Notice of Work

G-8-114 - Upland Pit

Tracking Number: 100317247

Applicant Information

If approved, will the authorization be issued to an Individual or Company/Organization?	Company/Organization
What is your relationship to the company/organization?	Agent

APPLICANT COMPANY/ORGANIZATION CONTACT INFORMATION

Have you considered using a BCeID?A BCeID allows you to save your application at any time and return later to complete it or check the status of your application. It only takes a few minutes to sign up for a free BCeID which also allows you to use the same ID for many other government services.Click on 'Save Application' on the bottom and then on 'Register' to sign up. You will return to this application once the sign up has been completed.

Name:	Upland Contacting Ltd
Doing Business As:	Upland
Phone:	604-286-1148
Fax:	
Email:	
BC Incorporation Number:	
Extra Provincial Inc. No:	
Society Number:	
GST Registration Number:	
Contact Name:	Mark Stuart
Mailing Address:	7295 Gold River Hwy Campbell River BC V9H 1P1

AGENT INFORMATION

Please enter the contact information of the Individual/Organization who is acting on behalf of the applicant.

Are you an Individual or Company/Organization?	Company/Organization
Name:	GHD Limited
Doing Business As:	GHD
Phone:	604-248-3670
Fax:	
Email:	
BC Incorporation Number:	
Extra Provincial Inc. No:	
Society Number:	
GST Registration Number:	
Contact Name:	Greg Ferraro
Mailing Address:	165-10271 Shellbridge Way Richmond BC V6X 2W8
Letter(s) Attached:	Yes (G-8-114-Authorization of Agent.pdf)

TECHNICAL INFORMATION

APPLICATION INFORMATION

Type of Notice of Work:	Sand & Gravel
Is this a New Permit or an Amendment to an existing permit for this property?	Amendment

MINE INFORMATION

Do you have an existing mine number? Yes **Mine Number:** G-8-114
Name of the property: Upland Pit
Tenure Numbers:
Crown Grant / District Lot Numbers: LOT A PLAN VIP30709 DISTRICT LOT 85, SAYWARD DISTRICT, PLAN 30709 EXCEPT PART IN PLAN EPP15087 W ½ of DL 85 (PID: 001-223-321); THE NORTH EAST 1/4 OF SECTION 32 TOWNSHIP 2 COMOX DISTRICT PLAN 552A (PID: 009-004-505) ; AND LOT 1, DISTRICT LOT 86, SAYWARD DISTRICT, PLAN 30957 EXCEPT PART IN PLAN 42515 (PID:001-201-484)
Directions to site from nearest municipality: 7km west of Campbell River, BC on Hwy 28
Geographic Coordinates of Mine: **Latitude:** 50.0029440 **Longitude:** -125.3595600
Maximum Annual Tonnage Extracted: 220000 tonnes

INFORMATION ABOUT PROPOSED ACTIVITIES

Activities to be undertaken:
Access roads, trails, heli pads, air strips and boat ramps
Blasting
Sand & Gravel / Quarry Operations
Settling Ponds
Water Supply

FIRST AID

Proposed First Aid equipment on site: Level One, AED
Level of First Aid Certificate held by attendant: Occupational First Aid Level 1 with Transportation Endorsement

DESCRIPTION OF WORK PROGRAM

If you prefer to upload a document, please enter "see attached document" and attach the document in the "Document Upload" step later in the application under "Other".

Sufficient details of your work program to enable a good understanding of the types and scope of the activities that will be conducted:
See attached documents.

TIME OF PROPOSED ACTIVITIES

Proposed start and end date: Aug 20, 2020 to Jul 1, 2062

Please remember that you need to give 10 days notice to the Inspector of Mines of your intention to start work, and 7 days notice of your intention to stop work.

ACCESS

Access presently gated: No

PRESENT STATE OF LAND

Please identify what the present state of the land is where you would like to undertake your activities. If some of the questions do not apply to you please enter n/a in the space provided.

Present condition of the land: Active sand & gravel pit and rock quarry.
Type of vegetation: Forest inhabiting non-riparian areas in and around the Pit Site are dominated by Douglas fir and coastal western hemlock, typical of drier maritime subzones. As well, there are occurrences of grand fir and big leaf maple in the warmer, and drier, southern areas of the zone such as near the Pit Site. The active mining areas are disturbed and unvegetated.
Physiography: The Pit Site is located on a terrace partially surrounded by mountainous terrain to the south, southwest, and northwest. The terrace gradually slopes towards the Quinsam River located 3.8 km to the southeast of the east Pit Site boundary. The topography outside the Pit is relatively level at approximate elevation 190 mAMSL The Pit area has been excavated to a depth of approximately 170 mAMSL, 20 m below the surrounding land

surface.

Current means of access: Existing road access from Hwy 28.
Old equipment: n/a
Recreational trails / use: n/a

ACCESS TO TENURE

Do you need to build a road, create stream crossings or other surface disturbance that will not be on your tenure? No

LAND OWNERSHIP

Application area in a community watershed: No
Proposed activities on private land: Yes

Please note that under Section 19 of the Mineral Tenure Act and Section 2.1 of the Mineral Tenure Act Regulation you must not begin any mining activities until 8 days after giving notice to every owner of the surface area on which the recorded holder intends to carry out that activity.

Please attach a copy of the letter of authorization signed by the landowner The document can be uploaded at the "Document Upload" step later in the application process.

Legal description of land: LOT A PLAN VIP30709 DISTRICT LOT 85, SAYWARD DISTRICT, PLAN 30709 EXCEPT PART IN PLAN EPP15087 W ½ of DL 85 (PID: 001-223-321); THE NORTH EAST 1/4 OF SECTION 32 TOWNSHIP 2 COMOX DISTRICT PLAN 552A (PID: 009-004-505) ; AND LOT 1, DISTRICT LOT 86, SAYWARD DISTRICT, PLAN 30957 EXCEPT PART IN PLAN 42515 (PID:001-201-484)

Proposed activities on Crown land: No

Activities in a park: No

CULTURAL HERITAGE RESOURCES

Cultural Heritage applies to a large spectrum of heritage resources that is defined as "an object, a site or the location of a traditional societal practice that is of historical, cultural or archaeological significance to British Columbia, a community or an aboriginal people."

The Archaeology Branch of the Ministry of Forests, Land and Natural Resource Operations is responsible for the administration of the Heritage Conservation Act as it applies to archaeological sites. The Archaeology Branch has developed guidelines for companies engaged in natural resource extraction to aid in planning for and avoiding or managing impacts to protected archaeological sites.

Are you aware of any protected archaeological sites that may be affected by the proposed project? No

FIRST NATIONS ENGAGEMENT

In making decisions on authorizations, the government will be fulfilling its responsibility to consult, and where appropriate, accommodate First Nations. The government takes this responsibility seriously and encourages the applicant to engage First Nations early and often as part of any planned development.

Establishing good relations with First Nations who might be affected by a proposed development is a key part of any successful mining operation. The Ministry of Energy and Mines encourages applicants to engage and information share with First Nations that might be affected by a proposed development prior to submitting an application. The earlier in the life of a proposed activity that the avenues of

communication are established the greater the likelihood that the relationships formed will be constructive and beneficial to all parties. A lack of information sharing and engagement by the applicant may result in extended timeframes for decision.

Applicants should keep a detailed record of information sharing and engagement with First Nations on their project in the event the government needs to review it. Information on First Nations information sharing and engagement should include the following: a list of First Nations contacted, whether the activity was modified based on feedback from First Nations, and whether the applicant has entered into any informal or formal agreements with First Nations in connection with the project.

The Consultative Areas Database Public Map Service is an online, interactive mapping tool that allows you to identify First Nations who have treaty rights or asserted or proven rights or title on the land base. More information can be found at http://maps.gov.bc.ca/ess/sv/cadb/.

Have you shared information and engaged with First Nations in the area of the proposed activity? Yes

Please tell us about your engagements in the field below or attach a your record of engagement by uploading it at the "Document Upload" step later in the application process. If you are attaching your record later, please enter in the text box "See record attached". Please ensure your record does not contain an individual's personal information such as contact information.

Describe your First Nations engagement activities: First Nation consultation summary report attached.

As a result of the engagement, are you aware of any cultural heritage resources in the area where the work is proposed? No

BLASTING

MAPS

Please mark the location(s) of the proposed magazine(s) on the map. Unless this is an area based application also mark the proposed locations of the blast site(s) on the map. The maps will be uploaded at the document upload step later in the application process.

ACTIVITIES WHERE BLASTING WILL TAKE PLACE

Please select the activities to which blasting is related: Sand & Gravel / Quarry Operations

ON SITE STORAGE OF EXPLOSIVES

Are you proposing to store explosives on site? No

Describe how you will get the explosives to the site: Explosives will be brought to site as needed by road by a transporter licenced to carry explosives under the Transportation of Dangerous Goods regulation. The explosives will be used on the same day they arrive on-site.

ADDITIONAL INFORMATION

Only a person with a valid certificate granted under Section 8.2.1 of the Code is permitted to conduct a blasting operation.

ACCESS ROADS, TRAILS, HELI PADS, AIR STRIPS AND BOAT RAMPS

MAPS

Mark the locations of the proposed access roads and trails on the map. The maps will be uploaded at the document upload step later in the application.

ACTIVITIES

Click on the "Add Activity" button to add one or more activities. Select your activity out of the list and enter the length in km, the total disturbed area and total merchantable timber volume.

Activity	Length (km)	Disturbed Area (ha)	Merchantable timber volume (m^3)
Existing Access Modification	1.00	0.00	0.00

Total:	**1.00**	**0.00**	**0.00**

BRIDGES, CULVERTS AND CROSSINGS

Are you proposing any bridges, culverts and/or other river / stream crossings? No

RECLAMATION PROGRAM

Describe the proposed reclamation and timing for this specific activity: Currently, reclamation of roads is not proposed.

Estimated cost of reclamation activities described above: $0.00

ADDITIONAL INFORMATION

Please note that you may require a Special Use Permit under the Forest Practices Code of British Columbia Act or a Land Act tenure or other authorization under the legislation to use roads to access your tenure.

For further information please contact FrontCounter BC.

SAND & GRAVEL / QUARRY OPERATIONS

MAPS

All plans and sections must indicate the scale and orientation of the drawing and must include:

1) Plan View of Proposed Development illustrating:

- Property boundaries and set back of excavation from property boundary
- Watercourses and drainage (wet, dry or intermittent) on the property and within 150 metres of its boundaries
- All previous surface workings, the final boundaries of proposed excavation, and boundaries of excavation at the end of development described in the Notice of Work
- Access roads, including development roads within the pit and access to the public roads
- All proposed and existing stockpiles (topsoil, overburden, product etc.)
- All settling ponds (for both surface run off and process water) and source of process water
- Buildings and other facilities (fuel/lubricant storage, sanitary facilities, weigh scale, etc.)
- Sediment control structures and the location of any point discharges from the property
- Fencing, berms and/or vegetative buffers.

2) Cross and longitudinal sections of Proposed Development illustrating:

- The orginial land surface and, if applicable, the groundwater table elevation
- Typical configuration during mining, indicating angle of slope and, where applicable, bench locations
- Proposed configuration on completion of reclamation

3) A copy of the land title/crown land tenure map must be provided.

SOIL CONSERVATION

Average depth of overburden:
Average depth of topsoil:
Measures to stabilize soil overburden stockpiles and control noxious weeds:

LAND USE

Is the site within the Agricultural Land Reserve? No

Does the local government have a Soil Removal Bylaw? No
Official Community Plan for the site:
Current land use zoning for the site:
Proposed end land use is:
Estimate total minable reserves over the life of the mine:
Estimate annual extraction from site:

Application must be made to the Environmental Assessment Office if estimated extraction for sand/gravel production is 500,000 tonnes/year or 1,000,000 tonnes over 4 years; or if estimated extraction is 250,000 tonnes/year for quarried product.

ACTIVITIES

Click on the "Add Activity" button to add one or more activities. Select your activity out of the list and enter the tonnes, the total disturbed area and the total merchantable timber volume.

Please note that you must notify the Inspector at least two weeks before if you are planning to bring a crusher on site.

Activity	Total Disturbed Area (ha)	Merchantable timber volume (m^3)
Crushing	0.00	0.00
Excavation of Pit Run	48.00	0.00
Mechanical Screening	0.00	0.00
Washing	0.00	0.00
Total:	**48.00**	**0.00**

Is the work year round or only seasonal? Year round
Brief description of operation, including proposed work schedule: See 2020 Mine Plan.

RECLAMATION PROGRAM

Describe the proposed reclamation and timing for this specific activity: See 2020 Reclamation and Closure Plan (App C of Mine Plan)
If backfilling of pits or pit slopes is proposed in the final configuration for reclamation, details of materials to be used and placement procedures:
Estimated cost of reclamation activities described above: $1,305,000.00
Will progressive reclamation be carried out? Yes
Maximum unreclaimed disturbance at any given time: 48.00 ha

GROUNDWATER PROTECTION

Average depth to the high groundwater table at the proposed excavation: 10.0 m
Elevation of the groundwater table was determined from:
- ☑ Existing area wells
- ☐ Test pits
- ☐ Test wells drilled for this purpose
- ☐ Other:

Measures proposed to protect groundwater from potential impacts of the proposed mining activity:

IMPACT MINIMIZATION

Shortest distance between proposed excavation to nearest residence:
Shortest distance between proposed excavation

to nearest residential water source:

Measures proposed to prevent inadvertent access of unauthorized persons to the mine site:

Measures proposed to minimize noise impacts of the operation:

Measures proposed to minimize the dust impacts of the operation:

Measures proposed to minimize visual impacts of the operation:

WATER SUPPLY

MAPS

Mark the locations of all proposed water intakes, settling ponds and/or sediment control structures on the appropriate maps.

SOURCE OF WATER

Click on the "Add Source" button to add one or more water sources.

Source	Activity	Water Use	Estimated Rate (m^3/s)
Rico Lake	Mining - Aggregate	washing	0.01

Pump size in water (inches): 6

Location of water intake: Rico Lake (max 25,000 gal/day)

Please clearly mark the locations of all water intakes on the maps uploaded in Step 6 - Document Upload.

Total: **0.01**

SETTLING PONDS

The Inspector may require a seismic design for ponds above grade.

Describe the waste water treatment facility (settling pond design, recycling, distance from creek, etc.): Infiltration pond for clean surface water run-off.

ACTIVITIES

Click on the "Add Activity" button to add one or more proposed settling pond.

