NORTHWIN LANDFILL 2024 ANNUAL OPERATIONS & MONITORING REPORT





Prepared for: Northwin Environmental Limited

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Submitted by:

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PRJ24074

March 31st, 2025



SPERLING Hansen Associates

- Landfill Engineering
- Solid Waste Planning
- Environmental Monitoring
- Landfill Fire Control

March 28th, 2025

Terry Stuart Operations Project Manager Northwin Environmental, Ltd. Suite 315, 1432 Ironwood Street Campbell River, B.C. V9W 5T5

Re: Northwin Landfill 2024 Annual Operations & Monitoring Report

Dear Mr. Stuart,

Sperling Hansen Associates (SHA) is pleased to submit the finalized and authenticated 2024 Northwin Landfill Annual Operations and Monitoring Report, which includes all required sections and supporting data from the provided documents to comply with permit requirements for your facility. The 2024 Annual Operations and Monitoring Report is being submitted to the British Columbia Ministry of Environment and Climate Change Strategy on or before March 31st, 2025, in accordance with Upland Excavating Ltd. Operational Certificate 107689.

Since our engagement in August 2024, our team has greatly enjoyed collaborating with Northwin Environmental as your Landfill Engineering Consultants. We look forward to continuing our work with you on this project in the foreseeable future.

Should you have any questions, concerns, or require any further information regarding this report, please feel free to contact the undersigned at **604-986-7723**.

Yours truly, SPERLING HANSEN ASSOCIATES EGBC Permit Number 1003066

Dr. Tony Sperling, P.Eng. (EGBC Licence 17,621) President



March 28th, 2025

HANSEN ASSOCIATES

PRJ24074

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EXECUTIVE SUMMARY

The Northwin Landfill, located in Campbell River, British Columbia, serves as a modern waste management facility replacing the Original Landfill, which was decommissioned in 2023. The transition to the New Landfill was necessary to comply with modern environmental regulations, improve waste management efficiency, and mitigate environmental risks associated with leachate contamination and landfill gas emissions. The site is operated by Northwin Environmental Ltd. and regulated under Operational Certificate (OC) 107689, ensuring compliance with the BC Landfill Criteria for Municipal Solid Waste (2016) and the Environmental Management Act.

The opportunity presented by the New Landfill is to enhance environmental sustainability, ensure regulatory compliance, and maintain operational efficiency through effective leachate management, landfill gas monitoring, and strategic waste disposal. The New Landfill comprises two cells, Cell 1 East (operational since 2021) and Cell 1 West (completed in 2023) known as Phase 1. Phase 1 was designed with advanced liner and leachate collection systems to minimize environmental impact. This 2024 Annual Report provides an overview of landfill operations, environmental monitoring results, leachate treatment performance, and regulatory compliance for the past year.

The construction and commissioning of Phase 1 have been completed, with both landfill cells now fully operational. The double-liner system with a leak detection layer ensures effective containment of waste and leachate, protecting groundwater and surrounding ecosystems. As of January 29th, 2025, the landfill contains 140,252 m³ of waste, with 67,532 m³ of remaining airspace for the first phase of disposal. Meanwhile, the Original Landfill was fully decommissioned, and all waste was successfully relocated to the New Landfill. A confirmatory soil sampling program verified site closure compliance, and decommissioning of the original leachate management system was completed.

The leachate treatment system has been fully commissioned, treating leachate in batches ranging from 625 m³ to 980 m³ per cycle. The treated leachate met BC Contaminated Sites Regulation (CSR) Schedule 3.2 Drinking Water Standards, ensuring compliance with regulatory requirements. The leak detection monitoring system confirmed that no leaks were detected in the landfill liner, reinforcing the effectiveness of containment measures. Additionally, groundwater monitoring through quarterly sampling at 18 monitoring wells showed no significant contamination trends, while stormwater was properly managed, preventing leachate discharge into natural water bodies. Furthermore, no public complaints were received regarding landfill operations during the reporting period.

Despite these achievements, several operational challenges were encountered and addressed. The effluent holding pond capacity was initially undersized, but an expansion was completed in November 2021 to accommodate peak flows. Minor liner damage during Cell 1 construction was identified and immediately repaired before landfill operations began. Occasional leachate exceedances for sulfate and boron required additional treatment cycles and chemical dosing adjustments to ensure compliance. According to Northwin Environmental, landfill gas monitoring was not conducted this year, so methane concentrations could not be confirmed whether below regulatory thresholds which would indicate stable landfill gas conditions. Furthermore, the remaining airspace in Phase 1 of the New Landfill is limited, necessitating the initiation of Phase 2 expansion planning to ensure continued disposal capacity.



For 2025, recommendations focus on optimizing landfill operations and ensuring long-term sustainability. Continued leachate treatment optimization through sampling and chemical adjustments will maintain compliance with water quality standards. Landfill gas monitoring will be conducted in Q1 of 2025, to establish whether methane concentrations are below regulatory thresholds, as expected based on the nature of the waste being disposed of in this landfill. Landfill expansion planning will progress to Phase 2 development, ensuring that future waste disposal needs are met without capacity constraints. Additionally, efforts will be made to enhance stormwater management, improve liner integrity inspections, and refine waste compaction strategies to maximize landfill airspace utilization. To maintain regulatory compliance, scheduled reporting and environmental audits will continue to ensure community transparency and address any potential concerns.

Overall, the Northwin Landfill remains an environmentally responsible and fully compliant waste management facility with environmental regulations and successful implementation of the New Landfill (a modern, engineered landfill system). The completion of New landfill Phase 1 included the effective implementation of the leachate treatment facility, and ongoing environmental monitoring efforts that reflect the site's commitment to sustainable waste management and regulatory compliance. The 2025 operational focus will be on expanding landfill capacity, optimizing treatment processes, and ensuring continued environmental protection.



1. INTRODUCTION

1.1 Background

The Northwin Landfill, located in Campbell River, British Columbia, was developed to replace the Original Landfill, which had been in operation since 1992. The transition to the New Landfill was undertaken to comply with modern environmental standards and enhance waste management practices.

The site is owned by Upland Excavating Ltd. and operated by Northwin Environmental Ltd., functioning as both a waste disposal facility and an aggregate extraction site (GHD O&M Report, 2023).

1.2 Project Description

Under Operational Certificate (OC) 107689, the New Landfill was authorized to begin accepting waste in Phase 1 as of November 2021 for the last 4 years. Phase 1 featured a double-liner system, leak detection layer, and leachate management works.

Northwin Landfill is designed to accept:

- Construction & Demolition (C&D) Waste
- Landfill Clearing Waste
- Industrial Quality Soil that is not considered hazardous waste (IL+)
- Sludge from leachate and water treatment works

The New Leachate Management System includes collection, extraction, storage, treatment, and infiltration processes to ensure environmental compliance (GHD O&M Report, 2023).

1.3 Regulatory Requirements

Northwin Landfill operates under the BC Landfill Criteria for Municipal Solid Waste (2016) and the Environmental Management Act.

Key regulatory approvals include:

- Operational Certificate (OC) 107689, issued in 2019 and amended in 2022, which governs waste acceptance, leachate management, and environmental monitoring (GHD O&M Report, 2023).
- Approval for soil that is non-hazardous waste; soil acceptance granted in April 2022.
- Ministry of Environment oversight, requiring annual environmental monitoring reports and adherence to groundwater and surface water protection measures.

Quarterly monitoring and reporting ensure compliance with BC's Contaminated Sites Regulation, with detailed evaluations submitted annually to the Ministry of Environment and Climate Change Strategy.

1.4 Site Location

The landfill is situated at 7295 and 7311 Gold River Highway, approximately 7 km west of Campbell River as shown in **Figure 1**.



Site Boundaries:

- North Gold River Highway (Highway 28).
- East Forested and industrial land.
- West Rico Lake, a construction storage yard, and an undeveloped industrial lot.
- South Strathcona Regional District, including forestry industry land.

The total site area is approximately 48 hectares, encompassing:

- A sand and gravel pit
- The New Landfill (Phase 1)
- Leachate treatment works

The site is accessed via Gold River Highway and is equipped with internal roads and site infrastructure to support landfill and quarry operations.

1.5 Site Security

To ensure safety, regulatory compliance, and protection from unauthorized access, Northwin Landfill has implemented a comprehensive security system.

- Signage: Clearly marked signs at the main entrance and all access points, stating:
 - o "Industrial Site No Trespassing"
 - "Property Under Video Surveillance"
- 24-Hour Surveillance:
 - $_{\odot}$ $\,$ Security cameras monitored around the clock by a professional security company.
- Restricted Access:
 - Only authorized personnel and waste haulers are permitted entry.
- Night time Illumination:
 - Outdoor lighting ensures visibility and security at night.

These security measures are aligned with Section 6.10 of the BC Landfill Criteria to maintain compliance and prevent unauthorized dumping or trespassing.

The Northwin Landfill represents a modern, environmentally responsible waste management facility that aligns with provincial regulations and sustainability goals. The site's state-of-the-art design, regulatory compliance, and security measures ensure that waste is managed efficiently while minimizing environmental impact.



2. SITE PHYSICAL SETTING

2.1 Climate

The climate in the vicinity of the Northwin Landfill is characterized by mild, wet winters and warmer, drier summers, consistent with the east coast of mid-Vancouver Island. Climate data recorded at Environment Canada's Campbell River Airport Climate Station (ID 1021261), approximately 8 km southeast of the site, indicates an average annual precipitation of 1,489 mm. Over 75% of this precipitation occurs between October and March, with the heaviest rainfall recorded in November and December. Annual snowfall averages 84 mm.

Projected climate changes for the region, as modeled using the Pacific Climate Impacts Consortium's Plan2Adapt tool, suggest a 2.7% increase in total annual precipitation by the 2050s. Seasonal changes indicate that summer precipitation could decrease by up to 15%, while winter precipitation may increase by approximately 5.2% (GHD DOCP, 2021).

2.2 Topography and Drainage

The Northwin Landfill is located on a terrace partially surrounded by mountainous terrain to the south and southwest. The terrace slopes gradually downward towards the Quinsam River, which lies approximately 3.8 km southeast of the eastern site boundary. The Quinsam River's channel elevation is more than 100 m below the landfill, meaning there is no direct overland drainage to the river.

There are no natural surface watercourses on the site. Surface drainage is managed through a stormwater management plan, as outlined in the Design, Operations, and Closure Plan (DOCP). Perimeter berms have been constructed around landfill cells to ensure that precipitation landing within the landfill footprint is collected and treated as leachate. Rainfall outside the landfill footprint infiltrates naturally into the subsurface sand and gravel aquifer.

Two significant water bodies are located near the site:

- Rico Lake, situated to the west, is within a natural depression. Its elevation ranges between 168 m and 172 m above mean sea level (AMSL).
- McIvor Lake, located north of the site, is hydrologically connected to Campbell Lake and influenced by BC Hydro's Ladore Dam, which maintains an operational water elevation of 174-178 m AMSL.

The site lies within two watershed areas: the Campbell River Watershed and the Quinsam River Watershed, which are separated by a watershed divide running through the southwestern portion of the site.

2.3 Geologic Setting

The regional geology of the Northwin Landfill site has been influenced by multiple glaciation events during the Pleistocene Epoch. Vancouver Island was covered by ice sheets up to 2 km thick, leading to the deposition of various glacial and glacio-fluvial sediments. These deposits include:



- Glacial Till: Comprised of a mix of clay, silt, sand, gravel, and boulders deposited directly by glaciers.
- Glacial Outwash: Poorly sorted coarse-grained sand and gravel deposited by glacial meltwater.

The landfill is predominantly underlain by interbedded sand and gravel with occasional layers of silty sand. These deposits exceed 40 m in thickness directly beneath the landfill footprint.

2.3.1 Bedrock Geology

The site is underlain by the Karmutsen Formation, part of the Wrangellia Terrane. The formation consists mainly of submarine flood basalts, which can reach thicknesses of up to 6 km. Site investigations confirm that the bedrock beneath the landfill is competent igneous basalt, with the surface located at least 50 m below ground level (GHD O&M Report, 2023).

A significant bedrock ridge exists between Rico Lake and the landfill excavation pit, forming a surface water and groundwater flow divide. This geological feature influences local drainage and hydrogeologic conditions.

2.4 Hydrogeologic Settings

The hydrogeologic setting of the site consists of three primary aquifer units:

- 1. Sand and Gravel Aquifer This unconfined aquifer exists within the sand and gravel deposits overlying bedrock and is the dominant groundwater flow zone at the site. The water table is typically 13–18 meters below the top of the monitoring well risers in the landfill area. Groundwater flow is predominantly northwest to southeast, toward the Quinsam River.
- 2. Shallow Aquifer This discontinuous aquifer exists in certain areas of the site, particularly in the northern section and the southwest corner. Groundwater flow in this zone is primarily controlled by bedrock topography.
- 3. Bedrock Aquifer Fractured basalt within the Karmutsen Formation hosts a deeper bedrock aquifer, which interacts with the overlying sand and gravel aquifer through upward hydraulic gradients.

Hydraulic conductivity tests indicate that the sand and gravel aquifer has an estimated conductivity of 1.8×10^{-2} cm/sec, signifying a relatively high permeability and potential for groundwater movement (GHD O&M Report, 2023).

Groundwater monitoring and hydrogeologic assessments confirm that:

- The aquifer is classified as a major aquifer (Aquifer 975 IIA) under the BC Water Resource Atlas.
- Groundwater flow patterns are influenced by local bedrock structures, with McIvor Lake serving as the primary recharge source.
- •



• No surface water bodies are downgradient within 500 m of the landfill, negating the need for aquatic life standards in groundwater assessments.

Ongoing hydrogeologic monitoring is conducted to assess potential impacts from landfill operations, particularly concerning groundwater quality and migration of contaminants.



3. 2024 ENVIRONMENTAL MONITORING PLAN

3.1 Groundwater Monitoring Program

The main objective for this monitoring program is to detect the extent and magnitude of potential landfillderived impacts to the underlying aquifer, and to monitor the groundwater flow direction across the Site.

The groundwater monitoring program consists of quarterly monitoring of eighteen (18) groundwater monitoring wells located upgradient, cross-gradient, and downgradient of the Site. Hydraulic monitoring is done on all eighteen wells, and eleven of the wells are included in the sampling program.

The groundwater samples are analyzed for general chemistry parameters, anions, nutrients, dissolved metals and LEPH, HEPH, and PAHs.

The locations of the groundwater monitoring locations for the Site can be seen on Figure 4.

Groundwater	Location	Monitoring
MW6-17	Upgradient well	Quarterly Sampling
MW9-17	Upgradient well	Quarterly Sampling
MW1-14	Upgradient well	Quarterly Sampling
MW4A-15	Upgradient well	Quarterly Sampling
MW4B-15	Upgradient well	Quarterly Sampling
MW2-14	Cross-gradient well	Quarterly Sampling
MW2A-16	Cross-gradient well	Quarterly Sampling
MW3-14	Downgradient well	Quarterly Sampling
MW10-17	Downgradient well	Quarterly Sampling
MW11-19	Downgradient well	Quarterly Sampling
MW12-22	Downgradient well	Quarterly Sampling
MW7-17	Upgradient well	Water Levels Only
MW8-17	Upgradient well	Water Levels Only
MW5A-15	Cross-gradient well	Water Levels Only
MW5B-15	Cross-gradient well	Water Levels Only
MW15A-18	Cross-gradient well	Water Levels Only
MW15B-18	Cross-gradient well	Water Levels Only
PZ1-19	Cross-gradient well	Water Levels Only

Table 3-1: New Landfill Groundwater Monitoring Locations

3.2 Surface Water Monitoring Program

The surface water monitoring program consists of quarterly water level monitoring, and annual sampling of Rico Lake and McIvor Lake. The water levels in Rico Lake are read on a surface water gauge at the north end of the lake, while water level readings for McIvor Lake are obtained from BC Hydro's database for the Ladore Dam. The water samples are collected from surface water monitoring locations SW15-1



and SW15-2 respectively. Samples are analyzed for general chemistry parameters, nutrients, anions, total metals, and dissolved hardness. The locations for SW15-1 and SW15-2 can be seen on **Figure 4**.

Surface Water Monitoring Stations	Location
SW15-01	McIvor Lake north of the New Landfill
SW15-02	Rico Lake west of the New Landfill

 Table 3-2:
 Surface Water Monitoring Locations

3.3 Landfill Gas Monitoring

The objective for the landfill gas (LFG) monitoring program is to detect if there is any lateral migration of LFG at the site. The 2021 GHD DOCP recommend monitoring at the perimeter of the Site, as well as monitoring of existing on-site buildings (occupied by operational personnel) for potential landfill gas migration. The BC Landfill Criteria requires that soil gas concentrations at the Site boundary must not exceed the lower explosive limit of methane (5% by volume). The soil gas concentrations in on-site buildings must not exceed 20% of the lower explosive limit of methane (1% by volume) at all times.

In accordance with the above-mentioned requirements, the 2021 GHD DOCP recommended that soil vapor monitoring probes be installed at the site as part of the construction of the new cells. The two recommended probes were installed in 2022, with their locations shown in **Figure 4**.

Surface Water Monitoring Stations	Location
LFG1-22	Near Wash Plant
LFG2-22	Southern property boundary (monitor LFG migration offsite)

Table 3-3: Landfill Gas Monitoring Locations

The monitoring program for 2024 stipulates that landfill gas monitoring be conducted annually using the two gas monitoring probes and be consistent with the BC Landfill Gas Management Facilities Design Guidelines, Section 6 of the Guidelines for Environmental Monitoring at Municipal Solid Waste Landfills, and Sections 4.2 and 9.3 of the Landfill Criteria.

3.4 Stormwater Monitoring

According to Operational Certificate (OC 107689), the site operator must ensure that stormwater does not include leachate, and the concentration of any substances in the stormwater not exceed the Contaminated Sites Regulated Generic Numerical Water Standards for Drinking Water (DW).

Drainage within the New Landfill area is managed according to the stormwater management plan provided in the DOCP. Perimeter berms have been constructed around the landfill cells to ensure that precipitation that falls on the landfill footprints remains within the footprint and managed as leachate. Precipitation that falls outside of the landfill footprint is considered clean water and infiltrates into the groundwater aquifer below the Site. Stormwater monitoring is currently not part of the monitoring



program as contact water is kept within the lined areas, and precipitation falling outside of the lined areas rapidly infiltrates with no surface runoff at the site.

3.5 Leachate Monitoring

In order to prevent leachate from migrating to the underlying aquifers, nearby lakes and rivers, the New Landfill (Cell 1 East and Cell 1 West) have lined cells with perforated pipes installed at the base of the cell that discharge to a leachate sump as shown in **Figure 7**. The New Landfill includes leachate collection, extraction, storage, treatment, and infiltration or recirculation through the Granular Activated Carbon (GAC) system. The treatment process continues until treated effluent concentrations meet the British Columbia Contaminated Sites Regulations (BC CSR) Schedule 3.2 DW standards.

The New Landfill leachate management system process begins with filling the aerated equalization pond, whereafter the aeration system is switched on. Following aeration, the leachate is pumped through pipes to the leachate treatment container, where chemicals can be added inline through injection ports. After chemical addition, leachate can be recirculated to the equalization pond or sent through a series of sand filters before entering the effluent holding pond. The effluent batch is held in the effluent holding pond and sampled with a 3-day turnaround on the laboratory analysis. Following receipt of sample results, the batch is then be pumped to the infiltration pond or recirculated through the GAC, if polycyclic aromatic hydrocarbons (PAHs) did not meet discharge criteria. During operations the batches are tested periodically to confirm discharge criteria are being met. The treatment process continues until treated effluent concentrations meet the BC CSR Schedule 3.2 DW standards.

Table 3-4 shown below lists the three current leachate sampling locations at the Site. The raw leachate from the leachate collection sumps (S06-21 and S07-24) is sampled on a quarterly basis, and samples tested for general chemistry parameters, anions, nutrients, total metals, LEPH, HEPH, and PAHs. Leachate sump S07-24 was not sampled in 2024 as Cell 1 West had not received any waste at that time. The treated leachate in the Treated Leachate Infiltration Pond (TLIP) is being tested batch by batch for the following parameters: hardness, sulphate, dissolved metals, volatile organic compounds (VOCs), PAHs, light extractable petroleum hydrocarbons (LEPH), and heavy extractable petroleum hydrocarbons (HEPH).

