and road salt application. Overall, the 2025/2026 monitoring results confirm that landfill leachate remained contained within the property boundary and that Hartland Landfill continues to function as designed.

HARTLAND LANDFILL
OPERATING & ENVIRONMENTAL MONITORING
2025/2026 REPORT

Table of Contents

EXECUTIVE SUMMARY 3
1.0 INTRODUCTION 1
2.0 SITE OVERVIEW 1
3.0 REGULATORY SETTING 2
4.0 WASTE VOLUMES AND AIR SPACE CONSUMPTION 2
4.1 Compaction Data 3
4.2 Air Space Utilization – Consumption and General Refuse Tonnage 3
4.3 Asbestos Air Space Utilization – Consumption and Asbestos Tonnage 3
4.4 Uncertainties 3
4.5 Design Conformance 3
5.0 REMAINING SITE LIFE 4
6.0 CLOSURE AND POST-CLOSURE FUND 4
7.0 2025 COMPLETED STUDIES AND PROJECTS 4
8.0 2026 PLANNED STUDIES AND PROJECTS 5
9.0 2025/2026 ENVIRONMENTAL MONITORING 6
9.1 Environmental Monitoring Program 7
9.1.1 Groundwater Flow 7
9.1.2 Groundwater Quality Monitoring Program 7
9.1.3 Domestic Well Monitoring Program 8
9.1.4 Surface Water Quality Monitoring Program 8
9.1.5 Leachate Management and Monitoring Program 10
9.2 Landfill Gas Monitoring Program 10
9.2.1 Gas Generation, Collection and Utilization 10
9.2.2 Gas Monitoring and Compliance Summary 11
10.0 RECOMMENDATIONS 11
11.0 CONCLUSIONS 12
12.0 AUTHOR QUALIFICATIONS 13
13.0 STATEMENT OF LIMITATIONS 13
14.0 REPORT SIGNOFF 14

List of Tables

Table 1 General Refuse Air Space Utilization 3
Table 2 Asbestos Air Space Utilization 3
Table 3 Summary of Landfill Capacity from the Hartland Landfill DOCP, 2022 4
Table 4 Compliance Groundwater Quality (2025/2026) 8
Table 5 Compliance Surface Water Quality (2025/2026) 9

List of Appendices

Appendix I Hartland Landfill Groundwater, Surface Water and Leachate Monitoring Annual Report (April 2024 to March 2025)
Appendix II Hartland Landfill – Landfill Gas Monitoring 2025 Report

List of Acronyms and Units of Measurement

%	Percent
ANFO	Ammonium Nitrate / Fuel Oil
BC	British Columbia
BCWQG STA	BC Working and Approved Water Quality Guidelines for Freshwater Aquatic Life - Short Term Acute
BCWQG LTC	BC Working and Approved Water Quality Guidelines for Freshwater Aquatic Life - Long-Term Chronic
BUF	Biogas Upgrading Facility
CH_4	Methane
CO_2e	Carbon dioxide equivalent
COD	Chemical Oxygen Demand
CRD	Capital Regional District
CSR	Contaminated Sites Regulation
DOCP	Design, Operations and Closure Plan
ECCC	Environment and Climate Change Canada
ECCC Model	Environment and Climate Change Canada Landfill Gas Generation Model
ENV	BC Ministry of Environment and Parks
ENV Model	BC Ministry of Environment and Parks Landfill Gas Generation Model
km	Kilometer
LFG	Landfill Gas
LIDAR	Light Detection of Ranging
MDTS	Materials Diversion and Transfer Station
m	Meter
m^3	Cubic Meter
Nm^3/hour	Normal cubic meters per hour
pH	potential of Hydrogen
Q1-4	Four quarters of the year
RNG	Renewable Natural Gas
RSCP	Regional Source Control Program
SCADA	Supervisory Control and Data Acquisition
scfm	Standard cubic feet per minute
SWMP	Solid Waste Management Plan
TSS	Total Suspended Solids
UBCi Model	University of BC Integrated Gas Generation Model ©
WAGABOX	Waga Energy's patented landfill gas upgrading technology ©

HARTLAND LANDFILL
OPERATING & ENVIRONMENTAL MONITORING
2025/2026 REPORT

1.0 INTRODUCTION

Hartland Landfill (Hartland) is owned and operated by the Capital Regional District (CRD) and is located about 14 km northwest of Victoria. It is the only sanitary landfill in the capital region, serving a population of approximately 450,000 people. The operation is a multi-purpose facility providing recycling, household hazardous waste collection, a salvage area, yard and garden waste collection and processing, controlled waste disposal, and landfill services to commercial and residential customers.

This report represents the consolidation of three documents (Hartland Landfill Operations Annual Report, Hartland Landfill Environmental Programs Annual Report, and Landfill Gas Monitoring Annual Report). The data herein is required to meet CRD operating standards, and provincial regulatory requirements per Section 3.2 of the Operational Certificate and includes a summary of:

- waste tonnages
- remaining landfill lifespan
- post-closure funding
- 2025 operations activities
- 2025 construction contract-related activities
- 2025/2026 environmental monitoring program results[1]
- 2025 annual landfill gas monitoring report summary

2.0 SITE OVERVIEW

Hartland Landfill is located in the Tod Creek watershed, in the bedrock highlands of the Gowlland Range, northwest of Victoria. The terrain is moderately rugged with relief of up to 446 meters in the area. Undeveloped CRD property (about 320 hectares in total) lies to the west and south of the landfill site. Mount Work Regional Park lies to the west. Willis Point Road borders the site to the north, and beyond that is a Department of National Defense rifle range. Private residential properties are located to the east and southeast of the landfill.