Pond ID	Width (m)	Length (m)	Depth (m)	Total disturbed area (ha)	Total merchantable timber volume (m^3)
infiltration pond	30	30	2	0.09	0

Water Source: run off and wash plant

Construction Method: excavated

Disposal of fines from clean out (i.e. use as a subsoil material):

Water from ponds will be:

- **Recycled:** Yes
- **Exfiltrated to Ground:** Yes
- **Discharged to Environment:** No

RECLAMATION PROGRAM

Describe the proposed reclamation and timing for this specific activity: none

Estimated cost of reclamation activities described above: $0.00

TIMBER CUTTING

Total merchantable timber volume: 0.00 m3

No TimberYou have indicated that there is no merchantable timber that will be cut. Therefore a Free Use Permit or a Licence to Cut is not required. If this is not accurate, please correct your entries.

EQUIPMENT

Click on the "Add Equipment" button to add one type of equipment at a time. All equipment must comply with the requirements of the Health, Safety and Reclamation Code.

Quantity	Type	Size / Capacity
1	Crusher	2436
2	Crusher	48"
3	Excavator	450/ Class 10
5	Loader	980/Class 14
4	Truck	740/ 40 tonne

SUMMARY OF RECLAMATION

Based on the information you have provided on the previous screens the Summary of Reclamation is:

Activity	Total Affected area (ha)	Estimated cost of reclamation ($)
Sand & Gravel / Quarry	48.00	1,305,000.00
Settling Ponds	0.09	0.00
Subtotal:	48.09	1,305,000.00
Unreclaimed disturbance from previous year:	0.00	
Disturbance planned for reclamation this year:	0.00	
Total:	**48.09**	**1,305,000.00**

OTHER CONTACTS

Please enter the contacts that are applicable to your application.

Contact Info		Type of Contact
Name:	Mark Stuart	Mine manager
Phone:	250-286-1148	
Daytime Phone:		
Fax:		
Email:	mark.stuart@uplandgroup.ca	
Mailing Address:	7295 Gold River Hwy Campbell River BC V9H1P1	

Contact Info		Type of Contact
Name:	Upland Contracting Ltd.	Permittee
Doing Business As:		
Phone:	250-286-1148	
Fax:		
Email:		
BC Inc. Number:	BC0990459	
Extra Provincial Number:		
Society Number:		
GST Registration Number:	831912977RT0001	
Contact Name:		
Mailing Address:	7925 Gold River Hwy Campbell River BC V9H 1P1	

Name:	Upland Contracting Ltd.	Site operator
Doing Business As:		
Phone:	250-286-1148	
Fax:		
Email:		
BC Inc. Number:	BC0990459	
Extra Provincial Number:		
Society Number:		
GST Registration Number:	831912977RT0001	
Contact Name:		
Mailing Address:	7925 Gold River Hwy Campbell River BC V9H 1P1	

Name:	Upland Excavating Ltd.	Tenure Holder
Doing Business As:		
Phone:	250-286-1148	
Fax:		
Email:		
BC Inc. Number:		
Extra Provincial Number:		
Society Number:		
GST Registration Number:		
Contact Name:		
Mailing Address:	7295 Gold River Hwy Campbell River BC V9H 1P1	

LOCATION INFORMATION

LAND DETAILS

Do you have the legal description of the land or the civic address then click on 'Add Land Information'.

DRAWINGS

All applications must include the appropriate maps and applications received without maps will be returned. All maps must be in colour, computer generated, with a scale, north arrow and a detailed legend.

For Mineral, Coal and Placer applications you must provide a minimum of 3 maps:
- A Location Map which must show the location of the property in relation to the nearest community with the access route from the community to the work site clearly marked;
- A Tenure Map which must show the boundaries of the tenure(s) and tenure numbers, at a scale of 1:20,000 or less;
- A Map of Proposed Work which must show topography, water courses, existing access, existing disturbance, contour lines, known cultural heritage resources and/or protected heritage property, at a scale of 1:10,000 or 1:5,000. For site specific applications the location of all proposed exploration activities must be shown; for area-based applications the work area must be shown as a polygon, with the location of all proposed exploration activities for year 1 shown, and shape files provided of the area.

For Sand & Gravel/Quarry applications you must provide a Plan View, Cross and Longitudinal Sections and a Land Title/Crown Land Tenure Map. Details of these requirements are listed in the Sand & Gravel/Quarry Operations Activity sheet.

☑ I have shape files from my Geographic Information System

SPATIAL FILES

Do you have a spatial file from your GIS system? You can upload it here.

Description	Filename
Pit final conditions	11188156_final_conditions_c...

ATTACHED DOCUMENTS

Document Type	Description	Filename
Annual Summary	2019 Annual Summary	_2019 Upland Pit Annual Rep...
Blasting Procedure	Blasting	_Blasting Procedures.pdf
Landowner Authorization Letter	Landowner Agreement	_Landowner Agreement.PDF
Mine Emergency Response Plan	Emergency Contact List	_Upland Contracting ltd Off...
Mine Emergency Response Plan	MERP	_Upland Contracting MERP 20...
Other	2020 Mine Plan	_2020 Mine Plan-Final-reduc...
Other	Egarms Rct	2020-06-30 Egarms Rct Uplan...
Record of First Nations Engagement	Record of FN Engagament	_First Nation Consultation ...

PRIVACY DECLARATION

PRIVACY NOTE FOR THE COLLECTION, USE AND DISCLOSURE OF PERSONAL INFORMATION
Personal information is collected by FrontCounter BC under the legal authority of section 26 (c) and 27 (1)(a)(i) of the Freedom of Information and Protection of Privacy Act (the Act).
The collection, use, and disclosure of personal information is subject to the provisions of the Act. The personal information collected by FrontCounter BC will be used to process your inquiry or application(s). It may also be shared when strictly necessary with partner agencies that are also subject to the provisions of the Act. The personal information supplied in the application package may be used for referrals or notifications as required. Personal information may be used by FrontCounter BC for survey purposes.For more information regarding the collection, use, and/or disclosure of your personal information by FrontCounter BC, please contact FrontCounter BC at 1-877-855-3222 or at:
FrontCounter BC Program Director
FrontCounter BC, Provincial Operation
441 Columbia Street
Kamloops, BC V2C 2T3
☑ Check here to indicate that you have read and agree to the privacy declaration stated above.

REFERRAL INFORMATION

Some applications may also be passed on to other agencies, ministries or other affected parties for referral or consultation purposes. A referral or notification is necessary when the approval of your application might affect someone else's rights or resources or those of the citizens of BC. An example of someone who could receive your application for referral purposes is a habitat officer who looks after the fish and wildlife in the area of your application. This does not apply to all applications and is done only when required.

Please enter contact information below for the person who would best answer questions about your application that may arise from anyone who received a referral or notification.

Company / Organization: Upland Contacting Ltd

Contact Name:	Mark Stuart
Contact Address:	7295 Gold River Hwy Campbell River BC V9H 1P1
Contact Phone:	604-286-1148
Contact Email:	Mark.stuart@uplandgroup.ca

☑ **I hereby consent to the disclosure of the information contained in this application to other agencies, government ministries or other affected parties for referral or First Nation consultation purposes.**

IMPORTANT NOTICES

- Once you click 'Next' the application will be locked down and you will NOT be able to edit it any more.

DECLARATION

☑ By submitting this application form, I, declare that the information contained on this form is complete and accurate.

APPLICATION AND ASSOCIATED FEES

Item	Amount	Taxes	Total	Outstanding Balance
Mines Notice of Work Application Fee	$50,000.00		$50,000.00	$0.00

OFFICE

Office to submit application to: Nanaimo

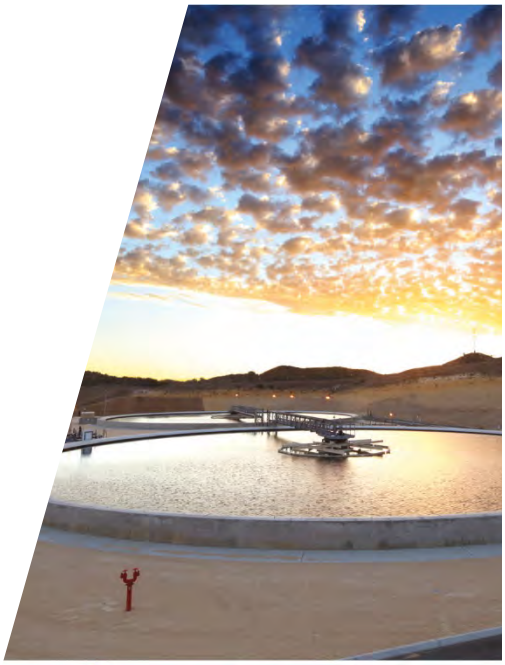
PROJECT INFORMATION

Is this application for an activity or project which requires more than one natural resource authorization from the Province of BC? No

APPLICANT SIGNATURE

Applicant Signature **Date**

OFFICE USE ONLY		
Office Nanaimo	**File Number**	**Project Number**
	Disposition ID	**Client Number**



2020 Mine Plan

Upland Sand and Gravel Pit
Campbell River, British Columbia

Upland Contracting Ltd.

Table of Contents

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Symbols and Abbreviations

AMSL	Above Mean Sea Level
BC	British Columbia
Code	Health, Safety and Reclamation Code for Mines in British Columbia
ENV	British Columbia Ministry of Environment
FOS	Factor of Safety
Ha	Hectare
km	kilometre
Landfill Criteria	Second Edition Landfill Criteria for Municipal Solid Waste, dated June 2016
m	Metre
m^2	Square Metre
m^3	Cubic Metre

Definitions

“Code” – Health, Safety and Reclamation Code for Mines in British Columbia

“Mine” refers to the area used for the extraction and processing of sand and gravel.

“New Landfill” – means the proposed 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.

“Operation” refers to the active work and processing areas related to the extraction and processing of sand and gravel including the Pit, stockpile and storage areas, access roads, weigh scales, etc.

“Original Landfill” – means the existing Original Lined Cell and the Original Un-Lined Cell.

“Permit” refers to Permit G-8-114, issued pursuant to the *Mines Act*, RSBC 1996, c. 293.

“Pit” refers to the area used for the extraction and processing of sand and gravel.

“Site” refers to all of the disturbed and undisturbed land within the legal boundaries of the property located at civic addresses 7295 and 7311 Gold River Highway.

1. Introduction

GHD was retained by Upland Contracting Ltd. (Upland) to prepare the 2020 Mine Plan for Upland Sand and Gravel Pit (Pit) located on the Upland Excavating Ltd. property at civic addresses 7925 and 7311 Gold River Highway, in Campbell River, British Columbia (BC) (Site). The Site location map is shown on Figure 1.1.

This Mine Plan has been written in accordance with the Permit and section 10 of the Health, Safety and Reclamation Code for Mines in British Columbia (Revised June 2017) (Code). The Permit was issued to Upland on December 27, 1989, and amended on February 27, 2014. A copy of the Permit is provided as Appendix A.

The Mine Plan includes relevant Site information and a progressive mine development strategy that considers the development and operations of the New Landfill on Upland property, as authorized by the Operational Certificate No. 107689 (OC) issued by the Ministry of Environment and Climate Change Strategy (ENV). The Mine Plan outlines the mining activities to be completed by Upland for the next five years (2020 to 2025), and the integration of these activities with landfill development at the Site. A Reclamation and Closure Plan for the Site is appended to this plan, which provides both a long-term and a five-year strategy for progressive Site reclamation.

1.1 Scope

This document was developed according to the outline for the Mine Plan preparation provided in the Joint Application Information Requirements for Mine Act and Environmental Management Act Permits (MEMPR & ENV, Sept 2019), as guidance.

The purpose of this Mine Plan is to provide an overview of the life of the mine and a detailed year-by-year plan for the next five years. The most recent Mine Plan was prepared by Upland in 2013 indicating years and areas to be mined. The 2013 Mine Plan is presented in Appendix B. This 2020 Mine Plan was prepared in conjunction with the 2020 Reclamation and Closure Plan appended to this report (Appendix C). It is intended that this Mine Plan and the 2020 Reclamation and Closure Plan refer to and compliment each other to link all mining and reclamation activities together.

2. Site Information

2.1 Site Location

The Site civic addresses are 7295 and 7311 Gold River Highway, Campbell River, BC. The Site is located approximately 7 kilometres (km) west of city centre. The Site's southern property boundary is close to the boundary between the City and the Strathcona Regional District (SRD) (the Site is primarily in the City's jurisdiction but extends into the SRD). The Gold River Highway and McIvor Lake are located to the north and west of the Site.

The Site is located on land parcels with the legal description of:

- LOT A PLAN VIP30709 DISTRICT LOT 85, SAYWARD DISTRICT, PLAN 30709 EXCEPT PART IN PLAN EPP15087 W ½ of DL 85 (PID: 001-223-321)

- THE NORTH EAST 1/4 OF SECTION 32 TOWNSHIP 2 COMOX DISTRICT PLAN 552A (PID: 009-004-505)
- LOT 1, DISTRICT LOT 86, SAYWARD DISTRICT, PLAN 30957 EXCEPT PART IN PLAN 42515 (PID:001-201-484)

A Site Plan is shown on Figure 2.1.

2.2 Site Description

The Site is accessed from the north via an entrance from Gold River Highway. Currently, the Site encompasses a large sand and gravel pit (Pit), a rock quarry and the Original Landfill area. The Pit is approximately 48 hectare (Ha) in size.

The Site is located on a terrace that is partially surrounded by mountainous terrain to the south and southwest. The terrace gradually slopes towards the Quinsam River located approximately 3.8 km to the southeast of the east Site boundary. The Quinsam River channel is at an elevation that is greater than 100 metres (m) below the Site.

Two lakes are located in close proximity to the Site. McIvor Lake, which is contiguous with Campbell Lake, is located approximately 50 to 150 m north of the northern Site property boundary. Rico Lake is located approximately 10 to 15 m west of the western Site property boundary and approximately 280 m west of the Landfill.

The current land uses in proximity to the Site include residential, industrial and resource extraction activities (logging and gravel extraction). Gold River Highway, also referred to as Highway 28, is located to the north of the Site.

Further detail on the physical site setting is provided in Section 6.

2.3 Surveys

Upland provided the topographic and legal land surveys for the Site. The 2018 topographic survey forms the basis of aggregate volume calculations used in this Report, with updates based on 2019 production rates. The topographic survey was completed with the use of an aerial drone and Lidar. A copy of the original legal survey plan for the Pit is provided in Appendix D.