Surface Water Monitoring Stations	Location	Monitoring
S06-21	Raw leachate sump at northeast end of Cell 1 East	Quarterly Sampling
S07-24	Raw leachate from liner in Cell 1 West (implemented in 2025)	Quarterly Sampling (2025)
TLIP	Treated leachate discharged to the infiltration pit	Batch by batch

3.6 Liner Leakage Detection Monitoring

The New Landfill cells, as well as the leachate treatment and holding ponds are all double lined with a liner leakage detection system under the primary liner. The leakage detection system has two leakage



detection sumps (LDS-E and LDS-W) located under each of the two leachate collection sumps. Each leakage detection sump is connected with pipes to each of the two leachate pumping sheds. This allows for inspection for presence of water between the primary and secondary liners as well as pumping out water for sampling should water be detected. The seven liner leakage detection ports are part of the Trigger Level Response Plan and assist in identifying which area of the cells that could have a compromised primary liner. In the event that water is detected in any of the two liner leakage detection sumps, samples are collected and analyzed for the same parameters as the leachate monitoring program. Monitoring of the liner leakage detection system is conducted on a quarterly basis. Monitoring locations S07-24 and LDMP-5 will become part of the monitoring program in 2025, which is located on the west side of Phase 1. The locations of the liner leakage detection monitoring points can be seen in **Figure 7**.

Liner Leakage Monitoring Locations	Location		
LDS-E	Liner leakage detection sump (Cell 1 East)		
LDS-W	Liner leakage detection sump (Cell 1 West)		
LDMP-1	Liner leakage detection port (accessed from north side cell 1 east)		
LDMP-2	Liner leakage detection port (accessed from north side cell 1 east)		
LDMP-3	Liner leakage detection port (accessed from east side cell 1 east)		
LDMP-4	Liner leakage detection port (accessed from east side cell 1 east)		
LDMP-5	Liner leakage detection port (accessed from north side cell 1 west) (2025)		
LDMP-6	Liner leakage detection port (accessed from north side cell 1 west) (2025)		
LDMP-7	Liner leakage detection port for aeration pond		

 Table 3-5:
 Liner Leak Detection Monitoring Locations

The head of the liner is being monitored with leachate level transducers in the two leachate collection sumps to ensure that leachate levels do not exceed 30 cm.

3.7 Leachate Indicator Parameters

The following section provides a summary of leachate indicator parameters that are typically used when identifying leachate impact on ground and surface water at landfill sites.

Parameter	Description
Alkalinity	Alkalinity typically increases down-gradient of landfills primarily due to elevated levels of dissolved carbon dioxide in affected water.
Ammonia	High concentrations of ammonia are often observed in landfill leachate, especially sites receiving waste with high organic content. Municipal Solid Waste (MSW) landfills often see concentrations above 500 mg/L, while DLC landfill such as this site have much lower concentrations in the untreated leachate.

Table 3-6:	Typical	Leachate	Indicator	Parameters
	- J prour	Licucinate	Indicator	I al allievel b



Boron	Boron can be a useful leachate indicator parameter as it is not subject to retardation processes and is therefore a conservative tracer.
Chloride	Chloride is often found at significantly elevated levels in landfill leachate. This is particularly the case for MSW sites, but elevated levels are frequently noted at DLC sites as well. Chloride can be a very useful leachate indicator parameter as it is not subject to retardation processes and is therefore a conservative tracer.
Conductivity	Specific conductivity increases in leachate-affected groundwater due to the increased conductive capacity of water as a result of increased dissolved ions.
Hardness	Caused by the increased concentrations of calcium and magnesium ions due to the waste materials and more acidic pH breaking down the native lime-rich soils.
Hydrogen Sulphide	Hydrogen sulphide levels can be particularly high in both the leachate and in the landfill gas at sites receiving gypsum type waste such as drywall. Under anaerobic conditions, sulphide (as H2S) is observed through the reduction of sulphur species.
Iron and Manganese	Concentrations typically increase in landfill-affected groundwater due to the alteration of redox conditions within the groundwater. The breakdown of dissolved organic matter within leachate consumes dissolved oxygen in groundwater and creates reducing conditions. Where conditions are reducing, naturally-occurring iron and manganese oxides within the geologic material are reduced to more soluble forms.
ORP	Oxidation-Reduction Potential (Redox Potential) is often a useful indicator parameter as the ORP values in leachate impacted water is noticeably lower than in unimpacted water.
Petroleum hydrocarbons (including PAHs)	Waste in the form of creosote timbers and IL+ soil can contain petroleum hydrocarbons including polycyclic aromatic hydrocarbons (PAHs). It is therefore a useful indicator parameter since petroleum hydrocarbons are not naturally present in groundwater on-site.
Sulphate	Construction and demolition waste landfills often generate elevated concentrations of sulphate in leachate due to the abundance of sulphate available from gypsum in drywall and other building materials in the waste stream.

3.8 Applicable Water Quality Standards

Environmental standards in British Columbia (BC) are governed under the Contaminated Sites Regulation (CSR), which is a key component of the Environmental Management Act (EMA). The applicable standards are determined based on the site's land use and groundwater utilization. According to prior reports from GHD, the following environmental standard has been applied at the site:



• Schedule 3.2 – Generic Numerical Water Standards, Column 6: Drinking Water (DW)

Although the groundwater at the site is not currently used for drinking water, the BC ENV Protocol 21 requires that drinking water use standards be considered by default unless site-specific conditions justify their exclusion. To formally exclude drinking water standards, additional hydraulic response testing would be necessary.

Standards for aquatic life, irrigation, and livestock use were deemed unnecessary based on the following justifications:

- A hydrogeological assessment cited in GHD's 2023 Operations and Monitoring Report and the Hydrogeology and Hydrology Characterization Report (HHCR) (originally issued May 27, 2016, and last updated May 4, 2021) established that groundwater at the site does not discharge into any surface water bodies within 500 meters. As a result, aquatic life standards were not applied.
- No agricultural activities, including groundwater extraction for irrigation or livestock watering, are known to be occurring within 500 meters of the site, thereby excluding the need for irrigation and livestock standards.

As a result, the BC CSR Drinking Water (DW) standards were applied when evaluating groundwater quality at the site. While these standards are not directly applicable to surface water and raw leachate, they were used as a reference point to assess whether surface water and leachate quality might impact groundwater conditions. The groundwater and surface water analytical results were assessed in accordance with BC CSR DW standards as outlined in Section 3.5 of the Operational Certificate (OC). These standards are recognized as appropriate benchmarks for monitoring water quality at permitted landfills, as stated by the BC Ministry of Environment (MOE) that is outlined in 2024 EnviroChem – Field Inspection & Sampling Report in **Appendix E**.

3.9 Sampling and Analytical Procedures

The first three quarterly sampling events in 2024 were completed by GHD, while the fourth quarterly sampling event was completed by EnviroChem Services Inc. (EnviroChem). Based on the information provided in the last three annual reports that GHD completed for this Site, it is SHA's understanding that GHD completed the first three sampling events in 2024 in accordance with the BC Ministry of Environment and Climate Change Strategy (2020) British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air Emission, Water, Wastewater, Soil, Sediment and Biological Samples (British Columbia, Ministry of Environment, 2013) (BC Field Sampling Manual).

It is noted in EnviroChem's field inspection and sampling report (**Appendix E**), that they also completed the fourth sampling event in 2024 in accordance with the BC Field Sampling Manual.

3.10 Data Quality Assessment and Verification

As information regarding data verification and QA/QC review for the Q1-Q3 2024 data by GHD could not be verified, it is not known whether this was completed. Based on the information provided in the



last three annual reports that GHD has completed for this Site, it is SHA's understanding that data verification and assessment of the QA/QC information was completed.

EnviroChem completed data verification to assess laboratory and field QA/QC measures for the Q4 2024 sampling event. The QA/QC results are presented in the EnviroChem's field inspection and sampling report in **Appendix E** which indicates that data exhibits acceptable levels of accuracy and precision with the qualifications noted.

3.11 Laboratory Program

All samples collected in 2024 were submitted to accredited laboratories for analysis. Samples collected from the leachate treatment system by Northwin staff were submitted to ALS Environmental Inc. in Burnaby BC for analysis, and samples collected by GHD (Q1-Q3) and EnviroChem (Q4) were submitted to Bureau Veritas in Burnaby BC.



4. WATER LEVEL MONITORING RESULTS

EnviroChem conducted a groundwater level survey at the Q4 2024 monitoring event, with the results from the survey shown in **Table 4-1** (EnviroChem, 2024). The water level measurements for McIvor and Rico Lake were recorded on January 27, 2025. **Figure 5** shows the groundwater contours and the inferred flow direction at the Q4 2024 monitoring event. As can be seen in the figure, the groundwater gradient across the site is relatively steep at approximately 4%, with an inferred flow direction towards the southeast. Groundwater level data was not available for the Q1-Q3 period at the time of preparation of this report. The Q4 2024 results are consistent with historical results for the Site.

Monitoring	Depth to Bottom	Reference Elevation TOR	Depth to Water	Water Table Elevation
Location	(m BGS)	(m AMSL)		
	Monitoring Date:			
	D	ecember 18-20 th , 20	J24 & January 27 ^d	, 2025
MW1-14	11.0	172.9	7.65	165.2
MW2-14	21.6	173.8	16.81	157.0
MW2A-16	45.4	173.9	16.73	157.2
MW3-14	18.6	168.6	14.66	153.9
MW4A-15	21.3	169.3	7.00	162.3
MW4B-15	18.3	169.3	7.15	162.1
MW5A-15	10.7	191.9	-	-
MW5B-15	8.2	192.0	-	-
MW6-17	11.3	185.4	7.50	177.9
MW7-17	4.3	187.5	-	-
MW8-17	18.8	192.5	-	-
MW9-17	33.5	191.7	24.41	167.3
MW10-17	46.3	189.1	42.34	146.8
MW11-19	54.9	194.8	48.54	146.3
MW12-22	45.1	N/A	40.98	-
MW15A-18	15.2	183.1	-	-
MW15B-18	9.0	183.2	-	-
PZ1-19	20.4	192.1	-	_
McIvor Lake*	-	-		177.3
Rico Lake**	-	180.3	0.40	

Table 4-1: Water Level Survey Data December 2024 and January 2025

Notes:

**

191.88 Surveys completed by McElhanney on April 6, 2016, and March 16 and 31, 2017.

185.4 Survey completed by Upland Excavating Ltd. on January 29th, 2015, March 8, 2016, and April 6th, 2016.

m BGS metres below ground surface.

m AMSL metres above mean sea level (WGS1984).

m BTOR meters below top of riser

McIvor Lake elevations are based on BC Hydro record of water elevations at Ladore Dam recorded every three hours.

Surface water gauge reference elevation refers to the bottom of the gauge (0 m on gauge = 180.33 m AMSL).

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TOR top of riser.

5. EMP RESULTS AND WATER QUALITY ASSESSMENT

5.1 Leachate Quality and Quantity

5.1.1 Raw Leachate (S06-21)

The chemistry of the raw leachate as collected at S06-1was evaluated by EnviroChem, and is presented in **Appendix E**. In their report they conclude that the raw leachate is consistent with historical results, with no major changes in the chemistry.

5.1.2 Treated Leachate

In 2024, a total of 4,500 m³ of treated leachate was discharged to the infiltration pond, which is within the max volume of leachate effluent discharge of 7,139 m³/calendar year stipulated in the OC. As shown in Table 1, all treated discharged leachate met CSR–DW criteria, except for Quinoline (Feb. 14th, 2024), Boron (Oct. 31, Nov. 07, Nov. 18 and Dec. 16, 2024). Treated leachate was discharged on the following dates as shown in **Table 1**:

- Feb. 14th, 2024 discharged Exceedances of Quinoline of 0.096 μ g/L (CSR-DW limit of 0.05 μ g/L)
- Feb. 16th, 2024 discharged No exceedances
- Oct. 31st, 2024 discharged Exceedances of Boron of 6.88 mg/L (CSR-DW limit of 5 mg/L)
- Nov. 7th, 2024 discharged Exceedances of Boron of 6.64 mg/L (CSR-DW limit of 5 mg/L)
- Nov. 18th, 2024 discharged Exceedances of Boron of 6.72 mg/L (CSR-DW limit of 5 mg/L)
- Dec. 16th, 2024 discharged Exceedances of Boron of 5.26 mg/L (CSR-DW limit of 5 mg/L)

As mentioned in Chapter 8 & 9, Northwin Environmental is in the process of redesigning and improving the existing leachate treatment process to mitigate exceedance of CSR-DW criteria and protect against potential adverse environmental impacts.

5.2 Landfill Leak Detection System Water Quality

As was mentioned in Chapter 3, the New Landfill is outfitted with a liner leakage detection system. There are a total of seven leachate leakage detection monitoring ports (LDMPs), with two ports on the east side of Cell 1, four ports on the north side of Cell 1, and one port at the aeration pond. In addition, there is one leakage detection port located under each of the two leachate collection sumps.

As reported by EnviroChem, all leakage detection points were dry at the Q4 2024 monitoring event. No field notes for the Q1-Q3 2024 sampling events were available at the time of preparation of this report, so the status of the leakage detection system for this period is unknown. As GHD reported in the annual report for 2023 that all leakage detection points were dry during Q1-Q4 2023, it is reasonable to believe that they were also dry during the Q1-Q3 2024 period.

5.3 Groundwater Quality

The groundwater results from 2024 are presented in Table 3 in EnviroChem's report found in **Appendix E.** In this report, EnviroChem evaluates all groundwater results against the water quality standards that are applicable for the Site (CSR-DW), and compares the data against leachate indicator parameters.



EnviroChem concluded that with only one exception (benzo(a)pyrene in MW6-17 (upgradient well location) at the Q1 2024 sampling event), the results from the 2024 sampling events were all below the BC CSR-DW standards. EnviroChem stated that the elevated level of benzo(a)pyrene that was noted in MW6-17 was likely caused by elevated turbidity which can create false positive results for hydrocarbons.

As the EnviroChem report fully covers the regulatory aspects of groundwater monitoring for the Site, this section will therefore be limited to historical trends and spatial variance across the site.

5.3.1 Conductivity Heat Map

One of the first parameters that is often used as a leachate indicator is electrical conductivity (EC) as leachate impacted water always has elevated EC values. The EC values can also be naturally elevated due to elevated levels of dissolved minerals such as calcium and magnesium. SHA generated a "heatmap" for EC from the Q4 2024 results, and it is shown on Figure 6. Surprisingly, the heatmap shows elevated EC in the northwestern corner of the site at monitoring well MW6-17, which is upgradient of the landfill. The borehole log for MW6-17 shows that this is a relatively shallow well, with top two meters of the borehole consisting of fill, and not native soil. The elevated EC observed in this corner is most likely attributable to non-native fill or de-icing salts from the nearby road, as there is little evidence to suggest that the landfill is the source. There is also a sliver in the southeastern corner with slightly higher EC values. This could be the result from the old landfill that was located in this corner. The figure also shows that the EC values around the new landfill cell, leachate treatment ponds, and the infiltration pond are not elevated, which suggests that the landfilling activities are currently not contributing to dissolved ion loading of the groundwater at the site.

5.3.2 Long Term Trends

SHA compiled all available historical data and generated time vs concentration graphs for the following leachate indicator parameters: ORP, alkalinity, chloride, conductivity, hardness, sulphide, sulphate, TDS, ammonia, boron, calcium, iron, magnesium and manganese. All graphs are shown in **Appendix D**, with the D1 series covering the last four years of data (2021 to 2024), and the D2 series covering all the years with data (2015 to 2024).

None of the plotted parameters display any definitive trends. ORP had stable readings between 2015 and 2021, followed by variable results during 2021 and 2022. As the variability was noted even at the upgradient wells during this period, the variability was likely related to sampling procedures and/or instrument calibration. The latest event in December 2024 showed unusually low ORP values for eight of the eleven wells that were tested. These low values were likely a result of an instrument malfunction rather than actual changes in the groundwater conditions. The chloride concentrations in the groundwater at the site are low with most wells having less than 20 mg/L. As was noted in section 5.3.1 above, monitoring well MW06-17 had higher conductivity than all the other wells. This can be explained by the well consistently having noticeably higher concentrations of chloride, dissolved calcium, magnesium and manganese than the other wells. This suggests that this well is installed in a different type of soil formation than the other wells at the site. Leachate indicator parameters such as ammonia, hydrogen sulphide, sulphate, TDS, and dissolved iron have remained very low across the entire site.



Overall, no noticeable changes in the groundwater chemistry can be seen which indicate that the landfill has none to minimal impacts to the local ground water quality.

5.4 Stormwater

Stormwater monitoring is currently not required at the site since precipitation that falls on areas outside the landfill footprint rapidly infiltrates into the ground, and precipitation that falls within the lined cells is collected and treated as leachate.

5.5 Surface Water

The chemistry of the surface water samples collected from SW15-1 and SW15-2 was evaluated by EnviroChem, and is presented in **Appendix E**. In their report they conclude that the surface water in the two lakes is consistent with historical results, with no major changes in the chemistry.

5.6 Landfill Gas

As described in chapter 3, there are two landfill gas migration monitoring probes (LFG1-22 and LFG2-22) at the Site. There is one on the southern property line, and one beside the wash plant at the centre of the Site. The locations are shown on Figure 4. Due to miscommunication during the switch of the monitoring consultant mid 2024, the landfill gas monitoring was not completed in 2024. The November 2022 results showed no methane in LFG1-22, and 0.2% methane in LFG2-22. No methane was detected in the two probes in 2023. Monitoring probe LFG2-22 was monitored in March 2025 with no detectable levels of methane. Monitoring probe LFG2-1 could not be located at the Q1 2025 sampling event. Given that only one probe reading has shown detectable level (0.2%) of methane in the past three years, it is reasonable to assume that the landfill gas levels in the two probes were well below the 5% (v/v) criteria in 2024.



6. CONCLUSION AND RECOMMNEDATIONS – ENVIRONMENTAL MONITORING

6.1 Conclusions

The groundwater level measurements collected in 2024 show a relatively steep groundwater gradient across the site, with an inferred flow direction towards the southeast. This consistent with historical data.

The raw leachate samples collected from leachate sump S06-21 in 2024 would be considered relatively weak compared to many other landfills. In 2024, the ammonia levels ranged between 3.7 and 42 mg/L, BOD ranged between non detectable and 36 mg/L and conductivity ranged between 2,620 and 3,770 μ S/cm. All results were consistent with historical data for leachate collected at Cell 1.

Landfill gas monitoring was not completed in 2024 due to miscommunication during the transition to a new environmental consultant overseeing the Site. As only occurrence with detectable level (0.2%) of methane was noted in LFG22-2 in 2022, non-detectable levels in 2023, and non-detectable at the Q1 2025 sampling event, it is reasonable to assume that in 2024, the gas concentrations in the two probes also was below the criteria of 5% (v/v).

6.2 Recommendations

It is recommended that the EMP for 2025 follows the 2024 program with only a few modifications. It is recommended that the new monitoring well (MW13) proposed by GHD in 2023 be installed and added to the monitoring program. In addition, it is recommended that the liner leakage monitoring probe (LDMP-7) for the leachate treatment pond also be added the EMP for 2025. The sampling parameters, sampling frequency, sampling locations for the 2025 EMP Plan can be seen in **Table 2**.



7. OPERATIONS AND DEVELOPMENT – ORIGINAL LANDFILL

7.1 Original Landfill

Permit PR-10807 was issued on June 1, 1992, for the Original Landfill. As the Comox Valley Regional District included this facility in their approved Solid Waste Management Plan, the Ministry of Environment and Climate change Strategy (ENV) issued the Operational Certificate (OC) on August 1, 2019, authorizing disposal of waste at the lined New Landfill. The OC authorized continued discharge to the existing Original Landfill lined cell prior to construction of the New Landfill.

7.2 Original Landfill Closure & Decommission

The Original Landfill includes an un-lined cell with an area of 0.7 ha and a lined cell with an area of 0.7 ha (85 m x 85 m) located at the southeast corner of the waste management area of the site as shown in **Figure 3**. The Original Landfill within the existing waste management area also included a material sorting area, leachate treatment equipment and related appurtenances.

