City of Campbell River
Report/ Recommendation to Council

Date:	May 2, 2019	File No. 16-010
Submitted by:	Long Range Planning and Sustainability, Community Development	
Subject:	Upland Excavating Ltd. Proposed Landfill, Draft Operational Certificate City Peer Review	

Purpose / Introduction

To provide Council with an overview of:

1. The City's second portion third-party peer review technical memorandum: *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* (B. Lyons, Waterline Resources, 25 April 2019). Attached as Appendix 1.
2. Proposed next steps in the process

Recommended Resolutions

THAT the Long Range Planning and Sustainability Department 2 May 2019 report regarding Upland Excavating Ltd. Proposed Landfill, Draft Operational Certificate City Peer Review by Waterline Resources be received for information,

AND THAT the Ministry of Environment and Climate Change Strategy be provided with the Waterline Resources April 25, 2019 technical memorandum as well as its initial February 25, 2019 review, as the City of Campbell River's official comments on the Draft Operational Certificate #107689 for the Upland Excavating Ltd. Landfill at 7295 Gold River Highway,

AND THAT the Ministry be requested to address the recommendations contained within the February 25, 2019 review and April 25, 2019 technical memorandum prior to issuance of an Operational Certificate.

Background

Recent History: This report follows up on the previous Long Range Planning and Sustainability Department's 15 March 2019 report: *Upland Excavating Ltd. Proposed Landfill, City Peer Review.* This March 2019 staff report provided Council with a copy of the City's consultant's report, *Hydrogeological Review of the Proposed Upland Landfill* (B. Lyons, Waterline

Resources, 25 February 2019) which is attached as Appendix 2. The consultant's report included an assessment of:

1. technical documents supplied by Upland from their consultant GHD to Ministry of Environment and Climate Change (ENV) as part of its application
2. technical information supplied by Upland from its consultant to ENV in response the Ministry's request for additional information subsequent to the application
3. Upland's peer review completed by Patrick Consulting
4. Campbell River Environmental Committee's peer review of ENV Tasks 7 and 8 completed by GW Solutions

The City's consultant, Waterline Resources (Waterline), also conducted a site visit to the facility with Upland and City staff on 22 January 2019.

Additional review by Waterline was planned once the draft Operational Certificate was issued by the Ministry of Environment and Climate Change Strategy (ENV) along with any new supporting technical data.

Landfill Project History: Upland Excavating Ltd. (Upland) has applied to the Ministry of Environment and Climate Change Strategy (ENV) for an Operational Certificate under the *Environmental Management Act* to replace the existing landfill permit issued in 1992. If approved, the facility at 7295 Gold River Highway would be upgraded to an engineered, lined landfill with a leachate collection and treatment system. The facility would accept land clearing debris, inert construction and demolition waste and non-hazardous contaminated soil. Materials currently landfilled on site, including end-of-life creosote timbers, would be relocated to the engineered cells.

The landfill application process has been underway since 2016 and the City has submitted two sets of detailed technical review comments on the application during the public comment period. A number of Council reports have been written; the last one dated 15 March 2019 to provide Council with an overview of the City's first peer review report by Waterline Resources and providing an update on the status of ENV's timeline in relation to the issuance of a Draft Operational Certificate.

Council's interest in a third-party peer review is based on concerns and possible data gaps identified by City staff and GW Solutions Inc., (Dr. Gilles Wendling, P.Eng.) retained by the Campbell River Environmental Committee (CREC) to review Upland's technical information.

Discussion

Status of the Upland Landfill Application:
On 19 March 2019, ENV notified the City that a Draft Operational Certificate had been issued to Upland Excavating Ltd for the proposed landfill under the provisions of the *Environmental Management Act.* The Draft Operational Certificate is attached as Apppendix 3.

The Draft Operational Certification and additional information about the authorization process can be found on the ENV website at: https://www2.gov.bc.ca/gov/content/environment/air-land-water/site-permitting-compliance/upland-excavating

All of the technical data supporting the application can be found on the Upland Group's website "Reports" page at: https://www.uplandgroup.ca/reports. Twenty-six documents are listed at this location and this list has been reviewed for completeness by ENV staff.

ENV states that any comments or any person who may be adversely affected by the granting of an operational certificate and wishes to provide relevant information may, within 30 days after the last date of publication of the ENV notice, send written comments to the ENV Director.

Although the comment period officially ended 28 April 2019, ENV noted that the Public Notification Regulation Section 7(2) states that the director *"may take into consideration any information received after the 30 day period prescribed … if the director has not made a decision on the … operational certificate"*. There is every indication that the City's comments will be taken into consideration given the breadth of material received and under review by the community; however, staff are currently pursuing greater surety from ENV on this issue.

Scope of the City's Second Peer Review Technical Memorandum:
The scope of the City's third-party peer review technical memorandum: *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* (B. Lyons, Waterline Resources, 25 April 2019) included:

1. *GHD Response to Waterline's Hydrogeological Review of the Proposed Upland Landfill* (GHD is Upland's consultant)
2. *Groundwater and Surface Water Monitoring Data, Upland Landfill* (GHD, 9 April 2019)
3. Draft Operational Certificate 107689

Overview of Results:
The second portion of Waterline's review of the Upland landfill proposal and Draft Operational Certificate is brief at three pages. Essentially, Waterline's initial professional opinions remain unchanged, and the technical memorandum notes that:

> *"Waterline continues to have concerns that the groundwater monitoring testing to date is not adequate to characterize the hydrogeological conditions at the site. Even with the additional sampling that was presented and summarized by Upland's consultant, Waterline is of the opinion that groundwater monitoring should be long-term and continuous to confirm that the Landfill Criteria for Municipal Solid Waste can be met."*

The concerns that bedrock in the southwestern portion of the site and the lack of on-site infiltration testing remain.

The Draft Operational Certificate contains conditions on:

1. Authorized discharges, facilities and works
2. General requirements
3. Operating and performance requirements
4. Sampling requirements
5. Reporting requirements

Waterline's comment on the Draft Operational Certificate focuses on two key technical documents discussed in Section 2 (General Requirements): Hydrogeology and Hydrology Characterization Report and Design Operation and Closure Plan. Waterline notes that the Draft Operational Certificate requires that these two reports be submitted *"on or before 90 days before the 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.*"

Waterline recommends that the all of the concerns and data gaps should be addressed prior to the issuance of an Operational Certificate. ENV appears to be of the opinion, based on the issuance of the Draft Operational Certificate, that some of the data can be collected after issuance of the Operational Certificate and depending on the results, adjustments can be made to the design and the various plans as the site is developed. On the basis of the City's consultant's recommendations, staff recommends that these matters ought to be addressed prior to issuance of an operational certificate.

Stakeholder Response:
There has been significant response from the community with over 300 letters to ENV and Upland that have been copied to the City expressing concern about the proposal and requesting that an Operational Certificate not be approved. There may be additional letters that were not copied to the City.

Next Steps:
Staff will remain in contact with ENV to determine how the City and stakeholder comments have been incorporated in the ENV process. Should an Operational Certificate be granted, staff will write to Upland reminding the company that prior to any works associated with the development of a new landfill will, rezoning will be required.

Options

1. THAT the Long Range Planning and Sustainability Department 2 May 2019 report regarding Upland Excavating Ltd. Proposed Landfill, Draft Operational Certificate City Peer Review by Waterline Resources be received for information,

   AND THAT the Ministry of Environment and Climate Change Strategy be provided with the Waterline Resources April 25, 2019 technical memorandum as well as its initial February 25, 2019 review, as the City of Campbell River's official comments on the Draft

Operational Certificate #107689 for the Upland Excavating Ltd. Landfill at 7295 Gold River Highway,

AND THAT the Ministry be requested to address the recommendations contained within the February 25, 2019 review and April 25, 2019 technical memorandum prior to issuance of an Operational Certificate.

2. Propose further comments in addition to the Waterline Resources peer review for submission from the City to the Ministry of Environment and Climate Change Strategy.

3. Elect not to submit the Waterline Resources peer review comments to the Ministry of Environment and Climate Change Strategy.

Staff recommends Option 1. The City's drinking watershed is of paramount importance; given the nature of the landfill and the duration of potential risk, the professional peer review and assessment to date has been a worthwhile investment. Staff believe that Waterline Resources has appropriately prioritized its risk assessment and comments. However, should Council wish to add additional comments to the City submission, Option 2 is presented.

Financial /Operational Considerations

Council approved $20,000 which was included in the 2019 budget for the third-party hydrogeological review. This funding has been exhausted. Additional funding will be required should Council wish to initiate additional third party review on the environmental receptors to the southeast of the proposed landfill including the Quinsam River and the fish hatchery. This review cannot realistically be accomplished within the 30-day comment period for the Draft Operational Certificate (now expired) but could be pursued at the time of rezoning. Staff will keep Council apprised of budget implications for continuing technical review. As the Upland landfill file progresses, it is expected that other professional fees, such as further legal review, will be required. Staff time for technical review is ongoing.

Should a final Operational Certificate be issued to Upland for the proposed landfill, rezoning will be required which is expected to draw significant community interest. If zoning is successful, a development permit will then be required prior to any ground disturbance associated with the construction of the upgraded (new) landfill.

Communications

Staff will keep Council informed on:

1. Correspondence from ENV relating to the issuance of a draft Operational Certificate to Upland
2. Communications with Upland in relation to re zoning requirements

Conclusion

Staff appreciate the complexity of the technical aspects of Upland's proposed engineered landfill and will continue to work with the applicant, ENV staff and stakeholders in order to feel confident that every precaution has been considered to avoid effects on the community's drinking watershed as well as the Quinsam River fish hatchery, Cold Creek and other environmental receptors.

Attachments:

1. Waterline Resources, April 25, 2019 Technical Memorandum
2. Long Range Planning and Sustainability March 15, 2019 report which includes Waterline Resources February 25, 2019 report of the proposed landfill
3. Draft Operational Certificate #107689 Upland Excavating Ltd

Prepared by:		**Reviewed by:**
Terri Martin, R.PBio, Environmental Specialist		Chris Osborne, MRTPI, MCIP, RPP Acting Long Range Planning & Sustainability Manager

Reviewed for Form and Content / Approved for Submission to Council:

Deborah Sargent, MCIP, RPP
City Manager

Corporate Review	**Initials**
Assets and Operations	DH; NV; MR
Corporate and Protective Services	
Community Development	PW
Finance	

2430 Jingle Pot Road
Nanaimo, British Columbia
Canada V9R 6W2
Tel: 250.585.0800
Toll Free: 1.844.585.0800
www.waterlineresources.com

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.

Original Signed and Stamped

Bernadette Lyons, M.Sc.E., P.Eng.
Senior Hydrogeological Engineer

Reviewed By:

Original Signed

Darren David, M.Sc. P.Geo.
Principal Hydrogeologist

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.

LIMITATIONS AND USE

The information presented in this document was compiled exclusively for (the City of Campbell River) (the Client) by Waterline Resources Inc. (Waterline). This work was completed in accordance with the scope of work for this project that was agreed between Waterline and the Client. Waterline exercised reasonable skill, care and diligence to assess the information acquired during the preparation of this document, but makes no guarantees or warranties as to the accuracy or completeness of this information. The information contained in this document is based upon, and limited by, the circumstances and conditions acknowledged herein, and upon information available at the time of the preparation of this document. Any information provided by others is believed to be accurate but cannot be guaranteed. No other warranty, expressed or implied, is made as to the professional services provided to the Client.