2.4 Site History

Upland Pit has been in operations as a sand and gravel pit and aggregate quarry since 1976. The property has large reserves of sand, gravel and basalt. Rock blasting, excavation of pit- run, and material processing via crushing, screening and washing have been systematically carried out to produce a variety of merchantable aggregate products. According to the 2008 Mine Plan, the historical rate of extraction was approximately 250,000 tonnes annually. Prior to 2013, it is estimated that approximately 2.5 million cubic metre of material were extracted from the centre of the Pit. The centre of the Pit now serves as an operational area that houses a wash plant and associated wash plant settling ponds as well as material stockpiles. The rate of extraction since 2014, has been approximately 190,000 tonnes per year.

A landfill (Original Landfill) has been in operation on the southeastern corner of the property since 1992.

2.5 Regulatory Setting

The Pit operations are conducted in accordance with the Permit. The Permit requires adherence and compliance with the following legislation and guidance document:

- BC Mines Act
- Environmental Management Act
- Health, Safety and Reclamation Code for Mines in British Columbia (Revised June 2017)
- The BC Landfill Criteria for Municipal Solid Waste (BC ENV, 2016) (Landfill Criteria)
- Comox Strathcona Waste Management – 2012 Solid Waste Management Plan, December 2012

2.6 Regulatory Permits

Mine Act Permit

Quarry activities for excavation, blasting, crushing, screening and washing of pit run material are authorized under the Permit. The Permit was issued to Upland on December 27, 1989, amended on February 27, 2014 and allows for the production of 220,000 tonnes per year in accordance with the December 13, 2013 Mine Plan. The Permit stipulates the reclamation requirements for the Site.

Water Licence

The use of water from Rico Lake for the Site is approved under the Water Licence 51287 issued November 2, 1978, under the provision of the Water Act. The Water Licence allows for diversion of 25,000 gallons per day for the purpose of gravel washing.

Waste Discharge Permit (superseded)

Acceptance and discharge of certain waste materials at the Site are authorized under Waste Discharge Permit No. PR-10807, issued under the provision of the Environmental Management Act. The Waste Discharge Permit was first issued on June 1, 1992. Under the Waste Discharge Permit the Site accepted clean wood wastes that are burned in the permitted Burn Area located along the southern boundary of the Site. The Waste Discharge Permit allows for the discharge of wastes consisting of construction, demolition, and land clearing waste. Land clearing waste includes stumps, trees, selected building demolition debris and residue of combustion from the open burning of wood waste. Permit No. PR-10807 has been superseded by the OC issued in August 2019.

Operational Certificate

Upland was issued an OC on August 1, 2019, under the provision of the Environmental Management Act that allows for a modernized landfill cell (referred to as New Landfill) to be developed in the southern portion of the Site. The OC authorizes the acceptance and discharge of 45,000 tonnes of waste materials per year at the Site. The characteristics of the authorized waste materials include construction, demolition, and land clearing wastes and soil that meets the industrial land use standards per the Contaminated Site Regulations (CSR).

The OC authorizes continued interim discharge to the Original Landfill and requires that waste from the Original Landfill be relocated to the New Landfill within one year of commencing landfilling operations in the New Landfill.

The New Landfill design, operations and closure details are provided in Landfill Design, Operations and Closure Plan (DOCP) most recently prepared by GHD in 2017. An update to the DOCP is planned for 2020. This and future updates to the Landfill DOCP will be supplied to the Chief Inspector.

2.7 Upland Sand and Gravel Mine Business Plan

Upland Contracting Ltd. is part of Upland Group, which is one of the largest and most diversified construction companies on Vancouver Island, BC. Upland is based out of Campbell River, and the head office is located at the entrance of the subject Site. Upland has been owned and operated by the same family since it was founded in 1969. In addition to aggregate services, Upland Group also provides trucking services, civil contracting and waste management services. Currently, Upland employs over 100 people in fulltime permanent positions; and at certain times, the number of employees can increase to approximately 200.

Upland believes in being a part of the local community and investing in the future of the community by contributing to local organizations. Some beneficiaries include the Salmon Enhancement Foundations, Campbell River Water Park, Rotary Club, and the Campbell River Motor Cross Track. Upland's mission is to be a leader in construction innovation and employment by working closely with the community, business leaders and First Nation Groups.

2.7.1 Safety and Environment

Upland is committed to providing its employees with a safe, diverse and supportive working environment. Upland has a comprehensive occupational health and safety program in place to ensure the safety of the work force is the top priority. All workers are required to take part in the project specific safety plan.

Upland is also committed to the preservation and protection of the environment. Upland employs a rigorous Environmental Management Policy. All Upland work sites employ a Site specific environmental management plan, and all workers must take part in a pre-job environmental management plan awareness training.

2.7.2 Business Objectives

Upland Sand and Gravel Pit Business Plan is "to continue to lead the construction industry in quality and safety. Constantly looking and servicing new markets and customers regardless of location or isolation challenges. Upland aggregate source is the key to supporting the growth of the Company and helping to develop further diversification with landfill and environmental opportunities."

This Mine Plan provides Upland with a framework to meet required production quantities of aggregate and quarry products for the next five years to support this business plan. Note that Upland typically mines aggregates according to which mining area (predominant aggregate type available in that mining area) provides the highest return on investment at the time of mining and

local market demand. Therefore, the timing of mining in specific areas as proposed in this report may fluctuate.

3. Mine Plan Overview

3.1 Mining Methods

Upland Pit operates as an open pit sand and gravel mine and quarry. Mining methods includes excavation through Heavy Machine Equipment (HME). Rock blasting and crushing is carried out in the southwestern portion of the Site. The equipment used at this Site includes:

- Cat 980 K Front End Loader Class 14
- Cat 740 Rock Truck – 40 tonne
- Hitachi 450 Excavator Class 10
- Nordberg Primary Crusher 2436
- Terex Secondary Crusher 48”

3.2 Mining Rates

A maximum annual production rate of 220,000 tonnes is stipulated in the Permit under Site Specific Conditions. The Pit has produced an average of approximately 190,000 tonnes per year (since 2013) of sand and gravel aggregate products and quarry products. The average in-situ (undisturbed) aggregate density is approximately 2.3 tonnes/m^3.

In 2019, the Pit produced a total 219,867 tonnes of products, including 36,220 tonnes of quarry product. Approximately, 199,156 tonnes of product were removed from the Site in sales.

3.2.1 Products

The following are the types of products produced from Upland Pit. A full list of products provided in Appendix E.

- Bank aggregates
- Processes aggregates
- Washed aggregates
- Quarry products
- Recycled aggregate products
- Non-retail aggregate

The continued production of the all products is planned and the year-to-year breakdown of the quantities will be dependent on the demand for each product type.

3.3 Projected Mine Life

At the time of the topographic survey (2018), the estimated remaining production of the Pit was approximately is 3,881,616 m^3 or 8,927,717 tonnes of aggregate. In 2019, Upland produced 183,647 tonnes of sand and gravel aggregate, which is equivalent to approximately 79,847 m^3. The current estimated remaining production is 3,786,022 m^3 or 8,707,851 tonnes. For the purposes of estimating the projected mine life, it was assumed that the excavation of the Pit extends to the buffer zone on a 2H:1V slope no deeper than the current base elevation of 168 m AMSL and that no additional deeper benches will be mined. The basalt reserves are located outside the main Pit area. The rock quarry is mined at approximately 40,000 tonnes per year.

Based on the remaining Pit volume, and the anticipated annual production rates, the Pit Site life span is estimated at 42 years. The projected life of the Pit, by area is outlined in Table 3.1 below.

Table 3.1 Projected Pit Life

Location	Estimated Volume (m^3)	Assumed Production Rate (tonnes / yr)	Mining Timeframe
Area 1	441,000	180,000	5.6 years See Five-year Mine Plan (Section 5)
Area 2	251,000	180,000	3.2 years
Area 3	336,000	180,000	4.3 years
Area 4	64,700	180,000	0.8 years
Area 5	29,600	180,000	0.4 years
Future Reserve Areas	2,663,722	220,000	28 years
Total Mine Life	**3,786,022**		**42.4 years**

3.4 Processing Methods

Aggregate excavation, blasting, screening, crushing, washing and stockpiling are carried out on-site. The merchantable materials are separated by type and stockpiled.

3.5 Infrastructure Requirements

The infrastructure required to support mining operations includes:

- Wash plant and associated water plant settling ponds
- Primary and secondary crusher
- Access roads
- Weigh scale

Secondary supporting infrastructure includes:

- Office facility for administrative requirements
- Machine shop for any on-site equipment repairs and/or storage
- Shelters and structures used to store miscellaneous operational items

3.6 Existing Development

The Pit has been in operation since 1976 under the Permit. Current operation activities include excavation of pit-run material, blasting, crushing, and screening and washing of excavated material. The mine currently operates from 9:00 a.m. to 5:00 p.m. from Monday to Friday. A variety of structures and equipment are located on-Site to support Pit operations.

Structures related to Pit operations include:

- An office facility located on the north side of the Site.
- A machine shop and maintenance shop located on the north side of the Site near the entrance.
- A wash plant and associated wash plant settling ponds located in the centre of the Pit.
- A primary and secondary crusher located northeast of the wash plant and ponds.
- Various imported segregated material stockpiles for reuse (concrete, asphalt, rebar, fill, etc.) located on the Site as part of the pit and material recycling operations.
- Various shelters and structures used to store miscellaneous operational items located at the southeast corner of the Site.
- Unused fuel storage tanks.

Equipment related to Pit Operations include:

- A weigh scale located on the north side of the Site near the entrance.

The components of the Pit Operations are shown on Figure 3.1. The figure also shows that Pit is divided into operational Cells (Cell 1A to 1D, Cell 2A to 2D, and Cell 3A to 3D).

4. Life of Mine Plan

4.1 Construction

As the Pit has been in operation for over 40 years, much of the required infrastructure for the operation and expansion of the Pit has been constructed as described in Section 3 above. Ongoing construction for development includes upgrades and replacement of existing facilities and establishing new /relocated on-Site access roads as the Mine Plan dictates.

Within the five-year Mine Plan (Section 5), closure of the Original Landfill area will occur and construction of the New Landfill will commence as part of the Site development and reclamation. Construction for the New Landfill in the base of the Pit is planned to commence in 2020.

The planned landfill design and construction is described in the Landfill Design, Operations and Closure Plan (DCOP) (GHD, 2017).

4.2 Operation

Existing operations at the Site will continue under this Mine Plan. The operations include the use of the infrastructure described in Section 3.6.

As described in Section 2.1, the Site is divided into Cells (Cell 1A to 1D, Cell 2A to 2D, and Cell 3A to 3D). The Site will be mined using a phased-approach over the life span of the Pit operation. Future mining will target the following Cells; 1B – 1D, 2B – 2D, and 3B – 3C. These cells have been broken down to the followings mining Areas 1 through to 5, and are dependent on volume of available aggregate and Pit geometry. The progressive mine development areas are shown in Figure 4.1.

All excavations are planned to terminate at a minimum base elevation of 168 m AMSL. Mine areas are targeted to prepare for the construction of the New Landfill and to respond to aggregate market forces. Targeted areas may vary depending of product demand, available stockpiled aggregate and site preparation requirements. The planned mining areas for the next five years are described in Section 5.1.1.

The rock quarry area, which is approximately 52,750 m^2 is shown on Figure 2.1. Drilling and blasting of rock for the production of quarry product is planned at an approximate rate of 40,000 tonnes per year. The rock cut in this area is planned to terminate at the elevation of the rim of the Pit (approximately 191 m amsl).

The five-year plan provided in Section 5 describes the integration of mining and reclamation, which includes the discharge of waste materials over the next five years. The DOCP for the New Landfill is planned to be updated in 2020 to better integrate the landfill cell construction with the Mine Plan operation.

4.3 Closure

The final closure conditions of the mine are shown on Figure 4.2. The progressive closure strategy and the long-term reclamation and closure objectives are outlined in the 2020 Reclamation, and Closure Plan is in Appendix C.

The closure of the Pit includes stabilizing pit slopes with both in-situ non-merchantable material and imported common fill. A portion of the Pit will be closed using certain non-putrescible solid waste materials placed within the New Landfill cells. The closure and relocation of waste from the Original Landfill to the New Landfill, as well as the development and subsequent closure of the New Landfill form part of the Site's Reclamation and Closure Plan. Other areas of the mine will be reclaimed to support compatible future industrial land uses through the framework described in the Reclamation and Closure Plan.

4.4 Mining Waste Inventory

The mine waste generated on-site is minimal. Stripped top soil is stockpiled on-site for re-use as part of progressive landfill closure. Excavated material determined to be non-merchantable will be sorted and subsequently used in the Pit reclamation.

4.5 Stockpiles

Currently, there is approximately 90,300 m^3 (207,690 tonnes) of processed aggregate stockpiled on Site. The general location of the stockpile areas is shown on Figure 4.3. The following best practices are followed with regards to aggregate stockpiling:

- The height of any individual stockpile is limited to less than 6 m in height.
- Stockpiling will have limited to no interference with existing Pit operations and stormwater management works.
- Stockpiles will be managed as to not promote erosion and sediment control issues.
- Whenever practical, stockpiles will be located in close proximity to a cell approaching closure and reclamation.
- Areas will be clean and level prior to stockpiling material.
- Aggregates should not be removed form stockpiles within 0.3 m of the ground until final cleanup/removal of the stockpile.
- Aggregate layering and tarps may be used to minimize moisture absorption.

4.6 Haul Routes

Site access is provided via the Gold River Highway. It is intended that a perimeter access road be maintained around the Pit.

All new haul routes will be designed and constructed to be 10 m wide with a maximum grade of 10% and comply with Section 6.9.1 of the Health, Safety and Reclamation Code. Roads will be maintained with regular grading, dust suppression and repair works, as necessary.

Several access roads will be decommissioned, re-aligned, or reconstructed to facilitate this Mine Plan, notably in the following areas:

Area 1

Access to Area 1 for excavation and processing of material is gained from the base of the Pit. An access road will be constructed from the Original Landfill area to the New Landfill area to facilitate haul trucks working in these areas. This new access road may also be connected to a proposed access road on the east side of the property and to the access road network on the south side of the property.

Area 2

The perimeter road in the northeast corner of the Site will have to be re-aligned approximately 100 m to the north and 140 m to the east beyond the proposed mining Area 2.

Area 3

The perimeter road on the east side of the Site will be re-aligned approximately 140 m to the east beyond the proposed mining Area 3 and connected to the existing road network in the area of the Original Landfill.

In the long-term, existing roads will be reclaimed to meet the land use objectives (Permit Condition 9), productivity objectives, and left in a manner that ensures long-term physical stability of the Site (Permit Condition 10).

4.7 Water Management

Stormwater management controls have been designed to convey stormwater runoff in a manner that limits erosion and sediment loading potential.