The un-lined cell received wood waste, ash and burning residue, and construction and demolition waste since 1990s until the lined cell was constructed in April 2015. The liner system of the Original Landfill lined cell was constructed with two layers of 20 mil Coated Woven Polyethylene (CWPE) and a leak detection system in between. The leak detection layer consists of a 300 mm thick gravel drainage layer with a 100 mm PVC pipe at both ends as rises from the toe of the slope to the top of the north and east berms to check water level for the leak detection.

The leachate collection system in the lined cell includes leachate sumps, leachate extraction chamber located within the west side of the cell and a series of tanks for temporary storage and leachate treatment.

Waste was not discharged into the Original Landfill lined cell in 2022 which was covered by a tarp until November of the year when decommissioning of the Original Landfill began as shown in **Table 7-1**. During that period, the old landfill was fully decommissioned, all required sampling was conducted, and the necessary reporting was submitted to satisfy the Ministry of Environment (MoE). The original leachate management works were fully decommissioned in 2023, but the new leachate management works started in 2022.

Dates	Un-lined Cell (m ³)	Lined Cell (m ³)	Total Original Landfill (m ³)
Historical to Oct 4, 2019	35,000	4,446	39,446
Oct 5 thru December 31, 2019	0	5,445	5,445
January 1 thru December 31, 2020	0	7,812	7,812
January 1 thru December 31, 2021	0	4,464	4,464
January 1 thru December 31, 2022	0	0	0

Table 7-1: Original Landfill Waste Volumes (metric tonnes) by Year



Total Volumes by Vear	35,000	22,167	57,167
I cai			

Waste from the lined and un-lined Original Landfill was segregated by category (soil, fine debris and coarse debris) for relocation to the New Landfill as per Section 2.9 (b) of the OC. The segregation of the materials allowed for the protection of the liner by placement of only the fine waste and soil into first lift of the lined cell of the New Landfill with the coarse debris held back to be placed only in the second lift. Material from the Original Landfill lined cell was excavated until a clean base was encountered through visual inspection. The estimated volume of waste relocated from the Original Landfill to the New Landfill Cell 1 East is 74,746 m³ (GHD, 2021).

The CWPE liners were also disposed of in the New Landfill with other waste. The original leachate management works were also decommissioned while some of the components were salvaged for reuse in the New Leachate Management System.

A confirmatory soil sampling program was carried out to ensure clean closure of the entire Original Landfill and the adjacent buffer zone. It was also ensured that the soils in place meet the applicable IL standard.



8. OPERATIONS AND DEVELOPMENT – NEW LANDFILL

8.1 New Landfill

The New Landfill includes two cells: Cell 1 East and Cell 1 West. Cell 1 East construction was completed in October 19, 2021 and started accepting waste on November 24, 2021 (GHD O & M Report, 2023). Cell 1 West construction activities began on October 12, 2022 and were completed on September 22, 2023 (GHD West Construction Report, 2024).

As per the 2021 DOCP, the design capacity of the New Landfill is 532,365 m³ or 692,076 tonnes with an apparent density of 1.3 tonnes/m³ (GHD DOCP, 2021). It was estimated in the 2021 DOCP that the New Landfill has an approximate lifespan of 13.3 years.

Cell 1 East and Cell 1 West have both been constructed with a primary and secondary base liner. The primary base liner comprises of a composite liner system consisting of a 60 mil HDPE textured geomembrane liner and a geosynthetic clay liner (GCL) beneath the leachate collection system while the secondary base liner composite liner system comprises of a 60 mil HDPE textured geomembrane liner and GCL below the leak detection system in between the two liner systems.

As per the 2021 DOCP development sequence, the landfill is proposed to be developed in three phases with a number of stages in each phase.

Phase 1: Consists of two stages - Stage 1 East and Stage 1 West – with a total capacity of 207,784 m³ Phase 2: Consists of three stages – Stage 2A, Stage 2B, Stage 2C – with a total capacity of 178,280 m³ Phase 3: Consists of three stages – Stage 3A, Stage 3B, Stage 3C – with a total capacity of 145,761 m³

As per the survey completed on January 29th, 2025, Cell 1 West has 47,425 m³ of waste in place while Cell 1 East has 92,827 m³ of waste in place with a total of 140,252 m³ and the remaining capacity of 67,532 m³ for the two stages of Phase 1 as presented above.

The new leachate system has been successfully commissioned. A Registered Site Number (RS#) has been assigned. Demolition waste has been placed in Cell 1 East and West, with leachate collection active from both cells.

8.2 New Leachate Management Works

Leachate works for Cell 1 West were completed, and leachate is now being treated along with that from Cell 1 East that was previously completed. The leachate treatment system was commissioned as per the 2021 DOCP.

8.3 Summary of DOCP Implementation

The latest 2021 GHD DOCP will be under review in 2025 and a new revised DOCP will be prepared no later than December, 2026.

8.4 2024 Significant Works

No significant works conducted or completed in 2024.



8.5 Construction Reports

The Northwin Landfill expansion included the construction and commissioning of Cell 1 East, Cell 1 West, and associated leachate management ponds to improve waste containment, leachate treatment, and environmental compliance (**Appendix C**). The project followed rigorous engineering, quality control, and regulatory requirements, ensuring the safe operation and long-term sustainability of the landfill.

8.5.1 Completed Phases

Site Preparation & Excavation: Completed for both cells, including subgrade preparation and berm construction.

- 1. Cell 1 East Construction (March 2021 October 2021)
 - Double liner system with leachate collection and leak detection layers.
 - Leachate treatment facility (LTF) and infiltration ponds built for water management.
 - Initial commissioning of leachate treatment system with compliance testing.
 - QA/QC inspections and final deficiency corrections completed.
- 2. Cell 1 West Construction (October 2022 September 2023)
 - Integrated with Cell 1 East's leachate treatment system.
 - Double liner and leachate collection system installed.
 - QA/QC inspections and final deficiency corrections completed.
- 3. Leachate Treatment Facility (LTF) & Ponds
 - Aeration Pond:
 - Includes aeration, filtration, and chemical treatment for contaminants removal. Adjustment made to batch size, pH levels, chemical dosing.
 - Effluent Holding Pond:
 - Initial construction in October 2021, expanded in November 2021 due to under sizing issues.
 - Functionality confirmed through pump tests and sampling.
 - Infiltration Pond:
 - o Treated effluent tested before discharge into the infiltration pond.
 - Receives treated leachate from the LTF.
 - Regular monitoring ensures compliance with BC Contaminated Sites Regulation (CSR) Schedule 3.2 Drinking Water Criteria.

8.5.2 Ongoing Projects

- Leachate Monitoring & Treatment Adjustments
 - Periodic sampling and chemical dosing optimization to maintain CSR Drinking Water Criteria compliance.
 - Monitoring of pH, dissolved metals, sulfate, boron, and PAHs as primary contaminants.
 - Adjustments to chemical treatment and aeration levels as needed.
- QA/QC for Leachate Collection & Leak Detection System



- Continued inspections and data collection to ensure adequate drainage and liner integrity.
- Refinement of leachate recirculation and pumping strategies.

8.5.3 Planned Developments

- Final Approval & Certification Submission of the commissioning report to the Ministry of Environment to certify compliance.
- Expansion of Landfill Operations Preparation for future cells and capacity expansion. Enhanced stormwater and leachate diversion strategies.
- Operational Optimization
 Adjustments to treatment cycles and aeration efficiency.
 Implementation of performance monitoring plans to ensure long-term stability.
- Long-Term Environmental Compliance & Reporting Scheduled compliance reporting to regulatory agencies. Continued leachate treatment efficiency assessments.

8.5.4 Key Metrics

- Construction Timeline:
 - Cell 1 East: March 2021 October 2021.
 - o Cell 1 West: October 2022 September 2023.
 - Ponds Expansion: October 2021 November 2021.
 - Leachate Treatment Facility: Commissioned between 2021 2023.
- Leachate Treatment Capacity:
 - Average batch size: 625 m³, maximum 980 m³ per cycle.
- Quality Compliance:
 - Over 24 sampling events completed between 2021-2023.
 - Treated leachate was discharged when compliant, otherwise recirculated.
 - Primary contaminants monitored: Sulfates, metals, PAHs, and pH levels.

8.5.5 Challenges & Resolutions

- 1. Historical Data Delays
 - Challenge: Slow acquisition of historical leachate treatment data.
 - Resolution: Additional sampling and QA/QC verification.
- 2. Effluent Holding Pond Under sizing (2021)
 - Challenge: Initial pond size insufficient for peak flows.
 - Resolution: Expansion completed in November 2021 to meet storage needs.
- 3. Liner Damage During Installation & Repairs (2022)
 - Challenge: Minor liner damage observed during installation.
 - Resolution: Immediate repairs & QA/QC re-inspections.



- 4. Leachate Exceedances
 - Challenge: Occasional elevated sulfate, boron, and PAHs in treated effluent.
 - Resolution: Additional treatment cycles & chemical dosing optimizations.
- 5. Construction Delays (Winter 2022)
- Challenge: Seasonal construction delays in the winter of 2022
- Resolution: Resumed June 2023, completed by September 2023

The construction and commissioning of Cell 1 East, Cell 1 West, and associated ponds have significantly enhanced landfill leachate containment and treatment at Northwin Landfill. The leachate treatment facility has been optimized to meet strict environmental regulations, ensuring safe and sustainable landfill operations. Continued monitoring and system refinements will further improve treatment efficiency and long-term environmental protection.

8.6 Waste Tonnage and Volume

In 2024, the New Landfill accepted a total 26,285 tonnes of waste for discharge to the New Landfill:

Material Type	Tonnage (m ³)
Asbestos	266 (204)
Creosote	37 (28)
Demo	10,456 (8,043)
Soil	15,485 (11,912)
Other (Unspecified)	42 (32)
Grand Total	26,285 (20,219)

 Table 8-1: 2024 New Landfill Waste Tonnage and Volume

No recyclable material was diverted from the landfill in 2024 as the landfill only received residual material.

No hazardous waste, controlled waste, and attractants were received in 2024.

8.7 Airspace Consumption, Remaining Volume, and Remaining Life

As shown in Table 8.2, the design capacity of Cell 1 East and Cell 1 West is 207,784 m³. The total airspace consumption from January 1 to December 31, 2024 was approximately 20,219 m³. The total air space consumed to date is 140,252 m³. The total landfill capacity is 532,365 m³. Using the maximum allowable discharge rate of 45,000 tonnes per year the annual fill rate is about 34,615 m³ per year. The remaining airspace capacity of the New Landfill is approximately 392,113 m³. The remaining lifespan of the facility at a fill rate of 34,615 m³/year is 11.3 years.

As per the survey completed on January 29th, 2025, Cell 1 West has 47,425 m³ of waste in place while Cell 1 East has 92,827 m³ of waste in place with a total of 140,252 m³ and the remaining capacity of 67,532 m³ for the two stages of Phase 1 as presented above. The remaining life of the constructed cells is approximately 1.9-years effective January 29th, 2025.



	Total New Landfill (m ³)
November 24 thru December 31, 2021 (estimated)	2,262
January 1 thru December 31, 2022 (estimated)	34,472
January 1 thru December 31, 2023 (estimated)	29,482
Relocation of Original Landfill (estimated)	57,167
January 1 thru December 31, 2024 (estimated)	20,219
Total Waste Discharged to Cell 1 East and Cell 1 West	140,252 Surveyed
Cell 1 East and Cell 1 West Capacity	207,784
Airspace Remaining	67,532
Remaining Life in Constructed Cells	1.9-years

Table 8-2: New Landfill Airspace Consumption, Remaining Volume, And Remaining Life

8.8 Leachate Treatment

As per the leachate treatment concept outlined in the commissioning report, below is a summary of the new leachate treatment concept:

Leachate is collected from the landfill cells via a series of perforated leachate collector pipes installed at the base liner system of the New Landfill cells and conveyed to two sumps: Cell 1 East Sump and Cell 1 West Sump. Leachate from the sumps is pumped to the New Leachate Treatment Facility.

The New Leachate Treatment Facility begins with pumping the leachate to the aerated treatment pond with submerged aeration diffusers, which also serves as a flow equalization pond. The treatment operation is performed as a weekly batch at the estimated peak daily rates with an average batch size ranging from 625 m^3 to $1,400 \text{ m}^3$. The leachate undergoes aeration in the equalization pond as filling continues for one batch. Once the aeration cycle is complete, leachate is then pumped through a shipping container where chemicals for oxidization (Hydrogen Peroxide - H₂O₂), Chemical for pH adjustment (lime) and coagulants and flocculants are added through injection ports. After addition of chemicals in the shipping container, leachate continues to be mixed for the target treatment cycle and then tested. The leachate is then pumped through a series of sand filters. If the leachate meets field testing parameters it is then discharged to the effluent holding pond, otherwise it is recirculated back into the aeration treatment pond for additional treatment.

The effluent batch is held in the effluent holding pond until the effluent quality meets discharge criteria based on sampling and laboratory analysis. If excessive levels of hydrocarbons are detected during testing, the leachate is recirculated through granular activated carbon filters back into the effluent holding pond. The leachate continues to be recirculated through the activated charcoal filters, as required, until the effluent quality meets the discharge criteria. Once the leachate meets all discharge criteria it is then discharged into the infiltration pond.

The target discharge criteria from the Effluent Pond is the CSR Schedule 3.2 Drinking Water Criteria.

Figure 8-1 below depicts the leachate treatment process:





Figure 8-1: Leachate Treatment Process Diagram (Source: GHD West & Ponds Commissioning Report, 2024)

Currently leachate continues to be treated and sampled in batches, with results compared to standards prior to discharge. There have been no instances of untreated leachate discharges.

8.9 Addressing Non-Compliance

There were non-compliances outlined in the Ministry's (ENV) Advisory letter addressed to the permit holder dated July 16, 2024.

8.10 Public Complaints

There were no public complaints received during this reporting period in accordance with the management of Northwin Landfill.



9. SUMMARY AND RECOMMENDATIONS – OPERATIONS

9.1 Conclusions

The Original Landfill was effectively decommissioned following the completion of waste segregation, leachate system decommissioning, and confirmatory soil sampling. All waste, including materials from both lined and unlined cells, was relocated to the New Landfill, ensuring compliance with regulatory standards. The site was fully cleared, and the liner system, where applicable, was also disposed of at the New Landfill, completing the closure process.

The New Landfill, with its Cell 1 East and Cell 1 West, has been successfully constructed and is operational, featuring an advanced liner and leachate collection system to minimize environmental risks. The landfill was originally designed for 13.3 years of operational capacity. Based on the January 29th, 2025 survey, it was determined that the remaining lifespan is 11.3 years.

The landfill is being developed in three phases, ensuring adequate capacity for future waste disposal needs. The leachate treatment facility has been commissioned and is meeting discharge criteria under regulatory guidelines. Additionally, the relocation of waste from the Original Landfill to the New Landfill was carried out efficiently, with careful placement to protect the integrity of the new liner.

Key Achievements Include:

- Full decommissioning of the Original Landfill, including leachate system decommissioning.
- Completion of Cell 1 East and Cell 1 West lined cells at the New Landfill.
- Implementation of a double-liner leachate collection and leak detection system.
- Construction of a functional leachate treatment facility, ensuring compliance with water quality standards.
- No recorded incidents of untreated leachate discharges.
- No public complaints during the reporting period.

Despite these achievements, there are remaining operational challenges to be addressed, including airspace limitations, ongoing leachate treatment adjustments, and future capacity expansion.

9.2 Recommendations

- Leachate Treatment Optimization
 - Continue regular sampling and monitoring to ensure compliance with environmental regulations.
 - Implement periodic adjustments to chemical dosing and aeration efficiency based on leachate composition.
 - Consider additional filtration systems or treatment expansion as leachate volume increases.
- Future Capacity Planning
 - Given the 1.9-year remaining life in the current landfill cells, initiate planning for Phase 2 development to prevent capacity constraints.



- Continue with the three-phase landfill expansion plan while assessing new technologies for waste volume reduction.
- Operational Adjustments & Efficiency Improvements
 - Enhance stormwater and leachate diversion strategies to reduce treatment demands.
 - Improve liner integrity inspections and quality control processes during future construction to prevent any future damage.
 - Monitor airspace consumption closely to optimize waste compaction and maximize landfill lifespan.
- Environmental & Regulatory Compliance
 - Address any outstanding non-compliance issues as outlined in the Ministry's Advisory letter.
 - Maintain transparency with regulatory agencies through scheduled reporting and environmental audits.
- Public Awareness & Community Engagement
 - Continue proactive public engagement efforts to maintain community trust and transparency.
 - Establish an open feedback mechanism to address potential public concerns before they escalate.

By following these strategic recommendations, the New Landfill will continue to operate efficiently, maintain compliance with environmental standards, and ensure long-term sustainability in waste management.



10. LIMITATIONS

This report has been prepared by Sperling Hansen Associates (SHA) on behalf of Northwin Environmental Ltd. in accordance with generally accepted engineering practices to a level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions in British Columbia, subject to the time limits and financial and physical constraints applicable to the services.

The report, which specifically includes all tables and figures, is based on engineering analysis by SHA staff of data compiled during the course of the project. Except where specifically stated to the contrary, the information on which this study is based has been obtained from external sources. This external information has not been independently verified or otherwise examined by Sperling Hansen Associates to determine its accuracy and completeness. Sperling Hansen Associates has relied in good faith on this information and does not accept responsibility of any deficiency, misstatements or inaccuracies contained in the reports as a result of omissions, misinterpretation and/or fraudulent acts of the persons interviewed or contacted, or errors or omissions in the reviewed documentation.

The report is intended solely for the use of Northwin Environmental Ltd. Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Sperling Hansen Associates does not accept any responsibility for other uses of the material contained herein nor for damages, if any, suffered by any third party because of decisions made or actions based on this report. Copying of this intellectual property for other purposes is not permitted.

The findings and conclusions of this report are valid only as of the date of this report. The interpretations presented in this report and the conclusions and recommendations that are drawn are based on information that was made available to Sperling Hansen Associates during the course of this project. Should additional new data become available in the future, Sperling Hansen Associates should be requested to re-evaluate the findings of this report and modify the conclusions and recommendations drawn, as required.

Sperling Hansen Associates has enjoyed working on this project with Northwin Environmental Limited and looks forward to continuing to work with you on this project. Should you have any questions or concerns regarding this report, or require any further information please feel free to contact the undersigned at 604-986-7723.