Any use, reliance on, or decision made, by a third party based on this document is the sole responsibility of said third party. Waterline makes no representation or warranty to any third party with regard to this document and, or the work referred to in this document, and accepts no duty of care to any third party or any liability or responsibility whatsoever for any losses, expenses, damages, fines, penalties or other harm that may be suffered or incurred as a result of the use of, reliance on, any decision made, or any action taken based on, this document or the work referred to in this document.

When Waterline submits instruments of professional service; including, reports, drawings and project-related deliverables, the Client agrees that only original signed and stamped paper versions shall be considered as original documents. The hard copy versions submitted by Waterline to the Client shall be considered as copies of the original documents, and in the event of a dispute or discrepancy, the signed and stamped original documents retained by Waterline shall govern over all copies, electronic or otherwise, provided to the Client.

This document is intended to be used in its entirety, and no individual part of the document may be taken as representative of the findings of the document. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form, by any third party, without the expressed written permission of the Client or Waterline.

City of Campbell River
Report/ Recommendation to Council

Date:	March 15, 2019	File No. 16-010
Submitted by:	Long Range Planning and Sustainability, Community Development	
Subject:	Upland Excavating Ltd. Proposed Landfill, City Peer Review	

Purpose / Introduction

To provide Council with an overview of the:

1. City's third-party peer review report: *Hydrogeological Review of the Proposed Upland Landfill* (B. Lyons, Waterline Resources, 25 February 2019)
2. Status of the Ministry of Environment and Climate Change Strategy (ENV) issuance of the draft Operational Certificate for Upland Excavating Ltd.'s application for an engineered landfill
3. Proposed next steps in the process

Recommended Resolutions

THAT the Long Range Planning and Sustainability Department 15 March 2019 report regarding Upland Excavating Ltd. Proposed Landfill, City Peer Review by Waterline Resources be received for information,

AND THAT the Ministry of Environment and Climate Change Strategy be requested to:

1. **advise the City (in writing) on how the concerns raised in the City peer review report will be addressed, and**
2. **extend the 30-day comment period for the draft Operational Certificate to Upland Excavating Ltd. to ensure that the City's consultant has adequate time to review the supporting technical information.**

Background

This report addresses two resolutions from the 19 November 2018 Council meeting:

> ic 18-0245
> *THAT Council receive the attached draft scope of work for a Qualified Professional review of the technical information supporting Upland Excavating Ltd.'s application to the Ministry of Environment and Climate Change Strategy for an engineered landfill as recommended in the report dated November 9, 2018 from the Long Range Planning & Sustainability and Water Departments.*

ic 18-0246
THAT Council direct staff to obtain a Qualified Professional review of the technical information supporting Upland Excavating Ltd.'s application to the Ministry of Environment and Climate Change Strategy for an engineered landfill in the amount of $20,000, with funding to come from Council Contingency in 2018.

Upland Excavating Ltd. (Upland) has applied to the Ministry of Environment and Climate Change Strategy (ENV) for an Operational Certificate under the *Environmental Management Act* to replace the existing landfill permit issued in 1992. If approved, the facility at 7295 Gold River Highway would be upgraded to an engineered, lined landfill with a leachate collection and treatment system. The facility would accept land clearing debris, inert construction and demolition waste and non-hazardous contaminated soil. Materials currently landfilled on site, including end of life creosote timbers, would be relocated to the engineered cells.

The landfill application process has been underway since 2016 and the City has submitted two sets of detailed technical review comments on the application during the public comment period. A number of Council reports have been written; the last one dated 9 November 2018 which proposed a scope of work for a Qualified Professional peer review of Upland's relevant technical information including site hydrogeology, hydrology characterizations, groundwater divide, and the risk to the City's drinking water supply and to Quinsam and Cold Creek.

Council's interest in a third-party peer review is based on concerns and possible data gaps identified by City staff and GW Solutions Inc., Dr. Gilles Wendling, P.Eng. retained by the Campbell River Environmental Committee (CREC) to review Upland's technical information.

Discussion

Overview of the City's Peer Review Report:
Hydrogeological Review of the Proposed Upland Landfill (B. Lyons, Waterline Resources, 25 February 2019) is attached as Appendix 1.
The peer review scope of work included assessment of:

1. technical documents supplied by Upland from their consultant GHD to ENV as part of their application
2. technical information supplied by Upland from their consultant to ENV in response the Ministry's request for additional information subsequent to the application
3. Upland's peer review completed by Guy Patrick
4. Campbell River Environmental Committee's peer review of ENV Tasks 7 and 8 completed by GW Solutions

In addition to reviewing the relevant documents, the City's consultant, Waterline Resources (Waterline), also conducted a site visit to the facility with Upland and City staff on 22 January 2019.

Risk to the City's Drinking Water:
Waterline assessed that the risk to the City's water supply appears to be low given that the groundwater gradient has historically been from Rico and McIvor Lakes southeast towards the landfill. Although there appears to be a hydraulic connection between the lakes and the aquifer below the landfill, the groundwater gradient is not expected to change or could be managed. Managing this risk could include ensuring that the level of Rico Lake is maintained above the water level in the infiltration ponds and gravel pit. For the gradients to reverse, causing groundwater to flow from the landfill area to the lakes, the hydraulic pressure in the landfill, infiltration ponds and/or pit area would have to be higher than the water levels in the lakes.

Furthermore, for contamination from the landfill to reach the lakes the gradient reversal would have to be maintained long enough for contaminant migration. Waterline notes that even if water levels in the pit area build up to a level higher than the lake levels there will likely be a significant hydraulic gradient moving groundwater primarily to the southeast.

Risk to the Quinsam River including Cold Creek and the Fish Hatchery:
Waterline will assess these risks once the draft Operational Certificate and the additional supporting technical information has been issued for public comment. This information is needed to understand what data gaps of consequence still remain and if these gaps exist, how ENV will manage potential deficiencies through conditions in the draft Operational Certificate. Some of the data deficiencies and concerns currently flagged by Waterline are highlighted below.

Baseline Groundwater and Surface Water Data:
It is Waterline's opinion that insufficient baseline groundwater and surface water data, including water chemistry, has been collected by Upland's consultant to fully characterize the local and regional hydrogeological system in relation to the proposed landfill project. ENV has confirmed that Upland's consultant has collected additional groundwater information since the application was submitted in 2016; however, this information was not available in time for this review. ENV noted to staff that this information will form an additional technical document available for public review when the draft Operational Certificate for the proposed landfill is issued.

Fractured Bedrock Characterization:
Waterline indicates that it appears that the hydraulic connection between the bedrock aquifer and the sand and gravel aquifer in the pit area have been mischaracterized. Based on the available data, it is Waterline's view that the bedrock and sand and gravel aquifer are not acting as a single hydraulic unit as described by the applicant's consultant. This matters because this information factors into the analyses that form the landfill design and influence the environmental impact assessment. Based on updated bedrock surface characterization supplied by the applicant's consultant, Waterline indicates that the surface of groundwater in the bedrock would likely be above the base of the landfill in the southwest corner of the proposed landfill and this would have implications for meeting the ENV landfill criteria.

Infiltration Capacity:
Testing for site-specific infiltration capacity should have been conducted to determine if the native soil has the capacity to infiltrate the treated leachate at the design rate. The applicant's consultant has indicated that this testing will be done during the detailed design phase; however, Waterline has recommended that these tests should have been done even at the preliminary landfill design phase. To date the hydraulic conductivity testing has largely evaluated horizontal hydraulic conductivity of the sand and gravel aquifer. Vertical infiltration is typically an order of magnitude less due to layered sedimentary deposition. Ponding observed in the pit and the distinct layering observed in the south pit wall indicate that vertical infiltration requires further investigation.

Leachate Generation and Impacts:
Rainfall from extreme storms and the resulting leachate production should be estimated and compared to the available storage in the landfill waste at various phases of operation and landfill closure to confirm that adequate storage is available. Waterline notes that modelling is currently based on monthly precipitation and this may not be adequate to address extreme storm rainfall events. This could influence strategies to address these events.

Other Considerations:
In light of the above listed concerns, Waterline recommends that the proposed groundwater monitoring program will need to be reconsidered. The report also recommends that there should be an understanding of how the closure plan for the landfill ties into the closure of the site as a whole (the gravel pit operates under a separate Mine Permit).

Next Steps:
Staff will seek further review from Waterline Resources once the draft Operational Certificate is issued by ENV to:

1. review additional and updated technical information from Upland's consultant to support the proposed landfill
2. review the draft Operational Certificate conditions

The purpose of this ongoing review will be to assess potential risk to environmental receptors in the Quinsam and Cold Creek watersheds once the additional data has been provided, comment on the completeness of the hydrogeological characterization and the proposed environmental monitoring program.

ENV indicated (12 March 2019) that a Notice of Intent and the draft Operational Certificate will be issued shortly, and this will trigger the 30-day public comment period.

The Statutory Decision Maker from ENV, Luc Lachance, has indicated that a decision will not necessarily be made immediately after the 30-day comment period is over as all of the comments received will need to be reviewed and the most appropriate course of action determined. Although ENV has assured that this provides a little leeway time for the City's comments to come in after the 30-day period, the City's consultant will not be able to start the review until the end of April. Timing is expected to be tight and a request to ENV for a formal extension is advisable.

Options

1. THAT the Long Range Planning and Sustainability Department 15 March 2019 report regarding Upland Excavating Ltd. Proposed Landfill, City Peer Review by Waterline Resources be received for information,

   AND THAT the Ministry of Environment and Climate Change Strategy be requested to:

   1. advise the City (in writing) on how the concerns raised in the City peer review report will be addressed, and
   2. extend the 30-day comment period for the draft Operational Certificate to Upland Excavating Ltd. to ensure that the City's consultant has adequate time to review the supporting technical information.

2. Propose additional peer review of the data from the City consultant beyond what has been outlined in this report's section on next steps.

3. Elect not to continue additional peer review of the technical information supporting the draft Operational Certificate including the certificate conditions.

Staff are recommending Option 1. The City's drinking watershed is of paramount importance as are the environmental receptors to the southeast of the proposed landfill including the Quinsam River and the fish hatchery. Given the nature of the landfill and the duration of potential risk, continued professional assessment is a worthwhile investment.

Financial /Operational Considerations

Council approved $20,000 which was included in the 2019 budget for the third-party hydrogeological review. Some of this funding remains but additional funding may be required depending on the amount of additional technical data that is presented with the issuance of the draft Operational Certificate. Staff will keep Council apprised of budget implications for continuing technical review. As the Upland landfill file progresses, it is expected that other professional fees, such as further legal review, will be required. Staff time for technical review is ongoing.

Should a final Operational Certificate be issued to Upland for the proposed landfill, rezoning will be required which is expected to draw significant community interest. If zoning is successful, a development permit will then be required prior to any ground disturbance associated with the construction of the upgraded landfill.

Communications

Staff will keep Council informed on:

1. Timing of the ENV issuance of a draft Operational Certificate to Upland – the City has 30 days to comment once the draft is issued
2. Continued City led third-party peer review of the technical documents including ENV feedback

.

Conclusion

Staff appreciate the complexity of the technical aspects of Upland's proposed engineered landfill and will continue to work with the applicant, ENV staff and stakeholders in order to feel confident that every precaution has been considered to avoid effects on the community's drinking watershed as well as the Quinsam River fish hatchery, Cold Creek and other environmental receptors. The third-party peer review of the technical information is helping with staff preparations to comment when ENV issues a draft Operational Certificate for the proposed landfill.

Attachments:

1. *Hydrogeological Review of the Proposed Upland Landfill* (B. Lyons, Waterline Resources, 25 February 2019).