During the Mine's active site life, all stormwater generated within the Pit will infiltrate into the underling aquifer through the base of the Pit. Surface water runoff above the Pit walls will be directed by surface grading and installation of swales and diversion berms to prevent uncontrolled overbank flow and erosion of the Pit slopes. Drainage from the Site above the Pit will discharge from the Site by overland sheet flow or will be directed into the Pit by engineered swales. No concentrated stormwater runoff currently discharges from the Site.

Stormwater management works for the final Mine closure include:

- Mid-slope-engineered swales constructed on the pit wall surface to intercept runoff and prevent erosion of soils. Swales will be spaced approximately every 15 m of vertical separation.
- Perimeter infiltration ditch 1.0 m wide and 1.0 m in depth to collect and infiltrate stormwater runoff from the base of the Pit.
- Pit floor grading to promote positive drainage towards the perimeter ditch and away from the waste management area.
- Grading of the highland area of the Site to promote drainage away from the Pit.

To limit surficial erosion and small-scale slumping, the Pit side slopes have been designed with graded engineered swales to promote drainage into the Pit and subsequently the underlying aquifer.

4.8 Environmental Monitoring

Environmental monitoring at the Site is carried out as part of the Environmental Monitoring Plan (EMP) required by the OC. The EMP satisfies the water quality monitoring requirements for the Mine Plan and Site Operations. An annual report providing the results of the EMP is prepared and submitted to the ENV and appropriate stakeholders.

Groundwater levels and groundwater quality is presently monitored twice per year. Once the New Landfill is constructed and landfill operations for the New Landfill commence the frequency of

groundwater monitoring will increase to quarterly. As there is no concentrated stormwater discharges from the Site, no surface water quality monitoring is carried out.

The EMP consists of semi-annual monitoring of groundwater at 15 monitoring well locations across the Site. Water level data is also collected at Rico Lake and McIvor Lake. The water levels in the lakes are monitored to assess the hydraulic relationship between these surface water bodies and the overburden and bedrock aquifer beneath the Site. The water level surface elevation at Rico Lake is measured from a surface water gauge installed in the lake. The hydrometric surface of McIvor Lake is monitored by BC Hydro. GHD records the water level surface elevation from the publically available BC Hydro Data Records.

Groundwater levels are monitored at 15 monitoring wells located across the Site. Groundwater quality data collected at downgradient monitoring well locations is assessed relative to the BC Contaminated Site Regulation Generic Numerical Water Standards for Drinking Water (DW), Schedule 3.2 (CSR) as specified in Section 3.5 of the Landfill OC.

The Site is operating in full compliance with the required water quality standards.

5. Five-Year Mine Plan

5.1 Five-Year Development Schedule

A five-year Mine Development Plan for 2020 to 2024 has been prepared for the Site, which includes a plan for the excavation of sand and gravel material, blasting and crushing of rock, construction and operations of the New Landfill and reclamation activities.

5.1.1 Excavation Plan

Area 1 (Figure 5.1) will be targeted for excavation of sand and gravel over approximately the next five to six years. The excavation plan for Area 1 has been developed to allow for integrated phased construction of the Landfill.

Once the first Landfill cell has been excavated though mining activities, Landfill base liner construction will commence in that area followed by commissioning and landfilling. The five-year excavation plan is presented in Figures 5.1 a, b and c.

Area 1 has been subdivided into five sub-areas, each to be mined sequentially. Excavations are planned to terminate at a base elevation of 168 m AMSL. Mining in this area is proposed to be conducted at 2H:1V slopes. As the available aggregate in Area 1 may not be consistent will all Upland products, extraction will be supplemented from other site areas (Areas 2 – 5) depending on market demands. In addition, Upland will also be mining the rock quarry area to produce quarry products (at a rate of approximately 40,000 tonnes/year). Table 5.1 summarizes the excavation plan for Area 1.

Table 5.1 Area 1 Excavation Plan

Area	Tonnage	Cubic metres	Production Time (Months)	Production Start Year
Area 1A	69,000	30,000	4.6	2020
Area 1B	234,600	102,000	15.6	2021
Area 1C	216,200	94,000	14.4	2022
Area 1D	140,300	61,000	9.4	2024
Area 1E	354,200	154,000	23.6	2025
Total	**1,014,300**	**441,000**	**68**	

The maximum permitted production rate from the Pit is 220,000 tonnes per year. The estimates in Table 5.1 are based on a production rate of 180,000 tonnes of aggregate and 40,000 tonnes of quarry products per year. Note that the actual volume mined and aggregate extracted per year may vary. Additional mining may take place in Areas 2 through 5, however, the maximum overall production rate of 220,000 tonnes per year will be upheld.

5.1.2 Landfill Development Plan

Construction of the New Landfill is scheduled to commence in 2021. Through the five-year excavation plan outlined in Section 6.1.1, the footprint of the New Landfill will be mined to a base elevation of 168 m AMSL to facilitate construction of the landfill liner system and supporting water management ponds. The planned five-year landfill construction includes:

- Double layer of composite base liners with leachate collection system, and leak detection system for Stage 1 East, Stage 1 West and Stage 2A
- Aeration pond
- Infiltration pond
- Surface water diversion berms, ditches and energy dissipation structures

An access road will be constructed to access and facilitate construction of the southern half of the New Landfill as shown of Figure 5.1. This access road will maintain a 10 m width with a maximum 10% grade.

5.1.3 Reclamation Plan

Reclamation activities identified for the for short term (2020 to 2025) support the overall reclamation and closure objectives for the site detailed in Appendix B. Two area are identified for reclamation within the five-year plan are:

- Reclamation Area 1 – located south of the New Landfill (Cells 3C)
- Reclamation Area 2 – Original Landfill area (Cell 3D)

Reclamation Area 1 is currently used for materials stockpiles and as an access road. The intent is that this area will serve as the 50 m buffer zone between the Landfill footprint and the property boundary. The access road in Reclamation Area 1 will be maintained to provide Landfill access connecting to the existing on-site road network.

Reclamation Area 2 is the Original Landfill, which in accordance with the OC, will have all of the existing waste relocated to the New Landfill within the first year of landfilling at the New Landfill. The area will be re-graded to promote positive drainage and infiltration of surface water. This area contains aggregate reserves and will be mined in the future.

5.1.4 Integrated Site Activity Plan

The integration of mining and landfilling activities is presented in Figures 5.2 and b. Table 5.2 summarizes the anticipated timing of the pit excavation, landfill construction, landfilling and reclamation activities.

Table 5.2 Integrated Site Activity Plan

Year	Pit Excavation	Landfill Construction	Landfilling	Reclamation
Year 1 – 2020	Area 1A	Construction of Stage 1 East cell base and short-term leachate management infrastructure.	-	Reclamation Area 1
Year 2 – 2021	Area 1B	-	Stage 1 East	
Year 3 – 2022	Area 1B and Area 1C	Construction of Stage 1 West cell base.	Stage 1 East and Stage 1 West (once cell is complete)	Reclamation Area 2
Year 4 – 2023	Area 1C	Construction of Infiltration pond.	Stage 1 West	
Year 5 – 2024	Area 1D	Construction of Aeration Pond.	Stage 1 West	
Year 6+ – 2025+	Area 1 E	Construction of Stage 2A cell base.	Stage 1 West	

5.2 Stockpile Location

Aggregate stockpile areas for 2020 to 2024 will be located within the base of the Pit and the rock Quarry area, as shown on Figure 5.3. Required soil and fill materials as outlined in the Reclamation and Closure Plan can also be stockpiled in these areas. Future stockpiles should be located and arranged in way consistent with Section 4.5 of this Mine Plan.

5.3 Haul Routes

Site access from the Gold River Highway will continue during the period included in this Mine Plan (2020–2024). Within the five-year period an access road will be constructed from the Lined Cell of the Original Landfill to the New Landfill area to facilitate haul trucks working in these areas. This new access road may also be connected to a proposed access road on the east side of the property and to the access road network on the south side of the property, as shown in Figure 5.1.

5.4 Water Management

Stormwater management controls have been designed to convey stormwater runoff in a manner that limits erosion and sediment loading potential.

During the active mining phase of Areas 1, and through the construction of the New Landfill, stormwater will infiltrate into the underling aquifer through the base of the Pit, swales and ditches. The stormwater management works for the new landfill area have been developed separately.

6. Site Physical Characteristics

The Site physical characteristics including topography, drainage, geology, hydrogeology, and climate are described below.

6.1 Topography

The Site is located on a terrace partially surrounded by mountainous terrain to the south, southwest, and northwest. The terrace gradually slopes towards the Quinsam River located 3.8 km to the southeast of the east Site boundary. The Quinsam River channel is at an elevation approximately 100 m below the Site.

On-Site, the topography is relatively level at approximate elevation 190 m AMSL with the exception of the Pit located in the centre of the Site. The Pit area has been excavated to a depth of approximately 168 to 170 m AMSL, 20 m below the surrounding land surface. The final base elevation of the Pit will range from 168 to 169 m AMSL. Along the western Site boundary, above the Pit wall bedrock is present at 170 to 193.5 m AMSL. Bedrock slopes toward Rico Lake and along the eastern Site boundary towards the adjoining property. The bedrock represents the base of a small mountain near the southwestern Site boundary. The small mountain stands approximately 100 m above the Site. Bedrock outcrops are also present on the northern portion of the adjoining K&D property.

6.2 Drainage

The Pit is located within the Quinsam River Watershed. The Quinsam River watershed covers an area of 20,900 Ha and is bound to the north and west by a mountainous divide that isolates it from the Campbell River watershed (Blackmun, Lukyn, McLean & Ewart, 1985). The Pit has no surface water outflow and all precipitation that falls into the Pit infiltrations into the Pit floor reaching the underlying groundwater flow system, which flows to the southeast and eventually discharges into the Quinsam River Watershed.

6.3 Geology

The Pit is located on part of the Wrangellia Terrane, which includes most of Vancouver Island, the Queen Charlotte Islands and parts of central Alaska. The Wrangellia Terrane is composed mostly of widespread, late Triassic aged flood basalts, including the Karmutsen Formation. The Karmutsen Formation consists mostly of submarine flood basalts up to 6 km in thickness. Vancouver Island is extensively faulted with thrust faults associated with the subduction of the Juan de Fuca Plate under the North American Plate (MOE and Guthrie, 2005) (Greene, Scoates & Weis, 2005).

At several time periods during the Pleistocene Epoch, Vancouver Island was glaciated with ice thicknesses to 2,000 m. During the recession of the last glaciation approximately 14,000 years ago, glacial and glaciofluvial sediments were deposited, and in some cases reworked and redeposited, to make up many of the present surficial deposits of Vancouver Island. These deposits consist of till, which is deposited directly by glacial activity and consist of larger clasts supported in a matrix of fine grained sediment, and of glacial outwash, which consists primarily of poorly sorted, coarse grained (sand and gravel) sediments deposited by glacial melt water (Greene, Scoates & Weis, 2005). The overburden at the site consists of glaciofluvial and outwash deposits of sand and gravel. (McCammon, 1977).

The following stratigraphic units, in order from shallowest to deepest, characterize the Site geology:

1. A native interbedded sand and gravel unit is present throughout the Site. The thickness of this unit is highly variable and ranges from 0 to at least 47 m thick. The variability is due to the presence of bedrock at surface and underlying the Site.
2. A substantial sand unit was encountered in the central portion of Pit and in the southeast portion of the Site. This sand unit ranges in depth and thicknesses from approximately 12 m to greater than 33 m. This sand unit varies in composition from sand with gravel to silty sand/sandy silt.
3. Bedrock at ground surface and underlying the Site is Karmutsen basalt (igneous rock). Underlying the Pit, the bedrock surface appears to dip steeply west to east.
4. The structure of the overburden unit is consistent with glaciofluvial and outwash depositional sources.

6.4 Hydrogeology

In general, the geologic units identified in the previous sections may be grouped into the following hydrogeologic units – a sand and gravel aquifer.

The sand and gravel aquifer is present within the unconsolidated overburden units. The aquifer consists of coarse grained materials, primarily sand and gravel of varying degrees, with occasional seams of sand and silty sand. The sand and gravel aquifer is identified as the principal groundwater flow zone at the Site and has been identified in the BC Water Resource Atlas as aquifer 975 IIA (10).

On-Site, groundwater elevations within the sand and gravel aquifer range from 186.7 m AMSL along the northern Site boundary to 148.1 m AMSL near the southeastern property boundary. Groundwater within the sand and gravel aquifer flows from northwest to southeast (i.e., from McIvor

Lake to the southeast corner of the Site). McIvor Lake recharges the sand and gravel aquifer underlying the Site.

6.5 Climate

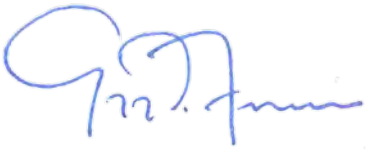
The Site is located on the east coast of Vancouver Island. This region is marked by wet and mild winters, and warmer drier summers. Based on Environment Canada's Climate Normals measured between 1980 and 2010 at the Campbell River Airport (Climate ID: 1021261), the average annual precipitation is reported to be 1,489 millimetres (mm) with over 75 percent of the precipitation occurring between October and March. November and December experience the most precipitation with an average of 232 and 226 mm, respectively. On average 84 mm worth of snowfall is recorded per year.

A copy of the site physical characteristics is presented as Appendix E.

All of Which is Respectfully Submitted,

GHD

Roxy Hasior, B.A.Sc., EIT



Gregory D. Ferraro, P.Eng.