Report Prepared by:

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David Kvick, M.Sc. Environmental Scientist



Yours truly, SPERLING HANSEN ASSOCIATES EGBC Permit Number 1003066

Dr. Tony Sperling, P.Eng. (EGBC License 17,621)



March 28th, 2025


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TABLES

Table 1: Discharged Treated Leachate

SampleTy	:be:			Dis	charged Treated	l Leachate		
Sample	ä		New Landfill Holding Pond Feb 14, 2024	New Landfill Aeration Pond Feb 16, 2024	Aeration Pond Pre Sample	Aeration Pond Post Sample	Aertation Pond Post Sample	Aeration Pond
Sample Dr	ate:	BC CSR ¹	14-Feb-2024	16-Feb-2024	31-Oct-2024	07-Nov-2024	18-Nov-2024	16-Dec-2024
Physical Tests (Matrix: Water) Hardness (as CaCO3), dissolved	mg/L				301			
Anions and Nutrients (Matrix: Water) Sulfate (as SO4)	mg/L	500	280	264	260	224	167	104
Dissolved Metals (Matrix: Water)								
Aluminum, dissolved Antimony, dissolved	mg/L	9.5 0.006	0.0377	0.0551	0.122	0.0416	0.0754	0.0834
Arsenic, dissolved	mg/L mg/L	0.01	0.00207	0.00438	0.00389	0.00402	0.00332	0.00364
Barium, dissolved	mg/L	1.00	0.0195	0.0373	0.014	0.0131	0.0162	0.00768
Berylmum, aissolvea Bismuth, dissolved	mg/L me/L		<0.000100	<0.000250	<0.000250	<0.000100	<0.000100	<0.000250
Boron, dissolved	mg/L	5	4.53	4.20	6.88	6.64	6.72	5.26
Cadmium, dissolved	mg/L	0.005	0.0000418	0.000058	0.0000567	0.0000473	<0.0000250	0.0000272
Calcium, dissolved	mg/L	ł	73.1	151	77.4	80.7	79.4	38.4
Cestum, dissolved Chromium, discolved	mg/L mg/I		0.000075	0.000179 0.00488	0.000106	0.000109	0.000104	0.000092
Cobalt, dissolved	ng/L	0.02	0.0019	0.0042	0.00163	0.00155	0.00141	0.00091
Copper, dissolved	mg/L	1.5	0.0205	0.0456	0.0161	0.0168	0.0164	0.0068
Iron, dissolved	mg/L	6.50	0.199	0.364	0.115	0.115	0.115	0.081
Lead, dissolved Tithium dissolved	mg/L	0.01	0.000118	<0.000250	<0.000250	<0.000250	<0.000250	<0.000250
Dututut, utseotyed Magnesium, dissolved	mg/L mg/L		19.7	41.9	26.2	27.2	25.9	23.5
Manganese, dissolved	mg/L	1.50	0.201	0.43	0.0293	0.0457	0.0682	0.0154
Mercury, dissolved	mg/L	0.001	00.0	0.00	<0.0000050	0.0000075	0.00	<0.0000050
Molybdenum, dissolved	mg/L	0.25	0.00309	0.00675	0.00254	0.00244	0.00238	0.00112
Nickel, dissolved Phosphorus, dissolved	mg/L mg/L	- 80.0	0.00432 <0.100	0.00936 < 0.250	0.00498 <0.250	c/.250 <0.250	0.0043 < 0.250	<pre>0.00365 <0.250</pre>
Potassium, dissolved	mg/L	1	15	33	21.2	19.4	22.2	18.1
Rubidium, dissolved	mg/L	1	0.011	0.024	0.0152	0.0146	0.0164	0.0134
Selenium, dissolved	mg/L	0.01	0.000115	0.000274	<0.000250	<0.000250	<0.000250	<0.000250
Silicon, dissolved Silvar dissolved	mg/L		20.0 0000000	9.84 <0.000050	8.48 0 000050	050000 02	C1.6 020000.0~	.7.0000
Sodium, dissolved	ng/L mg/L	200	102	119	151	142	141	115
Strontium, dissolved	mg/L	2.50	0.463	0.979	0.526	0.485	0.527	0.288
Sulfur, dissolved	mg/L	1	86.4	186	86	83	58.4	37.2
Tellurium, dissolved	mg/L	I	<0.00040	< 0.00100	< 0.00100	< 0.00100	< 0.00100	< 0.00100
Thallium, dissolved	mg/L	:	<0.000020	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Thorium, dissolved	mg/L	1	<0.00020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Tin, dissolved	mg/L	2.5	<0.00020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Thantun, ansonyed Tymosten dissolved	⊐/gш	0.003	16000.0>	0100.0	0.100.0 <0.00050	05100.0>	<0.00050	16200.0
Uranium, dissolved	mg/L mg/L	0.02	0.00062	0.00134	0.000457	0.000452	0.00042	0.000343
Vanadium, dissolved	mg/L	0.02	0.00205	0.00413	0.00584	0.00471	0.00681	0.00904
Zinc, dissolved	mg/L	3.00	0.0217	0.0459	0.0071	0.0081	0.0074	0.0065
Zirconium, dissolved	mg/L	ł	<0.00040	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100

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Table 1: Discharged Treated Leachate

	outhic Type.				DISI	charged Treated	I Leachate		
	Sample ID:			New Landfill Holding Pond Feb 14, 2024	New Landfill Aeration Pond Feb 16, 2024	Aeration Pond Pre Sample	Aeration Pond Post Sample	Aertation Pond Post Sample	Aeration Pond
či 	Sample Date:		BC CSR ¹	14-Feb-2024	16-Feb-2024	31-Oct-2024	07-Nov-2024	18-Nov-2024	16-Dec-2024
Volatile Organic Compounds (Matrix: Water)									
Chlorobenzene	'n	g/L	80	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Chloromethane	ri.	g/L	1	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Dichlorobenzene, 1,2-	л .	g/L	200	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dichlorobenzene, 1,3-	n .	g/L	1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dichlorobenzene, 1,4-	n .	j%	s :	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dichloropropane, 1,2-	n.	g/L	4.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dichloropropylene, cis+trans-1,3-	n .	g/L	1.5	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75
Dichloropropylene, cis-1,3-	л.	g/L	:	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tetrachloroethane, 1,1,1,2-	n.	g/L	9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tetrachloroethane, 1,1,2,2-	n .	je ž	0.80	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
I richloroethane, 1,1,2- Trichloroethane	<u>n</u> . :	1/6 1/9	3	<0.50	<0.50	<0.50	05.0> 05.0>	<0.50	<0.50
	1.	ý L	1 MM	00.00	00.00	00.00	0000	00.04	0000
Volatile Organic Compounds [Drycleaning] (Matrix: Water)									
Carbon tetrachloride	ri.	g/L	2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Chloroethane	ri.	g/L	:	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dichloroethane, 1,1-	н.	g/L	30	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dichloroethane, 1,2-	'n	g/L	5.00	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dichloroethylene, 1,1-	ri.	g/L	14	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dichloroethylene, cis-1,2-	<u>.</u>	g/L	~	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dichloroethylene, trans-1,2-	л .	g/L	80	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dichloromethane	л.	g/L	50	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dichloropropylene, trans-1,3-	n.	1% ,	1.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
I etrachloroethylene	<u>-</u>	1% 1	50 0000	05.0>	05.0>	05.02	05.0>	05.0>	05.0>
THURIOUCEIIAIIC, 1,1,1 ⁻ Trichlomathylana	1 . :	ц Ч Г Г	0000 2	05.02	05.0~	05.02	05.02	05.02	05.02
Vinvl chloride	1. 3	a La	0.0	<0.40	<0.40	<0.40	<0.40	<0.05	<0.40
	1	j 1	1						2
Volatile Organic Compounds [Fuels] (Matrix: Water)									
Benzene	п .	g/L	5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Ethylbenzene	<u>.</u>	1/9 1 5	140	05.05	05.0>	0.50	05.05	00:0>	<0.50
Methyl-tett-butyl ether [MLLBE] Streams	a. :	л Г	008	05.02	05.02	05.02	05.02	05.02	05.02
Toluene	1. =	ور لـ 1/2	60	<0.40	<0.40	<0.40	<0.40	<00>	<0.40
Xylene, m+p-	. =	p La	1	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Xylene, o-	. =.	g/L	;	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Xylenes, total	'n	g/L	06	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Volatile Organic Compounds [THMs] (Matrix: Water)									
Bromodichloromethane		g/L	100(2)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromoform		g/L	100(2)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Chloroform	ri.	g/L	100(2)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dibromochloromethane	<u>д</u>	g/L	100(2)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Hydrocarbons (Matrix: Water)			:						
EPH (C10-C19)	п	g/L	5000	<250	<250	<250	<250	<250	<250
EPH (C19-C32)	. =.	°L J	:	<250	<250	<250	<250	<250	<250
LEPHW+		g/L	1	<250	<250	<250	<250	<250	<250
	п.	g/L	1	<250	<250	<250	<250	<250	<250
andfill									

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Table 1: Discharged Treated Leachate

SampleType:				Disc	charged Treated	Leachate		
Sample ID:			New Landfill Holding Pond Feb 14, 2024	New Landfill Aeration Pond Feb 16, 2024	Aeration Pond Pre Sample	Aeration Pond Post Sample	Aertation Pond Post Sample	Aeration Pond
Sample Date:		BC CSR ¹	14-Feb-2024	16-Feb-2024	31-Oct-2024	07-Nov-2024	18-Nov-2024	16-Dec-2024
Polycyclic Aromatic Hydrocarbons (Matrix: Water)								
Acenaphthene	μg/L	:	<0.012	0.066	0.146	< 0.010	< 0.010	0.069
Acenaphthylene	μg/L	250	< 0.010	<0.010	<0.010	< 0.010	< 0.010	<0.010
Acridine	μg/L	;	0.039	0.052	0.11	< 0.010	0.113	0.08
Anthracene	μg/L	1,000	0.012	0.015	<0.013	< 0.010	< 0.010	<0.010
Benz(a)anthracene	μg/L	0.07	0.01	<0.015	<0.010	< 0.010	< 0.010	<0.010
Benzo(a)pyrene	μg/L	0.01	0.0058	0.0086	<0.0050	<0.0050	<0.0050	<0.0050
Benzo(b+j)fluoranthene	μg/L	0.07	0.014	0.014	<0.010	< 0.010	< 0.010	<0.010
Benzo(b+j+k)fluoranthene	μg/L	;	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Benzo(g,h,i)perylene	μg/L	1	<0.010	<0.010	<0.010	< 0.010	<0.010	<0.010
Benzo(k)fluoranthene	μg/L	:	<0.010	<0.010	< 0.010	< 0.010	<0.010	<0.010
Chrysene	μg/L	7	< 0.014	<0.015	<0.010	< 0.010	< 0.010	<0.010
Dibenz(a,h)anthracene	μg/L	0.01	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Fluoranthene	μg/L	150	0.062	0.074	0.058	< 0.010	<0.010	0.018
Fluorene	μg/L	150	0.012	0.026	0.115	< 0.010	< 0.010	0.043
Indeno(1,2,3-c,d)pyrene	μg/L	;	< 0.010	<0.010	<0.010	< 0.010	< 0.010	<0.010
Methylnaphthalene, 1-	μg/L	1	<0.010	<0.014	0.011	< 0.010	< 0.010	<0.010
Methylnaphthalene, 2-	μg/L	;	< 0.010	<0.010	<0.010	< 0.010	< 0.010	<0.010
Naphthalene	μg/L	80	<0.050	<0.050	<0.050	< 0.050	<0.050	<0.050
Phenanthrene	μg/L	;	0.024	<0.020	0.047	<0.020	<0.020	<0.020
Pyrene	μg/L	100	0.055	0.066	0.041	< 0.010	0.024	0.018
Quinoline	μg/L	0.05	<0.050	0.096	<0.050	< 0.050	<0.050	<0.050
	,							

British Columbia Approved Water Quality Guidelines, 2018 Edition or Canadian Drinking Guidelines unless otherwise stated.
 Standard is for sum of concentrations of Bromodichloromethane, Bromoform, Chloroform and Dibromochloromethane

ND - Not detected at the associated reporting limit.	
J - Estimated concentration.	
ND $(50)^a$	- Laboratory detection limit exceeds guideline
2890 ^a	- Concentration exceeds standard.
	 Currently no standard.
	- Not analyzed.
μS/cm	- Microsiemens per centimetre
mg/L	- Milligrams per litre
mg/L	- Micrograms per litre
Deg C	- Degrees Celcius
NTU	- Nephelometric turbidity units
uidd	- parts per million
4/4/6	- Percent volume.

2025 Monitoring / Sampling Plan - Q1 New Landfill Campbell River, British Columbia

									Monitoring	3 Wells								ŝ	Urfa ce Water	L		Leachate					Leal	k Detection				Landfill Ga	
Monitorion I or ation / Samula ID		Up-Gradient		F	Cross-Gra	dient		Down-G.	tradient		QAQC	Samples			Other			Mch	vor Rico	SO6.21	4C.708	ja F	QAQC Sam	oles I Deu	E I DS.W	1 DMP-1	1 DMP.2	1 DMP-3	MP.4 I DMP.	5 I DMP-6	1 DMP/7	EQ1.22 E	03.33
	MW1-14 MW4A-15	MW4B-15	MW6-17	MW9-17	MW2-14 N	W2A-16 N.	W3-14 MM	V10-17 MW1	11-19 MW12-	-22 MW13-2.	5° Field Blant	k Field Dup	MW5A-15 MM	5B-15 MW7-1	7 MW8-17	MW15A-18 A	MW15B-18 P.	Z1-19 SW1.	5-01 SW15-01			-	rrip Blank Fie	d Dup									
Water Level Monitoring	>	,	,	ļ	,	ŀ				2	ŀ		-		,	,	,	-	-			ľ	ŀ			>	>	-	>	>	>	ŀ	
Leptro VV asser (m)	×	~	× 1	~	~	< 1	× :	< :	< :	~			×	× :	× 1	~	×	· ~				•		×	×	×	×	×	×	×	×		
Depth to Bottom (m)	×	×	×	×	×	×	×	×	×	×	•		×	×	×	×	×	· ;	•	•		•		•	•				•				
Water Elevation - McNor Lake"	•								•	•				•				- -	• •	•				•	•								
Water Level - Noo Lake Gauge	•	·	•	1		-	-		-	-	•]	-	: -	-	·	-	-	-	·	·	•		-	-	·		-	•		·		
Provid Paratition 0015		,	,	ļ	-	ŀ	ŀ			ŀ	ŀ		ŀ				ŀ	F		ŀ	,	Ē	-			>	>	ŀ	>	>	,	ŀ	Ľ
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Dissolved Oxygen (DO) (mg/L)	×	×	×	×	×	×	×	~ ×	×	×				•				•	•	×	×	•		×	×	×	×	×	× ×	×	×		
Oxidation Reduction Potential (ORP) (mV)	×	×	×	×	×	×	×	× ×	×	×				•				•	•	×	×	•		×	×	×	×	×	×	×	×		
pH	×	×	×	×	×	×	×	× ×	×	×				•				•	•	×	×	•		×	×	×	×	×	×	×	×		
Temperature (°C)	×	×	×	×	×	×	×	×	×	×								•		×	×			. ×	×	×	×	×	×	×	×		
Total Dissolved Solids(TDS) (mg/L)	×	×	×	×	×	×	×	×	×	×				•					•	×	×			×	×	×	×	×	×	×	×		
Turbidity (NTU)	×	×	×	×	×	×	×	×	×	×				•					•	×	×			×	×	×	×	×	×	×	×		
Landfil Gases (Methane, etc.)										•				•										•	•							×	×
Analytical Parameters		I		1		ſ																1											
Ganaral Chamietry																										l	l		l	l	l	l	Γ
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Attaining (as used on much)	< : < :	<	<	<	<	<	<	<	<	<	<	<								<	< 1	•		<	<	< :	<	<	<	< :	< :		
Alkalinity, total (as Ce/CO3)	×	×	×	×	×	×	×	~ ×	×	×	×	×		•				•	•	×	×	•		×	×	×	×	×	×	×	×		
Bicarbonate (as CarCO3)	×	×	×	×	×	×	×	×	×	×	×	×		•				•	•	×	×	•		×	×	×	×	×	×	×	×		
Carbonate (as CaCO3)	×	×	×	×	×	×	×	×	×	×	×	×		•				•	•	×	×			×	×	×	×	×	×	×	×		
Hydroxide (as Ca CO3)	×	×	×	×	×	×	×	×	×	×	×	×		•					•	×	×			×	×	×	×	×	××	×	×		
Chloride (dissolved)	×	×	×	×	×	×	×	×	×	×	×	×		•					•	×	×			×	×	×	×	×	×	×	×		
Conductivity	×	×	×	×	×	×	×	×	×	×	×	×								×	×			×	×	×	×	×	×	×	×		
to a company of the second sec	: >	: >	: >	: >	: >	: >	: >	· >	: >	: >	. >	. >								: >	: >	T		: >	: >	: >	: >	: >	: >	: >	: >		1
the decision of the decision o	< >	< >	< >	< >	< >	< >	< >	< >	< >	< >	< >	< >		•	-			·		< >	< >	•		< >	< >	< >	< >	< >	< >	< >	< >		
Hardness (dissorted)	× ; × ;	× ;	× ;	< ;	< ;	< >	< >	< ` < `	< :	< >	× ;	< ;		•				•	•	< ?	× ;	•		× :	× ;	× >	< >	× ;	<	× >	< >		
Criteri opri ospinate	< : < :	< :	<	< :	< :	< :	< :	< : < :	< : _	< :	< :	< :						•		< :	< :	•		< :	< :	< :	< :	< :	< : < :	< :	< :		
5.	×	× :	×	× :	×	× :	× :	< : < :	× :	× :	× :	× :	•	•				•	•	× ;	×	•		× :	×	× :	×	× :	× :	× :	× :		
Sulphate (Dissolved)	×	×	×	×	×	×	×	~ ×	×	×	×	×		•				•	•	×	×			×	×	×	×	×	×	×	×		
Total Un-ionized Hydrogen Sulfide as S	×	×	×	×	×	×	×	× ×	×	×	×	×		•				•	•	×	×			×	×	×	×	×	×	×	×		
Total Un-ionized Hydrogen Sulfide as H2S	×	×	×	×	×	×	×	× ×	×	×	×	×		•				•	•	×	×	•		×	×	×	×	×	×	×	×		
Total Sulfide as H2S	×	×	×	×	×	×	×	× ×	×	×	×	×		•				•	•	×	×	•		×	×	×	×	×	×	×	×		
Total Sulfide as S	×	×	×	×	×	×	×	×	×	×	×	×		•				•	•	×	×			×	×	×	×	×	×	×	×		
Total dissolved solids (TDS)	×	×	×	×	×	×	×	×	×	×	×	×					•	•	•	×	×			×	×	×	×	×	×	×	×		
Total suspended solids (TSS)									•	•				•					•	×	×			×	×	×	×	×	×	×	×		
Biochemical oxygen demand (BOD)									•	•				•	•				•	×	×			×	×	×	×	×	××	×	×		
Chemical oxygen demand (COD)									•	•				•						×	×			×	×	×	×	×	×	×	×		
Nutions		1		1																		1											1
Armonia M	×	×	×	×	×	×	k	×	×	×	×	×	ŀ		ŀ	-	ŀ	ŀ	ŀ	×	×	ŀ	-	×	×	×	×	×	×	×	×	-	Ŀ
Alterete (or N1)	: >	: >	: >	: >	: >	: >	: >	· >	: >	: >	. >	. >								. >	: >	T		: >	: >	: >	: >	: >	: >	: >	: >		1
reuctor (cos re) Alteritor (cos Al.)	< > < >	< >	< >	< >	< >	< >	< >	< >	< >	< >	< >	< >								< >	< >			< >	< >	< >	< >	< >	< >	< >	< >		
factorial operators	< >	< >	< >	< >	< >	< >	< >				< >	< >								<	< >			< >		< >	< >	< >		< >	< >		
PN 02100/P4 02 68/0	<	<	<	~	<	<	<			<	<	<	-		-			-	•	<	<	•		<	<	<	<	<	<	<	<		
Dissolved Meteks (CSR incl. Ha)	×	×	×	×	×	×	×	×	×	×	×	×	-		-	-	-	ŀ	ŀ	×	×	ŀ	-	×	×	×	×	×	×	×	×	-	
Total Metals (CSR incl. Ho)										•										×	×			×	- ×	×	: ×	×	: ×	: ×	×		
Petroleum Hydrocarhone / VOC		1	1	1		1												$\left \right $				1											T
I EDH / HEDH / DAH / EDH ⁶	×	×	×	×	×	×	×	×	×	×	×	×	╞	ŀ	ŀ	ŀ	ŀ	ŀ	ŀ	×	×	ŀ	-	×	×	×	×	×	×	×	×	ŀ	Ŀ
	<	<	<	<	<	<	<	` <	< /	<	<	-			I		-				<			<	<	<	<	<	<	<	<		
DIEASMY VITH	•	·	•	-	-	-	-		-	-	•	•	-	: -	•		-	-	-	·	·	•			-			-	•				
L'INNIGS		ſ	ŀ	ŀ	ŀ	╞	-	╞	-	-	ļ		╞		F		$\left \right $	-	-			ľ	-	$\left \right $	ŀ			$\left \right $			ŀ	ŀ	
Chlorin alled phenois								•	•	•				•				•	•			•		•	•				•				
Non-chlorinated phenols	•							•	•	•				•				•	•	•		•		•	•				•				
Mftophen ds									•	•				•				•				•		•	•				•	•			
Hydroxy phenols									•	•				•				•				•		•					•	•			
Table Notes:	1 - Sample col.	sction perform	red by Nothwi	n personnel.																													
	2 - Mchror Lak.	elevation ob!	tained online fro	۵I ۳	C Hydro Ladol	re (LDR) Reser	voir Surface E	leva tion																									
	3 - Rico Laker.	urface elevañv	on obtained fro.	n gauge at su	ampling locatio	n (Note: the re.	le ren ce elevali.	on for "O" on the	e gauge is 180.	(3 m)																							
	4 - If Leachate	concentration	s for LEPH/H.	EPH are 80%	of CSR Scher	tule 3.2 Aquat	c Life Criteria.	include LEPH/	HEPH analysis	s for Surface W	ater during nex	sampling ever	-																				
	5 - Monitoring	veli MW 13-25	i not yet installe.	Ð																													