Prepared by:		**Reviewed by:**
Terri Martin, R.PBio, Environmental Specialist		Amber Zirnhelt, M.Sc., MCIP, RPP Long Range Planning & Sustainability Manager

Reviewed for Form and Content / Approved for Submission to Council:
Deborah Sargent, MCIP, RPP **City Manager**

Corporate Review	**Initials**
Assets and Operations	DH; NV; MR
Corporate and Protective Services	
Community Development	
Finance	

Waterline

www.waterlineresorces.com

2430 Jingle Pot Rd
Nanaimo, British Columbia
Canada V9R 6W2
I: 250.585.0800
Fax: 250.585.0802
Toll Free: 1.888.641.6795

February 25, 2019
3110-18-001

City of Campbell River, Water Department
1120 Evergreen Road
Campbell River, BC V9W 0B1

Attention: Matt Rykers, Environmental Science Officer – Watershed Protection

RE: Hydrogeological Review of the Proposed Upland Landfill

1.0 INTRODUCTION

Upland Excavating LTD (Upland) has submitted a Waste Discharge Application (Application) to the Ministry of Environment & Climate Change Strategy (ENV) in order 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 of Campbell River (the City). The Site location is shown in Figure 1. Upland retained GHD Limited (GHD) as a Qualified Professional (QP) to assist with the Application submission to ENV. GHD submitted a series of technical documents relating to proposed landfill engineering design including an assessment of the local and regional hydrogeology.

The Site is located adjacent to Rico and McIvor Lake and within the boundary of provincially mapped surficial sand and gravel Aquifer #975 (ENV 2017) which is underlain by an unmapped fractured bedrock aquifer. The City's municipal water supply is sourced from the Campbell River watershed downstream of McIvor Lake. The City is concerned that the proposed landfill could impact their water supply. The concern relates to the possibility of contaminant migration via groundwater through the underlying sand and gravel and/or bedrock to McIvor Lake, either directly or through Rico Lake.

1.1 Scope of Work

Waterline Resources Inc. (Waterline) was retained by the City to review the reports submitted by GHD to provide comments on the site hydrogeology and hydrology characterization, groundwater divide, and risk to the drinking water supply. The City recognizes that additional testing and/or data may be necessary, and beyond the scope of this initial review.

In addition, the City provided Waterline with a series of question to guide the review. Waterline has provided answers to these questions in Appendix A.

Waterline, as a hydrogeology QP, has only address the potential for contaminant from the proposed landfill to reach McIvor and/or Rico lakes through a groundwater pathway. Issues relating to surface water contaminant mixing and transport if contaminants from the landfill were determined to reach the lakes was not considered by Waterline as it would require a detailed understanding of lake hydrology which is outside of Waterline's field of practice.

1.1.1 Documents Reviewed and Site Visit

Waterline reviewed the following documents prepared by GHD and provided by the City:

- *Technical Assessment Report* (TAR) (GHD 2017c),
- *Hydrogeology and Hydrology Characterization Report* (HHCR) (GHD 2017b), and
- *2017 Design, Operations and Closure Plan* (DOCP)(GHD 2017a).

The *2016 Geotechnical Investigation* (GHD 2016) was also reviewed to confirm that any relevant hydrogeological data collected was included and agreed with the HHCR.

Waterline understands that the Ministry of Environment & Climate Change Strategy (ENV) also reviewed the GHD documents and prepared a formal memorandum with a list of recommendations and requesting additional information. Waterline has not reviewed the ENV memorandum but did review the following letter reports prepared by GHD to address ENV's recommendations:

- *Technical Response Letter, Task 1 Technical Work Plan and Schedule*, dated March 7, 2018 (March 7, 2018 TRL) (GHD 2018b)
- *Technical Response Letter*, dated March 23, 2018 (March 23, 2018 TRL) (GHD 2018a) which provides additional information on contingency planning and an updated landfill liner design including leak detection system
- *Technical Response Letter, Task 8 – Sand and Gravel Aquifer Pumping Tests*, (Task 8 TRL) (GHD 2018c) dated October 1
- *Technical Response Letter, Task 7 – Additional Bedrock Characterization* (Task 7 TRL) (GHD 2018d) dated December 11, 2018

In addition, Waterline reviewed:

- A peer review letter prepared by Mr. Guy Patrick, P.Eng undertaken on behalf of Upland (Patrick Consulting 2017) and GHD's response to the peer review (GHD 2017e). Mr. Patrick provided a peer review of the original 2017 technical reports submitted for the Application, his review did not include the supplemental information provided in the technical response letters to ENV's memorandum.
- A letter report prepared by GW Solutions (GWS 2018) on behalf of the Campbell River Environmental Group (CREC). The GW Solutions' report provided review comments on GHD's technical responses for Task 7 and 8.

Waterline completed a tour of the Site with Upland and City staff on January 22, 2019.

2.0 HYDROGEOLOGICAL REVIEW COMMENTS

2.1 Potential Contaminant Pathway to McIvor and Rico Lakes

As part of our review, Waterline was requested to consider the potential for contaminant migration from the proposed landfill to McIvor and/or Rico Lake. The potential for contamination that reaches either lake to adversely affect the City's water supply is a surface water contaminant mixing and transport study and is out of Waterline's area of expertise.

Based on the information reviewed, a hydraulic connection likely exists between the lakes and the aquifers beneath the proposed landfill, however insufficient data has been collected to fully understand this connection. The groundwater flow regime is a gravity driven system and will be influenced by natural landforms, surficial sediment and bedrock structure, watershed geometry (lake and river levels), recharge and surface activities. Bedrock surface mapping in the vicinity of the landfill slopes to the southeast and away from the lakes suggesting that the natural groundwater flow follows a similar pattern.

The limited groundwater level data set collected for the Site indicate that groundwater is flowing from the lakes across the Upland gravel pit property to the southeast, shown on Figure 2. For the gradients to reverse, causing groundwater to flow from the landfill area to the lakes, the hydraulic head in the landfill, infiltration ponds and/or pit area would have to be higher than the water levels in the lakes. Furthermore, for contamination from the landfill to reach the lakes the gradient reversal would have to be maintained for long enough for contaminates to migrate to the lakes. It should also be noted that even if water levels in the pit area build up to a level higher than the lake levels there will likely still be a significant hydraulic gradient moving groundwater primarily to the southeast.

The DOCP notes that water levels in the waste will be maintained at less than 0.3 m above the liner, therefore the maximum head in the landfill should be below 168.3 m AMSL. The design elevation of the top of the infiltration ponds is 170 m AMSL (Figure 3). Section 8.4.3 of the DOCP notes that in the case of a multi-day precipitation event temporarily overwhelming the infiltration areas, excess water will be directed to the pit floor. The pit floor elevation is 172 m AMSL, the pit floor covers an extensive area (Figure 2), and therefore it is assumed that water elevations in the pit would likely not exceed 173 m AMSL. The closure plan presented in Section 8 and 11 of the DOCP, indicates that the long-term infiltration of runoff from the landfill will be to the base of the pit.

Page 21 of the HHCR gives the following description of McIvor Lake levels:
"The elevation of McIvor Lake is partially controlled by BC Hydro's Ladore Dam located on the northern shore of McIvor Lake approximately 1.7 km northwest of Site. BC Hydro attempts to

maintain a preferred water elevation at Ladore Dam between 176 and 178 m AMSL and has established and a minimum operational water elevation of 174 m AMSL (BC Hydro, 2016). Based on BC Hydro records, water elevations at Ladore Dam have fluctuated between 174.5 and 177.9 m AMSL since 2008."

Assuming:

- The proponent is able to address the infiltration and high groundwater table concerns noted in the following sections of this report and any associated design changes do not raise the water level in the landfill area above the minimum operational level of McIvor Lake
- The landfill design and closure plan remains as described in the DOCP,
- BC Hydro does not change the management plan for the Ladore Dam,
- There is no catastrophic event that damages the dam and significantly lowers the water level in McIvor Lake, and
- The closure plan for the whole site which has not been reviewed does not significantly change the hydraulics of the site.

It is unlikely that contamination from the proposed landfill, as currently designed, would reach McIvor Lake.

It should be noted that the geological continuity of the sand and gravel deposit between the landfill and McIvor Lake is based on regional information and has not been verified since groundwater is not expected to flow towards the lake.

Rico Lake was formed after the Gold River Highway was built, water from the Rico Lake is thought to seep under the highway toward McIvor Lake though a French drain, the Upland operation uses Rico Lake as a water source (Terry Stuart and Mark Stuart pers. comm). Six Rico Lake level measurements were presented in the reports reviewed, the lake level ranged from 181.2 m AMSL on January 29, 2016 and March 6, 2016 to178 m AMSL on September 17, 2018. Over the range of measured lake levels, water from Rico Lake in addition to flowing under the highway toward McIvor Lake would likely flow to the gravel pit either though the bedrock aquifer or though the sand and gravel in the recently delineated bedrock trough, shown on Figure 4. The base of the bedrock trough has not been established but based on the geophysical interpretation presented in the Task 7 TRL it is below 172 m AMSL. The HHCR notes that the bottom of Rico Lake is at 168 m AMSL.

There is a possibility that groundwater from the landfill area could migrate toward Rico Lake if the water level in Rico Lake fell below the ponded water level in the infiltration ponds or gravel pit, i.e. below 170 m AMSL under normal operating conditions or below 173 m AMSL if the gravel pit was flooded. In this case the water would only flow west toward McIvor Lake if the McIvor Lake level was lower than Rico Lake level. As noted above BC Hydro's current minimum operational water elevation for McIvor Lake is 174 M AMSL, therefore in a situation where Rico lake levels are low enough to induce groundwater flow from the landfill to Rico Lake the surface water gradient would most likely be from McIvor Lake to Rico Lake. The potential for groundwater to be a pathway for contamination of Rico Lake could be mitigated by ensuring that the lake level is maintained above the water level in the infiltration ponds and gravel pit. Ongoing monitoring of water levels in Rico

Lake and the bedrock and sand and gravel aquifer would help clarify the nature of the hydraulic connection between the lake and the proposed landfill.

2.2 Long-Term Water Level Monitoring

In Waterline's opinion, insufficient baseline groundwater and surface water data has been collected by GHD to fully characterize the local and regional hydrogeological system in relation to the proposed landfill project. The landfill design and aquifer characterization presented in the HHCR and DOCP rely largely on groundwater level monitoring data collected on April 6, 2017. It is not possible to assess the effect of seasonal and long-term variability on groundwater flow using a single groundwater monitoring event. At the request ENV, GHD collected supplemental data in an attempt to help understand the seasonal variability in groundwater levels (GHD 2018d). However; this only included two additional rounds of groundwater measurements and sampling conducted on June 7, 2018 and September 17, 2018. The most complete groundwater level data for the Site are shown on Table 5.1 in the March 23, 2018 TRL, reproduced here as Figure 5.

The standard hydrogeological practice for collecting long-term groundwater and surface water data is to install data loggers in monitoring wells and surface water bodies (lakes, creeks, ponds). This would allow for an ongoing analysis of the hydraulic inter-connections and relationship between the groundwater levels in the sand and gravel and bedrock aquifers to the changes in water levels in Rico and McIvor lakes. This data should also be compared to the local climate data (i.e.: precipitation) to improve the understanding of infiltration and recharge at the Site which is a critical factor in landfill design and operation.