The landfill is situated in a north-south trending bedrock saddle with Mount Work to the west and an unnamed bedrock ridge to the east. The crest of the landfill forms a drainage divide between the Heal Creek drainage basin to the north and the Killarney Creek drainage basin to the south.

Filling with waste started at the site in the 1950's under private ownership. The site continued to be owned and operated privately until 1975 when the CRD purchased the property. Hartland Landfill is the primary solid waste disposal site for all areas of the capital region. Landfilling operations and equipment maintenance is conducted by private companies under contract and direction of CRD staff.

The Hartland Landfill site is divided into two distinct areas referred to as Phase 1 and Phase 2. Initially, waste was deposited in Phase 1 which reached capacity in 1996 and was capped in 1997. Phase 2 is currently receiving waste. Filling of Phase 2, Cell 1 was completed in 2004. Subsequently, the filling of Phase 2, Cell 2 was completed in 2016 and its interim closure is in progress. Phase 2, Cell 3 became active in September 2016. Cell 4 and 5A construction was completed in October 2024 and August 2025 respectively. Filling of Cell 4 and 5A began in January 2025 and September 2025 respectively. Cell 5B construction will begin in Q4 2026 with landfilling anticipated to begin in 2028.

Leachate and surface runoff from the active landfill areas are directed to two leachate lagoons at the north end of the landfill. The leachate is then transported via the centrate return line (shared with the CRD's

[1] Note, operational and landfill gas data/information is presented in a calendar year (January to December), but environmental monitoring data is presented from April 2025 to March 2026 (so it encompasses a full wet season).

Residual Treatment Facility) to the McLoughlin Point Wastewater Treatment Plant. Leachate discharge to sewer is authorized by CRD Regional Source Control Program (RSCP) Waste Discharge Authorization 1978692 and is subject to the CRD Sewer Use Bylaw (Bylaw No. 2922).

The CRD initiated a surface water and groundwater monitoring program for the landfill in 1983. Annual monitoring reports have been prepared and issued by consultants since 1988. The current Hartland monitoring program is required under the Amended Operational Certificate #12659 issued by the Ministry of Environment and Parks (ENV) and last amended on January 21, 2013.

The Residuals Treatment Facility resides in the northwest corner of the Hartland Landfill property. The facility anaerobically digests residual solids from the CRD's McLoughlin Point Wastewater Treatment Plant and produces Class A biosolids for beneficial reuse, in accordance with the CRD's Liquid Waste Management Plan. Operation and annual reporting for the facility is completed under Operational Certificate #109471 issued by ENV.

3.0 REGULATORY SETTING

The Hartland Landfill operates in accordance with an approved Solid Waste Management Plan and an Operational Certificate. The following lists key regulatory approvals for Hartland Landfill:

- Solid Waste Management Plan, 2022 (received approval from ENV on July 13, 2023).
- Amended Operational Certificate (#12659) approved by ENV, last amended on January 21, 2013.
- Authorization to Dispose of Hazardous Waste Asbestos at the Hartland Landfill, approved by ENV on July 23, 2012.
- RSCP Waste Discharge Authorization 1978692, last amended on December 20, 2022, and subject to the CRD Sewer Use Bylaw (Bylaw No. 2922).
- Landfill gas is regulated by the BC *Landfill Gas Management Regulation* and various provincial guidelines and criteria. Hartland continues to operate under an approved Landfill Gas Management Design Plan.

4.0 WASTE VOLUMES AND AIR SPACE CONSUMPTION

In 2025, Hartland Landfill received 178,451 tonnes of waste for Engineering and operational reporting and air space estimation purposes, including 152,447 tonnes of general refuse, 20,540 tonnes of controlled waste, 2,761 tonnes of asbestos-containing material, and 2,703 tonnes of beneficially used material from Materials Diversion and Transfer Station (MDTS). Additionally, 1,920 tonnes of material received from off-site, private transfer stations was beneficially used and is included in the reported general refuse tonnage

Air space consumption is calculated separately for waste received at the active face and asbestos areas as they have different disposal locations and waste-to-cover ratios.

The following section reports annual landfill air space and waste tonnage statistics. The CRD conducts monthly volumetric surveys for all wastes in order to document changes in air space volume and support quality control, design conformance assessments, and assist in ongoing landfill optimization assessments. A total of 2,477,058 m³ of landfill air space is available in Cells 4 and 5 (up to 164 lift). Cell 4 and Cell 5A up to and including the 134 lift has 567,750 m³ of total air space. Cell 5B is under development and when ready will have 247,970 m³ of air space available up to and including the 134 lift. The remainder of Cell 5 above 134 lift (139 to164 lifts) will have 1,661,338 m³ of air space available.

The detailed Phase 2 cell design and filling plan optimization resulted in an estimated remaining capacity of 6,641,338 m^3 compared to that reported at the end of 2024 (6,926,635 m^3). The estimated landfill capacity will be reached in approximately 25 years (approximately 2050), assuming current rates of waste disposal.

4.1 Compaction Data

Localized compaction data is obtained routinely at Hartland Landfill to support the landfill operations and to verify target compaction rates. An average compaction density of 0.85 tonnes/m^3 is targeted during landfilling operations. No in-situ compaction tests were conducted in 2025. The CRD has a compaction monitoring system installed in the compactor and bulldozer. This system monitors the deflection of the compactor wheels through the garbage in real-time and provides visual assistance to ensure the operator conducts sufficient passes across each waste lift to achieve the targeted density.