dro P Inn Benkelins File: 2025 Q1-I

2025 Monitoring / Sampling Plan - Q2 New Landfill Campbell River, British Columbia

_									Monit	toring Wells									Surfac	o Water		Le	tchate		ŀ			Leak De	le ction			_	Landfill Gas	_
		Up-Gradie	Ę		Cross-G	radient		Down	n-Gradient		9	WOC Samples				Other			McNor	Rico			9	A/QC Samples									_	–
Monitoring Location/Sample ID	MW1-14 MW4A-	15 MW4B-1	5 MW6-17	r MW9-17	MW2-14	MW2A-16	WW3-14 A	WW10-17 MV	W11-19 M	4W12-22 MW	13-25 ⁶ Fieldi	Blank Field D.	Up MW5A-1	5 MW5B-15	MW7-17	MW8-17 MW	15A-18 MW15	5B-18 PZ1-1	9 SW15-01	SW15-02	12-90S	201-24	Trip!	Blank Field D	hup LUS-E	LUS-W	LUMP-1 L	DMP-2 LUM	P-3 LUMP-4	LUMP-5	LDMP-6 L	DMP-7 LP-6	1-22 LF62-22	
Water Level Monitoring																																		
Depth to Water (m)	×	×	×	×	×	×	×	×	×	×	×		×	×	×	×	×	×	•				-		×	×	×	×	×	×	×	×	•	
Depth to Bottom (m)	×	×	×	×	×	×	×	×	×	×	×	•	×	×	×	×	×	×						•					•					_
Water Elevation - McNor Lake?	•	•	•	•	•	•						•	•					•	×	•				•	•			•	•				•	
Water Level - Roo Lake Gauge ³	•	•	•									•	·				•	•	•	×				•	•			•	•				•	_
Field Parameters																																		
Conductivity (µS/cm)	×	×	×	×	×	×	×	×	×	×	×	•	•								×	×		•	×	×	×	×	×	×	×	×		_
Dissolved Oxygen (DO) (mg/L)	×	×	×	×	×	×	×	×	×	×	×	•	•					•	•		×	×		•	×	×	×	×	×	×	×	×	•	
Oxidation Reduction Potential (ORP) (mV)	××	×	×	×	×	×	×	×	×	×	×	•	•								×	×		•	×	×	×	×	×	×	×	×		_
Hq	×	×	×	×	×	×	×	×	×	×	×	•	•					•	•		×	×		•	×	×	×	×	×	×	×	×	•	
Temperature (°C)	××	×	×	×	×	×	×	×	×	×	×	•	•					•	•		×	×		•	×	×	×	×	×	×	×	×	•	-
Total Dissolved Solids (TDS) (mg/L)	×	×	×	×	×	×	×	×	×	×	×	•	•					•			×	×		•	×	×	×	×	×	×	×	×	•	1
Turbidity (NTU)	×	×	×	×	×	×	×	×	×	×	×	•	•					•			×	×		•	×	×	×	×	×	×	×	×	•	1
Landfill Gases (Methane, etc.)	•	•	•	•	•							•	•				· .	•	•					•					•				•	
Analytical Parameters																																		100
General Chemistry																																		
Akalinity (as CaCO3 pH=8.3)	×	×	×	×	×	×	×	×	×	×	×	×	ŀ	ŀ			ŀ	•	•		×	×	-	×	×	×	×	×	×	×	×	×		_
Alkalinity, total (as CaCO3)	×	×	×	×	×	×	×	×	×	×	×	×	•				· .	•	•		×	×		×	×	×	×	×	×	×	×	×		1
Bicarbonate (as CaCO3)	×	×	×	×	×	×	×	×	×	×	×	×	•					•			×	×		×	×	×	×	×	×	×	×	×	•	1
Carbonate (as CaCO3)	× ×	×	×	×	×	×	×	×	×	×	×	×	•					•			×	×		×	×	×	×	×	×	×	×	×		1
Hydroide (as Ca CO3)	× ×	×	×	×	×	×	×	×	×	×	×	×	ŀ					•	•		×	×		×	×	×	×	×	×	×	×	×		1
Chloride (dissolved)	×	×	×	×	×	×	×	×	×	×	×	×	•					•			×	×		×	×	×	×	×	×	×	×	×	•	1
Conductivity	×	×	×	×	×	×	×	×	×	×	×	×	•					•			×	×		×	×	×	×	×	×	×	×	×	•	1
Hardness	×	×	×	×	×	×	×	×	×	×	×	×	•					•			×	×		×	×	×	×	×	×	×	×	×		1
Hardness (dissolved)	×	×	×	×	×	×	×	×	×	×	×	×	•					•			×	×		×	×	×	×	×	×	×	×	×		-
Orth oph osphate	×	×	×	×	×	×	×	×	×	×	×	×	•					•	•		×	×		×	×	×	×	×	×	×	×	×	•	-
H	×	×	×	×	×	×	×	×	×	×	×	×	•								×	×		×	×	×	×	×	×	×	×	×		1
Sulphate (Dissolved)	×	×	×	×	×	×	×	×	×	×	×	×	•					•	•		×	×		×	×	×	×	×	×	×	×	×	•	-
Total Un-ionized Hydrogen Sulfide as S	×	×	×	×	×	×	×	×	×	×	×	×	•				· .	•	•		×	×		×	×	×	×	×	×	×	×	×		1
Total Un-ionized Hydrogen Sulfide as H2S	×	×	×	×	×	×	×	×	×	×	×	×	·					*	•	•	×	×		×	×	×	×	×	×	×	×	×	•	
Total Suifide as H2S	×	×	×	×	×	×	×	×	×	×	×	×	·					•	•		×	×		×	×	×	×	×	×	×	×	×	•	
Total Suffide as S	×	×	×	×	×	×	×	×	×	×	×	×	·					•	•		×	×		×	×	×	×	×	×	×	×	×	•	-
Total dissolved solids (TDS)	××	×	×	×	×	×	×	×	×	×	×	×	•					•	•		×	×		×	×	×	×	×	×	×	×	×	•	-
To tail surgeended solids (TSS)	•	•	•	•	•							•	•					•	•	•	×	×		×	×	×	×	×	×	×	×	×	•	
Biochemical oxygen demand (BOD)	•	•	•	•	•							•	·					•	•	•	×	×		×	×	×	×	×	×	×	×	×		_
Chemical oxygen demand (OOD)		•	•	•				•				•	•					•			×	×		× .	×	×	×	×	×	×	×	×	•	
Nutrients																																		
Amm onia-N	×	×	×	×	×	×	×	×	×	×	×	×	•					•	•		×	×	-	×	×	×	×	×	×	×	×	×	•	_
Nitrate (as N)	×	×	×	×	×	×	×	×	×	×	×	×	•				•	•			×	×		×	×	×	×	×	×	×	х	×		_
Ntrite (a s N)	×	×	×	×	×	×	×	×	×	×	^ ×	×	•					•			×	×		×	×	×	×	×	×	×	×	×	•	
Nitritee/Witratee	×	×	×	×	×	×	×	×	×	×	~ ×	×	·		·			÷			×	×	-	×	×	×	×	×	×	×	×	×	•	_,
Metals	-										-																						-	,
Dissolved Metals (CSR incl. Hg)	×	×	×	×	×	×	×	×	×	×	^ ×	×	•				•	•			×	×		×	×	×	×	×	×	×	×	×	•	
Total Medals (CSR Incl. Hg)	•	·	·	·	·	•		-	-	-	-	-	·	·	·		-	-	•		×	×	-	×	×	×	×	×	×	×	×	×		
Petroleum Hydrocarbons / VOC						ŀ	ŀ	ŀ	ŀ	ŀ	-						-					ŀ	$\left \right $	-					l			┝		
LEPH / HEPH / PAH / EPH*	×	×	×	×	×	×	×	×	×	×	^ ×	×	•				•	•	•		×	×		×	×	×	×	×	×	×	×	×	•	-
BIEXSM / VPH		•	·	·	·	·	-	-		-	-	•	·	•			-						-		·							-		
Phenols	-					ŀ	ŀ	$\left \right $	-	╞	-	-	-		ŀ		-	-				ŀ	$\left \right $	-	-		ŀ				-	ŀ	-	
		•	•	•		·	ł	+	+				•	•	•		-						-		•									-
NUMBER OF A DESCRIPTION	•					•	. [-
Hedrox of ends				. .									•																					_
Table Notes:	4 - Samula	ordiscription media	www.cl.hv. Mort	Their Description		1	1	-		-						-	-	-			-	-					-	-	_		-	-	-	7
These a converse		aire elevention .	whitehold chine	to from:	RC Hydro Lao	Www.(LDR) Rest	wwir Surface	1 Flavation																										
	3 - Rio Lat	te surface elev	alion obtained	1 from gauge .	st sampling local	tion (Note: the n	sterence elev.	ation for "O" on	n the gauge is	s 180.3 m)																								

It load one oncentrations for LEPH / IEPH are 80% of CSR Schedula 3.2 Aquatic Lile Olivia, include LEPH / HEPH analysis for Surface Water dringhog event.
 Aktivitating well WIV 15.52 for yet installed.

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Benkceling File: 2025 Q1-

2025 Monitoring / Sampling Plan - Q3 New Landfill Campbell River, British Columbia

_									Monit	toring Wells									Surfac	o Water		Le	tchate		ŀ			Leak De	le ction			_	Landfill Gas	_
		Up-Gradie	Ę		Cross-G	radient		Down	n-Gradient		9	WOC Samples				Other			McNor	Rico			9	A/QC Samples									_	–
Monitoring Location/Sample ID	MW1-14 MW4A-	15 MW4B-1	5 MW6-17	r MW9-17	MW2-14	MW2A-16	WW3-14 A	WW10-17 MV	W11-19 M	4W12-22 MW	13-25 ⁶ Fieldi	Blank Field D.	Up MW5A-1	5 MW5B-15	MW7-17	MW8-17 MW	15A-18 MW15	5B-18 PZ1-1	9 SW15-01	SW15-02	12-90S	201-24	Trip!	Blank Field D	hup LUS-E	LUS-W	LUMP-1 L	DMP-2 LUM	P-3 LUMP-4	LUMP-5	LDMP-6 L	DMP-7 LP-0	1-22 LF62-22	
Water Level Monitoring																																		
Depth to Water (m)	×	×	×	×	×	×	×	×	×	×	×		×	×	×	×	×	×	•				-		×	×	×	×	×	×	×	×	•	
Depth to Bottom (m)	×	×	×	×	×	×	×	×	×	×	×	•	×	×	×	×	×	×						•	•				•					_
Water Elevation - McNor Lake?	•	•	•	•	•	•						•	•					•	×	•				•	•			•	•				•	
Water Level - Roo Lake Gauge ³	•	•	•									•	·				•	•	•	×				•	•			•	•				•	_
Field Parameters																																		
Conductivity (µS/cm)	×	×	×	×	×	×	×	×	×	×	×	•	•								×	×		•	×	×	×	×	×	×	×	×		_
Dissolved Oxygen (DO) (mg/L)	×	×	×	×	×	×	×	×	×	×	×	•	•					•	•		×	×		•	×	×	×	×	×	×	×	×	•	
Oxidation Reduction Potential (ORP) (mV)	××	×	×	×	×	×	×	×	×	×	×	•	•								×	×		•	×	×	×	×	×	×	×	×		_
Hq	×	×	×	×	×	×	×	×	×	×	×	•	•					•	•		×	×		•	×	×	×	×	×	×	×	×	•	
Temperature (°C)	××	×	×	×	×	×	×	×	×	×	×	•	•					•	•		×	×		•	×	×	×	×	×	×	×	×	•	-
Total Dissolved Solids (TDS) (mg/L)	×	×	×	×	×	×	×	×	×	×	×	•	•					•			×	×		•	×	×	×	×	×	×	×	×	•	1
Turbidity (NTU)	×	×	×	×	×	×	×	×	×	×	×	•	•					•			×	×		•	×	×	×	×	×	×	×	×	•	1
Landfill Gases (Methane, etc.)	•	•	•	•	•							•	•				· .	•	•					•					•				•	
Analytical Parameters																																		100
General Chemistry																																		
Akalinity (as CaCO3 pH=8.3)	×	×	×	×	×	×	×	×	×	×	×	×	ŀ	ŀ			ŀ	•	•		×	×	-	×	×	×	×	×	×	×	×	×		_
Alkalinity, total (as CaCO3)	×	×	×	×	×	×	×	×	×	×	×	×	•				· .	•	•		×	×		×	×	×	×	×	×	×	×	×		1
Bicarbonate (as CaCO3)	×	×	×	×	×	×	×	×	×	×	×	×	•					•			×	×		×	×	×	×	×	×	×	×	×	•	1
Carbonate (as CaCO3)	× ×	×	×	×	×	×	×	×	×	×	×	×	•					•			×	×		×	×	×	×	×	×	×	×	×		1
Hydroide (as Ca CO3)	× ×	×	×	×	×	×	×	×	×	×	×	×	ŀ					•	•		×	×		×	×	×	×	×	×	×	×	×		1
Chloride (dissolved)	×	×	×	×	×	×	×	×	×	×	×	×	•					•			×	×		×	×	×	×	×	×	×	×	×	•	1
Conductivity	×	×	×	×	×	×	×	×	×	×	×	×	•					•			×	×		×	×	×	×	×	×	×	×	×	•	1
Hardness	×	×	×	×	×	×	×	×	×	×	×	×	•					•			×	×		×	×	×	×	×	×	×	×	×		1
Hardness (dissolved)	×	×	×	×	×	×	×	×	×	×	×	×	•					•			×	×		×	×	×	×	×	×	×	×	×		-
Orth oph osphate	×	×	×	×	×	×	×	×	×	×	×	×	•					•	•		×	×		×	×	×	×	×	×	×	×	×	•	-
H	×	×	×	×	×	×	×	×	×	×	×	×	•								×	×		×	×	×	×	×	×	×	×	×		1
Sulphate (Dissolved)	×	×	×	×	×	×	×	×	×	×	×	×	•					•	•		×	×		×	×	×	×	×	×	×	×	×	•	-
Total Un-ionized Hydrogen Sulfide as S	×	×	×	×	×	×	×	×	×	×	×	×	•				· .	•	•		×	×		×	×	×	×	×	×	×	×	×		1
Total Un-ionized Hydrogen Sulfide as H2S	×	×	×	×	×	×	×	×	×	×	×	×	·					*	•	•	×	×		×	×	×	×	×	×	×	×	×	•	
Total Suifide as H2S	×	×	×	×	×	×	×	×	×	×	×	×	·					*	•	•	×	×		×	×	×	×	×	×	×	×	×	•	
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 Aktivitating well WIV 15.52 for yet installed.

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Benkceling File: 2025 Q1-

2025 Monitoring / Sampling Plan - Q4 New Landfill Campbell River, British Columbia

-									Monit	toring Wells									Surface	Water		Les	tchate		F			Lea	k Detection				Land	l Gas
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It load one oncentrations for LEPH / IEPH are 80% of CSR Schedula 3.2 Aquatic Lile Olivia, include LEPH / HEPH analysis for Surface Water dringhog event.
 Aktivitating well WIV 15.52 for yet installed.

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FIGURES











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APPENDICES

APPENDIX A

Ministry of Environment Lands & Parks Permit



Province of British Columbia

Ministry of Environment, Lands and Parks



Vancouver Island Region 1 Regional Headquarters 2569 Kenworth Road Nanaimo British Columbia V9T 4P7 Telephone: (604) 751-3100

JUN 0 1 1992

File: PR-10807

REGISTERED MAIL

Upland Excavating Ltd. 480 - 10th Avenue Campbell River, British Columbia V9W 4E3

Gentlemen:

Enclosed is a copy of Permit No. PR-10807 issued under the provisions of the Waste Management Act, in the name of Upland Excavating Ltd. Your attention is respectfully directed to the terms and conditions outlined in the Permit.

The administration of this Permit will be carried out by staff from our Regional Office located at 2569 Kenworth Road, Nanaimo, British Columbia, V9T 4P7 (telephone 751-3100). Plans, data and reports pertinent to the Permit are to be submitted to the Regional Waste Manager at this address.

Yours truly,

G.E. Oldham, P. Eng. Regional Waste Manager

Enclosure





ENVIRONMENTAL PROTECTION 2569 Kenworth Road Nanaimo, British Columbia V9T 4P7 Telephone:(604) 751-3100

MINISTRY OF ENVIRONMENT, LANDS AND PARKS

PERMIT

Under the Provisions of the Waste Management Act

Upland Excavating Ltd.

480 - 10th Avenue

Campbell River, British Columbia

V9W 4E3

is authorized to discharge refuse from Campbell River and the surrounding area to the land and air contaminants from a regulated open burning operation.

An annual fee will be determined on the basis of your industrial code and capacity in accordance with the Waste Management Fees Regulation.

This Permit does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority shall rest with the Permittee.

G. E. Oldham, P. Eng. Regional Waste Manager

Date issued: JUN 01 1992

Date amended: (most recent)

Page: 1 of 6

1. AUTHORIZED DISCHARGES AND RELATED REQUIREMENTS

1.1 Refuse

1.1.1 The maximum rate at which refuse may be discharged is 3200 $\rm m^3/year.$

1.1.2 The type of refuse which may be discharged is inert municipal.

1.1.3 The components of the refuse which may be discharged are stumps, trees, land clearing waste, selected building demolition debris, and residue of combustion from the open burning of woodwaste.

1.1.4 The works authorized are a landfill operation as directed, located approximately as shown on the attached Appendix A-1.

1.1.5 The works authorized must be complete and in operation on and from the date of this permit.

1.2 Emissions

1.2.1 The works authorized are a regulated open burning operation, as directed, located approximately as shown on the attached Appendix A-1.

1.2.2 The works authorized must be complete and in operation on and from the date of this permit.

2. LOCATION OF THE FACILITIES

Lot A, District Lot 85, Plan 30709, Sayward District.

LE Coldham

G. E. Oldham, P. Eng. Regional Waste Manager

Date issued: JUN 0 1 1992

Date amended: (most recent)

Page: 2 of 6

3. LANDFILL OPERATION

The Permittee shall maintain the landfill as a Level E operation in accordance with the Pollution Control Objectives for Municipal Type Waste Discharges in British Columbia, dated September 1975, which, in normal conditions, requires that cover material be applied once per forty days of operation and at least once every two months. The Regional Waste Manager may vary the frequency of covering when freezing conditions or other circumstances affect normal operation.

4. SITE PREPARATION AND RESTORATION

Provision of fencing, site access, vehicle safety barriers, surface water diversionary works, firebreaks and site restoration as required, shall be carried out to the satisfaction of the Regional Waste Manager.

5. PUTRESCIBLE WASTE

No putrescible wastes shall be discharged at this site.

6. OPERATIONAL REQUIREMENTS FOR REGULATED OPEN BURNING

(a) <u>Area</u>

The operation shall be restricted to an area on the site which is satisfactory to the Regional Waste Manager. If required, this area shall be fenced to restrict access to the burn area stockpile.

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G. E. Oldham, P. Eng. Regional Waste Manager

Date issued: JUN 01 1992

Date amended: (most recent)

Page: 3 of 6

(b) Quantity and Frequency

The maximum quantity of wastes to be treated is 750 m^3 per burn at a frequency not to exceed four burns per year. Each burn shall comprise one continuous period necessary to reduce the stockpiled waste to ashes, and shall not exceed 48 hours.

(c) <u>Nature of Wastes</u>

Generally, no waste shall be burned which is unacceptable to the Regional Waste Manager. Acceptable materials may include stumps, trees and similar items, but exclude nuisance causing combustibles such as rubber, plastics, tars, insulation, etc. Demolition debris, excepting wood products, shall not be burned at this site. Burning of any antisapstain treated wood products is prohibited.

(d) <u>Timing</u>

Burning shall take place only when an attendant is on duty and when conditions promote rapid combustion and dispersion of combustion products with a wind direction that conveys the resulting gases away from McIvor Lake and Highway #28 (Gold River Highway). Burning shall take place only when the ventilation index for the Campbell River area is forecasted to exceed 33 for the period of the burn. The ventilation index is issued by the Pacific Weather Centre, Environment Canada, Vancouver, telephone 664-9032. Materials shall be charged to the facility in a manner to promote best combustion and restrict the uplift of lighter constituents. No burning shall take place during periods of fire hazard or when burning is prohibited by other government agencies.