The landfill design presented by GHD (2018a) is reproduced as Figure 3 for reference purposes. It shows the base of the landfill sloping from an elevation of 168 m AMSL on the south side to a sump elevation of 164 m AMSL at the center of the northern edge of the landfill. As referenced in GHD's DOCP report, the Landfill Criteria for Municipal Solid Waste (ENV 2016) requires that the landfill base be maintained at a minimum height of 1.5 m above the groundwater table at all times. Insufficient water level data has been collected to demonstrate that groundwater levels will remain 1.5 m below the base of landfill. In fact, groundwater levels at MW4A-15 was measured at 165.9 m AMSL on the 6 April 2017, and at 165.2 m AMSL in MW4B-15 on the 11 September 2015 which are above the design elevation of the sump and likely do not meet the ENV landfill criteria. It should be specifically noted that no groundwater level measurements have been collected in the months of November or December which are generally the two wettest months of the year in the Campbell River area based on the historical precipitation record (Government of Canada 2018).

Given the lack of long-term 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, and
- The hydraulic response in the sand and gravel and fractured bedrock beneath the Site to significant precipitation events or unusually wet periods.

A better understanding of the hydrological conditions on site are necessary to estimate the highest groundwater elevation expected over the life of the landfill, to ensure that groundwater remains 1.5 m below the base of the landfill during the operating and the estimated post closure contaminating lifespan of the landfill.

2.3 Fractured Bedrock Characterization

The bedrock at the site is described by GHD (2107b) as a Karmutsen Formation basalt with a varying degree of weathering and fracturing. The hydrogeological characterization of the bedrock beneath the Site has been largely focused on assessing the potential hydraulic connection between the proposed landfill and Rico Lake. An annotated copy of the GHD's bedrock surface contour map is included as Figure 4 (GHD 2018d). The update bedrock contours (Figure 4), show that the southwest corner of the proposed landfill will be at or near the bedrock surface. Groundwater level data collected by GHD from monitoring wells completed in bedrock show groundwater level elevations consistently being measured above the top of the bedrock and above groundwater levels measured in the sand and gravel aquifer (Figure 5). This information indicates the presence of an upward gradient from the bedrock to the sand and gravel aquifer. Considering the updated bedrock surface present by GHD (GHD 2018d) and the observed groundwater levels in the bedrock, the piezometric surface of groundwater in the bedrock would likely be above the base of the landfill in the southwest corner of the proposed landfill. The bedrock groundwater level data do not appear to have been considered by GHD in relation to the ENV landfill criteria requirement of that groundwater levels be maintained 1.5 m below the base of the landfill.

GHD appears to have repeatedly mischaracterised the hydraulic connection between the bedrock aquifer and the sand and gravel aquifer in the pit area. The following paragraph is an excerpt taken from page 7 of GHD's March 17, 2018 TRP but was previously noted in the HHCR and DOCP:

"Significant fracturing has been noted in the boring advanced within the Pit (MW4A-15), including evidence of weathering (i.e. iron staining) and secondary mineralization observed in some fractures. Analysis of hydraulic conductivity testing of the weathered zone gives a K ~ $2x10^{-2}$ cm/s, which is very permeable and essentially an equivalent porous media. As a result, the upper weathered bedrock zone and overlying sand and gravel aquifer can functionally be considered the same hydrogeologic unit."

If the upper portion of the bedrock aquifer and sand and gravel aquifer were essentially the same hydrologic unit as GHD suggests, then groundwater levels in the nested wells MW4A-15 (completed in the top 3 m of fractured bedrock) and MW4B-15 (completed in the overlying sand and gravel) should have the same elevation when measured at the same time. However as can be seen in GHD's water level summary table (Figure 5) groundwater levels in the bedrock well MW4A-15 are consistently 0.2 to 0.3 m higher than in the nested well completed in the sand and gravel aquifer, MW4B-15. This clearly shows that the bedrock and sand and gravel aquifer are not acting as a single hydraulic unit at this location.

Based on this incorrect assumption, GHD included the top 3 m of the bedrock aquifer as part of the sand and gravel aquifer in the pump test analysis presented in the Task 8 TRL. This information was also used to assess groundwater flow beneath the landfill and subsequent leachate dilution calculations presented in Section 13 of the DOCP. Therefore, these analyses cannot be relied upon as a basis for landfill design or environmental impact assessment and should be revised.

2.4 Infiltration Capacity and Groundwater Mounding

No infiltration capacity testing has been done to determine if the native soil has the capacity to infiltrate the treated leachate at the design rate of 60 mm/hr (GHD 2017a) or if groundwater mounding will occur. Section 8.4.5 of the DOCP states that the infiltration rate applied for the design and sizing of the infiltration ponds was based on book values for gravel and sand materials and compared to hydraulic conductivity estimates presented in the HHCR. GHD notes that infiltration testing will be done during the detailed design phase of the project (GHD 2017a).

To date all hydraulic conductivity testing undertaken at site, including slug tests and one low rate pumping test, have largely evaluated the horizontal hydraulic conductivity of the sand and gravel aquifer. Infiltration capacity is limited by the vertical hydraulic conductivity of the aquifer which is typically an order of magnitude less than the horizontal hydraulic conductivity due to the layered deposition of sedimentary systems. Distinct near horizontal layering observed in the south pit wall (Figure 6), indicates that vertical hydraulic conductivity maybe significantly less than horizontal hydraulic conductivity at the Site.

During Waterline's January 22, 2019 site visit, significant ponding was noted in the base of the pit (Figure 7). The Upland staff indicated that the pond remains for most of the winter but the area is consistently dry in the summer (Terry Stuart and Mark Stuart pers. comm.). The cause of ponding in the pit needs to be further investigated as it appears to contradict GHD's interpretation of high infiltration capacity. The layered structure of the sand and gravel aquifer visible in the south pit wall, should have prompted in-situ testing to determine the site-specific infiltration capacity even for the preliminary landfill design.

2.5 Leachate Generation and Groundwater and Surface Water Impacts Assessment

Section 9 and 13 of GHD's DOCP report provides an estimate of leachate volumes, groundwater flow beneath the landfill and contaminant travel times over the life of the landfill. The estimates were based on very limited data do not appear account for the variability or complexity in the aquifer as discussed above.

GHD modelled leachate generation based on monthly precipitation taken from Canadian Climate Normals (1981 – 2010) for Campbell River. It appears that no design storm analysis was undertaken to assess possible climate extremes. Rather, GHD suggests that 0.3 m of storage is available in the waste pile to manage a potentially large volume of leachate generated during a storm event. Scientifically defensible data is needed to verify site conditions and to determine if the adaptive management strategies presented are suitable. Specifically, leachate volumes

generated by design storms needs to be estimated and compared to available storage in the waste at various phases of operation and closure to confirm that adequate storage is available.

The groundwater flow beneath the landfill, dilution calculations, contaminant travel times and leachate pond volumes will all need to be reconsidered if a portion of the landfill sits directly on bedrock, and once the implications of the ponding are understood and the infiltration capacity is investigated.

2.6 Baseline Water Quality Assessment

Only two rounds of baseline groundwater quality sampling were completed to date which is not sufficient to provide statistically meaningful baseline water chemistry, especially since possible seasonal differences in groundwater chemistry were noted in the HHCR. The standard tool used to assess hydrochemistry from groundwater with various sources of recharge (bedrock aquifer, sand and gravel aquifer, surface water/precipitation) is to plot major ion chemistry on trilinear diagrams (e.g.: Piper Plots). The grouping of water samples on the Piper Plots allows for a visual assessment of recharge source and seasonal changes in groundwater chemistry, helping to better understand aquifer and groundwater-surface water interactions.

2.7 Proposed Environmental Monitoring Program

The recommended environmental monitoring program is presented in Section 14 of GHD's DOCP. Given the lack of continuous baseline groundwater monitoring, the mis-characterization of groundwater in the fractured bedrock (i.e.: water levels in bedrock wells indicated to be higher than in sand and gravel wells), and observed ponding in the pit area, the proposed groundwater monitoring program will need to be re-considered.

The frequency of groundwater and Rico Lake level monitoring was not specified; long-term, continuous monitoring using pressure transducers and data loggers calibrated to manual readings is recommended. Installation of data loggers that measure water level, temperature and electrical conductivity should be considered for establishing trends and seasonal fluctuations as an indicator of groundwater infiltration and recharge. More frequent groundwater quality monitoring using field test kits to assess indicator parameters (e.g.: electrical conductivity/total dissolved solids) should also be considered and verified with lab analysis.

3.0 CERTIFICATION

This document was prepared under the direction of a professional engineer and reviewed by a professional 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.

Original Signed and Stamped

Bernadette Lyons, M.Sc.E., P.Eng.
Senior Hydrogeological Engineer

Reviewed By:

Original Signed

Darren David, M.Sc. P.Geo.
Principal Hydrogeologist

4.0 REFERENCES

Environmental Management Act, Contaminated Site Regulation (CSR), BC Reg 375/96. Consolidation current to July 24, 2018 Retrieved from the BC Laws website: http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/375_96_00

Environmental Management Act, Hazardous Waste Regulation (HWR), BC Reg 63/88. Consolidation current to January 8, 2018 Retrieved from the BC Laws website: http://www.bclaws.ca/Recon/document/ID/freeside/63_88_00

GHD, 2016. 2016 Geotechnical Investigation, Upland Landfill, Campbell River, British Columbia. Prepared for Upland Excavating Ltd. May 27, 2016.

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, 2017b. Hydrogeology and Hydrology Characterization Report, Proposed Upland Landfill, Campbell River, British Columbia. Prepared for Upland Excavating Ltd. May 27, 2016 Amended on May 31, 2017.

GHD, 2017c. Technical Assessment Report, Waste Discharge Application, Upland Landfill, Campbell River, British Columbia. Prepared for Upland Excavating Ltd. May 27, 2016. Amendment May 31, 2017.

GHD, 2017d. Independent Peer Review, Upland Landfill – Waste Discharge Application, (Tracking No. 335965, Authorization No. 107689), Upland Excavating, Campbell River, British Columbia. Submitted to Mr. Allan Leuschen, Senior Environmental Protection Officer, Authorizations – South, Environmental Protection Division, Ministry of Environment. October 5, 2017

GHD, 2017e. Technical Addendum, Peer Review Response, Upland Landfill – Waste Discharge Application, (Tracking No. 335965, Authorization No. 107689), Upland Excavating, Campbell River, British Columbia. Submitted to Mr. Allan Leuschen, Senior Environmental Protection Officer, Authorizations – South, Environmental Protection Division, Ministry of Environment. October 5, 2017

GHD, 2018a. Technical Response to ENV Review (Auth. No.:Pr-10807), 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. March 23, 2018

GHD, 2018b. Technical Work Plan and Schedule, 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. March 23, 2018

GHD, 2018c. Technical Response to ENV Review (Auth. No.:Pr-10807), Task 8 – Sand and Gravel Aquifer Pumping Tests, 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. October 1, 2018.

GHD, 2018d. Technical Response to ENV Review (Auth. No.:Pr-10807), Task 7 – Additional Bedrock Characterization, 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. October 1, 2018. Amendment December 11, 2018.

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

Government of British Columbia Ministry of Environment - Water Protection and Sustainability (ENV), 2017. Ground Water Aquifers. Aquifer Classification Worksheet Aquifer 975. Retrieved from the ENV website: https://catalogue.data.gov.bc.ca/dataset/ground-water-aquifers

Government of Canada – Environment and Natural Resources. 2018. Canadian Climate Normals 1981-2010, Campbell River Airport (Stn # 1021261).

GW Solutions, 2018. Review of GHD Technical Responses Task 7 and Task 8, Upland Landfill, Waste Discharge Application, Tracking No. 335965, (Auth. No.:Pr-10807), 7295 Gold River Highway, Campbell River, British Columbia. Prepared for Leona Adams, Campbell River Environment Committee. December 21, 2018.