4.2 Air Space Utilization – Consumption and General Refuse Tonnage

The annual air space consumed at the active landfilling location from waste and daily cover, tonnage of waste landfilled, and associated Air Space Utilization Factor is shown below in Table 1. The waste air space utilization is calculated using all refuse and shredded wood.

Table 1 General Refuse Air Space Utilization

2025 Waste Air Space/Density Calculations	Quantity
Air space consumed by landfilling waste (m^3) (includes waste and cover)	251,527
Tonnage of waste landfilled (tonnes) (scale data)	172,987[1]
Air Space Utilization Factor (tonnes/m^3)[2]	0.69

[1] Includes 152,447 tonnes of general refuse, 20,540 tonnes of controlled waste
[2] Air Space Utilization Factor = Total tonnes disposed divided by the volume of air space consumed, including waste and cover

In 2025, it was not possible to accurately track the amount of cover material used for landfilling. Therefore, an Air Space Utilization Factor will be used as a key performance indicator.

4.3 Asbestos Air Space Utilization – Consumption and Asbestos Tonnage

The annual air space consumed at the asbestos location from asbestos and daily cover, tonnage of asbestos deposited, and associated asbestos utilization factor is shown below in Table 2.

Table 2 Asbestos Air Space Utilization

2025 Asbestos Air space/Density Calculations	Quantity
Air space consumed by asbestos (m^3) (includes asbestos and cover)	15,444
Tonnage of asbestos (tonnes)	2,761
Asbestos Air Space Utilization Factor (tonnes/m^3)[1]	0.18

[1] Asbestos Utilization Factor = Total tonnes disposed divided by the volume of air space consumed, including asbestos and cover

4.4 Uncertainties

The waste deposited at Hartland Landfill is constantly compressing and settling. Settlement and air space are assessed by monthly topographic surveys; however, this introduces uncertainty into the tracking data. The settlement factor has not been factored into the air space utilization data above, as reporting monthly landfill tracking data is assumed to be more accurate when calculating an air space utilization factor.

4.5 Design Conformance

Hartland Landfill is currently in Phase 2 of development and is being constructed in a series of cells with each cell divided into a series of lifts that are progressively filled with waste. In 2025, filling within Phase 2, Cell 3, 4 and 5A is ongoing until Cell 5B construction is complete in 2028. Current cell design and construction is proceeding as per the Hartland Design, Operations and Closure Plan (DOCP) and Master Filling Plan for the site.

5.0 REMAINING SITE LIFE

In 2021 the use of LIDAR (Light Detection of Ranging) technology was replaced with photogrammetry technology. Each month a drone is used to take top-down, overlapping photos of the landfill. The photos are run though photogrammetry software which produces a three-dimensional point cloud. The point clouds are used to create three-dimensional surfaces that allow for the filling volume calculations to be conducted monthly and assist with landfill lifespan estimates. The remaining landfill life is calculated by dividing the remaining capacity by the previous three-year average yearly landfilling volume.

In 2022 the Hartland DOCP was updated by Sperling Hansens Associates Inc. and a detailed assessment of air space was completed. The remaining capacity of the Phase 2 landfill is summarized in Table 3. It is estimated that Hartland's current capacity will be reached by the year 2050.

Table 3 Summary of Landfill Capacity from the Hartland Landfill DOCP, 2022

/Cell	Gross Cell Capacity m^3	Linear Area m^2	Net Cell Capacity Phase m^3	Filling Timeframe
Phase 2 (Cells 3-6)	7,484,122	141,772	7,292,730	2016-2050 (approx.)

6.0 CLOSURE AND POST-CLOSURE FUND

A requirement of the Operational Certificate is a closure and post-closure liability fund to meet or exceed the estimated closure and post-closure costs with a reasonable contingency. At the end of 2025, the closure/post-closure fund was $15,283,038.

7.0 2025 COMPLETED STUDIES AND PROJECTS

The annual Hartland capital and operations budgets support many capital projects and studies focused on environmental protection and meeting Solid Waste Management Plan (SWMP) commitments. The following is a summary of work completed in 2025:

- **Gas and leachate collection infrastructure**: Combined landfill gas and leachate collectors continue to be installed as landfilling progresses and in accordance with the Hartland Landfill gas design plan.
- **Completion of Cell 5A construction**: Filling in Cell 5A was started in Q3 2025.
- **Procurement of design services for Cell 5B.** This design is for new landfill infrastructure including a sedimentation pond, Cell 5B, commercial truck wheel wash and landfill containment berm for Cell 5 and 6. Following design, procurement for construction services will begin in Q3 2026.
- **Commissioning of the new Biogas Upgrading Facility (BUF)**: The BUF was commissioned in May 2025, representing a significant milestone for landfill gas management at the Hartland Landfill. The facility upgrades landfill gas to renewable natural gas (RNG), allowing beneficial use of the captured methane as a low-carbon energy source.
- **Landfill operations, mechanical services, security and vector control:** Throughout 2025, contract management continued for many services, on-site security, seasonal bird control, bin haul, stewardship, household hazardous materials, recycling and ozone-depleting substance removal.
- **Annual invasive plant species control:** Invasive species control continued with removal of some species and spraying of others with herbicide.
- **Litter control:** Ongoing litter cleanup and installation of litter fences were prioritized throughout the year.
- **Residential renovation waste management:** The Reno Safe Waste Wise program continued through 2025. This screening process for renovation waste is in place to improve health and safety at the public bins area.