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G. E. Oldham, P. Eng. Regional Waste Manager

Date issued: JUN 01 1992

Date amended: (most recent)

Page: 4 of 6

(e) <u>Fire Control</u>

Suitable approved devices shall be available for extinguishing fires to prevent them from spreading to surrounding areas. Such devices may include a pressurized water supply, chemical type fire extinguishers, or an earth stockpile. If an earth stockpile is contemplated for fire control, earth moving equipment shall be available at the site during burning. A fireguard shall be cleared and maintained free of combustible materials.

(f) Residue of Combustion

As soon as the residue of combustion has cooled to ambient temperature, it shall be incorporated into the adjacent landfill.

(g) Other Requirements

The Ministry of Environment, Lands and Parks has established a Smoke Management Steering Committee to review the present practice of burning wood residue. A need for additional controls, such as auxiliary forced air, or other requirements, may result from the recommendations of the Steering Committee or following the observation of any burning episode, and the Permittee shall install such equipment or take measures as may be required by the Regional Waste Manager.

The Ministry is also in the process of revising the existing pollution control objectives for municipal landfills. Based on the provisions of the new criteria, the Permittee may be required to terminate open burning at this site.

7. GROUNDWATER MONITORING WELLS

The Permittee shall install not more than two groundwater monitoring wells. The number, locations and structural details of these facilities are subject to the approval of the Regional Waste Manager.

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G. E. Oldham, P. Eng. Regional Waste Manager

Date issued: JUN 01 1992

Date amended: (most recent)

Page: 5 of 6

8. WASTE REDUCTION

The Ministry of Environment, Lands and Parks has developed a policy to reduce, recycle and reuse solid wastes. The Permittee is encouraged to segregate for recycling and reuse, where possible, materials destined for disposal at this site.

In certain landfill environments, some construction and demolition debris, may create air and water quality concerns. If problems arise at this site that are attributable to specific wastes, the Regional Waste Manager may require that alternate disposal procedures be implemented.

9. WASTE MANAGEMENT PLANNING

The Permittee is advised that the Regional District of Comox-Strathcona is developing a Solid Waste Management Plan which may have an impact on the discharge authorized by this Permit.

G. E. Oldham, P. Eng. Regional Waste Manager

Date issued: JUN 0 1 1992

Date amended: (most recent)

Page: 6 of 6



Ministry of Environment & Climate Change Strategy Operational Certificate



August 1, 2019

Tracking Number: 335965 Authorization Number: 107689

REGISTERED MAIL

UPLAND EXCAVATING LTD. #201-909 ISLAND HIGHWAY CAMPBELL RIVER BC V9W 2C2

Dear operational certificate holder:

Enclosed is Operational Certificate 107689 issued under the provisions of the *Environmental Management Act*. Your attention is respectfully directed to the terms and conditions outlined in the operational certificate. An annual fee will be determined according to the Permit and Approval Fees and Charges Regulation.

This operational certificate does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority rests with the operational certificate holder. It is also the responsibility of the operational certificate holder to ensure that all activities conducted under this authorization are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force.

Requirements may also be specified by the *Environmental Management Act* and regulations including, but not limited to, the Contaminated Sites Regulation, Environmental Data Quality Assurance Regulation, Hazardous Waste Regulation, Landfill Gas Management Regulation, Organic Matter Recycling Regulation, Ozone Depleting Substances and Other Halocarbons Regulation, Recycling Regulation, Spill Reporting Regulation, Storage of Recyclable Material Regulation, Waste Discharge Regulation and Codes of Practice.

This decision may be appealed to the Environmental Appeal Board in accordance with Part 8 of the *Environmental Management Act*. An appeal must be delivered within 30 days from the date that notice of this decision is given. For further information, please contact the Environmental Appeal Board at (250) 387-3464.

Administration of this operational certificate will be carried out by staff from the Environmental Protection Division's Regional Operations Branch. Documents pertinent to the operational certificate are to be submitted by email or electronic transfer to the director, in accordance with the ministry Data & Report Submissions website at: http://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/data-and-report-submissions, or as further instructed.

Ministry of Environment & Climate Change Strategy

Regional Operations

If you have any questions or concerns, please contact Authorizations - South at <u>Authorizations.South@gov.bc.ca</u>.

Yours truly,

C-

Luc Lachance, P.Eng for Director, *Environmental Management Act* Authorizations - South Region

Enclosure



MINISTRY OF ENVIRONMENT & CLIMATE CHANGE STRATEGY

OPERATIONAL CERTIFICATE

107689

Under the Provisions of the Environmental Management Act Pursuant to the Approved Comox Valley Regional District Solid Waste Management Plan

UPLAND EXCAVATING LTD.

#201-909 ISLAND HIGHWAY CAMPBELL RIVER BC V9W 2C2

Is authorized to manage waste at the Facility located in Campbell River, British Columbia, subject to the requirements listed below. Contravention of any of these requirements is a violation of the *Environmental Management Act* and may lead to prosecution.

Pursuant to section 24(10) of the *Environmental Management Act*, this operational certificate supersedes and cancels Permit PR-10807 issued under section 14 of the *Environmental Management Act*.

1. AUTHORIZED DISCHARGES, FACILITIES AND WORKS

1.1 Original Landfill

This section applies to the Original Landfill.

- 1.1.1 The maximum rate of waste discharge to the Original Lined Cell is 45,000 tonnes per calendar year.
- 1.1.2 The characteristics of the waste discharge to the Original Lined Cell must be:
 - (a) demolition waste,
 - (b) construction waste,
 - (c) land clearing waste,

(d) soil in which the concentrations of all substances are less than the lowest applicable industrial land use standard specified for those substances in

(i) the generic numerical soil standards,

(ii) the matrix numerical soil standards, or

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(iii) a director's interim standard for soil,

- referred to in section 41(1)(a) of the Contaminated Sites Regulation, B.C. Reg. 375/96,
- (e) sludge from the Original Leachate Management Works, or,
- (f) other waste as authorized in writing by the director,

but does not include:

(g) hazardous waste except as authorized pursuant to the Hazardous Waste Regulation, controlled waste, Attractants, and,

- (h) waste and/or recyclable material prohibited in writing by the director.
- 1.1.3 The waste discharge is authorized to the Original Lined Cell approximately located as shown on Site Plan A. Waste discharge to the Original Un-Lined Cell is not authorized.
- 1.1.4 Authorization to discharge waste to the Original Lined Cell ceases on the earlier of:(i) the date the Original Lined Cell is filled to capacity with grades not steeper than 3H:1V (33%),
 - (ii) the date of commencement of waste discharge to the New Landfill.
- 1.1.5 The authorized works are:

(i) a lined landfill footprint with a maximum area of 0.72 ha (85 m x 85 m) including from bottom to top a base with perimeter berm, 0.3 m sand cushion layer, 0.5 mm thick coated woven polyethylene liner, 0.3 m granular leak detection layer, leak detection riser pipe, 0.5 mm thick coated woven polyethylene liner, 0.3 m sand protection layer, leachate extraction chamber, final cover, and,

(ii) an un-lined landfill footprint with an approximate area of 0.7 ha, final cover, and related appurtenances, approximately located as shown on Site Plan A.

1.1.6 The operational certificate holder must ensure the Original Landfill, excluding final cover, is complete and fully operational on or before the date of issuance of this operational certificate, and at all times thereafter, until the Original Landfill is decommissioned in compliance with the plan referred to in section 2.9(a) (plan to remove all waste from the Original Landfill) of this operational certificate.

1.2 Original Leachate Management Works

This section applies to the management of leachate from the Original Lined Cell.

- 1.2.1 The operational certificate holder must convey the leachate from the Original Lined Cell, that is to be discharged on the Facility site, to the Original Leachate Management Works.
- 1.2.2 The maximum rate of treated leachate effluent discharge to the treated leachate infiltration pond is 7,139 m³ per calendar year.

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- 1.2.3 The concentration of any substance in the treated leachate effluent discharge to the treated leachate infiltration pond must not be greater than the Contaminated Sites Regulation Generic Numerical Water Standards for Drinking Water (DW), for that substance.
- 1.2.4 The treated leachate effluent is authorized to be discharged to the treated leachate infiltration pond and infiltrated into the ground. This authorization ceases on the date the Original Leachate Management Works are decommissioned in compliance with the plan referred to in section 2.9(a) (plan to remove all waste from the Original Landfill) of this operational certificate.
- 1.2.5 The authorized works are leachate conveyance, storage, treatment and discharge works including pumps, pipes, leachate storage and treatment tanks, treated leachate infiltration pond, flow monitoring works, and related appurtenances approximately located as shown on Site Plan A.
- 1.2.6 Minimum Freeboard must be maintained at all times as follows: treated leachate infiltration pond: 0.6 m
- 1.2.7 The operational certificate holder must ensure the Original Leachate Management Works are complete and fully operational on or before the date of commencement of discharge to the treated leachate infiltration pond, and at all times thereafter, until the Original Leachate Management Works are decommissioned in compliance with the plan referred to in section 2.9(a) (plan to remove all waste from the Original Landfill) of this operational certificate.

1.3 New Landfill

This section applies to the New Landfill.

- 1.3.1 The maximum rate of waste discharge to the New Landfill is: (45,000 minus the waste discharge to the Original Lined Cell) tonnes per calendar year.
- 1.3.2 The characteristics of the waste discharge to the New Landfill must be:
 - (a) demolition waste,
 - (b) construction waste,
 - (c) land clearing waste,

(d) soil in which the concentrations of all substances are less than the lowest applicable industrial land use standard specified for those substances in

(i) the generic numerical soil standards,

(ii) the matrix numerical soil standards, or

(iii) a director's interim standard for soil,

referred to in section 41(1)(a) of the Contaminated Sites Regulation, B.C. Reg. 375/96, (e) sludge from the New Leachate Management Works or the New Stormwater

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Management Works, or,

(f) other waste as authorized in writing by the director,

but does not include:

(g) hazardous waste except as authorized pursuant to the Hazardous Waste Regulation, controlled waste, Attractants, and,

(h) waste and/or recyclable material prohibited in writing by the director.

- 1.3.3 The waste discharge is authorized to the New Landfill approximately located as shown on Site Plan A.
- 1.3.4 The authorized works are a lined landfill footprint with a maximum area of 3.60 ha including from bottom to top a base with perimeter berm, secondary base liner, leak detection drainage layer and leak collection pipes and sump, primary base liner, leachate collection drainage layer and leachate collection pipes and sump, pumps, pipes, final cover, and related appurtenances, approximately located as shown on Site Plan A.
- 1.3.5 The secondary base liner and the primary base liner must each include an upper high density polyethylene double sided textured geomembrane of minimum 1.5 mm thickness and a lower geosynthetic clay liner of hydraulic conductivity less than or equal to 1×10^{-7} cm/s. However, on the south slope of the base more than 1 m above the primary base liner, the geosynthetic clay liners are not required.
- 1.3.6 The operational certificate holder must ensure the New Landfill, excluding final cover, is complete and fully operational on or before the date of commencement of waste discharge to the New Landfill, and at all times thereafter.

1.4 New Leachate Management Works

This section applies to the management of leachate from the New Landfill.

- 1.4.1 The operational certificate holder must convey the leachate from the New Landfill, that is to be discharged on the Facility site, to the New Leachate Management Works.
- 1.4.2 The maximum rate of treated leachate effluent discharge to the treated leachate infiltration pond is 24,633 m³ per calendar year.
- 1.4.3 The concentration of any substance in the treated leachate effluent discharge to the treated leachate infiltration pond must not be greater than the Contaminated Sites Regulation Generic Numerical Water Standards for Drinking Water (DW), for that substance.
- 1.4.4 The treated leachate effluent is authorized to be discharged to the treated leachate infiltration

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pond and infiltrated into the ground.

- 1.4.5 The authorized works are leachate conveyance, treatment and discharge works including pumps, pipes, leachate treatment pond(s), treated leachate infiltration pond, flow monitoring works, and related appurtenances approximately located as shown on Site Plan A.
- 1.4.6 The leachate treatment pond(s) must include from bottom to top a secondary base liner, leak detection drainage layer and leak collection pipe(s), and a primary base liner. The secondary base liner and the primary base liner must each include an upper high density polyethylene double sided textured geomembrane of minimum 1.5 mm thickness and a lower geosynthetic clay liner of hydraulic conductivity less than or equal to $1 \ge 10^{-7}$ cm/s.
- 1.4.7 Minimum Freeboard must be maintained at all times as follows: leachate treatment pond(s): 0.6 m treated leachate infiltration pond: 0.6 m
- 1.4.8 The operational certificate holder must ensure the New Leachate Management Works are complete and fully operational on or before the date of commencement of waste discharge to the New Landfill, and at all times thereafter.

1.5 New Stormwater Management Works

This section applies to the management of stormwater from the New Landfill.

- 1.5.1 The operational certificate holder must manage stormwater from the New Landfill such that stormwater is infiltrated into the ground with the authorized works.
- 1.5.2 The stormwater must not include leachate and the concentration of any substance in the stormwater must not be greater than the Contaminated Sites Regulation Generic Numerical Water Standards for Drinking Water (DW), for that substance.
- 1.5.3 The authorized works are diversion berm, perimeter berm, mid slope swales, drop down channels, ditches, energy dissipation and sediment traps, stormwater infiltration area, and related appurtenances approximately located as shown on Site Plan A.
- 1.5.4 Minimum Freeboard must be maintained at all times as follows: stormwater infiltration area: 0.6 m all other authorized works: 0.3 m
- 1.5.5 The operational certificate holder must ensure that adequate authorized works to manage stormwater, such that stormwater is infiltrated into the ground with the authorized works, are

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complete and fully operational on or before the date of commencement of waste discharge to the New Landfill, and at all times thereafter.

1.6 Facility Entrance

This section applies to the Facility entrance.

- 1.6.1 The authorized works are sign(s), gate, fence, weigh scale, and related appurtenances approximately located as shown on Site Plan A.
- 1.6.2 The operational certificate holder must ensure the authorized works are complete and fully operational on or before the date of issuance of this operational certificate and at all times thereafter.

1.7 Location of Facility

This section applies to the location of the Facility.

1.7.1 The location of the Facility is PID 001-223-321, LOT A, DISTRICT LOT 85, SAYWARD DISTRICT, PLAN 30709 EXCEPT PART IN PLAN EPP15087, approximately located as shown on Site Plan A.

2. GENERAL REQUIREMENTS

2.1 Glossary

The following capitalized terms referred to in this authorization are defined in the Glossary below. Other terms used in this authorization have the same meaning as those defined in the *Environmental Management Act*, applicable regulations, and the Landfill Criteria;

"Attractant" means food or food waste, compost, carcass or part of an animal, fish, or other meat, or other waste or garbage, that could attract bears, birds, rodents, insects, vectors or wildlife, but does not include grass, leaves, weeds, branches and woodwaste;

"Facility" means the Original Landfill, Original Leachate Management Works, New Landfill, New Leachate Management Works, New Stormwater Management Works and the authorized works in section 1.6.1 (Facility Entrance) of this operational certificate;

"Freeboard" means the difference in elevation between the contained liquid level and the top of the containment works at its lowest point;

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"Landfill Criteria" means the Landfill Criteria for Municipal Solid Waste Second Edition June 2016, as amended or replaced from time to time;

"New Landfill" means the authorized works in section 1.3.4 of this operational certificate;

"New Leachate Management Works" means the authorized works in section 1.4.5 of this operational certificate;

"New Stormwater Management Works" means the authorized works in section 1.5.3 of this operational certificate;

"Original Landfill" means the Original Lined Cell and the Original Un-Lined Cell;

"Original Leachate Management Works" means the authorized works in section 1.2.5 of this operational certificate;

"Original Lined Cell" means the authorized works in section 1.1.5(i) of this operational certificate;

"Original Un-Lined Cell" means the authorized works in section 1.1.5(ii) of this operational certificate;

"Province" means Her Majesty the Queen in right of British Columbia;

"Regulatory Document" means any document that the operational certificate holder is required to cause to be prepared, prepare or submit to the director or the Province, pursuant to: (i) this authorization; (ii) any regulation made under the *Environmental Management Act* that regulates the Facility described in this authorization or the discharge of waste from that Facility; or (iii) any order issued under the *Environmental Management Act* directed against the operational certificate holder that is related to the Facility described in this authorization or the discharge of waste from that Facility;

"Significant Works" means the Facility excluding the authorized works in section 1.6.1 (Facility Entrance) of this operational certificate.

2.2 Use of Qualified Professional(s)

The operational certificate holder must cause a Qualified Professional to:

- (a) Design and inspect the construction of the Facility, and,
- (b) Certify documents related to the Facility including plans, specifications, drawings, construction

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reports, assessments, reviews, investigations, studies, surveys, programs, reports and as-built record drawings.

(d) Submit a completed Declaration of Competency and a Conflict of Interest Disclosure Statement with each document.

2.3 **Operations and Closure Plan (OCP)**

(a) The operational certificate holder must cause a Qualified Professional to certify and submit an up to date OCP for the Original Landfill and the Original Leachate Management Works, to the director, on or before the earlier of:

(i) 30 days before the date of commencement of waste discharge to the Original Lined Cell,

(ii) 30 days after the date of issuance of this operational certificate.

(b) The OCP must comply with the requirements of this operational certificate, include information specified in relevant items listed in the Landfill Criteria Section 10.3 Design, Operations and Closure Plan including a site layout plan, a filling plan, a lifespan analysis table, a stormwater management plan, a leachate management plan, an environmental monitoring plan, an operations plan, a closure plan, and the information specified in the following sections of this operational certificate:

2.7(a) (soil acceptance plan), and,

2.10(a) (financial security plan).

(c) The operational certificate holder must carry out the most recent OCP and design, construct, operate, inspect, maintain, monitor and close the Original Landfill and the Original Leachate Management Works, in compliance with the most recent OCP and this operational certificate, until the Original Landfill and the Original Leachate Management Works are decommissioned in compliance with the plan referred to in section 2.9(a) (plan to remove all waste from the Original Landfill) of this operational certificate.

2.4 Hydrogeology and Hydrology Characterization Report (HHCR)

(a) The operational certificate holder must cause a Qualified Professional to certify and submit an up to date HHCR, to the director, on or before 90 days before the date of commencement of waste discharge to the New Landfill.

(b) The HHCR must include characterization of the geology, hydrogeology, and surface hydrology at and near the Facility site, and the information specified in all the items listed in the Landfill Criteria, section 10.1 Hydrogeology and Hydrology Characterization Report.

(c) The operational certificate holder must cause a Qualified Professional to certify and submit an updated HHCR to the director, at least once every five years after the date of commencement of waste

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discharge to the New Landfill.

2.5 Design, Operations and Closure Plan (DOCP)

(a) The operational certificate holder must cause a Qualified Professional to certify and submit an up to date DOCP, for the Facility, to the director, on or before 90 days before the date of commencement of waste discharge to the New Landfill.

(b) The DOCP must comply with the requirements of this operational certificate, include the information specified in all the items listed in the Landfill Criteria Section 10.3 Design, Operations and Closure Plan, and the information specified in the following sections of this operational certificate:

2.6(a) (New Leachate Management Works commissioning plan),

2.7(a) (soil acceptance plan),

2.8(a) (trigger level assessment plan),

2.9(a) (plan to remove all waste from the Original Landfill), and,

2.10(b) (financial security plan).

(c) The operational certificate holder must cause a Qualified Professional to certify and submit an updated DOCP to the director, as necessary to keep the DOCP up to date, at least once every five years after the date of commencement of waste discharge to the New Landfill.

(d) The operational certificate holder must carry out the most recent DOCP and design, construct, operate, inspect, maintain, monitor, and close the Facility, in compliance with most recent DOCP and this operational certificate.

2.6 New Leachate Management Works Commissioning Plan and Report

(a) The DOCP submitted pursuant to section 2.5 of this operational certificate must include a New Leachate Management Works commissioning plan that includes:

(i) the expected duration of the New Leachate Management Works commissioning period,(ii) description of the New Leachate Management Works and design, including treatment of

leachate from soil and treated leachate infiltration pond design and infiltration tests, (iii) the monitoring, sampling and analyses that will be carried out during the New Leachate Management Works commissioning period including the quantity and quality of leachate and treated leachate effluent, and confirmatory sampling before the discharge of any treated leachate effluent to the treated leachate infiltration pond,

(iv) operating procedures that will be carried out during the New Leachate Management Works commissioning period including review of confirmatory sampling results before the discharge of any treated leachate effluent to the treated leachate infiltration pond,

(v) contingency measures that will be carried out during the New Leachate Management Works

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commissioning period if the treated leachate effluent quality does not comply with this operational certificate, including storage, retreatment, and transport to an off-site authorized treatment facility,

(vi) New Leachate Management Works commissioning report description, table of contents and summary of contents.

