

Technical Memorandum

Prepared For:	Matt Rykers Environmental Science Officer, Watershed Protection City of Campbell River, Water Department	Date:	April 25, 2019
Prepared By:	Bernadette Lyons, M.Sc.E., P.Eng. Senior Hydrogeological Engineer	File No.:	3110-18-001
Subject:	Comment regarding Notice of Intent to Issue an Operational Certificate 107689 to Upland Excavating Ltd. (Upland) for a landfill located at 7295 Gold River Highway, Campbell River, BC V9H 1P1		

Waterline Resources Inc (Waterline) completed a hydrogeological review of the Waste Discharge Application (application) submitted by Upland Excavating Ltd. (Upland) to the Ministry of Environment & Climate Change Strategy (ENV) for the City of Campbell River (the City). The intent of the application is to obtain an Operational Certificate for a proposed landfill upgrade (the project) at their property located at 7295 Gold River Highway (the site) within the City. The results of Waterline's review were summarised in the *Hydrogeological Review, Proposed Upland Landfill, Campbell River BC* report submitted to the City on February 25th, 2019 (Waterline 2019).

Since the completion of our report, Waterline has reviewed two additional documents prepared by GHD Limited (GHD) in support of the application:

- *GHD Response to Waterline's Hydrogeological Review of the Proposed Upland Landfill*, dated April 9, 2019 (GHD 2019a), and
- *Groundwater and Surface Water Monitoring Data, Upland Landfill*, dated April 9, 2019 (GHD 2019b)

Following our review of the additional information and the draft Operational Certificate 107689, Waterline continues to have concerns that the groundwater monitoring and testing undertaken to date is not adequate to characterize the hydrogeological conditions at the site. The main deficiencies are summarised below:

- Manual water levels were measured by the proponent during 14 sampling events over a five-year period of investigation, the groundwater level in individual wells was measured between 2 and 12 times (GHD 2019b). No continuous groundwater level monitoring was undertaken. In Waterline's opinion, the groundwater level data collected to date is insufficient to confirm that the groundwater levels beneath the proposed landfill will meet Landfill Criteria for Municipal Solid Waste which states:

“The landfill base shall be a minimum 1.5 m above “groundwater” at all times. The separation distance shall consider the hydrogeologic conditions at the site including the hydraulic capacity of the underlying soils.” (p. 12, ENV 2016)

Given the lack of long-term, continuous, groundwater monitoring data, it is not possible to assess the following:

- the highest historical groundwater level that occurred on site over the monitoring period,
- how the groundwater elevations change (or don't change) in response to changes in the water level in McIvor Lake which is controlled by BC Hydro at the Ladore Dam,
- the hydraulic response in the sand and gravel and fractured bedrock beneath the site to significant precipitation events or unusually wet periods; and
- the hydraulic communication between the bedrock and the overburden aquifers.

A better understanding of the hydrological conditions on site are necessary to estimate the highest groundwater elevation that can reasonably be expected, to ensure that groundwater table remains 1.5 m below the base of the landfill during the 20-year operating and the 28-year estimated post closure contaminating lifespan of the landfill (GHD 2017a).

- The new bedrock contours developed from the recent geophysical investigation on site imply that the southwestern portion of the landfill will be situated at or near the bedrock surface. Groundwater level data collected from monitoring wells completed in bedrock show groundwater level elevations measured above the top of the bedrock and above groundwater levels measured in the sand and gravel aquifer. The bedrock groundwater level data do not appear to have been considered in relation to the Landfill Criteria described above.
- No on-site infiltration testing has been done. Seasonal ponding occurs in the pit and distinct horizontal layering can be observed in the south pit wall. These observations should have led to further investigation of the infiltration capacity of the site, which may be significantly lower than the assumed infiltration capacity used in the design of the infiltration ponds.

The draft Operational Certificate requires that an updated Hydrogeology and Hydrology Characterization Report (HHCR) and Design Operation and Closure Plan (DOC) be submitted “*on or before 90 days before the date of commencement of waste discharge to the New Landfill*”, however no specific requirements for additional monitoring data collection or infiltration testing to address the concerns listed above have been included in the draft Operational Certificate.

Waterline recommends that the above-noted concerns be considered by the approval agencies and addressed prior to issuing an Operational Certificate for the proposed landfill to ensure that the proposed landfill can be operated in compliance with the Landfill Criteria and that the leachate

and stormwater can be managed within the proposed infiltration ponds without significant design changes.

CERTIFICATION

This document was prepared under the direction of a professional engineer and geoscientist registered in the Province of British Columbia.

Waterline Resources Inc. trusts that the information provided in this document is sufficient for your requirements. Should you have any questions or concerns, please do not hesitate to contact the undersigned.

Respectfully submitted,

Waterline Resources Inc.

Reviewed By:

Original Signed and Stamped

Original Signed

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REFERENCES

- GHD, 2017a. 2017 Design, Operations and Closure Plan, Upland Landfill, Campbell River, British Columbia. Prepared for Upland Excavating Ltd. May 27, 2016 Amended on May 31, 2017.
- GHD, 2019a. GHD Response to Waterline's Hydrogeological Review of the Proposed Upland Landfill, Upland Excavating, Campbell River, British Columbia. Submitted to Mr. Allan Leuschen, Senior Environmental Protection Officer, Authorizations – South, Environmental Protection Division, Ministry of Environment. April 9, 2019
- GHD, 2019b. Groundwater and Surface Water Monitoring Data, Upland Landfill, Upland Excavating, Campbell River, British Columbia. Submitted to Mr. Allan Leuschen, Senior Environmental Protection Officer, Authorizations – South, Environmental Protection Division, Ministry of Environment. April 9, 2019
- Government of British Columbia Ministry of Environment (ENV), 2016. Landfill Criteria for Municipal Solid Waste, Second Edition, June 2016. Retrieved from the ENV website: https://www2.gov.bc.ca/assets/gov/environment/waste-management/garbage/landfill_criteria.pdf
- Waterline Resources Inc (Waterline), 2019. Hydrogeological Review, Proposed Upland Landfill, Campbell River BC. Prepared for the City of Campbell River. Submitted February 25, 2019.

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