Patrick, Guy. 2017. Peer Review of Technical Reports, Proposed Upland Landfill, Campbell River, BC. Prepared by Patrick Consulting on behalf of GHD and Upland Excavating Ltd. September 8, 2017.

5.0 LIMITATIONS AND USE

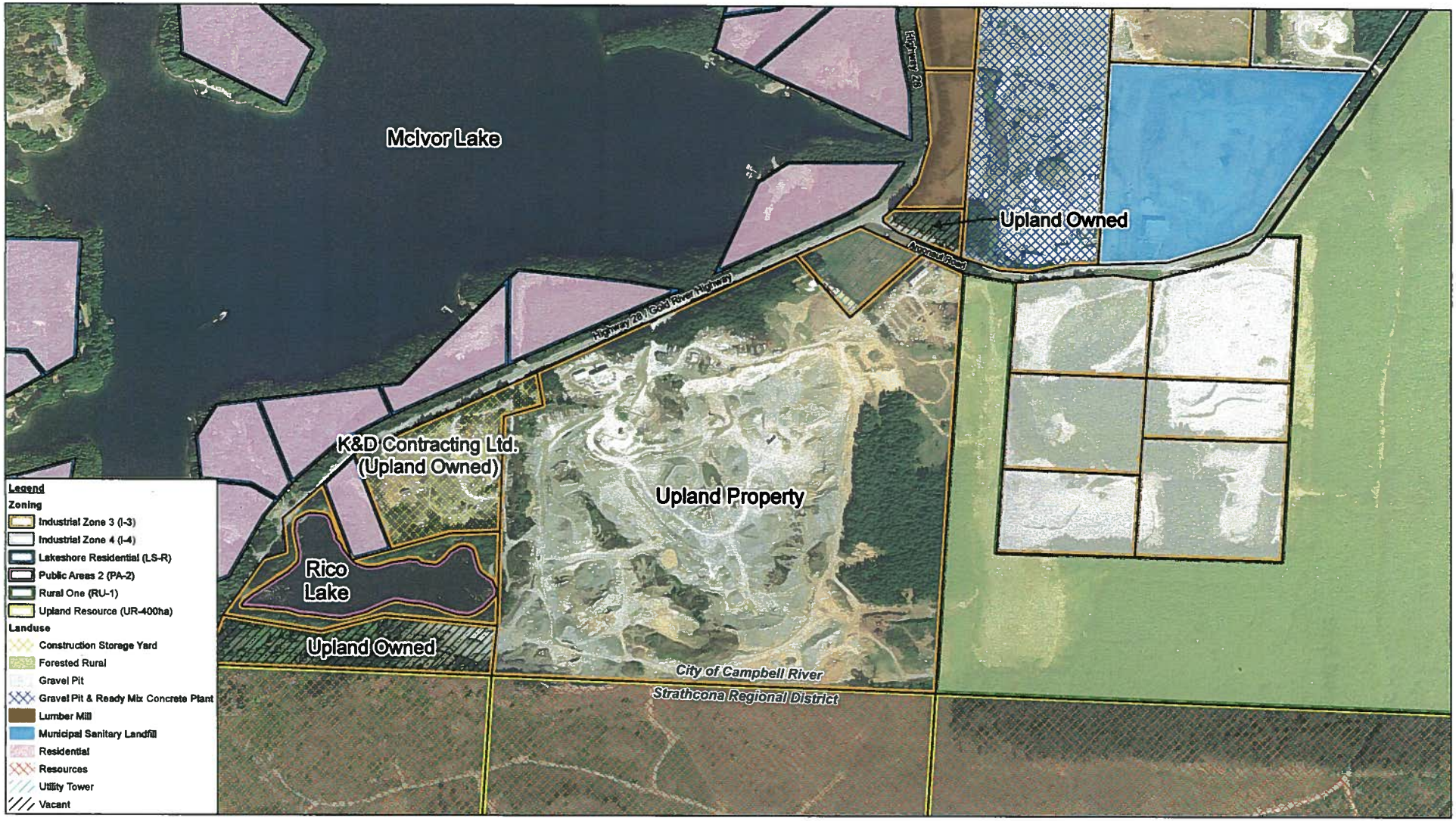
The information presented in this document was compiled exclusively for the City of Campbell River (the Client) by Waterline Resources Inc. (Waterline). This work was completed in accordance with the scope of work for this project that was agreed between Waterline and the Client. Waterline exercised reasonable skill, care and diligence to assess the information acquired during the preparation of this document but makes no guarantees or warranties as to the accuracy or completeness of this information. The information contained in this document is based upon, and limited by, the circumstances and conditions acknowledged herein, and upon information available at the time of the preparation of this document. Any information provided by others is believed to be accurate but cannot be guaranteed. No other warranty, expressed or implied, is made as to the professional services provided to the Client.

Any use, reliance on, or decision made, by a third party based on this document is the sole responsibility of said third party. Waterline makes no representation or warranty to any third party with regard to this document and, or the work referred to in this document, and accepts no duty of care to any third party or any liability or responsibility whatsoever for any losses, expenses, damages, fines, penalties or other harm that may be suffered or incurred as a result of the use of, reliance on, any decision made, or any action taken based on, this document or the work referred to in this document.

When Waterline submits instruments of professional service; including, reports, drawings and project-related deliverables, the Client agrees that only original signed and stamped paper versions shall be considered as original documents. The hard copy versions submitted by Waterline to the Client shall be considered as copies of the original documents, and in the event of a dispute or discrepancy, the signed and stamped original documents retained by Waterline shall govern over all copies, electronic or otherwise, provided to the Client.

This document is intended to be used in its entirety, and no individual part of the document may be taken as representative of the findings of the document. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form, by any third party, without the expressed written permission of the Client or Waterline.

FIGURES



0 60 120 180
Meters

Coordinate System:
NAD 1983 UTM Zone 10N

Figure 1: Site Location (GHD 2017b)

UPLANDS EXCAVATING LTD.
PROPOSED UPLAND LANDFILL
HYDROGEOLOGIC AND HYDROLOGY CHARACTERIZATION REPORT

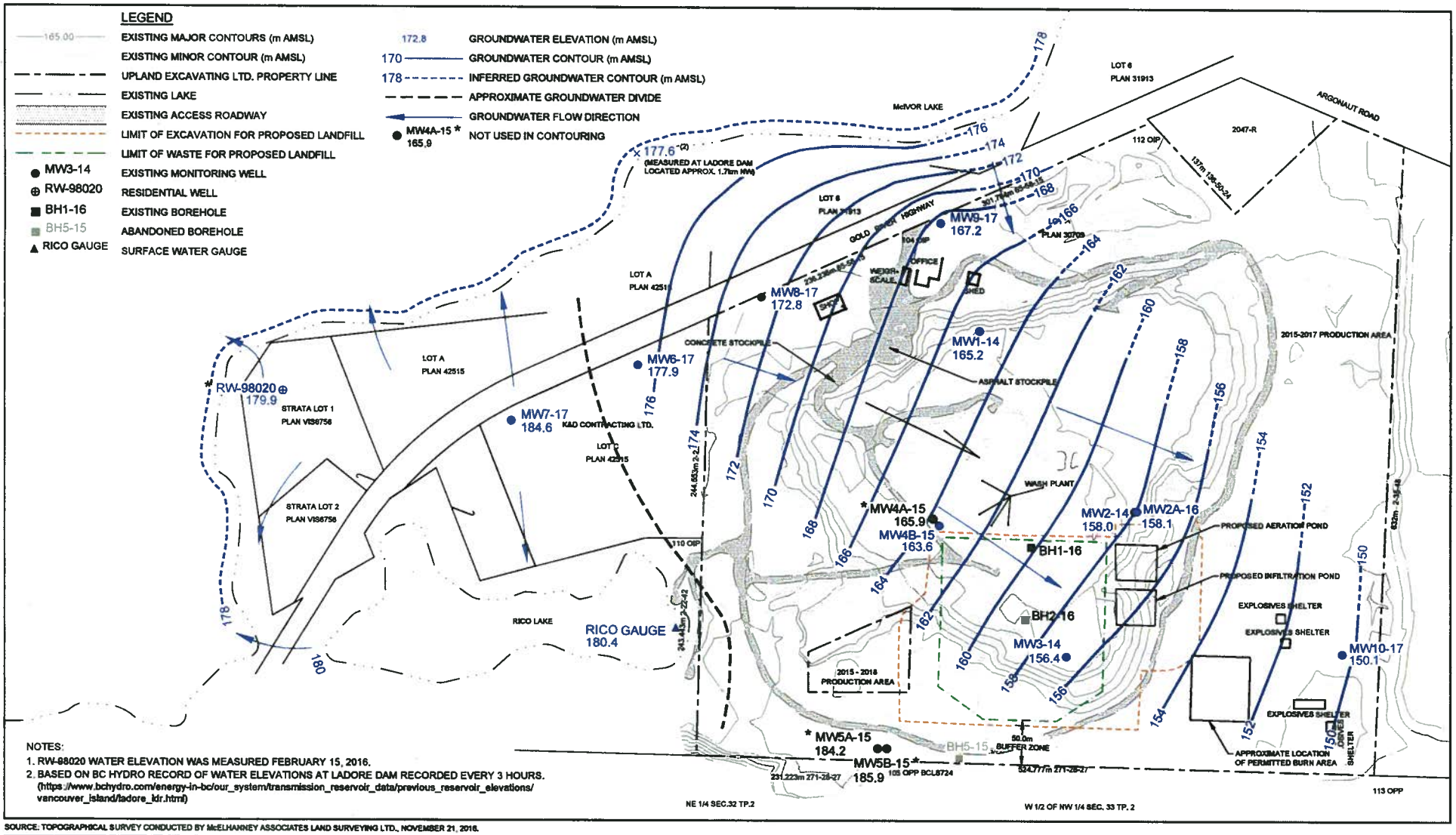
088877-03
May 26, 2017

ADJACENT LAND USES

~~FIGURE 1.2~~

GIS File: Q:\GIS\PROJECTS\88000s\88877\Layouts\009\88877-03(009)GIS-OT007.mxd

(Waterline annotations in red)



SOURCE: TOPOGRAPHICAL SURVEY CONDUCTED BY McELHANNEY ASSOCIATES LAND SURVEYING LTD., NOVEMBER 21, 2016.