- **Outreach campaigns:** Implemented in 2025 were the following education and outreach initiatives.
    - 'What Goes Where' launched, an online tool residents can use to search a database for diversion and disposal options. The tool recorded 27,486 users and 61,009 searches in 2025.
    - Development and circulation of five Rethink Waste newsletters to 673 subscribers
    - 109 3R programs delivered to 2,300 students
    - 18 community events attended with solid waste messaging including 'Love Food Hate Waste', Household Hazardous Waste and 'What Goes Where'
- **Material Diversion Transfer Station:** Diversion programs for yard and garden materials, asphalt roofing, wood waste, and mattress processing.
- **Mitigation of Aggregate Run-off:** In 2025, the ongoing Aggregate Management Plan was followed to mitigate water quality degradation related to quarrying and aggregate production. Measures to improve water quality included reduction and reconfiguration of aggregate stockpiles, expansion of containment systems, and ongoing monitoring.
- **Gas and leachate collection infrastructure:** Landfill gas infrastructure was installed per the Hartland Landfill Gas Management Design Plan. Wellheads, valves, condensation traps, monitoring points and piping are installed and commissioned to convey landfill gas to the gas plant, and leachate to the storage lagoons.
- **Landfill gas capture optimization:** A pilot project for automated well head tuning devices continued in 2025, aiming to improve gas collection efficiency and reduce emissions.
- **Landfill gas continuous fugitive emissions monitoring:** A pilot project for monitoring continuous methane surface emission monitoring devices were installed in 2025, aiming to improve monitoring and mitigating emissions.

8.0 2026 PLANNED STUDIES AND PROJECTS

- Capital Projects – the 2026 to 2030 budget has been established to initiate and/or complete the projects below:
    - **Gas and leachate collection infrastructure:** Combined landfill gas and leachate collectors continue to be designed and installed as landfilling progresses and in accordance with the Hartland landfill gas design plan.
    - **Design for Cell 5B:** This design is for new landfill infrastructure including a sedimentation pond, Cell 5B, commercial truck wheel wash and landfill containment berm for Cell 5 and 6. Following design, procurement for construction services will ensue for this work in Q3.
    - **Design and construction services to relocate the existing contractor workshop** outside of the future Cell 5B filling area.
    - **Procurement and development of a new LFG Master Design Plan:** The CRD is planning to undertake the development of a comprehensive Hartland Landfill Gas (LFG) Management Facilities Master Design Plan (Design Plan) to supplement the existing LFG Design Plan. It is intended to guide landfill gas collection infrastructure through the continued development of Cells 4, 5A, 5B and 6, and the closure of Phase 2 Cell 3.
    - **Procurement and Development of Landfill Design, Operations and Closure Plan:** The CRD is planning to initiate the procurement process in 2026 to update the Hartland Landfill Design, Operations and Closure Plan (DOCP).
    - **Procurement of design services for Cell 3 final closure will begin in Q4 2026:** With construction activities expected to take place beginning in 2027.

- **Landfill Operations and Infrastructure**
    - **Construction of electrical enhancements** required to meet the power and backup power requirements of the Hartland North scales, kitchen scrap depot, wheel wash and contractor's shop will begin in 2026.
    - **Fire protection system:** Expansion of the Cell 3 leachate fire suppression system into Cell 4, 5 and 6 is planned.
    - **Widening of the Hartland North access road** off Willis Point Road to improve turning radius' and improve safety sightlines.
    - I**nstallation of a bird deterrent cover over the food transfer station** to deter vectors.
- **Environmental and Waste Diversion Programs**
    - **Recycle Depot Upgrade:** Conceptual design to improve the safety and flow of residents and haulers through the existing recycle depot yard will be initiated in 2026.
    - **Outreach campaigns:** Public outreach campaigns will continue into 2026.
    - **Ongoing monitoring** and improvements to the environmental monitoring network.
- **Landfill Gas Capture Optimization**
    - **Monitoring continuous methane surface emissions** through continuous monitoring devices.
    - **Design services for conveying biogas from the Residual Treatment Facility to the Renewable Natural Gas Facility.** This line will enable the upgrading of RTF biogas at the RNG Facility.

9.0 2025/2026 ENVIRONMENTAL MONITORING

CRD staff monitor landfill gas, groundwater, surface water and leachate quality to ensure the effectiveness of management activities and confirm regulatory compliance. Environmental data reported herein is compared to the most current and applicable provincial standards.

Based on monitoring conducted in 2025/2026[2], the program continues to provide data needed to:

- meet Operational Certificate requirements;
- identify potential impacts of landfill operations, if any; and
- evaluate the effectiveness of control measures, and plan for mitigation (if required).

A brief summary of key findings of the landfill gas, groundwater, surface water and leachate monitoring program are presented here. For a detailed discussion of results, recommendations and actions please reference the following reports:

- Hartland Landfill Groundwater, Surface Water, Leachate Monitoring Program Annual Report (April 2025 to March 2026), AECOM Canada Ltd. (AECOM) – Appendix I
- Hartland Landfill – Landfill Gas Monitoring 2025 Report, Parks, Recreation & Environmental Services, Environmental Protection, CRD, November 2026 – Appendix II

[2] Monitoring periods vary such that the landfill gas reporting period is January to December, but the groundwater, surface water and leachate reporting period is April to March (to enable review of a full wet season).

9.1 Environmental Monitoring Program

Engineered controls at Hartland Landfill collect and contain leachate to control contaminant migration and, therefore, reduce or eliminate potential impacts to groundwater and surface water quality. Since 1990, the leachate has been captured and discharged via pipeline to the sanitary sewer.