(b) The operational certificate holder must cause a Qualified Professional to certify and submit a New Leachate Management Works commissioning report, that includes the information contemplated in section 2.6(a)(vi) of this operational certificate, to the director, on or before 30 days after the completion of the New Leachate Management Works commissioning period, or as specified by the director.

2.7 Soil Acceptance Plan

(a) The OCP submitted pursuant to section 2.3, and the DOCP submitted pursuant to section 2.5, of this operational certificate, must include a soil acceptance plan that includes procedures that will be carried out before soil is accepted at the Facility including receipt and review of documents required by section 2.7(b) of this operational certificate, and consideration of the applicable Original Leachate Management Works or New Leachate Management Works adequacy to treat leachate from the soil.

(b) Before a specific quantity of soil is accepted at the Facility, the operational certificate holder must cause a Qualified Professional to certify and submit to the operational certificate holder, a document pertaining to the specific quantity of soil that includes:

(i) the soil tonnage(s) and soil quality class(es) as described in the most recent version of Technical Guidance 1 on Contaminated Sites Site Characterization and Confirmation Testing,
(ii) the soil origin including applicable civic address, site identification number, parcel identifier, parcel identification number, legal description, and,

(iii) characterization of the soil in accordance with ministry procedures and applicable Contaminated Sites Regulation Guidance, Protocols and Procedures.

2.8 Trigger Level Assessment Plan

(a) The DOCP submitted pursuant to section 2.5 of this operational certificate must include a trigger level assessment plan that includes:

(i) Description of the routine monitoring of the quantity and quality of leachate leakage through the primary liner and into the leak detection layer for the New Landfill, and for the leachate treatment pond(s), and related leachate leakage quantities and qualities that will trigger corresponding described increased monitoring, investigations, contingency measures and actions.
(ii) Description of the routine monitoring of groundwater quality immediately downgradient of the New Landfill, the leachate treatment pond(s), and the treated leachate infiltration pond, and related groundwater substance concentrations that will trigger corresponding described increased

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monitoring, investigations, contingency measures and actions.

2.9 Plan to Remove all Waste from the Original Landfill

(a) The DOCP submitted pursuant to section 2.5 of this operational certificate must include a plan to remove all waste from the Original Landfill, categorize such waste, discharge all such waste to the New Landfill or to other identified and authorized waste management facility(ies), carry out sampling to confirm all such waste has been removed, and decommission the Original Landfill and the Original Leachate Management Works.

(b) Subject to section 1.3.2 of this operational certificate, waste removed from the Original Landfill is authorized to be discharged to the New Landfill. The tonnage of such waste must not be included for the purpose of determining compliance with section 1.3.1 of this operational certificate.

(c) The director may require the operational certificate holder to carry out and complete the plan referred to in section 2.9(a) of this operational certificate, in accordance with the director's requirements.

(d) If the plan referred to in section 2.9(a) of this operational certificate is carried out, the operational certificate holder must cause a Qualified Professional to certify and submit a report to the director that confirms that the plan has been carried out and completed in accordance with the director's requirements, describes the plan implementation, describes and provides the waste categorization, describes and provides the sampling and results, describes the decommissioning of the Original Landfill and the Original Leachate Management Works, provides photos documenting the implementation of the plan referred to in section 2.9(a) of this operational certificate, and lists the tonnages or volumes, and categories of waste removed and discharged to the New Landfill and to other identified and authorized waste management facility(ies), on or before 60 days after the plan referred to in section 2.9(a) of this operational certificate has been carried out and completed.

2.10 Financial Security

(a) The OCP submitted pursuant to section 2.3 of this operational certificate must include a financial security plan that includes:

(i) the calculations of the amounts of financial security and time periods for each phase of development for the Original Landfill in accordance with the Landfill Criteria Section 8.0 Financial Security, and,

(ii) the amounts of financial security for the corresponding time periods.

(b) The DOCP submitted pursuant to section 2.5 of this operational certificate must include a financial security plan that includes:

(i) the tasks, estimated costs, contingency costs, calculations of the amounts of financial security

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and time periods, to carry out and complete the plan referred to in section 2.9(a) of this operational certificate (plan to remove all waste from the Original Landfill),

(ii) the calculations of the amounts of financial security and time periods for each phase of development for the New Landfill in accordance with the Landfill Criteria Section 8.0 Financial Security, and,

(iii) the amounts of financial security for the corresponding time periods.

(c) The operational certificate holder must provide the director with financial security, on or before the earlier of:

(i) 30 days before the date of commencement of waste discharge to the Original Lined Cell,

(ii) 30 days after the date of issuance of this operational certificate,

(iii) 90 days before the date of commencement of waste discharge to the New Landfill, and at all times thereafter.

(d) The amount of financial security at any time must be equal to or greater than:

(i) Before the report referred to in section 2.9(d) (report that confirms that the plan referred to in section 2.9(a) of this operational certificate has been carried out and completed) of this operational certificate is submitted to the director, the greater amount specified for the corresponding time period in:

- the financial security plan in the most recent OCP,
- the financial security plan in the most recent DOCP.

(ii) On and after the report referred to in section 2.9(d) (report that confirms that the plan referred to in section 2.9(a) of this operational certificate has been carried out and completed) of this operational certificate is submitted to the director, the amount specified for the corresponding time period in the financial security plan in the most recent DOCP.

(e) The form of financial security must be satisfactory to the director.

- (f) At the discretion of the director, such financial security may be used among other things:(i) to correct any inadequacy of the Facility relating to its design, construction, operation,
 - inspection, maintenance, monitoring, closure, and post-closure;

(ii) to correct any default in compliance with this operational certificate or the *Environmental Management Act*; and,

(iii) for remediation of the Facility.

(g) The operational certificate holder must replenish any amounts drawn from the posted financial security within 60 days of such amounts being drawn or as otherwise specified by the director.

2.11 Construction Report(s)

(a) The operational certificate holder must cause a Qualified Professional to carry out inspections

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before and during the construction or modification of Significant Works, and, after the completion of construction or modification of Significant Works, to certify and submit construction report(s) to the director:

(i) for construction of the New Landfill and the New Leachate Management Works, on or before 30 days before the date of commencement of waste discharge to those new Significant Works, and,(ii) for all Significant Works, on or before 60 days after the completion of construction or modification of the Significant Works.

(b) The construction report(s) must demonstrate that the Significant Works have been constructed in accordance with this operational certificate and the applicable most recent OCP or DOCP, describe any technical concerns that arose from the inspections and testing and how they were addressed, and include as-built record drawings of the constructed Significant Works, all the inspection and testing reports and results including geologic inspection report, quality control and quality assurance testing, soil test data including field and laboratory data, as described in the Landfill Criteria section 10.2 Construction Report(s).

2.12 Notification of Commencement of Waste Discharge

The operational certificate holder must notify the director of:

(a) the date of commencement of waste discharge to the Original Lined Cell, on that date,

(b) the date of commencement of waste discharge to the New Landfill, on that date,

(c) the date the Original Lined Cell has reached capacity, on that date, and,

(d) the date the plan referred to in section 2.9(a) of this operational certificate has been carried out and completed, on that date.

2.13 Buffer Zone

The operational certificate holder must ensure that the New Landfill, New Leachate Management Works, and New Stormwater Management Works, are located a minimum of 50 m from the Facility site boundary.

2.14 Depth to Groundwater

The operational certificate holder must ensure that the New Landfill secondary base liner, and the New Leachate Management Works leachate treatment pond(s) secondary base liner, are a minimum of 1.5 m above groundwater at all times.

2.15 Covenant

On or before the date of commencement of waste discharge to the New Landfill, the operational certificate holder must register a covenant under section 219 (1) of the *Land Title Act*, in a form

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acceptable to the director, that binds successors in title to uphold the continued implementation of the closure plan in the most recent DOCP, and prohibits development of the Facility other than as contemplated by this operational certificate or approved by the director. Such covenant must include an acknowledgement that the property was used for the purpose of waste disposal, must be registered as a charge against title to the property on which the facility is located and must be registered in priority to all charges except charges which do not give the holders any rights which might conflict with the covenant.

2.16 Additional Requirements

The director may require the operational certificate holder to:

(a) Cause a Qualified Professional to certify and submit to the director additional, amended or improved documents of the Facility including plans, specifications, drawings, construction reports, assessments, reviews, investigations, studies, surveys, programs, reports and as-built record drawings.

(b) Carry out actions in accordance with the additional, amended or improved documents submitted, and additional actions as specified.

(c) Repair, alter, remove, improve or add to existing facilities and works, or construct new facilities and works, at the Facility.

(d) Temporarily or permanently cease waste discharge to the Original Lined Cell and/or the New Landfill, cover part(s) or all of the Original Landfill and/or the New Landfill with final cover, and close and decommission the Facility, as specified.

2.17 Authorization Requirements

Where this authorization provides that the director may specify a matter or require an action to be carried out, the operational certificate holder must comply with the specification and carry out the action in accordance with the requirements of the director.

3. **OPERATING AND PERFORMANCE REQUIREMENTS**

3.1 Multiple and/or Spare Works and Auxiliary Power Facilities

The operational certificate holder must provide and install multiple and/or spare works and auxiliary power facilities to ensure the Original Lined Cell, Original Leachate Management Works, New Landfill, New Leachate Management Works, and New Stormwater Management Works, are complete and fully operational as specified in this operational certificate, including during maintenance, breakdowns and electrical power outages.

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3.2 Maintenance of the Facility

(a) The operational certificate holder must cause persons that are qualified and trained to operate, regularly inspect, and maintain the Facility, in good working order. If components of the Facility have a manufacturer's recommended maintenance schedule, then those components must, at a minimum, be maintained in accordance with that schedule.

(b) The operational certificate holder must prepare documents of the qualification and training of the persons operating, inspecting and maintaining the Facility, and of Facility inspections, operation and maintenance.

3.3 Facility Manager and Operator Certification

(a) The operational certificate holder must ensure that at least one person responsible for the management of the Facility is certified, and maintains certification, by The Solid Waste Association of North America (SWANA) as a Manager of Landfill Operations, and at least one person responsible for the operation of the Facility has, within the preceding five years, successfully completed the SWANA Landfill Operations Basics course, on or before the earlier of:

(i) the date of commencement of waste discharge to the Original Lined Cell,

(ii) the date of commencement of waste discharge to the New Landfill,

and at all times thereafter.

(b) The operational certificate holder must prepare documents of the SWANA certification and training of the person(s) responsible for the management and operation of the Facility.

3.4 New Leachate Management Works Classification and Operator Certification

(a) The operational certificate holder must have the New Leachate Management Works classified by the Environmental Operators Certification Program (EOCP), on or before the date of commencement of waste discharge to the New Landfill, and at all times thereafter.

(b) The operational certificate holder must ensure that the person(s) responsible for the operation and maintenance of the New Leachate Management Works is(are) certified at an EOCP certification level equivalent to or higher than the EOCP classification level of the New Leachate Management Works, on or before the date of commencement of waste discharge to the New Landfill, and at all times thereafter.

(c) The operational certificate holder must prepare documents of the EOCP classification level of the New Leachate Management Works and the EOCP certification level(s) of the person(s) responsible for the operation and maintenance of the New Leachate Management Works.

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3.5 Groundwater Quality

(a) The operational certificate holder must ensure that the Facility does not cause the concentration of any substance in groundwater flowing from the Facility site boundary to be greater than:

(i) the Contaminated Sites Regulation Generic Numerical Water Standards for Drinking Water (DW), for that substance,

or,

(ii) if the local background concentration of any substance is greater than (i), the local background concentration of that substance.

(b) If section 3.5(a)(ii) of this operational certificate is being used, the operational certificate holder must cause a Qualified Professional to determine the local background concentration of substance(s) in (a), in accordance with the latest approved version of Protocol 9 for Contaminated Sites, Determining Background Groundwater Quality, and include such determination(s) in the Annual Operations and Monitoring Report.

(c) The director may specify more stringent groundwater quality standards than those set out in this section.

3.6 Landfill Gas Management

The operational certificate holder must ensure that:

(a) The Facility does not cause:

(i) combustible gas concentrations to exceed the lower explosive limit of methane (5 percent by volume), or a lower concentration specified by the director, in soil at the Facility site boundary; (ii) combustible gas concentrations to exceed 20 percent of the lower explosive limit of methane (1 percent by volume) in any building; and

(iii) federal, provincial, or local ambient air quality objectives and standards to be exceeded in air at the Facility site boundary.

(b) Landfill gas is managed in accordance with all migration and health and safety requirements.

3.7 Nuisance

The operational certificate holder must ensure that the Facility does not cause a nuisance including with regard to birds, rodents, insects, odour, noise, dust, litter, vector and wildlife attraction.

3.8 Complaints

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August 1, 2019

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The operational certificate holder must prepare documents of complaints with regard to matters relevant to this operational certificate, including environmental and nuisance complaints. These documents must include the source and nature of the complaint, actions, responses, and corresponding dates and times.

3.9 **Regulatory Documents**

(a) The operational certificate holder must retain all Regulatory Documents.

(b) The operational certificate holder must retain all Regulatory Documents for the last seven years at the Facility and such documents must be available for immediate inspection at the Facility by a director or an officer.

(c) If requested by a director or an officer, the operational certificate holder must submit the requested Regulatory Documents to the director or officer within 14 days of the request.

4. SAMPLING REQUIREMENTS

4.1 Sampling Procedures

The operational certificate holder must carry out required sampling in accordance with the procedures described in the "British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples, 2013 Edition (Permittee)" or most recent edition, or by alternative procedures as authorized by the director. A copy of the above manual is available on the Ministry web page at https://www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/monitoring/laboratory-standards-quality-assurance.

4.2 Analytical Procedures

The operational certificate holder must carry out required analyses in accordance with procedures described in the "British Columbia Laboratory Manual (2015 Permittee Edition)", or the most recent edition or by alternative procedures as authorized by the director. A copy of the above manual is available on the Ministry web page at <u>https://www2.gov.bc.ca/gov/content/environment/research-monitoring/laboratory-standards-quality-assurance</u>.

4.3 **Quality Assurance**

(a) The operational certificate holder must obtain from the analytical laboratory(ies) their precision, accuracy and blank data for each sample set submitted by the operational certificate holder and an evaluation of the data acceptability, based on criteria set by such laboratory.

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(b) The operational certificate holder must submit samples to analytical laboratory(ies) that meet the definition of a qualified laboratory under the Environmental Data Quality Assurance Regulation.

(c) The operational certificate holder must collect, prepare and submit for analysis by the analytical laboratory(ies) quality control (QC) samples for each parameter. As a minimum,

- (i) The number of QC samples should be 20% of all samples collected (environmental + QC samples) within 48 hours of each other, and
- (ii) Include duplicate, field and trip blank samples for each parameter.

5. <u>REPORTING REQUIREMENTS</u>

5.1 Routine Reporting

The operational certificate holder must submit all routine Regulatory Documents required by this operational certificate by email to the Ministry's Routine Environmental Reporting Submission Mailbox at <u>EnvAuthorizationsReporting@gov.bc.ca</u> or as otherwise instructed by the director. For guidelines on how to properly name the files and email subject lines or for more information visit the Ministry website <u>http://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/data-and-report-submissions/routine-environmental-reporting-submission-mailbox</u>.

5.2 Non-compliance Notification

(a) The operational certificate holder must immediately notify the director or designate by email at <u>EnvironmentalCompliance@gov.bc.ca</u>, or as otherwise instructed by the director of any non-compliance with the requirements of this authorization by the operational certificate holder and must take remedial action to remedy any effects of such non-compliance.

(b) The operational certificate holder must provide the director with written confirmation of all such non-compliance events, including available test results within 24 hours of the original notification by email at <u>EnvironmentalCompliance@gov.bc.ca</u>, or as otherwise instructed by the director.

5.3. Non-compliance Reporting

(a) If the operational certificate holder fails to comply with any of the requirements of this authorization, the operational certificate holder must, within 30 days of such non-compliance, submit to the director a written report that is satisfactory to the director and includes, but is not necessarily limited to, the following:

(i) all relevant test results obtained by the operational certificate holder related to the non-compliance,

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(ii) an explanation of the most probable cause(s) of the non-compliance, and (iii) a description of remedial action planned and/or taken by the operational certificate holder to prevent similar non-compliance(s) in the future.

(b) The operational certificate holder must submit all non-compliance reporting required to be submitted under this section by email to the Ministry's Compliance Reporting Submission Mailbox at <u>EnvironmentalCompliance@gov.bc.ca</u> or as otherwise instructed by the director. For guidelines on how to report a non-compliance or for more information visit the Ministry website <u>http://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/data-and-report-submissions/non-compliance-reporting-mailbox</u>.

5.4 Annual Operations and Monitoring Report

(a) The operational certificate holder must cause a Qualified Professional to certify and submit an Annual Operations and Monitoring Report in a format suitable for public release, for the preceding calendar year, to the director on or before March 31 of each year. On or before March 31 of each year, the operational certificate holder must post a copy of the Annual Operations and Monitoring Report online, on a website accessible to the public, and in accordance with any requirements of the director.

(b) The Annual Operations and Monitoring Report must include the following information: Operations Report:

(i) Summary of OCP implementation that addresses the information in section 2.3(b), and summary of DOCP implementation that addresses the information in 2.5(b), of this operational certificate,

(ii) Summary of construction report(s),

(iii) Annual and cumulative tonnages and categories of waste including soil tonnage(s) and soil quality class(es) discharged to the Original Lined Cell and to the New Landfill,

(iv) Remaining volume and life of the Original Lined Cell and of the New Landfill,

(v) Summary of treated leachate effluent quantity and quality discharged to the treated leachate infiltration pond,

(vi) Summary of complaints and nuisances and description of remedial action planned and/or taken by the operational certificate holder to prevent similar complaints and nuisances in the future,

(vii) Summary of non-compliance notifications and non-compliance reporting and description of remedial action planned and/or taken by the operational certificate holder to prevent similar non-compliance(s) in the future ,

(viii) Annual status form in accordance with the instructions and template at the ministry website <u>https://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-</u>authorization/data-and-report-submissions/annual-status-form

(ix) Summary of OCP and DOCP implementation, and construction of Significant Works, planned for the next calendar year,

Date issued:

August 1, 2019

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Environmental Monitoring Plan Report:

(x) Site plan(s), sampling locations, stormwater flow paths, groundwater elevations, gradients and flow directions,

(xi) Sampling facilities, frequencies, substances, sampling and analytical procedures,

(xii) Data including laboratory analysis and quality assurance and quality control results,

(xiii) Data tabulation, trend analysis, graphs, diagrams, and interpretation,

(xiv) Trigger level assessment plan monitoring, data, results and interpretation,

(xv) Any determination(s) of the local background concentration of substance(s) in accordance with section 3.5 of this operational certificate,

(xvi) Comparison of the data with the standards for treated leachate effluent discharge,

stormwater quality, groundwater quality, and landfill gas management, specified in sections 1.2, 1.4, 1.5, 3.5 and 3.6 of this operational certificate, and identification of any non-compliance and predicted future non-compliance,

(xvii) Results, conclusions, recommendations and changes to the environmental monitoring plan.

(c) The operational certificate holder must upload monitoring data associated with this operational certificate to the Ministry's Environmental Monitoring System (EMS) database, within 45 days of the end of the 3 month period in which the data is collected.

5.5 Licence to Publish Documents

(a) Subject to paragraph (b), the operational certificate holder authorizes the Province to publish on the Ministry of Environment and Climate Change Strategy website the entirety of any Regulatory Document.

(b) The Province will not publish any information that could not, if it were subject to a request under section 5 of the *Freedom of Information and Protection of Privacy Act*, be disclosed under that Act.

(c) The operational certificate holder will indemnify and save harmless the Province and the Province's employees and agents from any claim for infringement of copyright or other intellectual property rights that the Province or any of the Province's employees or agents may sustain, incur, suffer or be put to at any time that arise from the publication of a Regulatory Document.