Figure 2: Sand and Gravel Aquifer Groundwater Elevation Contours, developed from April 6, 2017 groundwater elevation data (GHD 2017b)

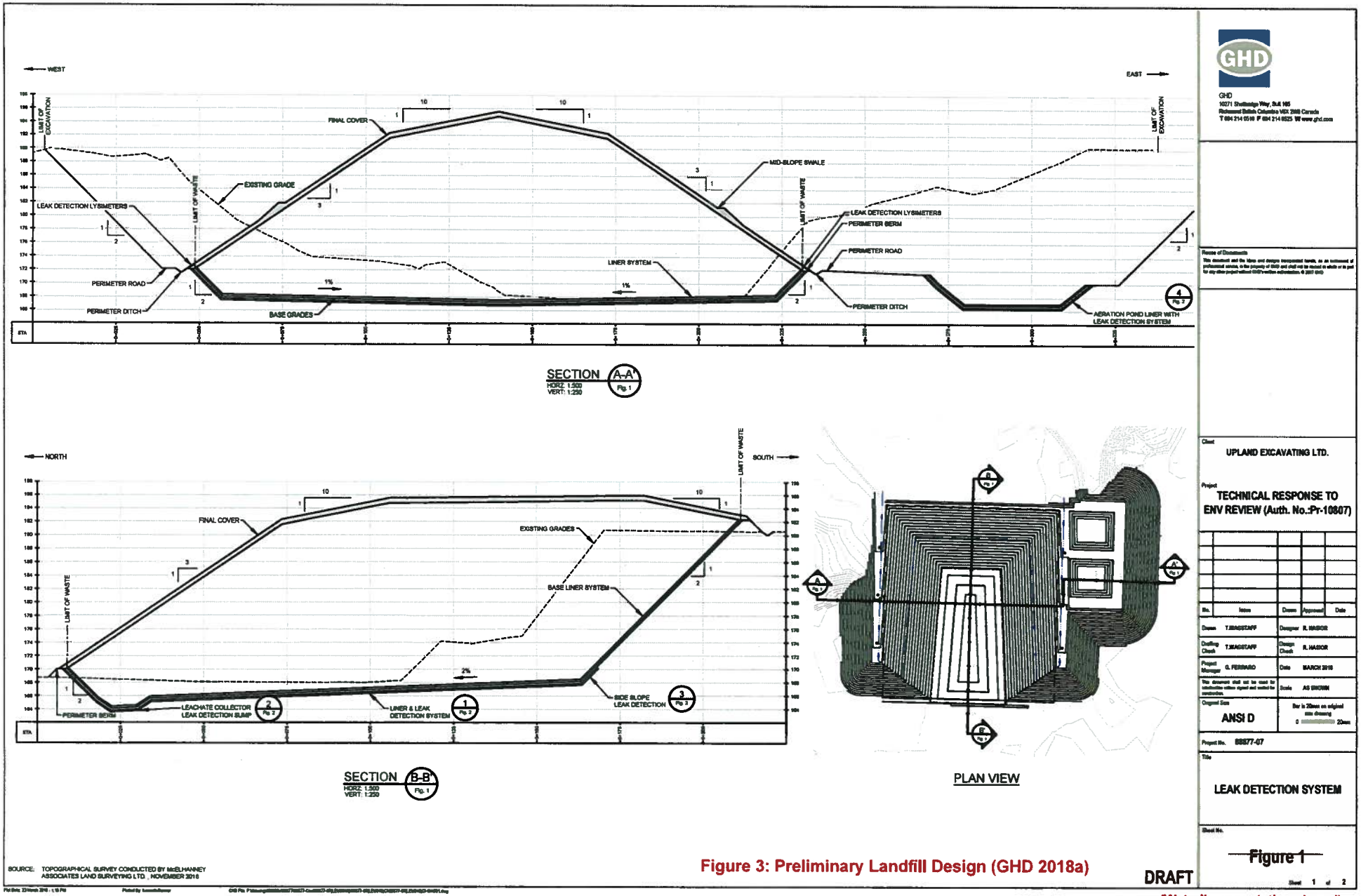
UPLAND EXCAVATING LTD.
PROPOSED UPLAND LANDFILL
HYDROGEOLOGIC AND HYDROLOGY CHARACTERIZATION REPORT
GROUNDWATER ELEVATION CONTOURS
SAND & GRAVEL AQUIFER - APRIL 6, 2017

88877-03
May 23, 2017

~~FIGURE 2.0~~

CAD File: 88877-03(009)GN-WA001.DWG

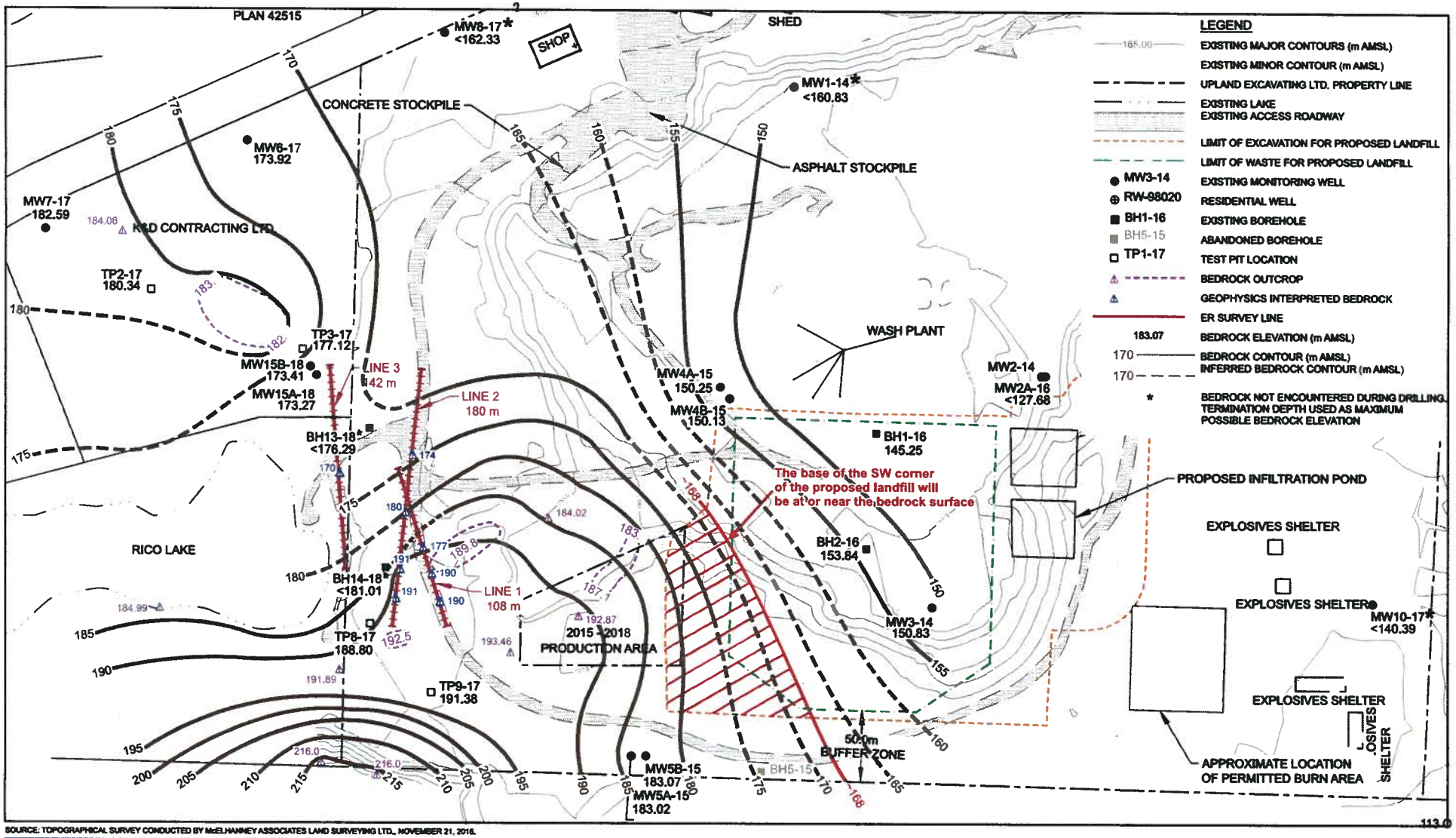
(Waterline annotations in red)



SOURCE: TOPOGRAPHICAL SURVEY CONDUCTED BY McELHANNEY ASSOCIATES LAND SURVEYING LTD., NOVEMBER 2016

Figure 3: Preliminary Landfill Design (GHD 2018a)

(Waterline annotations in red)



SOURCE: TOPOGRAPHICAL SURVEY CONDUCTED BY McELHANNEY ASSOCIATES LAND SURVEYING LTD., NOVEMBER 21, 2016.

0 25 50 75m

NOTES:
1. TP2-17 HAS NOT BEEN SURVEYED, ELEVATION IS ESTIMATED.
2. BEDROCK ELEVATIONS ARE BASED ON SURVEYS CONDUCTED BY McELHANNEY ON MARCH 16 AND 31, 2017 AND BY UPLAND EXCAVATING ON JANUARY 29, 2015, APRIL 6, 2016, AND MARCH 8, 2016.
3. TP4-17 LOCATION IS APPROXIMATE.

GHD

UPLAND EXCAVATING LTD.
PROPOSED UPLAND LANDFILL
CAMPBELL RIVER, BRITISH COLUMBIA

BEDROCK CONTOURS

088877-00
Dec 7, 2016

~~FIGURE 7.1A~~

Figure 4: Updated Bedrock Contours (GHD 2018d)

(Waterline annotations in red)

Table 5.1

Hydraulic Monitoring Results
Technical Response to ENV Review (Auth. No.:Pr-10807)
Task 7 – Additional Bedrock Characterization
Upland Landfill

Monitoring ID	Borehole Depth (m BGS)	Reference Elevation TOR (m AMSL)	Water Elevation (m AMSL)												Hydraulic Conductivity (cm/s)	Screened Unit (Aquifer)
Date:			11-Sep-15	17-Sep-15	5-Oct-15	25-Jan-16	29-Jan-16	15-Feb-16	8-Mar-16	6-Apr-16	15-Mar-17	6-Apr-17	7-Jun-18	17-Sep-18		Primary Constituent
MW1-14	10.97	172.9	167.3	166.6	166.9	166.9	-	-	-	-	164.8	165.2	162.5	163.0	-	Sand/gravel (S&G Aquifer)
MW2-14	21.64	173.8	159.4	159.1	158.6	159.1	-	159.3	-	-	158.0	158.0	155.4	156.4	-	Sand/gravel (S&G Aquifer)
MW2A-16	45.42	173.9	-	-	-	159.3	-	159.3	-	-	158.0	158.1	155.5	155.3	-	Sand (S&G Aquifer)
MW3-14	18.59	168.6	155.8	155.9	155.8	157.2	-	-	-	-	156.5	156.4	153.8	152.5	-	Sand/gravel (S&G Aquifer)
MW4A-15	21.33	169.3	165.4	165.0	164.4	165.3	-	-	-	-	163.6	165.9	161.1	160.9	2.2×10^{-2}	Bedrock (S&G Aquifer)
MW4B-15	18.28	169.3	165.2	164.8	164.1	165.0	-	-	-	-	163.3	163.6	160.9	160.7	2.0×10^{-2}	Sand (S&G Aquifer)
MW5A-15	10.66	191.9	182.9	182.9	183.6	184.6	-	-	-	-	183.8	184.2	183.2	182.9	1.4×10^{-6}	Bedrock Ridge (Shallow Aquifer)
MW5B-15	8.22	192.0	184.9	184.9	185.0	186.6	-	-	-	-	184.9	185.9	183.7	Dry	-	Sand/Silt with clay (Shallow Aquifer)
MW6-17	11.28	185.4	-	-	-	-	-	-	-	-	-	177.9	176.6	175.1	-	Sand (S&G Aquifer)
MW7-17	4.29	187.5	-	-	-	-	-	-	-	-	184.2	184.6	183.7	183.6	-	Gravel (Shallow Aquifer)
MW8-17	18.80	192.5	-	-	-	-	-	-	-	-	172.8	172.8	172.8	172.8	-	Gravel (S&G Aquifer)
MW9-17	33.54	191.7	-	-	-	-	-	-	-	-	166.8	167.2	165.1	166.6	-	Sand/gravel (S&G Aquifer)
MW10-17	46.25	189.1	-	-	-	-	-	-	-	-	-	150.1	148.1	147.0	-	Sand (S&G Aquifer)
MW15A-18	15.24	183.1	-	-	-	-	-	-	-	-	-	-	-	175.4	8.3×10^{-3}	Bedrock (S&G Aquifer)
MW15B-18	8.99	183.2	-	-	-	-	-	-	-	-	-	-	-	174.3	7.5×10^{-4}	Silty/Clayey Sand (S&G Aquifer)
RW-98020	60.96	196.9	-	-	-	-	-	179.9	-	-	-	-	-	-	-	Bedrock Ridge
McIvor Lake	-	-	-	-	-	-	177.5[3]	-	177.9[2]	177.0[2]	177.6[3]	177.6[3]	-	-	-	-
SW15-02 Rico Lake	-	180.33*	-	-	-	-	181.2	-	181.2[2]	180.8[2]	180.4	180.4	-	178.0	-	-

Notes:

1 - Surveys completed by McElhanney on April 6, 2016 and March 16 and 31, 2017

2 - Survey completed by Upland Excavating Ltd. on January 29th, 2015, March 8, 2016 and April 6th, 2016. Elevations measured with respect to AMSL.