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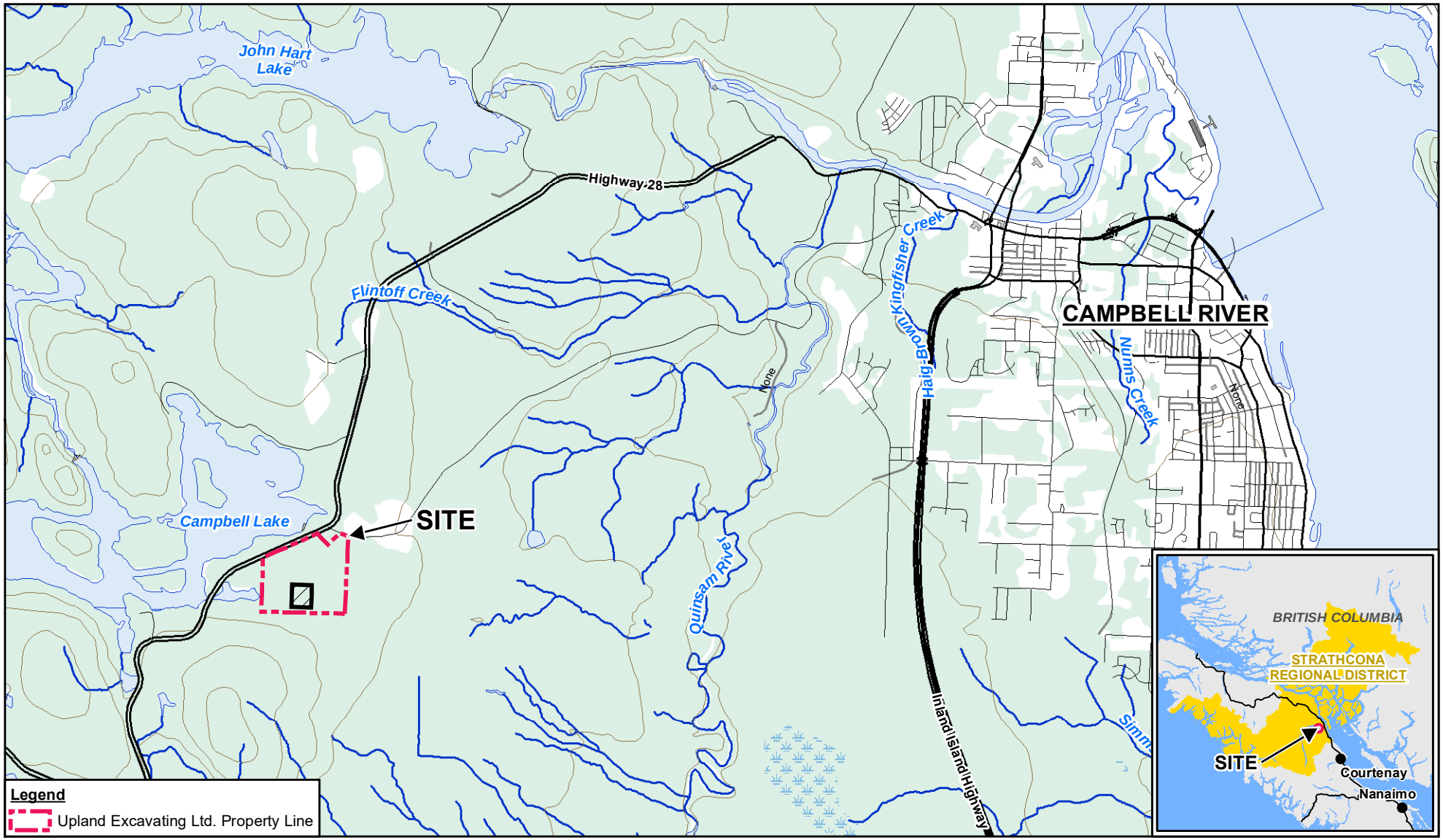


0 500 1,000 1,500
Meters

Coordinate System:
NAD 1983 UTM Zone 10N

N

GHD

UPLAND CONTRACTING SAND AND GRAVEL PIT
2020 MINE PLAN

11188156
Mar 24, 2020

SITE LOCATION MAP

FIGURE 1.1

GIS File: Q:\GIS\PROJECTS\11188000s\11188156\Layouts\001\11188156-00(001)GIS-OT001.mxd

LEGEND

- 165.00 — EXISTING MAJOR CONTOURS (m AMSL)
- EXISTING MINOR CONTOUR (m AMSL)
- PIT PROPERTY LINE
- EXISTING LAKE
- EXISTING ACCESS ROADWAY
- LIMIT OF WASTE FOR NEW LANDFILL
- QUARRY EXCAVATION LIMITS
- ORIGINAL LANDFILL LINED CELL
- ORIGINAL LANDFILL UNLINED AREA
- LIMIT OF EXCAVATION FOR NEW LANDFILL
- APPROXIMATE LIMIT OF ROCK QUARRY

A B C D

1 2 3

1A 1B 1C 1D

2A 2B 2C 2D

3A 3B 3C 3D

LOT 6
PLAN 31913

McIVOR LAKE

ARGONAUT ROAD

2047-R

GOLD RIVER HIGHWAY

LOT A
PLAN 30709

OFFICE

WEIGH SCALE

SHED

SHOP

LOT A
PLAN 42515

CONCRETE STOCKPILE

ASPHALT STOCKPILE

LOT A PLAN VIP30709 DISTRICT LOT 85 LAND DISTRICT 51 EXCEPT PLAN EPP15087 W 1/2 OF DL 85 (PID: 001-223-321)

RW-98020

STRATA LOT 1
PLAN VIS6756

STRATA LOT 2
PLAN VIS6756

K&D CONTRACTING LTD.

LOT C
PLAN 42515

WASH PLANT

AERATION POND

INFILTRATION POND

UNLINED AREA

RICO LAKE

LOT 1, DISTRICT LOT 86, SAYWARD DISTRICT, PLAN 30957, EXCEPT PART IN PLAN 42515 (PID: 001-201-484)

50.0m
BUFFER ZONE

ORIGINAL LINED CELL

THE NORTH EAST 1/4 OF SECTION 32 TWONSHIP 2 COMMOX DISTRICT PLAN 552A (PID: 009-004-505)

SOURCE: TOPOGRAPHICAL SURVEY DATED DEC. 18, 2018 PROVIDED BY UPLAND CONTRACTING.

0 40 80 120m

UPLAND CONTRACTING
SAND AND GRAVEL PIT
2020 MINE PLAN

SITE PLAN

11188156-03

Apr 28, 2020

FIGURE 2.1

CAD File: N:\CA\Vancouver\Legacy\Drawings\11188000s\11188156\11188156 - REPORT\11188156-03(003)\11188156-03(003)GN\11188156-03(003)GN-VA001.dwg

Source: Image ©2020 Google, Imagery date: 09/26/2017, CanVec Edition 1.1 © Department of Natural Resources Canada. All rights reserved.

0 40 80 120
Meters

Coordinate System:
NAD 1983 UTM Zone 10N

UPLAND CONTRACTING SAND AND GRAVEL PIT
2020 MINE PLAN

11188156
Mar 24, 2020

PIT OPERATIONS

FIGURE 3.1

GIS File: Q:\GIS\PROJECTS\11188000s\11188156\Layouts\001\11188156-00(001)GIS-OT003.mxd

LEGEND

- 165.00 — EXISTING MAJOR CONTOURS (m AMSL)
- EXISTING MINOR CONTOUR (m AMSL)
- PIT PROPERTY LINE
- EXISTING LAKE
- EXISTING ACCESS ROADWAY
- ADDITIONAL ACCESS ROAD
- LIMIT OF WASTE FOR NEW LANDFILL
- QUARRY EXCAVATION LIMITS
- ORIGINAL LANDFILL LINED CELL
- ORIGINAL LANDFILL UNLINED AREA
- APPROXIMATE LIMIT OF ROCK QUARRY
- AREA 1
- AREA 2
- AREA 3
- AREA 4
- AREA 5

A B C D

1 2 3

1A 1B 1C 1D

2A 2B 2C 2D

3A 3B 3C 3D

LOT 6
PLAN 31913

McIVOR LAKE

ARGONAUT ROAD

2047-R

GOLD RIVER HIGHWAY

LOT A
PLAN 30709

AREA 2

WEIGH SCALE

OFFICE

SHED

SHOP

LOT A
PLAN 42515

CONCRETE STOCKPILE

ASPHALT STOCKPILE

AREA 4

LOT A PLAN VIP30709 DISTRICT LOT 85 LAND DISTRICT 51 EXCEPT PLAN EPP15087 W 1/2 OF DL 85 (PID: 001-223-321)

AREA 5

AREA 3

RW-98020

STRATA LOT 1
PLAN VIS6756

K&D CONTRACTING LTD.

LOT C
PLAN 42515

WASH PLANT

AERATION POND

2022

AREA 1

INFILTRATION POND

2021

2020

2024

UNLINED AREA

STRATA LOT 2
PLAN VIS6756

RICO LAKE

2025

LOT 1, DISTRICT LOT 86, SAYWARD DISTRICT, PLAN 30957, EXCEPT PART IN PLAN 42515 (PID: 001-201-484)

50.0m BUFFER ZONE

ORIGINAL LINED CELL

THE NORTH EAST 1/4 OF SECTION 32 TWONSHIP 2 COMMOX DISTRICT PLAN 552A (PID: 009-004-505)

SOURCE: TOPOGRAPHICAL SURVEY DATED DEC. 18, 2018 PROVIDED BY UPLAND CONTRACTING.

0 40 80 120m

N

GHD

UPLAND CONTRACTING
SAND AND GRAVEL PIT
2020 MINE PLAN

PROGRESSIVE MINE DEVELOPMENT

11188156-03

Apr 29, 2020

FIGURE 4.1

CAD File: N:\CA\Vancouver\Legacy\Drawings\11188000s\11188156\11188156 - REPORT\11188156-03(003)\11188156-03(003)GN\11188156-03(003)GN-VA002.dwg

LEGEND

- 165.00 — EXISTING MAJOR CONTOURS (m AMSL)
- EXISTING MINOR CONTOUR (m AMSL)
- PIT PROPERTY LINE
- EXISTING LAKE
- EXISTING ACCESS ROADWAY
- LIMIT OF WASTE FOR NEW LANDFILL
- QUARRY EXCAVATION LIMITS
- PERIMETER INFILTRATION DITCH
- ENGINEERED EROSION CONTROL SWALE
- APPROXIMATE LIMIT OF ROCK QUARRY

A B C D

1 2 3

1A 1B 1C 1D

2A 2B 2C 2D

3A 3B 3C 3D

LOT 6
PLAN 31913

McIVOR LAKE

ARGONAUT ROAD

2047-R

GOLD RIVER HIGHWAY

LOT 6
PLAN 31913

OFFICE

WEIGH SCALE

SHED

SHOP

LOT A
PLAN 42515

ENGINEERED EROSION CONTROL SWALE

LOT A PLAN VIP30709 DISTRICT LOT 85 LAND DISTRICT 51 EXCEPT PLAN EPP15087 W 1/2 OF DL 85 (PID: 001-223-321)

A FIG. 5.4

A' FIG. 5.4

PERIMETER INFILTRATION DITCH

PIT ACCESS ROAD

LOT A
PLAN 42515

RW-98020

STRATA LOT 1
PLAN VIS6756

K&D CONTRACTING LTD.

LOT C
PLAN 42515

PERIMETER INFILTRATION DITCH

STRATA LOT 2
PLAN VIS6756

ENGINEERED EROSION CONTROL SWALE

AERATION POND

INFILTRATION POND

RICO LAKE

LOT 1, DISTRICT LOT 86, SAYWARD DISTRICT, PLAN 30957, EXCEPT PART IN PLAN 42515 (PID: 001-201-484)

50.0m BUFFER ZONE

THE NORTH EAST 1/4 OF SECTION 32 TWONSHIP 2 COMMOX DISTRICT PLAN 552A (PID: 009-004-505)

SOURCE: TOPOGRAPHICAL SURVEY DATED DEC. 18, 2018 PROVIDED BY UPLAND CONTRACTING.

0 40 80 120m

N

NOTE:
FINISHED ELEVATION FOR BASE OF PIT IS APPROXIMATELY 168m amsl.
FINISHED ELEVATION FOR ROCK QUARRY IS APPROXIMATELY 191m amsl.

GHD

UPLAND CONTRACTING
SAND AND GRAVEL PIT
2020 MINE PLAN

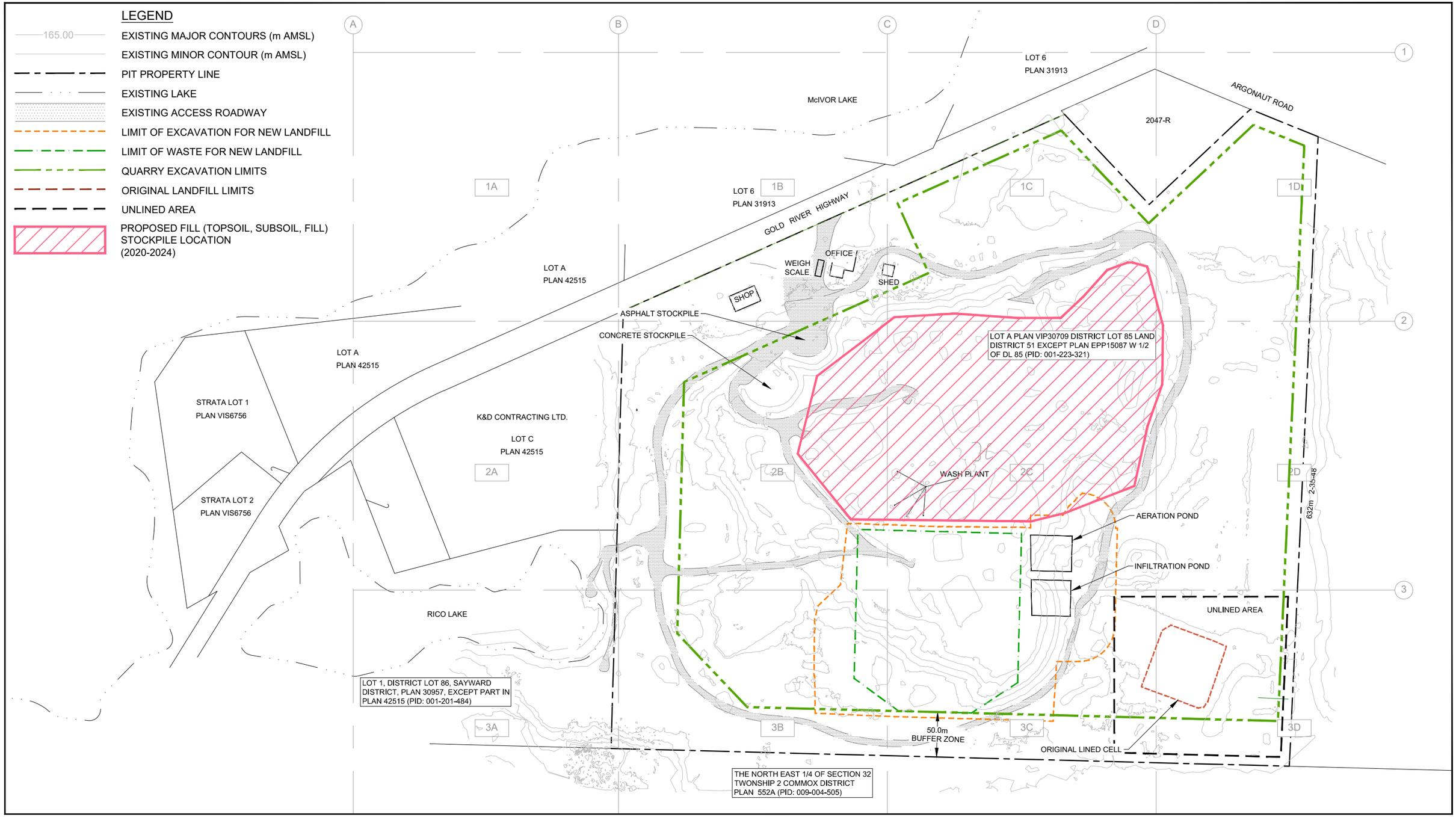
11188156-03

Apr 28, 2020

FINAL CONDITIONS AT MINE CLOSURE

FIGURE 4.2

CAD File: N:\CA\Vancouver\Legacy\Drawings\11188000s\11188156\11188156 - REPORT\11188156-03(003)\11188156-03(003)GN\11188156-03(003)GN-VA003.dwg



SOURCE: TOPOGRAPHICAL SURVEY DATED DEC. 18, 2018 PROVIDED BY UPLAND CONTRACTING.