Groundwater and surface water monitoring stations on the Hartland Landfill property and specific off-site locations have been monitored since 1983. Monitoring is mandated through the landfill Operational Certificate and is conducted on a quarterly basis to assess the potential for landfill processes to impact groundwater and surface water resources. Additionally, leachate, generated by the infiltration of precipitation through the waste, is monitored for flow characteristics, quantity and quality. The annual monitoring program has four main components, as listed below:

1. groundwater monitoring at on- and off-site locations
2. private domestic well monitoring off-site
3. surface water monitoring at on- and off-site locations
4. leachate quality and flow monitoring

Hartland Landfill has an extensive network of groundwater wells to monitor conditions immediately adjacent to the Phase 1 and Phase 2 areas, and at points adjacent to the landfill property boundary. Groundwater elevations are routinely monitored to understand the direction of groundwater flow within the landfill property. Groundwater quality is monitored at groundwater well locations to evaluate and identify changes in water chemistry that may be attributed to landfill processes and operations and, specifically, the effect of landfill leachate on groundwater resources.

9.1.1 Groundwater Flow

Groundwater flow throughout the landfill followed previously established patterns. Flow directions in the Phase 1 area were primarily to the north, and this component of flow is captured by the northern leachate containment system. At the south end of Phase 1, a groundwater divide exists where groundwater flows towards the north (into the landfill) and south (away from the landfill). The southerly component of flow is intercepted by the south leachate containment system.

In the Phase 2 area, west of Phase 1, groundwater flow is directed inward toward the base of the former Heal Lake. Because the groundwater flow is directed inward toward the basin, it is considered a hydraulic trap. In the basin, the leachate is then conveyed into the leachate lagoons. Leachate and groundwater levels are monitored in Phase 2 to ensure that the hydraulic trap is maintained. The 2025/2026 data indicate that the hydraulic trap functioned effectively throughout the year. Water level and quality monitoring should continue to confirm ongoing effectiveness of leachate containment and identify any changes in the extent or magnitude of potential leachate impacts.

9.1.2 Groundwater Quality Monitoring Program

The program consists of approximately 140 active groundwater monitoring wells, 40 of which are considered boundary compliance locations, listed below. Groundwater quality data is compared against the BC Contaminated Sites Regulation (CSR) water quality standards for aquatic life (AW) and drinking water (DW) quality standards for the protection of drinking water and aquatic life to evaluate landfill compliance with the Operational Certificate. To account for seasonal variations, groundwater quality is reported between April 1, 2025 and March 31, 2026.

South of the Landfill (10)

- 04-3-1, 04-4-1
- 71-1-1, 71-2-1, 71-3-1
- 72-1-1, 72-3-1
- 73-1-1, 73-2-1, 73-3-1

East of the Landfill (6)

- 17-1-1, 17-1-2, 17-1-3 (sampled bi-annually)
- 18-1-1, 18-2-1, 18-2-2
- 111-1-1, 111-2-1
- 112-1-1, 112-2-1

North of the Landfill (15)

- 20-1-1, 20-1-2
- 21-1-1, 21-1-2, 21-2-1
- 28-1-0
- 29-1-1, 29-1-2
- 30-1-1, 30-1-2
- 31-1-1, 31-1-2
- 39-1-1, 39-2-1
- 53-1-1

North of the Hartland North Pad (5)

- 41-1-1
- 42-1-1
- 55-1-1 (sampled bi-annually)
- 56-1-1
- 57-1-1 (sampled bi-annually)

9.1.2.1 Results

Groundwater quality in all boundary compliance locations met the applicable BC CSR groundwater standards except for antimony at GW-112-1-1, (downgradient of the Northeast Stockpile) during two sampling events (September 2025 and February 2026) summarized in Table 4.

Table 4 Compliance Groundwater Quality (2025/2026)

Well	Exceedances	# of Exceedances	Comments
112-1-1	Antimony	2	Located 182m from the property boundary

Groundwater quality at all other boundary compliance locations met all applicable regulatory limits. These results, paired with groundwater flow analyses indicate that all leachate is contained and controlled with within the landfill property.

9.1.3 Domestic Well Monitoring Program

Since the 1980's, the CRD has performed routine sampling and analysis of domestic wells in the vicinity of the landfill that are used as the primary source of drinking water. Nineteen domestic wells were sampled in 2025 within a two-kilometer radius of the landfill.

Analytical results were compared to the BC *Source Drinking Water Guidelines* (updated 2020) and *Guidelines for Canadian Drinking Water Quality* (updated 2022). Domestic well quality data was consistent with historical results, meeting all applicable federal and provincial drinking water quality guidelines except aesthetic objectives for temperature and operational guidelines for pH. Overall, the results indicate that off-site domestic water wells continue to remain unimpacted by landfill leachate.

9.1.4 Surface Water Quality Monitoring Program

Hartland Landfill is located within the Tod Creek watershed. Drainage south of the landfill is directed toward Killarney and Prospect lakes, discharging to Tod Creek. Drainage north of the landfill flows northeasterly within Heal Creek to Durrance Creek, discharging to Tod Creek and Tod Inlet. Surface water quality is monitored to assess the potential impacts for various landfill activities, such as road construction, blasting, and aggregate stockpiling, as well as their impact on the downstream environment.

The program consists of approximately 35 monitoring locations, seven of which are considered boundary compliance locations, listed below. These locations are concentrated along the southern and northern property boundaries downgradient of areas that have the potential to be impacted by leachate or aggregate runoff. Surface water quality data is compared to the BC Working and Approved Water Quality Guidelines (BCWQG) short term acute (STA) long term chronic (LTC) to assess compliance with the landfill's Operational Certificate.