Date issued:

August 1, 2019

Luc Lachance, P.Eng for Director, *Environmental Management Act* Authorizations - South Region



Date issued:

August 1, 2019

Luc Lachance, P.Eng for Director, *Environmental Management Act* Authorizations - South Region

Amendments to the Operational Certificate



April 26, 2022

Tracking Number: 405141 Authorization Number: 107689

UPLAND EXCAVATING LTD. #201-909 ISLAND HIGHWAY CAMPBELL RIVER BC V9W 2C2

<u>Re: Your application dated June 07, 2021, for amendments to Operational</u> <u>Certificate 107689, under the *Environmental Management Act*</u>

In response to the subject application, and pursuant to Section 16 of the *Environmental Management Act*, Operational Certificate 107689 is hereby amended as follows:

The subject part of the preamble page 1 is amended from:

Is authorized to manage waste at the Facility located in Campbell River, British Columbia, subject to the requirements listed below. Contravention of any of these requirements is a violation of the *Environmental Management Act* and may lead to prosecution.

to:

Is authorized to manage waste at the Facility located in Campbell River, British Columbia, provided that the operational certificate holder complies with all provisions of this operational certificate. Unless a contrary intention appears, the provisions of this operational certificate are requirements that must be complied with regardless of whether the operational certificate holder introduces waste to the environment. Contravention of any of these requirements, and any discharge of waste while out of compliance with any provisions of this operational certificate, is a violation of the *Environmental Management Act*, and may lead to prosecution.

Sub-section 1.3.2 (d) is amended to: (d) soil that is not hazardous waste,

Sub-section 1.4.5 is amended after "leachate treatment pond(s)" by adding: treated leachate holding pond or tank,

Sub-section 1.4.6 is amended after "1x 10^{-7} cm/s." by adding:

The treated leachate holding pond must include from bottom to top a secondary base liner, leak detection drainage layer and leak collection pipe(s), and a primary base liner. The treated leachate holding pond secondary base liner and the primary base liner must each include a coated woven polyethylene geomembrane of minimum 0.75 mm thickness.

Sub-section 1.4.7 is amended after "treated leachate infiltration pond: 0.6 m" by adding: treated leachate holding pond: 0.6 m.

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4. Sub-sections 2.9(c) and 2.9(d) are amended to:

(c) The operational certificate holder must carry out and complete the plan referred to in section 2.9(a) of this operational certificate, on or before one year after the date of this letter.

(d) The operational certificate holder must cause a Qualified Professional to certify and submit a report to the director that confirms that the plan referred to in section 2.9(a) of this operational certificate has been carried out and completed, describes the plan implementation, describes and provides the waste categorization, describes and provides the sampling and results, describes the decommissioning of the Original Landfill and the Original Leachate Management Works, provides photos documenting the implementation of the plan referred to in section 2.9(a) of this operational certificate, and lists the tonnages or volumes, and categories of waste removed and discharged to the New Landfill and to other identified and authorized waste management facility(ies), on or before 60 days after the plan referred to in section 2.9(a) of this operational certificate has been carried out and completed.

5. Site Plan A is amended to the enclosed Site Plan A.

All other terms and conditions of the operational certificate remain in full force and effect.

Please note that although a revised operational certificate document has not been produced at this time a copy of this letter is being placed on the operational certificate file, as an addendum to the operational certificate, to formally reflect the change.

This operational certificate does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority rests with the operational certificate holder. This operational certificate is issued pursuant to the provisions of the *Environmental Management Act* to ensure compliance with Section 120(3) of that statute, which makes it an offence to discharge waste, from a prescribed industry or activity, without proper authorization. It is also the responsibility of the operational certificate holder to ensure that all activities conducted under this operational certificate are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force.

This decision may be appealed to the Environmental Appeal Board in accordance with Part 8 of the *Environmental Management Act*. An appeal must be delivered within 30 days from the date that notice of this decision is given. For further information, please contact the Environmental Appeal Board at (250) 387-3464.

Administration of this operational certificate will be carried out by staff from the Environmental Protection Division's Regional Operations Branch. For guidance regarding how to comply with a waste discharge authorization including submitting reports and reporting non-compliance, please refer to the ministry website at: <u>https://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/comply</u>, or as further instructed.

For more information about how the Ministry will assess compliance with your operational certificate please refer to <u>gov.bc.ca/environmentalcompliance</u>.

For more information about how to make changes to your operational certificate and to access waste discharge amendment forms and guidance, please refer to gov.bc.ca/wastedischarge-authorizations.

Sincerely,

Haylik

Carol Danyluk, P.Eng. Director's Designate Environmental Management Act

ENCL: None



APPENDIX B: IFC Record Drawings

New Landfill Phase 1 East - Cell & Landfill Ponds




























New Landfill Stage 1 West - Detailed Design Drawings

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UPLAND EXCAVATING LTD. CAMPBELL RIVER, B.C.	NEW LANDFILL (NORTHWIN LANDFILL) STAGE 1 WEST - DETAILED DESIGN DRAWINGS MAY 2022		
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APPENDIX C

Cell 1 East & Ponds Construction Report



Cell 1 East & Ponds Construction Report

Northwin Landfill

Upland Excavating Ltd. 19 October 2021

Re Power of Commitment

GHD Limited 735

138 East 7th Avenue, Suite 100 Vancouver, BC V5T 1M6, Canada

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GHD | Upland Excavating Ltd. | 11223708 | Cell 1 East & Ponds Construction Report

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1. Introduction

The Northwin Landfill (Landfill or Site) is owned by Upland Excavating Ltd. (Upland) and operated by Northwin Environmental (Northwin). The Site has an area of approximately 48 hectares (ha) and is located at civic address 7295 and 7311 Gold River Highway, Campbell River, BC, approximately 7 kilometers (km) southwest of Campbell River city centre. The Site operates as a sand, gravel and rock quarry and a waste management facility.

This Construction Report (Report) documents the construction of Cell 1 East, as well as the civil construction for the leachate treatment pond, the treated effluent holding pond and infiltration pond (collectively, ponds) carried out by Upland Contracting Ltd. (Contractor), Northwin and other contractors hired by Upland.

The Report has been prepared by GHD for Upland for submission to the Ministry of Environment and Climate Change Strategy (ENV) in accordance with Section 2.4 and 2.11 of the Landfill's OC and satisfies the requirements of the Landfill Criteria for Municipal Solid Waste (Second Edition), BC Ministry of Environment, June 2016 (the Criteria):

Construction report(s) shall be prepared after the construction and/or significant modification of landfill facilities. Construction report(s) shall demonstrate the landfill has been constructed in accordance with the plans and reports and confirm that the geologic conditions encountered are as expected and used in a Groundwater and Surface water impact assessment. Construction report(s) shall include all inspection and quality assurance/quality control testing results, and as-built record drawings showing the lines, grades, and as-built elevations of the landfill.

Upland, as the OC holder retained GHD to act as the Qualified Professional (QP) for this project scope. In this capacity, GHD designed the civil work for Cell 1 East and the ponds and carried out inspections during construction.

1.1 Project Scope

Cell 1 East is the first landfill cell and establishes the initial footprint of the Landfill. In accordance with the 2021 Design Operations and Closure Plan (DOCP) for the Landfill and the detailed design, the Cell 1 East base is double liner system and includes a leak detection layer. Leachate generated from the landfill will be collected within the cell and conveyed to the leachate treatment system. The leachate treatment system is batch treatment system and includes the leachate collection system, aerated equalization pond, a treated leachate holding pond and an infiltration pond.

The composite double liner system for Cell 1 East is comprised of a primary and secondary base liner. The primary base liner refers to the composite liner system that consists of an HDPE geomembrane liner and geosynthetic clay liner (GCL) which underlies the leachate collection system, and the secondary base liner refers to the composite liner system comprised from of an HDPE geomembrane liner and GCL which underlies the leak detection system.

The leachate collection system includes perforated leachate collection pipes within a stone drainage blanket sloped towards the leachate sump, with the following components:

- 300 mm thick, 50 mm diameter, clear, round stone drainage blanket, with minimal fines
- Perforated leachate collection pipes (LCP) with minimum diameter of 200 mm
- Maximum 15 m lateral spacing between leachate collection pipes (LCP) running south to north
- Maximum 50 m drainage path for leachate to travel before it is intercepted by the LCPs
- Clean-outs at each end of the LCPs
- Leachate collection header pipe at the east end of the Landfill running towards the leachate collection sump at a minimum slope of 2 percent

• Leachate sump at elevation 161.1 m AMSL with two leachate sump riser pipes with minimum diameters of 600 mm

The aerated equalization pond, also referred to as the leachate treatment pond is double lined with HDPE and includes a leak detection system. The treated leachate holding pond is double lined with coated woven polyethylene and includes a leak detection system. The infiltration pond is unlined and allows treated effluent to infiltrate into the aquifer underlying the site.

2. Construction Narrative

The following sections provide the construction narrative for Cell 1 East and ponds. Record Drawings are provided in Appendix A.

Construction activities began on March 19, 2021 and were complete on October 19, 2021.

In general, construction generally progressed as follows:

- Site preparation and excavation
- Leachate treatment pond double liner installation
- Cell 1 East double liner installation
- Cell 1 East leachate collection system
- Treated leachate effluent holding pond double liner installation

2.1 Site Preparation & Excavation

Site preparation and excavation activities included construction of berms around the Cell 1 East perimeter, excavation of the Cell 1 East base, excavation of the infiltration pond and placement of the Cell 1 East sand cushion in preparation for liner placement.

Construction activities began with the construction of the east and north Cell 1 East berms on March 19th. The north and east Berm were built in 300 mm lifts. GHD and McElhanney (geotechnical subcontractor) witnessed compaction activities and, with the Contractor established the minimum number of passes with the compactor required to ensure compaction criteria were met. McElhanney performed density testing on March 22 to confirm the compaction results.

Excavation of Cell 1 East to subgrade contours began on April 7 and continued through May 7th. A 150 mm protective layer of screened sand was placed and compacted with a vibrator packer.

Excavation of the leachate treatment pond began after the Landfill earthworks were complete. The excavation was below grade and did not require construction of any structural berms, so no compaction testing was required.

2.2 Leachate Treatment Pond Composite Double Liner

Joe Cassidy (Liner Installer) was hired as an independent contractor to oversee the geosynthetic installation. Mr. Cassidy is an experienced liner installer with over thirty years of experience in the industry. Several experienced liner technicians were also hired for the installation and worked alongside Upland's (the Contractor's) employees with Mr. Cassidy overseeing the work. The geosynthetic installation crew mobilized to site on July 28th and the installers met with GHD to confirm QA/QC requirements.

Deployment of geotextile on the leachate treatment pond slopes and GCL began on July 29th. GHD carried out a daily site inspection each day that geosynthetics were being installed until completion to verify that QC requirements were being met.

The first roll of Geomembrane was deployed on July 30th. GHD witnessed roll deployment and field sheer and peel tests. The Liner Installer performed QC on the liner and provided documentation to GHD for review. Results of the Liner Installers QA/QC are found in Appendix E. During installation, two destructive tests were collected of the Geomembrane, one from the primary and one for the secondary layer and sent to a lab for peel and sheer testing.

This exceeded the minimum requirement of one destructive test per 300 m of seaming and the results from the tests were acceptable.

Installation of Geosynthetics were completed in the leachate treatment pond on August 6th. On that date David Barbour (GHD), Terry Stuart (Upland) and Joe Cassidy (Liner Installer) inspected each panel for defects and were satisfied that no defects were found.

2.3 Cell 1 East - Composite Double Liner

Installation of geosynthetics in the Cell 1 East began on August 9th by the same personnel that installed the leachate treatment pond geosynthetics with Mr. Cassidy's oversight. Similarly, GHD inspected the bedding sand before the first roll of GCL was deployed and made inspections each day the geosynthetics were placed. The QA/QC program for the construction of the base liner systems included non-destructive testing of each seam. Details of the QA/QC program are described in Section 3.

The geosynthetic deployment began with the GCL being installed on the floor of the landfill cell near the toe of the North Berm. Rolls were deployed using an excavator in the east/west direction working from the north end of the landfill to the south. The seams of the GCL were overlapped, with the crew using factory provided indicating lines that marked the minimum overlap. The seams were heat seamed shortly after the GCL deployment. In general, the geomembrane was installed on top of the GCL as soon as the width of GCL panels would allow. This process continued until the primary GCL and geomembrane layer was installed across the landfill floor.

Geocomposite installation began after the primary geomembrane installation on the landfill floor. The geocomposite was installed with panels in the same east-west direction starting near the north toe working south. A skid-steer with smooth rubber tracks was used to deploy the geocomposite on the liner while an excavator held the rolls. GHD observed the procedures being followed by the operators and determined they were acceptable to avoid damage to the liner. The deployment procedure involved using a leaf blower to remove any debris from the area being driven on, having a spotter observe the geomembrane between the skid-steer tracks and the geocomposite, and skid steer operator never turning the equipment on the exposed geomembrane. Nylon cable ties were applied at 1.5 m intervals at the edge netting and the overlapping geotextile was heat seamed.

As the geocomposite was being placed on the base of the landfill, the crew began deploying non-woven geotextile on the slopes of the landfill. The geotextile rolls were held with an excavator while the crew placed the material manually on the slopes. The geotextile was heat seamed shortly after deployment. The GCL was placed on the slopes after the geotextile using the same method. GCL was heat seamed shortly after it was placed and covered with the second layer of Geomembrane. The primary layer of GCL and geomembrane was completed and tied into the geosynthetics on the floor of the landfill before the secondary containment layers were installed. The same procedures were followed to install the secondary geosynthetics. The smooth tracked skid steer was used to pull the geosynthetics on the base of the landfill and while the excavator held the rolls and materials were pulled by hand down the slopes. Installation of geosynthetics was completed on August 27th with the final placement of non-woven geotextile on the floor of the landfill.

2.4 Leachate Collection System

The Contractor began installing the leachate collection pipes and stone drainage layer after completion of the geosynthetics. To facilitate installation over the liner system, the contractor initially placed the stone drainage layer in 3 rows of 900 mm high lifts to form roadways from the west to the east side of the landfill cell. The material was hauled with rock trucks and placed with an excavator. Traffic cones were used for visual aids to ensure the minimum 900mm depth of material was placed. After the drain rock roads were built the contractor fused and placed perforated leachate collection pipe on the base of the landfill. A Caterpillar D5 dozer was then used to spread the drain rock in 300 mm lifts across the floor of the landfill. The contractor placed woven geotextile on top of the drain rock, completing the leachate collection system installation.

GHD made regular site inspections during the installation of the leachate collection system.

2.5 Treated Effluent Pond Double Liner

The treated effluent pond was constructed with a double layer of coated woven polyethylene and geocomposite leak detection system between the two layers. Construction commenced on Oct 15th with placement of the protective geotextile and was completed on October 19th. A leak detection sump was installed with a 50 mm HDPE perforated riser pipe.

2.6 Close-Out

GHD performed a final inspection of the Cell 1 East Works on October 5th and created a deficiency list which was provided to the Contractor. All deficiencies were addressed to the satisfaction of GHD and Upland by October 15th. The completion of the treated effluent pond double liner was inspected on October 19th. No deficiencies were found at the time.

3. Construction Quality Assurance & Quality Control

GHD carried out regular daily inspections throughout the duration of the construction to assure construction quality and quality control (QA/QC). The QA/QC program included soil density testing for compaction, product data review and geosynthetics installation QA/QC according to the design specifications.

McElhanney performed density testing with a nuclear densometer with GHD present on March 22, 2021 while fill material was being placed on the North and East Berms. Results of the test results along with the sieve analysis of the material placed are provided in Appendix C. The results of the testing were reviewed by GHD, and a procedure was established to ensure minimum density requirements would be exceeded during the placement of fill on the berms

A photo log with select photographs from throughout the construction is provided in Appendix B. Appendix C provides the material test results. Product data and submittal review logs are provided in Appendix D. Appendix E provides geosynthetics QA/QC information including the results of destructive and non-destructive quality testing. GHD's notes from select field inspections during liner installation are included in Appendix F.

3.1 Earthworks QA/QC

During site preparation and excavation activities, GHD carried out daily inspections to confirm that materials were installed according to design specifications. Inspection activities included:

- Observation of proof rolling during construction of the north and east berms
- Observation of compaction effort with McElhanney to establish minimum number of passes with the compactor required to ensure compaction criteria were met
- Confirmation that the onsite stockpiled clean screened sand was acceptable for the GCL protection layer.
- Witnessing dozer equipped with a laser level placing 150 mm screened sand and vibrator packer compacting the sand to ensure adequate protective layer

3.2 Leachate Collection System & Leak Detection Piping

QA/QC activities carried out during leachate collection system installation include the following:

- Daily inspection to witness placement of materials
- Review of submittals for pipe materials
- Review of results of sieve analysis performed on samples of drain rock material collected by Contractor. A total of 4 samples were collected and analysed.

3.3 Geosynthetics QA/QC

The Geosynthetic Installer performed QA/QC according to the design specification on all geomembrane installed. QC included performing field sheer and peel on a test weld before welding began and whenever conditions changed, pressure testing each welded seam, recording roll number and location of each panel placed, location of each repair. After each repair was made the weld was tested with a vacuum box.

GHD collected samples of welds at intervals less than 300 m of seams. The samples were sent to a lab for peel and sheer testing and the results were reviewed by GHD.

4. Conformance with Design

In general, the construction of the Cell 1 East landfill cell and ponds was carried out according to the design and specifications prepared by GHD. The below documents conformance with the original design.

4.1 Earthworks

Construction of the berms and sub-base excavations for Cell 1 East, the leachate infiltration pond and the leachate treatment pond conform with the design. No field adjustments were made for the earthworks portion.

4.2 Leachate Collection System & Leak Detection Piping

A field adjustment was made to the 300 mm HDPE leak detection system riser (see Appendix A). Adjustments from design included wrapping the perforated portion of the pipe in geo-composite and placing sandbags on the east side of the pipe to secure the pipe in place. Wrapping the pipe in geo-composite ensured there was hydraulic connectivity around the pipe. GHD witnessed the sand being placed in the leak detection portion of the sump and observed that the sump would function as intended with the modifications made. (Aug. 25 field notes)

The leak detection ports were installed differently than designed by GHD. No depression was established beneath the leak detection port as shown in Appendix A. Without the depression, the leak detection pipe could not be buried in sand as originally designed. Instead, two layers of geocomposite were installed on top of the leak detection pipe to prevent the GCL layer from deflecting around the pipe and to ensure a hydraulic connection (Field Notes Aug 21 & 23). This change was approved by GHD.

The results of the sieve analysis performed on drain rock showed fines content above the design specification for 3 out of the 4 samples. The fines content was less than or equal to 1% for all samples and the material was accepted by GHD.

The two north most leachate collection pipes on the west transition berm had perforations installed at approximately 90 degrees from the intended orientation. The Contractor provided camera footage of the inside of the pipe for GHD to review and it was determined that the perforations are orientated in the intended direction a short distance into the landfill.

4.3 Geosynthetics

Construction of the geosynthetics for Cell 1 East and the leachate treatment pond were completed according to design.

The treated effluent holding pond was originally designed to have a single HDPE liner, however the liner system design was substituted for a double coated woven polyethylene liner with a geocomposite leak detection system (double liner). The substitution was accepted by GHD on the basis that the base liner material is acceptable for the application of the pond usage. Further, the performance of the primary liner can be monitored using the leak detection layer and replaced with little effort in the future.

5. Certification

This construction report dated October 19, 2021, demonstrates that the Cell 1 East and Ponds have been constructed in accordance with OC and the most recent DOCP, with the changes noted below and approved by the undersigned during construction. Qualified Professionals completed inspections before and during construction of Cell 1 East and the Ponds.

This construction report includes the information described in Section 10.2 Construction Report(s) of the Landfill Criteria and Section 2.11 of the OC, specifically:

- Changes from the original design that were approved during construction
- · As-built record drawings of Cell 1 East and the Ponds
- All inspection and testing reports
- Quality control and quality testing results
- Soil test data including field and laboratory testing

As per Section 2.11 of the OC, with the submission of this report on October 19, 2021, waste discharge to Cell 1 East may commence 30 days after the date of this report (November 18, 2021).

All of Which is Respectfully Certified and Submitted by:

GHD LIDDY # 33386 2021-10-19

Deacon Liddy, P.Eng.

other

David Barbour, P.Eng.

Roxy Hasior, P. Eng