0 40 80 120m

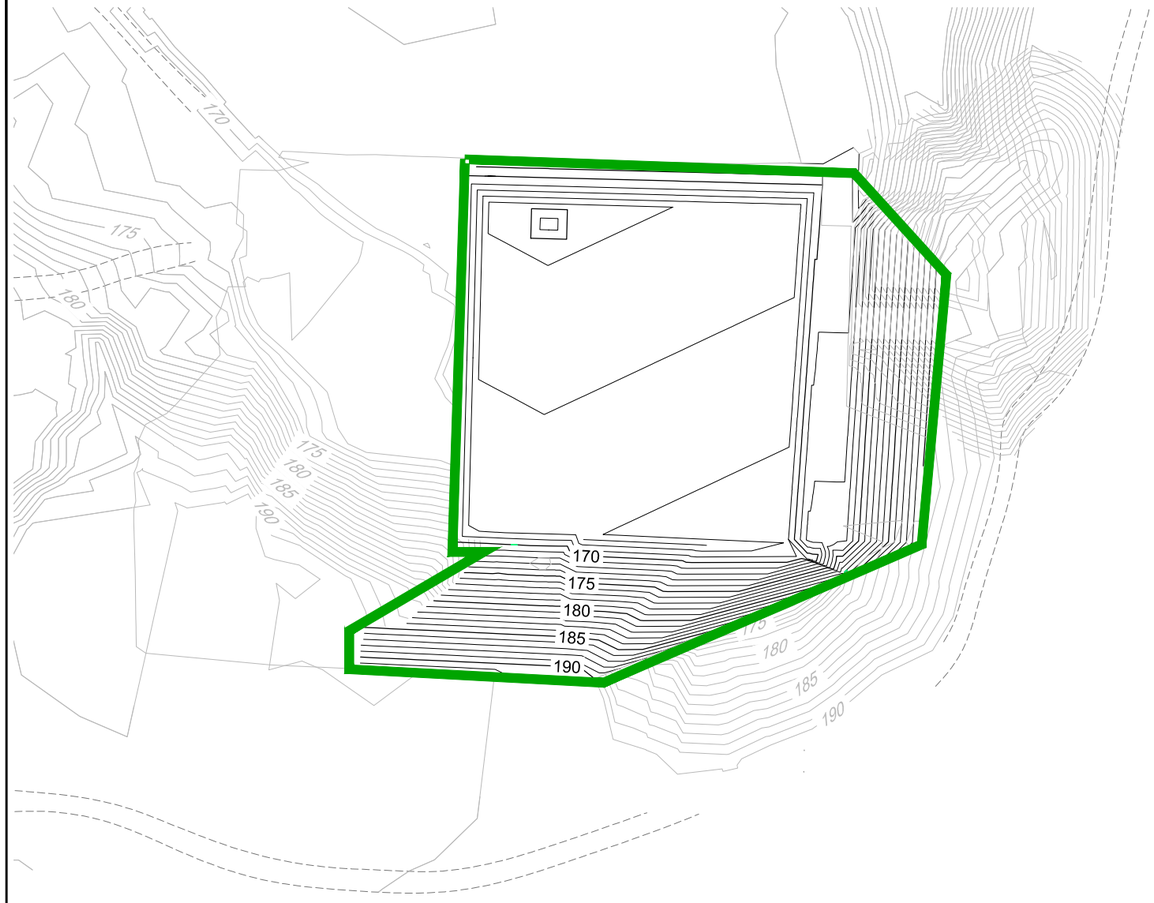
UPLAND CONTRACTING
SAND AND GRAVEL PIT
2020 MINE PLAN

11188156-03
Apr 24, 2020

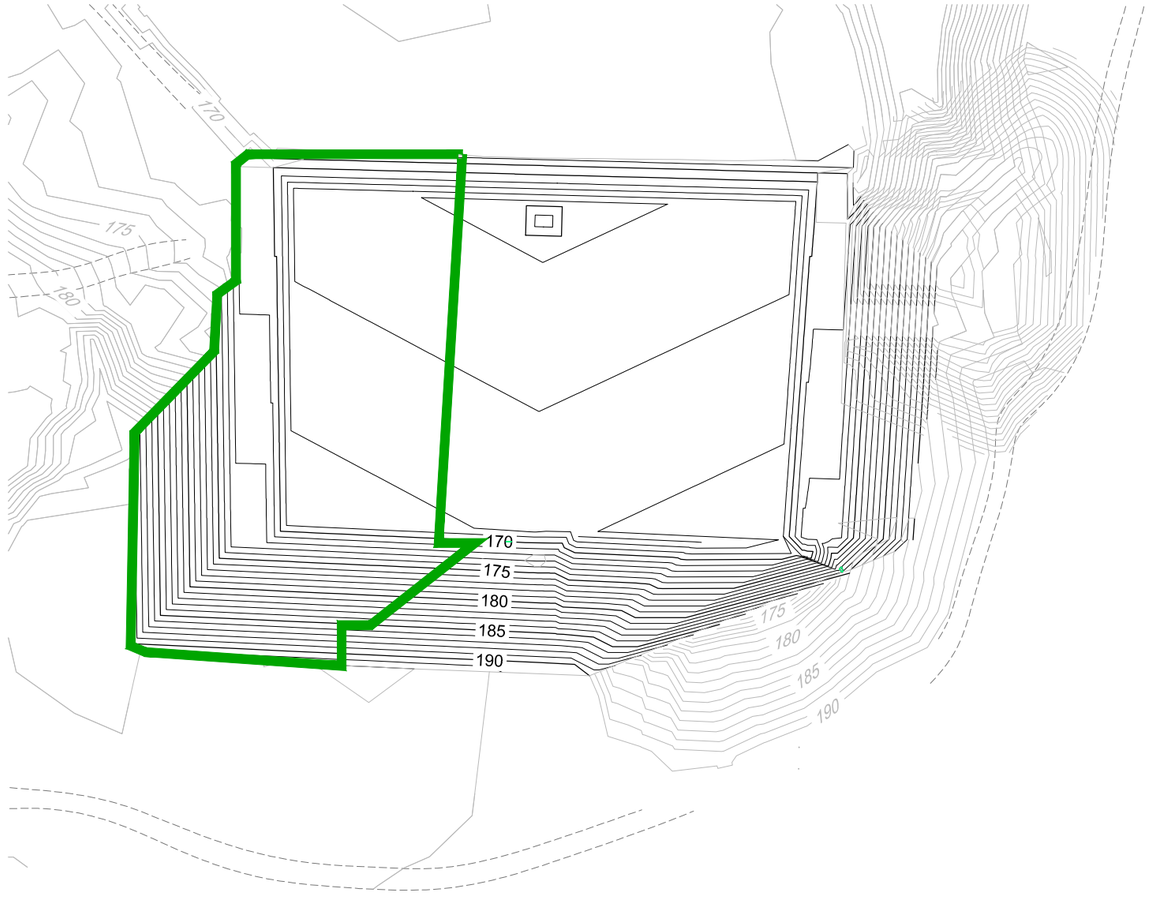
GENERAL LOCATION OF STOCKPILES

FIGURE 4.3

CAD File: N:\CA\Vancouver\Legacy\Drawings\11188000s\11188156\11188156 - REPORT\11188156-03(003)\11188156-03(003)GN\11188156-03(003)GN-VA004.dwg



YEAR 1 - 2020
LANDFILL STAGE 1 EAST BASE
EXCAVATION VOLUME: 30,000 m³



YEAR 2 - 2021
LANDFILL STAGE 1 WEST BASE
EXCAVATION VOLUME: 102,000 m³

0 20 40 60m

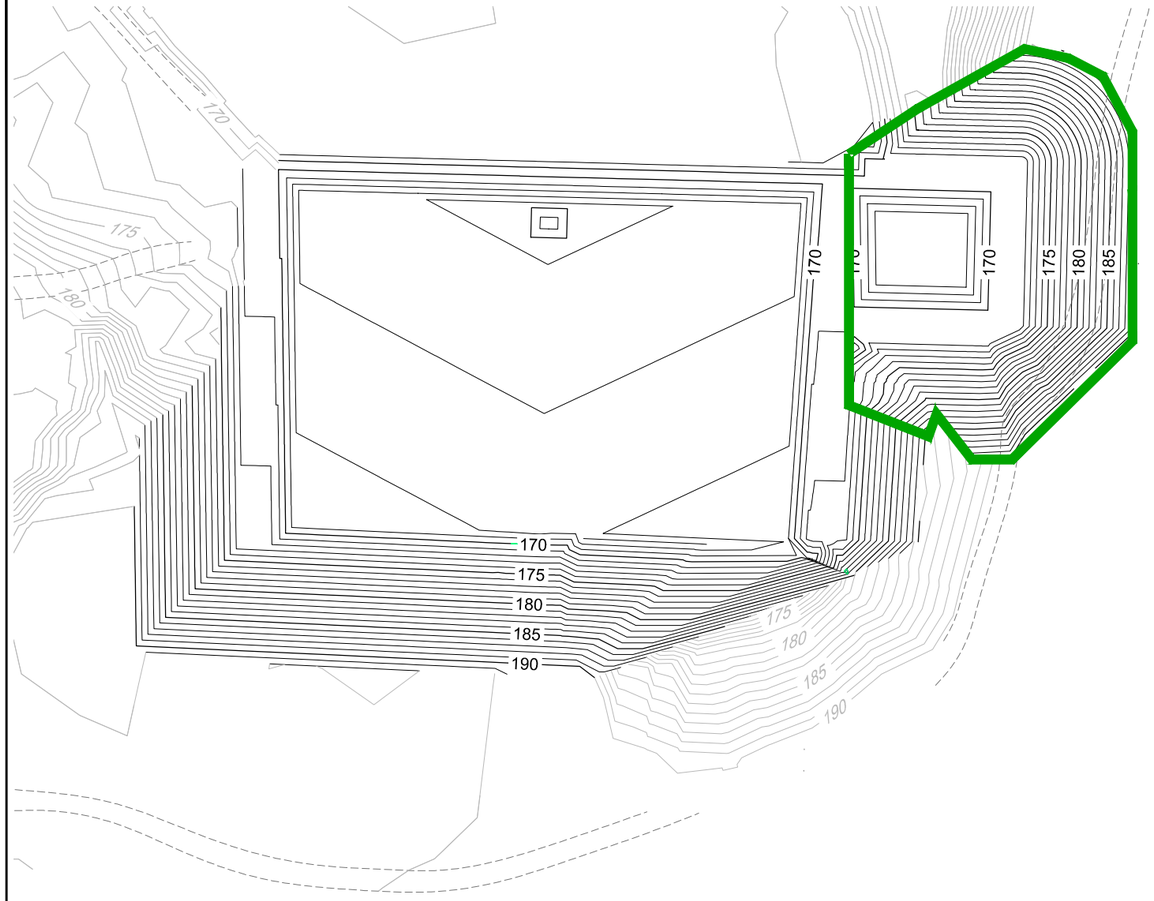
UPLAND CONTRACTING
2020 MINE PLAN

2020-2024 FIVE-YEAR EXCAVATION PLAN
YEAR 1 AND YEAR 2

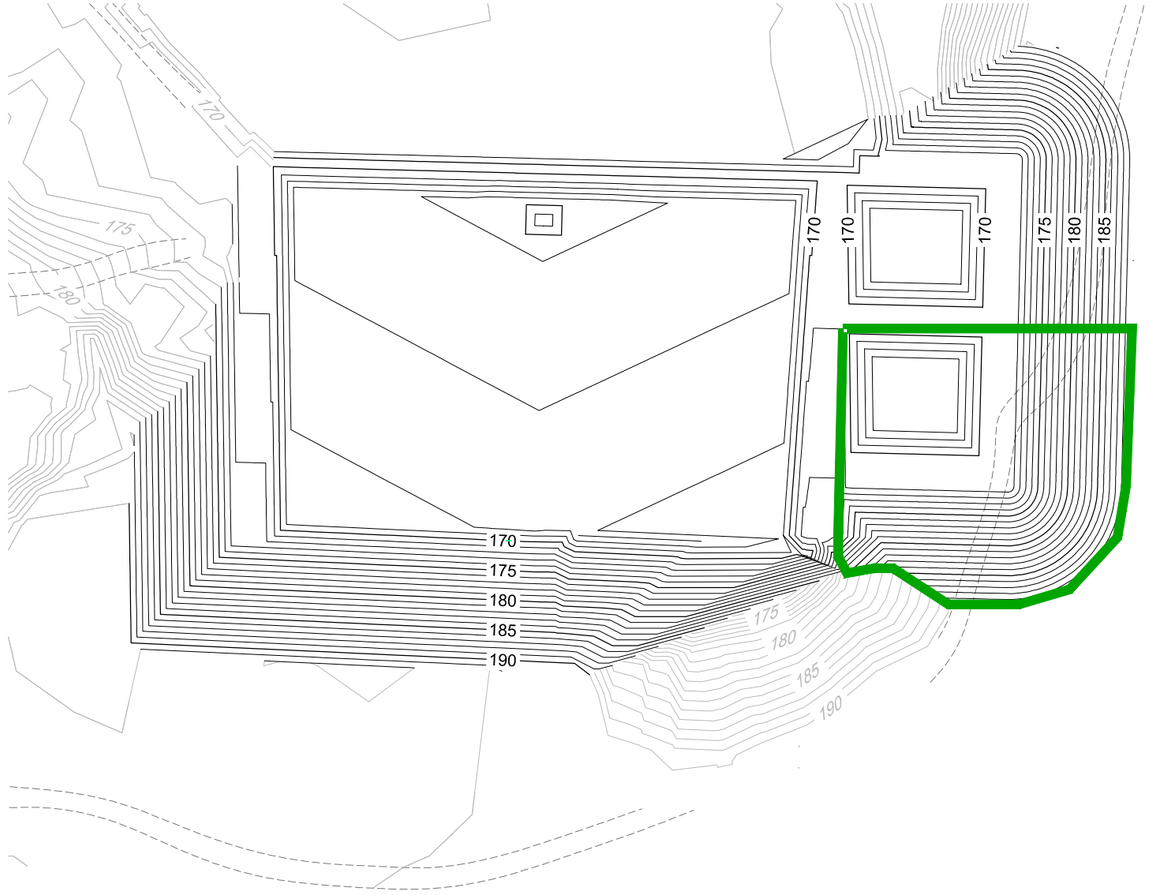
11188156-03
Apr 24, 2020

FIGURE 5.1A

CAD File: N:\CA\Vancouver\Legacy\Drawings\11188000s\11188156\11188156 - REPORT\11188156-03(003)\11188156-03(003)GN\11188156-03(003)GN-VA005.dwg