South of the Landfill

- SW-S-04

North of Phases 1 and 2

- SW-N-05
- SW-N-16
- SW-N-55
- SW-N-56

North of the Hartland North Pad

- SW-N-41S1
- SW-N-42S1

9.1.4.1 Results

Surface water quality in all boundary compliance locations met the applicable BCWQG STA for all parameters except for those summarized in Table 5.

Table 5 Compliance Surface Water Quality (2025/2026)

Location	Exceedances of BC Water Quality – Short-Term Acute Guidelines	# of Samples with Exceedances	Comments
SW-N-05	Dissolved Copper	3	• The total suspended solids (TSS) and metal concentration exceedances are anticipated to be related to turbid and/or low-flow conditions during sampling. It is unlikely that the elevated TSS and metal concentrations were influenced by landfill activities. • Elevated copper concentrations are typical of background conditions. • Nitrate exceedances are associated with aggregate production and stockpiling at Hartland. The nitrate originates from leaching of ANFO residue. • pH was marginally below the STA guideline at SW-N-56 and could be due to instrument error as pH is typically circumneutral at this location.
SW-N-16	Nitrate	2	
	Dissolved Cobalt	2	
	Dissolved Copper	3	
SW-N-41S1	TSS	3	
SW-S-04	Dissolved Copper	3	
SW-N-56	Dissolved Copper	1	
	pH	1	

Surface water quality is generally consistent with natural water quality surrounding the site and indicates the landfill is functioning as intended with a few exceptions:

- Several trace metal BCWQG LTC exceedances (e.g., aluminum, iron, dissolved copper) were reported that likely reflect turbid and/or low-flow conditions at the time of sampling.
- Copper concentrations exceeded the BCWQG LTC at background station SW-N-66, suggesting that elevated copper concentrations are typical of the local environment.
- Several areas on and offsite exhibited aggregate runoff impacts (elevated nitrate and sulphate), the temporal patters observed likely reflect differing reaction rates of ANFO leaching and sulphide oxidation in the stockpile. Aggregate runoff impacts were observed north of the site in Durrance Creek, and into Todd Creek.
- Some monitoring locations south of the landfill were likely impacted by road salt, as indicated by elevated chloride concentrations.

9.1.5 Leachate Management and Monitoring Program

Leachate is produced from the percolation of precipitation and groundwater through the decomposing refuse in the landfill. At Hartland Landfill, leachate is managed through landfill design, input monitoring, contaminant treatment, if required, and routine monitoring.

During the reporting period, leachate continued to be managed in accordance with the DOCP and its supporting documents.

9.1.5.1 Leachate Monitoring

A routine leachate monitoring program is conducted to:

- document leachate discharge volumes and flow rates to the sanitary sewer,
- characterize the physical and chemical constituents in the leachate, and
- verify compliance with the CRD RSCP Waste Discharge Authorization at the point of discharge.

Automated monitoring of the volume of leachate discharged is maintained on the CRD SCADA (Supervisory Control and Data Acquisition) system and provides a basis for measuring flow rates to the sanitary sewer and leak detection. Monthly leachate samples are collected to verify compliance with the Waste Discharge Authorization and are analyzed for a variety of chemical parameters (e.g., nutrients, mineral oil and grease, organic compounds, metals and chlorinated compounds).

9.1.5.2 Results

The total volume of leachate discharged during the reporting period was 462,028 m^3, which is the same as last year's volume of 461,488 m^3. Leachate generation rates typically vary with annual precipitation and landfill filling/construction-related activities (e.g., interim cover installation, final closures, etc.).

In 2025/2026, leachate quality observed in the Hartland Valve Chamber met the requirements of the Waste Discharge Authorization except for two chemical oxygen demand (COD) exceedances and one total suspended solids (TSS) exceedance.

Overall, average annual leachate quality in 2025/2026 was comparable with 2024/2025.

9.2 Landfill Gas Monitoring Program

Landfill gas management is regulated by a number of BC regulations (including the BC *Landfill Gas Management Regulation*), design guidelines, BC Landfill Criteria, Hartland-specific management plans, and WorkSafeBC. The BC *Landfill Gas Management Regulation* requires landfills generating more than 1,000 tonnes per year of methane to develop landfill gas management design plans that targets a 75% collection efficiency in four years. Landfill gas is managed in accordance with a site-specific Landfill Gas Management Design Plan required by the BC *Landfill Gas Management Regulation*.

To assess the effectiveness of the landfill gas collection infrastructure, Hartland Landfill monitors landfill gas collection and utilization, perimeter and foundation probes, ambient air and landfill gas speciation.

9.2.1 Gas Generation, Collection and Utilization

From 2020 to 2024, the CRD used the University of BC Integrated Gas Generation Model © (UBCi Model), supported by a comprehensive study that demonstrated close alignment between modelled generation rates and measured landfill gas recovery at Hartland Landfill. In 2025, following the release of Environment and Climate Change Canada's (ECCC) Landfill Methane Regulations and associated gas generation model, the ECCC Model was adopted as an additional estimation tool. Because its results closely align with the UBCi Model and it is required for federal regulatory reporting, the UBCi Model was discontinued for 2025 modelling. Going forward, landfill gas generation estimates will be produced using both the ENV and ECCC Models.