3 - Based on BC Hydro record of water elevations at Ladore Dam recorded every three hours. (https://www.bchydro.com/energy-in-bc/our_system/transmission_reservoir_data/previous_reservoir_elevations/vancouver_island/ladore_kdr.html)

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

m BGS - metres below ground surface

m AMSL - metres above mean sea level (WGS1984)

TOR - top of riser

S&G - Sand and gravel

Figure 5: Summary of Groundwater Elevation Data (GHD 2018d)

(Waterline annotations in red)

Figure 6: South pit wall, distinct near horizontal layering observed, vertical hydraulic conductivity maybe significantly less than horizontal hydraulic conductivity

Figure 7: View of pit from the south, ponding in foreground at the location of proposed landfill

Appendix A

Appendix A - Waterline Response to City Questions

The City provided the following questions to guide the review:

1. Does the proposal present a risk to the City's drinking water?
2. Is there enough information to give an assessment of risk to drinking water?
3. Do the reports meet a professional standard?
4. What is the characterization of the fractured bedrock aquifer?
5. Is the hydraulic connection between the Site and Rico Lake well understood?
6. What is the likelihood of this connection causing contamination?
7. Is review of the Hydrologic Evaluation Landfill Performance (HELP) model recommended?
8. Are there improvements that could be made to the proposed Environmental Management Program?

1. Does the proposal present a risk to the City's drinking water?

All industrial projects carry some risk for environmental impact. However, BC Hydro's minimum operating level for McIvor Lake is higher than the groundwater levels that can reasonably be anticipated at the proposed landfill site. Under these conditions it would be physically impossible for groundwater to flow from the landfill towards McIvor Lake. If a catastrophic event occurs, such as a dam failure, or if for some reason water in the reservoir needed to be lowered beyond historical lows, or if higher mounding at the landfill causes a hydraulic gradient reversal, then there may be a potential for groundwater to flow towards McIvor Lake.

There is a possibility that water from the pit area could migrate toward Rico Lake through groundwater if the water level in Rico Lake fell below the ponded water level in the pit. In this case the water would only flow west toward McIvor Lake if the McIvor Lake level was even lower than the Rico Lake level. The potential for groundwater to be a pathway for contamination of Rico Lake could be mitigated by ensuring that the lake level is maintained above the water level in the infiltration ponds and gravel pit. Ongoing monitoring of water levels in Rico Lake, the bedrock and sand and gravel aquifer would help clarify the nature of the hydraulic connection between the lake and the proposed landfill.

When assessing the risk to the City's water supply consideration should also be given to the contaminate source and loading, the proposed Upland landfill will not be accepting hazardous contaminated soil, as defined by the Hazardous Waste Regulation (HWR), will be underlain by a double liner and Upland has committed to treating all leachate to CSR drinking water standards prior to infiltration (GHD 2017a). The combination of these design and operational details should adequately protect the water quality in the aquifer.

2. *Is there enough information to give an assessment of risk to drinking water?*

A formal quantitative risk assessment was not completed for this project. However, given that the groundwater gradient between the landfill and the lakes has historically been towards the landfill and this is not expected to change or can be managed, the risk to the City's water supply would appear to be low.

However, it is also Waterline's professional opinion that additional baseline groundwater data needs to be collected to support the engineering design of the landfill which may result in landfill design changes. The City should reassess the risk to the water supply if design changes are made.

In addition, the DOCP for the proposed landfill notes that the gravel operation will be ongoing while the landfill is operating. The closure plan for the landfill does not explain how the closure of the landfill will tie into the closure of the site as a whole. The City should request an updated version of the closure plan for the whole site to better understand the long-term state/fate of the landfill and to confirm that gradients in the groundwater system will not be altered significantly enough to potentially affect the water quality in McIvor or Rico Lake.

3. *Do the reports meet a professional standard?*

Waterline can only comment on the hydrogeological characterization provided and cannot comment on landfill design or surface water assessment aspects of the project. Based on the standard of hydrogeological practice as a qualified professional in the province of British Columbia, Waterline does not believe that the reports meet the professional standard for characterization of the hydrogeological environment. Insufficient long-term data was collected and some data that was collected was mis-interpreted or not understood. The seasonal ponding in the pit and distinct horizontal layering in the south pit wall should have led to further investigation of the infiltration capacity of the Site.

4. *What is the characterization of the fractured bedrock aquifer?*

Characterization of the bedrock is insufficient to support the design of the landfill and showed a lack of understanding of the hydraulic relationship between the sand and gravel aquifer and the underlying bedrock. Although the data collected was limited, it suggests that groundwater in the bedrock beneath the site is under artesian pressure. The fracture bedrock system may therefore be locally confined but GHD indicates that the shallow bedrock and the sand and gravel acts as a single unit which is clearly not supported by the water level data. This interpretation was then applied to the landfill design and predictive modelling and raises some concerns with the overall assessment.

The new bedrock contours developed from the recent geophysical investigation on site, imply that the southwestern portion of the landfill will be on bedrock. The implications of the artesian groundwater pressure in the bedrock on the landfill design have not been considered.

5. Is the hydraulic connection between the Site and Rico Lake well understood?

As noted in Question 1 the groundwater flow direction has been characterised correctly, the flow direction under most reasonable likely conditions is to the southeast, from the lakes to the gravel pit/landfill. However, the effect of changes in the water level in McIvor Lake on groundwater levels at the site is not well understood and may have implications for meeting the ENV landfill criteria requirement of that groundwater levels be maintained 1.5 m below the base of the landfill.

6. What is the likelihood of this connection causing contamination?

As indicated in Question 1, given the water level elevation of the lakes it appears highly unlikely for groundwater to migrate from the landfill to McIvor Lake and migration to Rico Lake could be managed by maintaining water levels in the lake above an anticipated ponding in the infiltration ponds and gravel pit. In addition, the landfill liner design and treatment of the leachate prior to infiltration should be adequate to protect the water quality in the aquifer.

Although not part of the present scope of Waterline's work, the proponent should consider evaluating data from the existing municipal landfill located adjacent to the proposed Upland landfill. This could provide historical context and groundwater tracer to help confirm the level of risk and support the landfill application.

7. Is review of the Hydrologic Evaluation Landfill Performance (HELP) model recommended?

Yes, in particular, it will be important to ensure that input parameters are based on statistically accurate information and that extreme events are considered in the analysis.

8. Are there improvements that could be made to the proposed Environmental Management Program?

The environmental and adaptive management plans should be based on scientifically defensible baseline data to be able to properly compare post construction monitoring data to baseline conditions. Currently, long-term baseline groundwater level and groundwater quality monitoring data is lacking and does not allow for assessment of seasonal variations.

A standard hydrogeological approach includes the installation of data loggers and continuous field data collection. Seasonal fluctuations of water levels and water quality indicators would allow for further confirmation of hydraulic connections between the various hydrostratigraphic units and pathways. The fact that very limited baseline groundwater data was collected shows a fundamental lack of understanding of regional hydrogeological characterization standards.

In addition, the current monitoring program and environmental management plan:

- does not consider that a portion of the landfill may sit on bedrock,
- includes the incorrect assumption that the top 3 m of bedrock can be considered the same hydraulic unit as the sand and gravel aquifer, and
- is based on an infiltration capacity that may be unrealistically high.

[sign]CurrentDate
[sign]TrackingNumber

Tracking Number:

Authorization Number: 107689

REGISTERED MAIL

UPLAND EXCAVATING LTD.
#101 - 990 CEDAR STREET
CAMPBELL RIVER BC V9W 7Z8

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.

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

Yours truly,

[sign]image:SigningAuthoritySignatureId

[sign]SignatureBlockFirstLine
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.

#101 - 990 CEDAR STREET
CAMPBELL RIVER BC V9W 7Z8

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) contaminated soil that is not hazardous waste, or,
(e) other waste as authorized in writing by the director,

but does not include:

(f) hazardous waste except as authorized pursuant to the Hazardous Waste Regulation,

{[sign]DateLabel} {[sign]WILastUpdated}
{[sign]AmendmentText}

{[sign]image:SigningAuthoritySignatureId}
{[sign]SignatureBlockFirstLine}
for Director, *Environmental Management Act*
Authorizations - South Region

controlled waste, Attractants, and,
(g) 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,
(ii) three 9.46 m^3 leachate storage tanks,
(iii) an un-lined landfill footprint with a maximum 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 authorized works, excepting final cover, are complete and fully operational on or before the date of issuance of this operational certificate, and at all times thereafter, until the authorized 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 **New Landfill**

This section applies to the New Landfill.

1.2.1 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.

1.2.2 The characteristics of the waste discharge to the New Landfill must be:
(a) demolition waste,
(b) construction waste,
(c) land clearing waste,
(d) contaminated soil that is not hazardous waste,
(e) sludge from the leachate management works or from the stormwater management works authorized in sections 1.3 and 1.4 of this operational certificate, or,

{[sign]DateLabel} {[sign]WILastUpdated}
{[sign]AmendmentText}

{[sign]image:SigningAuthoritySignatureId}
{[sign]SignatureBlockFirstLine}
for Director, *Environmental Management Act*
Authorizations - South Region

(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.

1.2.3 The waste discharge is authorized to the New Landfill approximately located as shown on Site Plan A.

1.2.4 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.

1.2.5 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.

1.2.6 The operational certificate holder must ensure the authorized works, excepting final cover, are complete and fully operational on or before the date of commencement of waste discharge to the New Landfill, and at all times thereafter.

1.3 Leachate Management

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

1.3.1 The operational certificate holder must convey the leachate from the New Landfill to the authorized works.

1.3.2 The maximum rate of treated leachate effluent discharge to the treated leachate infiltration pond is 24,633 m^3 per calendar year.

1.3.3 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.

1.3.4 The treated leachate effluent is authorized to be discharged to the treated leachate infiltration pond and infiltrated into the ground.

{[sign]DateLabel} {[sign]WILastUpdated}
{[sign]AmendmentText}

{[sign]image:SigningAuthoritySignatureId}
{[sign]SignatureBlockFirstLine}
for Director, *Environmental Management Act*
Authorizations - South Region

1.3.5 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.

1.3.6 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 1×10^{-7} cm/s.

1.3.7 Minimum Freeboard must be maintained at all times as follows:
leachate treatment pond(s): 0.6 m
treated leachate infiltration pond: 0.6 m

1.3.8 The operational certificate holder must ensure the authorized 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.

1.4 Stormwater Management

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

1.4.1 The operational certificate holder must manage stormwater from the New Landfill such that stormwater is infiltrated into the ground with the authorized works.

1.4.2 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.