YEAR 3 - 2022
INFILTRATION POND
EXCAVATION VOLUME: 94,000 m³



YEAR 5 - 2024
AERATION POND
EXCAVATION VOLUME: 61,000 m³

0 20 40 60m

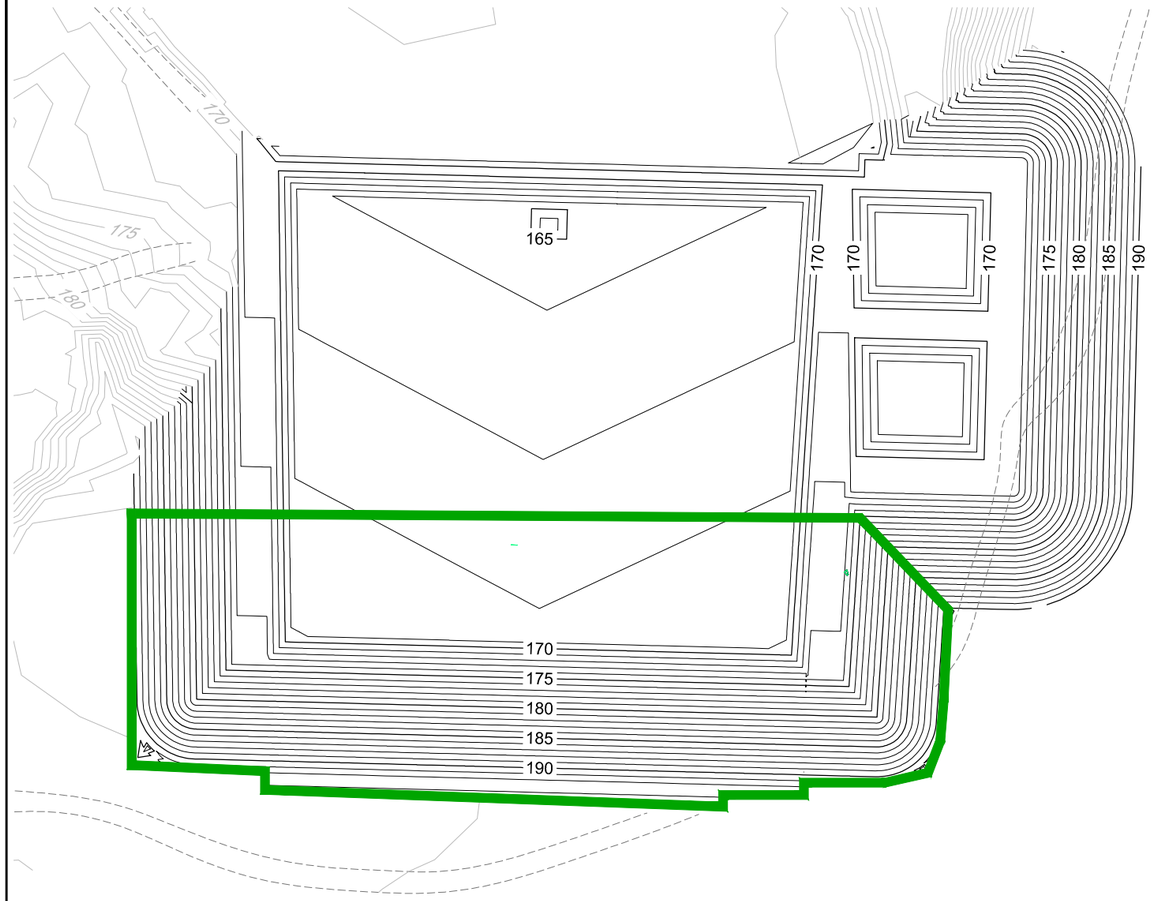
UPLAND CONTRACTING
2020 MINE PLAN

2020-2024 FIVE-YER EXCAVATION PLAN
YEAR 3 AND YEAR 4

11188156-03
Apr 24, 2020

FIGURE 5.1B

CAD File: N:\CA\Vancouver\Legacy\Drawings\11188000s\11188156\11188156 - REPORT\11188156-03(003)\11188156-03(003)GN\11188156-03(003)GN-VA005.dwg



YEAR 6 - 2025
STAGE 2A BASE
EXCAVATION VOLUME: 154,000 m³

0 20 40 60m

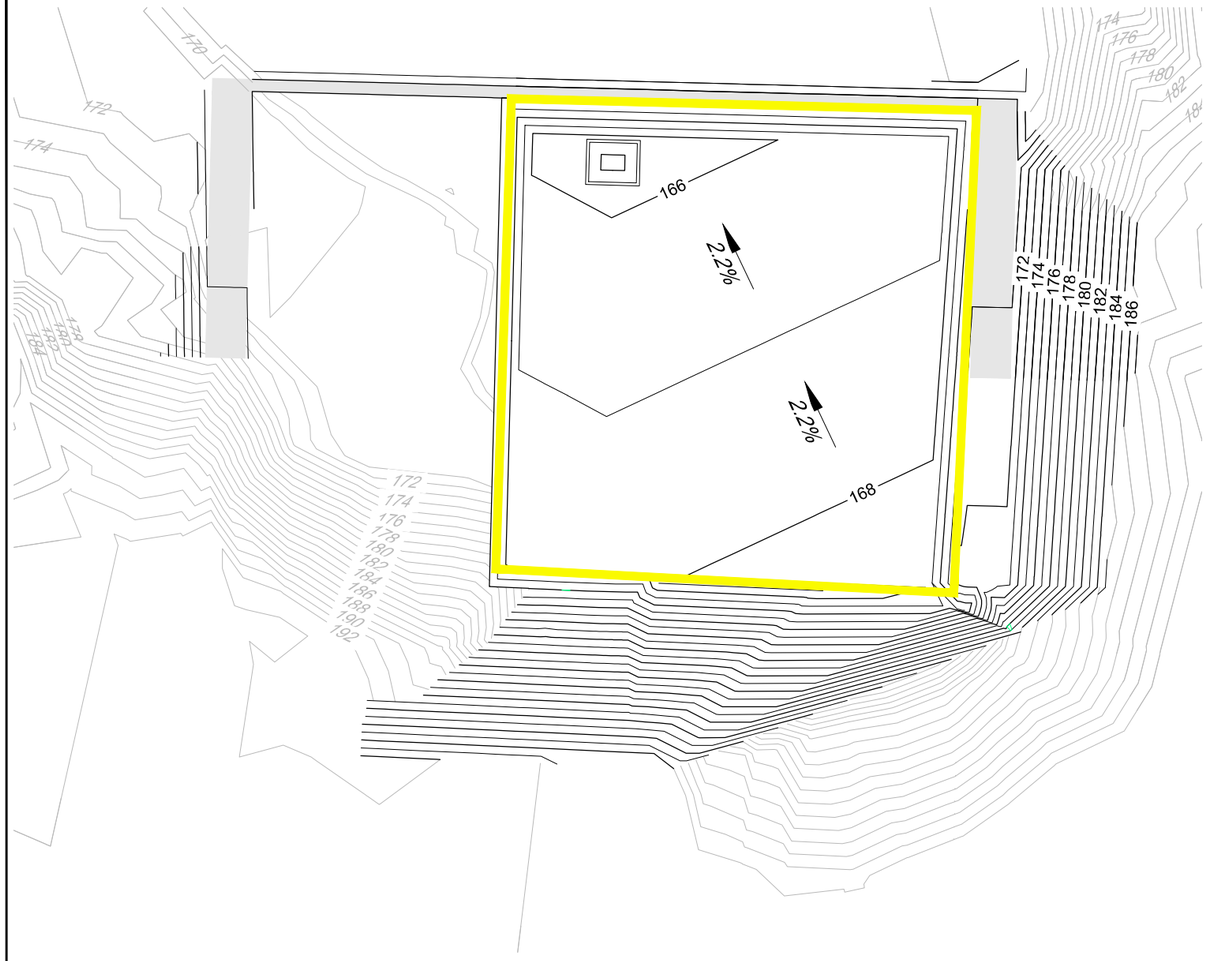
UPLAND CONTRACTING
2020 MINE PLAN

2020-2024 FIVE-YEAR EXCAVATION PLAN
YEAR 5

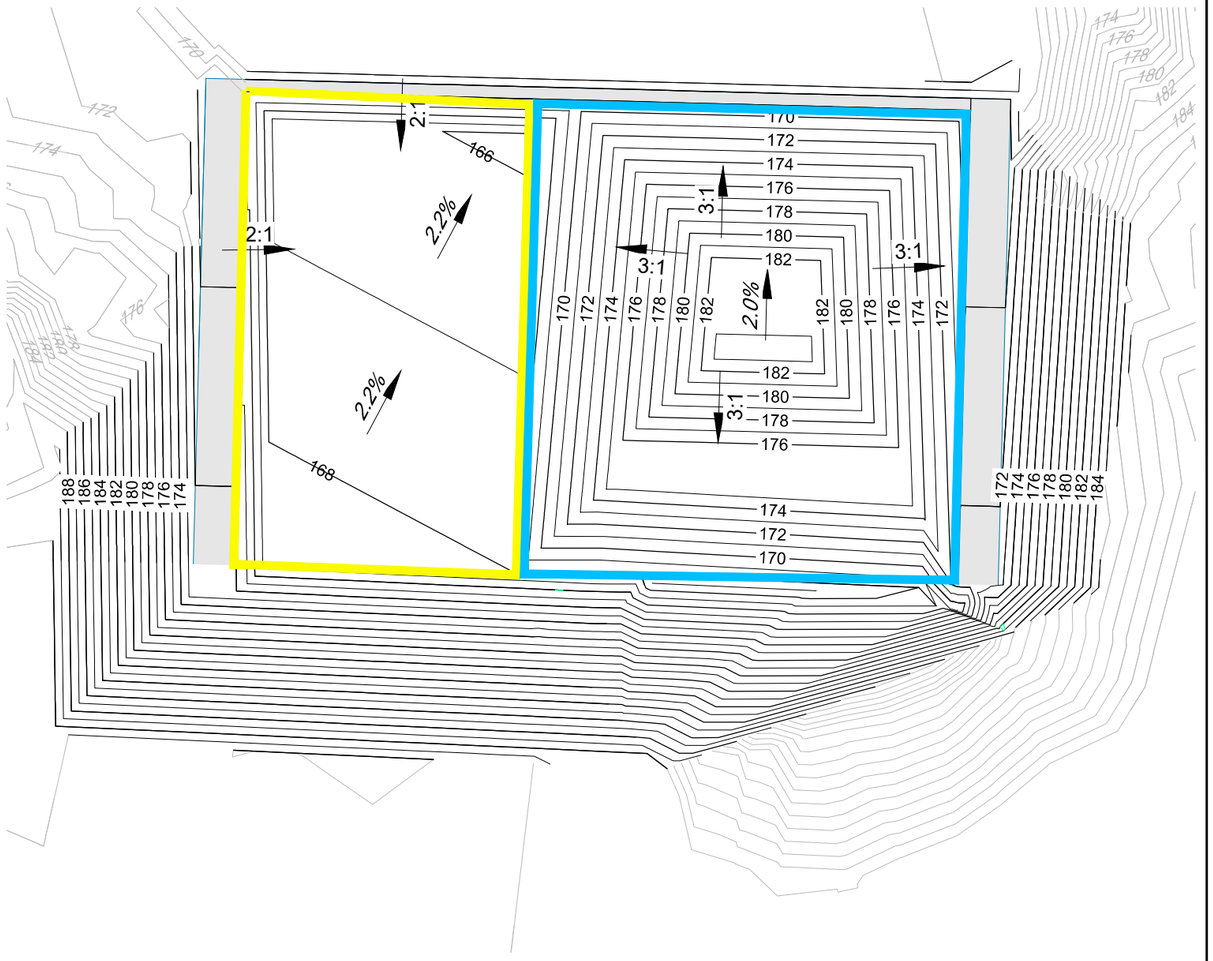
11188156-03
Apr 24, 2020

FIGURE 5.1C

CAD File: N:\CA\Vancouver\Legacy\Drawings\11188000s\11188156\11188156 - REPORT\11188156-03(003)\11188156-03(003)GN\11188156-03(003)GN-VA005.dwg