In 2025, the ENV and ECCC Models estimated methane generation at Hartland Landfill to be 8,574 and 7,407 tonnes CH_4 per year, respectively. Based on a measured methane collection rate of 5,247 tonnes CH_4 per year, estimated methane capture efficiencies were 61% for the ENV Model and 71% for the ECCC Model. After accounting for landfill cover oxidation (25%), fugitive emissions were estimated at 69,949 tonnes CO_2e using the ENV Model and 45,433 tonnes CO_2e using the ECCC Model. According to the ENV Model, collection efficiency increased significantly from 43% in 2024 to 61% and similarly from 50% to 71% according to ECCC Model in 2025. The ECCC Model therefore predicts lower methane generation and fugitive emissions than the ENV Model.

The Biogas Upgrading Facility (BUF) was commissioned in May 2025, representing a significant milestone for landfill gas management at the Hartland Landfill. The facility upgrades landfill gas to renewable natural gas (RNG), allowing beneficial use of the captured methane as a low-carbon energy source.

Gas collection optimization is expected to remain challenging throughout 2026 due to the ongoing transition to Cells 4 and 5, which has affected the installation and functional operation of landfill gas collection infrastructure. Technical design constraints associated with the transition have delayed the connection of new gas extraction wells, while the absence of extraction wells in the upper two lifts of Cell 3 continues to limit gas recovery from newly placed waste. Consequently, landfill gas collection efficiency is expected to remain below desired levels until additional collection infrastructure is installed and commissioned within active disposal areas.

9.2.2 Gas Monitoring and Compliance Summary

Numerous monitoring programs are in place to evaluate the performance of the landfill gas system. The CRD continues to follow the Landfill Gas Management Design Plan specifications for achieving 75% collection efficiency. Staff continue to monitor and adjust the well field to maximize collection and optimize key gas constituents (methane and nitrogen) in accordance with the BC Landfill Gas Management Facilities Design Guidelines.

10.0 RECOMMENDATIONS

- Continue to implement mitigation measures and engineering controls identified in the CRD's Aggregate Management Plan to mitigate current and future degradation of water quality related to aggregate runoff.
- Continue quarterly groundwater, surface water, and leachate monitoring to evaluate regulatory compliance with the landfill Operational Certificate and effectiveness of environmental/engineering controls. Detailed recommendations can be found in the appended Hartland Environmental Monitoring and Landfill Gas Reports.
- Continue to follow and implement the Landfill Gas Management Design Plan and annual amendments.
- Continue landfill gas monitoring and optimization activities, including routine wellfield balancing, evaluation of gas capture optimization initiatives, and annual ambient air and subsurface probe monitoring to assess collection system performance
- Continue to evaluate landfill operations/activities and assess potential impacts to the environment.

11.0 CONCLUSIONS

In 2025, Hartland Landfill received approximately 175,748 tonnes of waste (including beneficially used material, blended biosolids, controlled waste and asbestos) and the total air space volume (waste and cover) consumed in 2025 was 266,971 m^3. Currently, the estimated air space utilization factor is 0.66 tonnes/m^3. At the current disposal rate, it is estimated that Hartland Landfill's current capacity will be reached in approximately 2050.

2025 marked the completion of various capital projects in support of SWMP initiatives, including construction of Cell 5A, commissioning of the RNG facility and procurement of the design of Cell 5B.

Environmental Performance

Leachate and landfill gas are being managed in accordance with regulatory requirements and data are reported in Appendices I and II, respectively.

Groundwater quality data collected in 2025/2026 met the applicable BC CSR groundwater standards at all boundary compliance locations except for two antimony results at GW-112-1-1 (downgradient of the Northeast Stockpile), located 182 meters from the property boundary.

Surface water quality data collected in 2025/2026 indicates that surface water quality is generally consistent with natural water quality surrounding the site except for: aggregate runoff impacts (nitrate and sulphate) observed north of the site in Durrance and Todd Creek; and road salt impacts (chloride) observed south of the site. Several trace metal BCWQG LTC exceedances (e.g., aluminum, iron, dissolved copper) likely reflect turbid and/or low-flow conditions at the time of sampling.

Overall water quality results from 2025/2026 indicate that landfill leachate was contained within the property boundary. Additional details can be found in Appendix I.

12.0 AUTHOR QUALIFICATIONS

Shelley Donovan, M.Sc., has over 15 years experience in environmental monitoring, data analysis and regulatory reporting. She has been working extensively at Hartland Landfill for the past 5 years completing environmental monitoring of groundwater, surface water and landfill gas in accordance with the landfill Operational Certificate, the BC Environmental Management Act, and applicable regulations and guidelines. For this report, Shelley compiled and summarized existing data from the Hartland Landfill Gas and Environmental Monitoring Reports.

Arma Attar, M.Sc., has more than 15 years of experience in environmental management, regulatory compliance, and environmental monitoring. For over four years, Arma has been involved in the environmental management of Hartland Landfill by preparing and coordinating regulatory reporting, supporting landfill gas collection and utilization initiatives that support reduction in greenhouse gas emissions. Arma contributed to writing the regulatory compliance report for landfill gas and also contributed the completion of this operations report by coordinating among multiple operations, environmental and engineering teams.

Kelly Tradewell, B.Sc., P.Ag. has over 20 years of professional experience in leading environmental monitoring, assessment, and compliance programs in the solid waste and resource management sector. For the past 17 years, she has worked extensively at the Hartland Landfill, providing professional oversight and assessment of environmental compliance under the landfill Operational Certificate, the Environmental Management Act, and applicable regulations and guidelines, including BC the Landfill Criteria for Municipal Solid Waste. Kelly provided senior review of the summarized data analysis and interpretation, and regulatory compliance review for this report.