1.4.3 The authorized works are diversion berm, perimeter berm, mid slope swales, drop down channels, energy dissipation pools, ditches, energy dissipators, sediment forebays, stormwater infiltration ponds, and related appurtenances approximately located as shown on Site Plan A.

1.4.4 Minimum Freeboard must be maintained at all times as follows:
stormwater infiltration ponds: 0.6 m
all other authorized works: 0.3 m

1.4.5 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 complete and fully operational on or before the date of commencement of waste discharge to the

{[sign]DateLabel} {[sign]WILastUpdated}
{[sign]AmendmentText}

{[sign]image:SigningAuthoritySignatureId}
{[sign]SignatureBlockFirstLine}
for Director, *Environmental Management Act*
Authorizations - South Region

New Landfill, and at all times thereafter.

1.5 Facility Entrance

This section applies to the Facility entrance.

1.5.1 The authorized works are sign(s), gate, fence, weigh scale, and related appurtenances approximately located as shown on Site Plan A.

1.5.2 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.

1.6 Location of Facility

This section applies to the location of the Facility.

1.6.1 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, but does not include grass, leaves, weeds, branches and woodwaste;

"Facility" means the Original Landfill, the New Landfill, and the authorized works and related appurtenances listed in sections 1.3 (leachate management), 1.4 (stormwater management) and 1.5 (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;

"Landfill Criteria" means the Landfill Criteria for Municipal Solid Waste Second Edition June 2016,

{[sign]DateLabel} {[sign]WILastUpdated}
{[sign]AmendmentText}

{[sign]image:SigningAuthoritySignatureId}
{[sign]SignatureBlockFirstLine}
for Director, *Environmental Management Act*
Authorizations - South Region

as amended or replaced from time to time;

"New Landfill" means the authorized works listed in section 1.2.4 of this operational certificate, and related appurtenances, approximately located as shown on Site Plan A;

"Original Landfill" means the Original Lined Cell and the Original Un-Lined Cell, approximately located as shown on Site Plan A;

"Original Lined Cell" means the authorized works listed in section 1.1.5(i) of this operational certificate, and related appurtenances, approximately located as shown on Site Plan A;

"Original Un-Lined Cell" means the authorized works listed in section 1.1.5(iii) of this operational certificate, and related appurtenances, approximately located as shown on Site Plan A;

"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 excepting the authorized works and related appurtenances listed in section 1.5 (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 reports, assessments, reviews, investigations, studies, surveys, programs, reports and as-built record drawings.

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, to the director, on or before the earlier of:

{[sign]DateLabel} {[sign]WILastUpdated}
{[sign]AmendmentText}

{[sign]image:SigningAuthoritySignatureId}
{[sign]SignatureBlockFirstLine}
for Director, *Environmental Management Act*
Authorizations - South Region

(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) (contaminated 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, in compliance with the most recent OCP and this operational certificate, 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.

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 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:

{[sign]DateLabel} {[sign]WILastUpdated}
{[sign]AmendmentText}

{[sign]image:SigningAuthoritySignatureId}
{[sign]SignatureBlockFirstLine}
for Director, *Environmental Management Act*
Authorizations - South Region

2.6(a) (leachate treatment works commissioning plan),
2.7(a) (contaminated 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 **Leachate Treatment Works Commissioning Plan and Report**

(a) The DOCP submitted pursuant to section 2.5 of this operational certificate must include a leachate treatment works commissioning plan that includes:

(i) The expected duration of the leachate treatment works commissioning period,
(ii) Description of the leachate treatment works and design,
(iii) The monitoring, sampling and analyses that will be carried out during the leachate treatment 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 leachate treatment 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 leachate treatment works commissioning period if the treated leachate effluent quality does not comply with this operational certificate, including storage, retreatment, and pump and haul to an off-site authorized treatment facility,
(vi) Leachate treatment 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 leachate treatment 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 leachate treatment works commissioning period, or as specified by the director.

2.7 **Contaminated Soil Acceptance Plan**

{[sign]DateLabel} {[sign]WILastUpdated}
{[sign]AmendmentText}

{[sign]image:SigningAuthoritySignatureId}
{[sign]SignatureBlockFirstLine}
for Director, *Environmental Management Act*
Authorizations - South Region

(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 contaminated soil acceptance plan that includes procedures that will be carried out before contaminated soil is accepted at the Facility including receipt and review of documents required by section 2.7(b) of this operational certificate.

(b) Before a specific quantity of contaminated 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 contaminated soil that includes:

(i) the contaminated 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 contaminated soil origin including applicable civic address, site identification number, parcel identifier, parcel identification number, legal description, and,

(iii) characterization of the contaminated soil in accordance with ministry procedures including the most recent version of Technical Guidance 1 on Contaminated Sites Site Characterization and Confirmation Testing and Technical Guidance 2 on Contaminated Sites Statistical Criteria for Characterizing a Volume of Contaminated Material, or alternate procedures described and justified by the Qualified Professional, and related details including potential contaminants of concern, sampling procedures, data, interpretation, and results.

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 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.

(b) Subject to section 1.2.2 of this operational certificate, all waste removed from the Original Landfill

{[sign]DateLabel} {[sign]WILastUpdated}
{[sign]AmendmentText}

{[sign]image:SigningAuthoritySignatureId}
{[sign]SignatureBlockFirstLine}
for Director, *Environmental Management Act*
Authorizations - South Region

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 1.2.1 of this operational certificate.

(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 commencement of waste discharge to the New Landfill.

(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, 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 and time periods, to carry out and complete the plan referred to in section 2.9(a) of this operational certificate,
(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,

{[sign]DateLabel} {[sign]WILastUpdated}
{[sign]AmendmentText}

{[sign]image:SigningAuthoritySignatureId}
{[sign]SignatureBlockFirstLine}
for Director, *Environmental Management Act*
Authorizations - South Region

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 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 new Significant Works listed in sections 1.2 (New Landfill) and 1.3 (leachate management) of this operational certificate, 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

{[sign]DateLabel} {[sign]WILastUpdated}
{[sign]AmendmentText}

{[sign]image:SigningAuthoritySignatureId}
{[sign]SignatureBlockFirstLine}
for Director, *Environmental Management Act*
Authorizations - South Region

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

2.13 Buffer Zone

The operational certificate holder must ensure that the authorized works listed in sections 1.2 (New Landfill), 1.3 (leachate management) and 1.4 (stormwater management) of this operational certificate are located a minimum of 50 m from the Facility site boundary.

2.14 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 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.

2.15 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

{[sign]DateLabel} {[sign]WILastUpdated}
{[sign]AmendmentText}

{[sign]image:SigningAuthoritySignatureId}
{[sign]SignatureBlockFirstLine}
for Director, *Environmental Management Act*
Authorizations - South Region

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.

2.15 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 authorized works in sections 1.2 (New Landfill), 1.3 (leachate management) and 1.4 (stormwater management) of this operational certificate, are complete and fully operational as specified in sections 1.2, 1.3 and 1.4 of this operational certificate, including during maintenance, breakdowns and electrical power outages.

3.2 Maintenance of the Facility

(a) The operational certificate holder must cause persons that are qualified and trained to industry standards 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,

{[sign]DateLabel} {[sign]WILastUpdated}
{[sign]AmendmentText}

{[sign]image:SigningAuthoritySignatureId}
{[sign]SignatureBlockFirstLine}
for Director, *Environmental Management Act*
Authorizations - South Region

(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 Leachate Management Works Classification and Operator Certification

(a) The operational certificate holder must have the authorized works listed in section 1.3 (leachate management) of this operational certificate, 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 leachate management works is(are) certified at an EOCP certification level equivalent to or higher than the EOCP classification level of the 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 leachate management works and the EOCP certification level(s) of the person(s) responsible for the operation and maintenance of the leachate management works.

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.

{[sign]DateLabel} {[sign]WILastUpdated}
{[sign]AmendmentText}

{[sign]image:SigningAuthoritySignatureId}
{[sign]SignatureBlockFirstLine}
for Director, *Environmental Management Act*
Authorizations - South Region

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

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

{[sign]DateLabel} {[sign]WILastUpdated}
{[sign]AmendmentText}

{[sign]image:SigningAuthoritySignatureId}
{[sign]SignatureBlockFirstLine}
for Director, *Environmental Management Act*
Authorizations - South Region

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 https://www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/monitoring/laboratory-standards-quality-assurance.

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.

(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. REPORTING REQUIREMENTS

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 EnvAuthorizationsReporting@gov.bc.ca 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 http://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/data-and-report-submissions/routine-environmental-reporting-submission-

{[sign]DateLabel} {[sign]WILastUpdated}
{[sign]AmendmentText}

{[sign]image:SigningAuthoritySignatureId}
{[sign]SignatureBlockFirstLine}
for Director, *Environmental Management Act*
Authorizations - South Region

mailbox.

5.2 Non-compliance Notification

(a) The operational certificate holder must immediately notify the director or designate by email at EnvironmentalCompliance@gov.bc.ca, 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 EnvironmentalCompliance@gov.bc.ca, 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,
(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 EnvironmentalCompliance@gov.bc.ca or as otherwise instructed by the director. For guidelines on how to report a non-compliance or for more information visit the Ministry website http://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/data-and-report-submissions/non-compliance-reporting-mailbox.

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, for the preceding calendar year, to the director on or before March 31 of each year.

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

(i) Summary of OCP implementation that addresses the information noted in section 2.3(b), and

{[sign]DateLabel} {[sign]WILastUpdated}
{[sign]AmendmentText}

{[sign]image:SigningAuthoritySignatureId}
{[sign]SignatureBlockFirstLine}
for Director, *Environmental Management Act*
Authorizations - South Region

summary of DOCP implementation that addresses the information noted in 2.5(b), of this operational certificate,
(ii) Summary of construction report(s),
(iii) Annual and cumulative tonnages and categories of waste including contaminated 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,
(vii) Summary of non-compliance notifications and non-compliance reporting,
(viii) Annual status form in accordance with the instructions and template at the ministry website https://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-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,

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 1.3, 1.4, 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.

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

{[sign]DateLabel} {[sign]WILastUpdated}
{[sign]AmendmentText}

{[sign]image:SigningAuthoritySignatureId}
{[sign]SignatureBlockFirstLine}
for Director, *Environmental Management Act*
Authorizations - South Region

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.

{[sign]DateLabel} {[sign]WILastUpdated}
{[sign]AmendmentText}

{[sign]image:SigningAuthoritySignatureId}
{[sign]SignatureBlockFirstLine}
for Director, *Environmental Management Act*
Authorizations - South Region

Site Plan A

Please provide a high resolution, colour, to scale, pdf site plan(s) that:

- does not include a location map, monitoring wells, boreholes or testpits
- focuses on the Facility site and shows the Facility site boundary
- shows North arrow, scale and relevant legend
- shows the New Landfill (do not show individual cells), leachate management works, and stormwater management works, using the same terminology as in the draft operational certificate
- shows the Original Lined Cell, Original Un-Lined Cell, and three 9.46 m3 leachate storage tanks, using the same terminology as in the draft operational certificate
- shows the Facility entrance and works using the same terminology as in the draft operational certificate
- You may wish to use 2 site plans (e.g. one siteplan for the New Landfill, leachate management works, and stormwater management works and another siteplan for the Original Lined Cell, Original Un-Lined Cell, and three 9.46 m3 leachate storage tanks)

{[sign]DateLabel} {[sign]WILastUpdated}
{[sign]AmendmentText}

{[sign]image:SigningAuthoritySignatureId}
{[sign]SignatureBlockFirstLine}
for Director, *Environmental Management Act*
Authorizations - South Region