13.0 STATEMENT OF LIMITATIONS

This report consolidates operational, financial, engineering, and environmental data prepared and certified by multiple internal and external parties. Environmental monitoring, landfill gas data, and related analyses were compiled by other qualified professionals, as referenced in text and/or appended to this report. Certain design assumptions, capacity estimates, and lifespan calculations were provided by external qualified professionals. The conclusions herein are based on data available at the time of preparation and are subject to the limitations of that data and the scope of work completed by contributing professionals.

Ian Wiebenga's seal and signature on this report certifies that the information related to capital projects, budgets, closure and post-closure funds, and annual air space calculations have been reviewed and deemed to be accurate. It does not warrant or guarantee, nor accept any responsibility for, the accuracy or completeness of any other information supplied by others contained in this report.

Use of this report or any part thereof is subject to the understanding that professional judgment has been applied within the limits of the available information, applicable regulations, and accepted practice standards at the time of writing.

BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

Declaration of Competency

The Ministry of Environment and Climate Change Strategy relies on the work, advice, recommendations and in some cases decision making of qualified professionals[1], under government's professional reliance regime. With this comes an assumption that professionals who undertake work in relation to ministry legislation, regulations and codes of practice have the knowledge, experience and objectivity necessary to fulfill this role.

1. Name of Qualified Professional: Ian Wiebenga

   Title: Manager, Project Engineering

2. Are you a registered member of a professional association in B.C.? ☒ Yes ☐ No

   Name of Association: EGBC Registration # 47048

3. Brief description of professional services:

   Senior review and provision of information related to capital projects, budgets, closure and post-closure funds, and annual airspace calculations

This declaration of competency is collected under section 26(c) of the *Freedom of Information and Protection of Privacy Act* for the purposes of increasing government transparency and ensuring professional ethics and accountability. By signing and submitting this statement you consent to its publication and its disclosure outside of Canada. This consent is valid from the date submitted and cannot be revoked. If you have any questions about the collection, use or disclosure of your personal information please contact the Ministry of Environment and Climate Change Strategy Headquarters Office at 1-800-663-7867.

Declaration

I am a qualified professional with the knowledge, skills and experience to provide expert information, advice and/or recommendations in relation to the specific work described above.

Signature:

X _____

Print Name: Ian Wiebenga

Witnessed by:

X _____

Print Name: Kelly Fradenell

Date signed: November 9, 2026

[1] *Qualified Professional, in relation to a duty or function under ministry legislation, means an individual who*

a) *is registered in British Columbia with a professional association, is acting under that organization's code of ethics, and is subject to disciplinary action by that association, and*

b) *through suitable education, experience, accreditation and knowledge, may reasonably be relied on to provide advice within his or her area of expertise, which area of expertise is applicable to the duty or function.*

BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

Declaration of Competency

The Ministry of Environment and Climate Change Strategy relies on the work, advice, recommendations and in some cases decision making of qualified professionals[1], under government's professional reliance regime. With this comes an assumption that professionals who undertake work in relation to ministry legislation, regulations and codes of practice have the knowledge, experience and objectivity necessary to fulfill this role.

1. Name of Qualified Professional: Kelly Tradewell

   Title: Supervisor, GeoEnvironmental Programs

2. Are you a registered member of a professional association in B.C.? ☒ Yes ☐ No

   Name of Association: BC Institute of Agrologists Registration # 4409

3. Brief description of professional services:
   Oversight and senior review of the data analysis, interpretation and compliance summary of the 2025 Hartland Landfill Operating & Environmental Monitoring Annual Report

This declaration of competency is collected under section 26(c) of the *Freedom of Information and Protection of Privacy Act* for the purposes of increasing government transparency and ensuring professional ethics and accountability. By signing and submitting this statement you consent to its publication and its disclosure outside of Canada. This consent is valid from the date submitted and cannot be revoked. If you have any questions about the collection, use or disclosure of your personal information please contact the Ministry of Environment and Climate Change Strategy Headquarters Office at 1-800-663-7867.

Declaration

I am a qualified professional with the knowledge, skills and experience to provide expert information, advice and/or recommendations in relation to the specific work described above.

Signature: X _____ Witnessed by: X Lori Nickerson

Print Name: Kelly Tradewell Print Name: LORI NICKERSON

Date signed: November 6, 2026

[1] *Qualified Professional, in relation to a duty or function under ministry legislation, means an individual who*

a) *is registered in British Columbia with a professional association, is acting under that organization's code of ethics, and is subject to disciplinary action by that association, and*

b) *through suitable education, experience, accreditation and knowledge, may reasonably be relied on to provide advice within his or her area of expertise, which area of expertise is applicable to the duty or function.*

14.0 REPORT SIGNOFF

Approved by:



Kelly Tradewell, P.Ag.
Supervisor, GeoEnvironmental Programs

The Undersigned's seal and signature on this report certifies that the information related to capital projects, budgets, closure and post-closure funds, and annual air space calculations have been reviewed and deemed to be accurate. It does not warrant or guarantee, nor accept any responsibility for, the accuracy or completeness of any other information supplied by others contained in this report.



Ian Wiebenga, P.Eng.
Manager, Project Engineering

Oct 28, 2026
CRD permit to Practice
1003385

Reviewed by:

Luke Novy, P.Eng. Manager, Solid Waste Operations

Ian Wiebenga, P.Eng, Manager, Project Engineering

Rory Tooke, Senior Manager, Environmental Resource Management

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