YEAR 0 - 2020
STAGE 1 EAST BASE LINER INSTALLATION



YEAR 1 TO 2 - 2021: STAGE 1 EAST
(INCLUDING RELOCATION OF WASTE FROM ORIGINAL LANDFILL)
FILL VOLUME = 94,927.0 m³

LEGEND

- BASE LINER AREA
- FILLING AREA
- INTERMEDIATE COVER AREA

0 15 30 45m

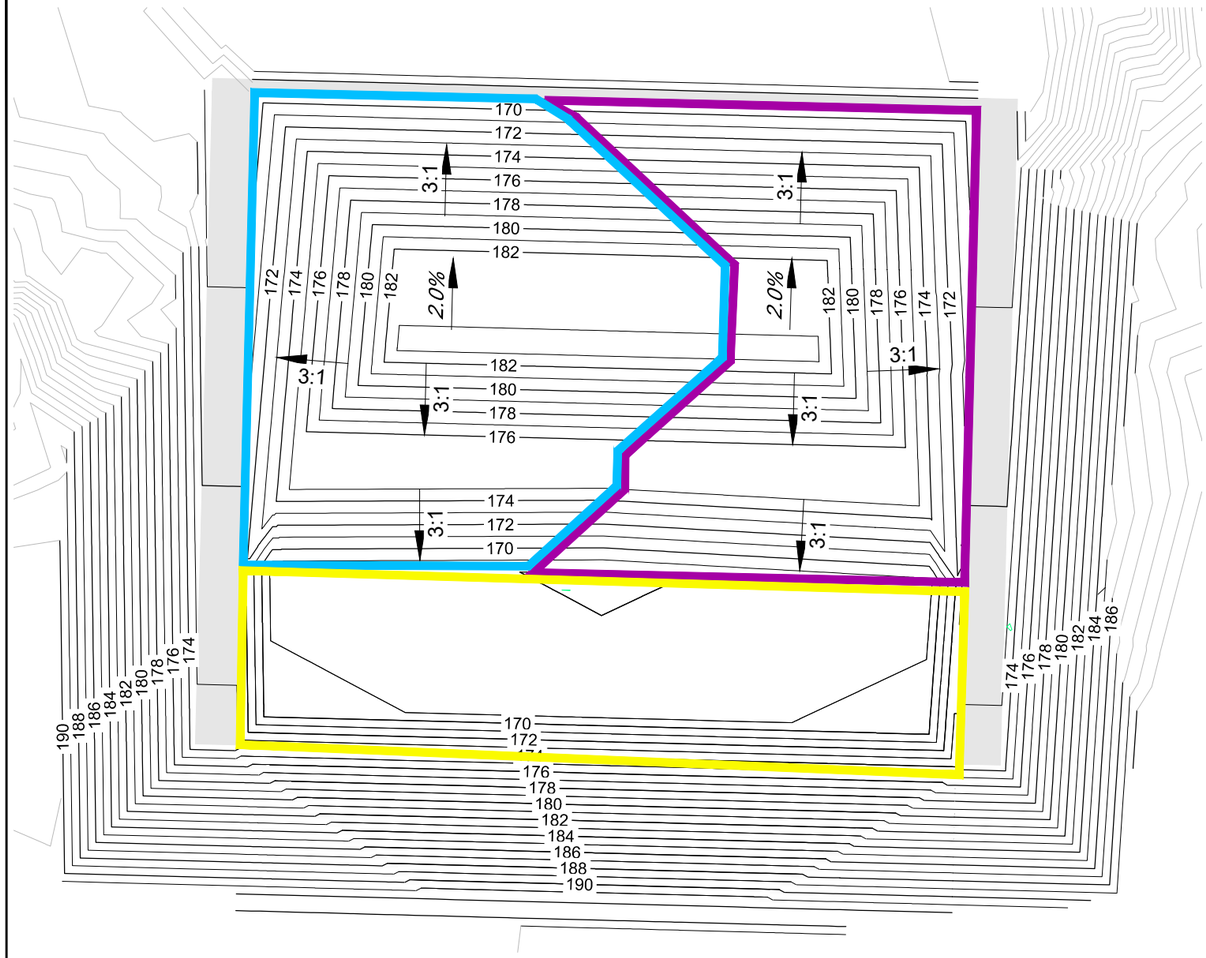
UPLAND CONTRACTING
2020 MINE PLAN

11188156-03
Apr 24, 2020

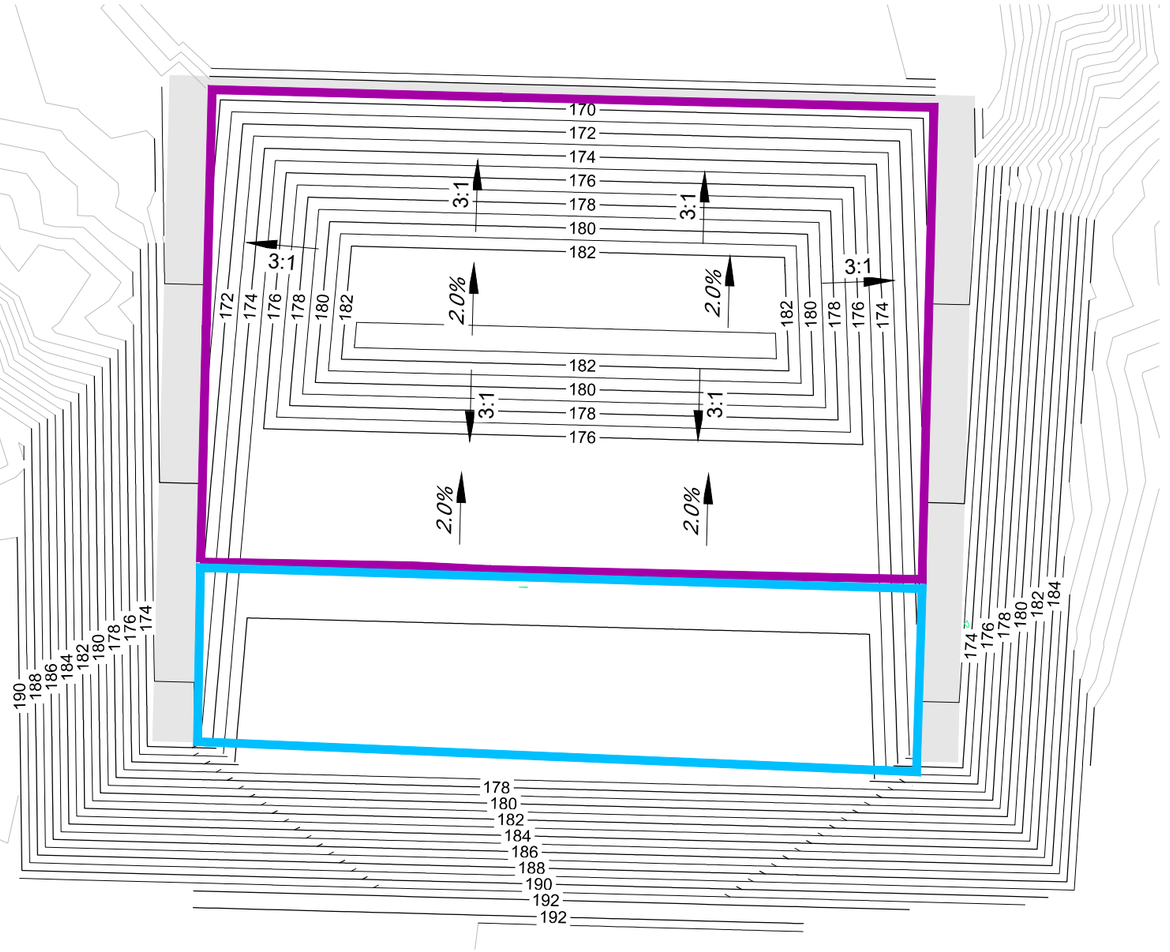
INTEGRATED FIVE-YEAR MINING AND LANDFILL DEVELOPMENT PLAN
STAGE 1 EAST

FIGURE 5.2A

CAD File: N:\CA\Vancouver\Legacy\Drawings\11188000s\11188156\11188156 - REPORT\11188156-03(003)\11188156-03(003)GN\11188156-03(003)GN-VA006.dwg



YEARS 2 TO 5 - 2022-2024: STAGE 1 WEST
FILL VOLUME = 76,936.0 m³



BEYOND YEAR 6 - 2024-2026: STAGE 2A
FILL VOLUME = 68,938 m³

LEGEND

- BASE LINER AREA
- FILLING AREA
- INTERMEDIATE COVER AREA

0 15 30 45m

N

GHD

UPLAND CONTRACTING
2020 MINE PLAN

11188156-03
Apr 24, 2020

INTEGRATED FIVE-YEAR MINING AND LANDFILL DEVELOPMENT PLAN
STAGE 1 WEST AND STAGE 2A

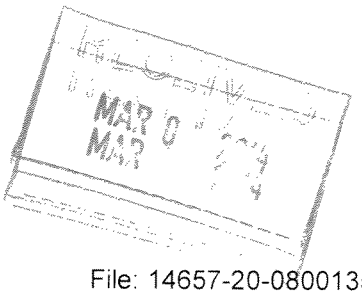
FIGURE 5.2B

CAD File: N:\CA\Vancouver\Legacy\Drawings\11188000s\11188156\11188156 - REPORT\11188156-03(003)\11188156-03(003)GN\11188156-03(003)GN-VA006.dwg

Appendices

Appendix A
Existing Sand and Gravel Permit G-8-114

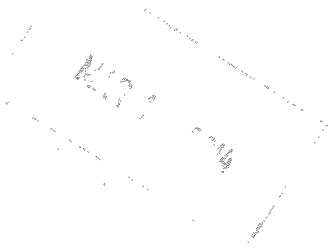
BRITISH COLUMBIA Ministry of Energy and Mines



Friday, February 28, 2014

File: 14657-20-0800135

~~Bruce Russell~~ Mark Stuart
Upland Excavating Ltd.
7295 Gold River Hwy
Campbell River BC V9H 1P1



Dear Bruce Russell:

Re: **Mines Act Permit G-8-114, Property PIT NO. 1**
Approval # 14-0800135-0227

Please find enclosed your *Mines Act* permit which authorizes quarry activities as detailed in the Notice of Work and Reclamation Program dated September 25, 1989. The Notice of Work and Reclamation Program forms part of the permit and you are reminded that you may not depart from the permitted program without written authorization.

Please ensure that you and all persons who are carrying out activities in accordance with this permit comply with all terms and conditions of the permit and are familiar with the permitted work program.

This permit applies only to the requirements under the *Mines Act* and Health, Safety and Reclamation Code for Mines in British Columbia (Code). Other legislation may be applicable to the operation and you (the Permittee) may be required to obtain approvals or permits under that legislation.

Your security deposit, currently in the amount of Fifteen thousand dollars, ($15,000.00), has been adjusted to Fifty thousand dollars, ($50,000.00). It may be adjusted further on the basis of reclamation performance, field inspections by this ministry, and on reports which may be requested. Please submit your bond to the Ministry office within 60 days. If you have any questions regarding instrument of reclamation please contact Rue Pope at ru.pope@gov.bc.ca.

Health and safety inspections fall under the jurisdiction of this Ministry. A Mine Health and Safety Inspection Fee is collected for this service. The fee structure is based on annual production in metric tonnes for the period January 1st through December 31st. You will receive the remittance forms and a payment schedule in December of each year, with payment due by January 31st of the New Year.

For further information regarding the Health and Safety Inspection Fee please contact your regional office or Cindy Head at the Mineral, Oil and Gas Revenue Branch in Victoria at (250) 356-1366.

When activity on the site is finished and reclamation completed, please forward to this office a request for cancellation of permit and return of security.

Sincerely,

Jim Dunkley, P.Geo.
Inspector of Mines

Encl: Mines Act Permit, Copy: NOW
Cc: Reclamation Section, Victoria

Ministry of Energy and Mines | Mining Division
Mailing Address:
PO Box 9395 Stn Prov Govt
Victoria, BC V8W 9M9
Telephone: (250) 387-4832
Facsimile: (250) 953-3878
Location:
6th Floor
1810 Blanshard Street
Victoria

PROVINCE OF BRITISH COLUMBIA
MINISTRY OF ENERGY AND MINES

SAND AND GRAVEL PERMIT
APPROVING WORK SYSTEM AND RECLAMATION PROGRAM
(Issued pursuant to Section 10 of the ***Mines Act*** R.S.B.C. 1996, C.293)

Permit: **G-8-114** Mine No.:**0800135**

Issued to: **Upland Excavating Ltd.**
7295 Gold River Hwy
Campbell River BC V9H 1P1

for work located at the following property:

PIT NO. 1

This approval and permit is subject to the appended conditions.

Issued this 27th day of December in the year 1989.
Amended this 27th day of February in the year 2014.

Ed Taje
Senior Mines Inspector

PREAMBLE

Notice of intention to commence work on a sand and gravel pit, including a plan of the proposed work system and a program for the protection and reclamation of the surface of the land and watercourses affected by the Notice of Work dated September 25, 1989 was filed with the Inspector of Mines on September 27, 1989. Notice of such filing was waived.

This permit contains the requirements of the Ministry of Energy and Mines for reclamation. It is also compatible, to the extent possible, with the requirements of other provincial ministries for reclamation issues. The amount of security required by this permit, and the manner in which this security may be applied, will also reflect the requirements of those ministries. Nothing in this permit, however, limits the authority of other provincial ministries to set other conditions, or to act independently, under their respective permits and legislation.

Decisions made by staff of the Ministry of Energy and Mines will be made in consultation with other ministries.

CONDITIONS

The Chief Inspector of Mines (Chief Inspector) hereby approves the work plan and the program for protection and reclamation of the land surface and watercourses subject to compliance with the following conditions:

1. Reclamation Security

   (a) The owner, agent or manager (herein called the Permittee) shall maintain with the Minister of Finance securities in the amount of fifteen thousand dollars ($50,000). The security will be held by the Minister of Finance for the proper performance of the approved program and all the conditions of this permit in a manner satisfactory to the Chief Inspector.

   (b) The Permittee shall conform to all forest tenure requirements of the Ministry of Forests, Lands and Natural Resources. Should the Permittee not conform to these requirements then all or part of the security may be used to cover the costs of these requirements.

   (c) The Permittee shall conform to all Ministry of Environment approval, licence and permit conditions, as well as requirements under the **Wildlife Act**. Should the Permittee not conform to these conditions, then all or part of the security may be used to fulfill these requirements.

2. Land Use

The surface of the land and watercourses shall be reclaimed to the following land use: ***Undetermined***.

3. Productivity

The level of land productivity to be achieved on reclaimed areas shall not be less than existed prior to mining on an average property basis unless the Permittee can provide evidence which demonstrates, to the satisfaction of the Chief Inspector, the impracticality of doing so.

4. Revegetation

Land shall be re-vegetated to a self-sustaining state using appropriate plant species.

5. Use of Suitable Growth Medium

(a) On all lands to be revegetated, the growth medium shall satisfy land use, productivity, and water quality objectives. Topsoil and overburden (to rooting depth) shall be removed from operational areas prior to any disturbance of the land and stockpiled separately on the property for use in reclamation programs, unless the Permittee can provide evidence which demonstrates, to the satisfaction of the Chief Inspector, that reclamation objectives can otherwise be achieved.

(b) No topsoil shall be removed from the property without the specific written permission of the Inspector of Mines.

6. Buffer Zones and Berms

Buffer zones and/or berms shall be established between the mine and the property boundary unless exempted in writing by the Inspector of Mines.

7. Treatment of Structures and Equipment

Prior to abandonment, and unless the Chief Inspector has made a ruling otherwise, such as heritage project consideration or industrial use,

(a) all machinery, equipment and building superstructures shall be removed,

(b) concrete foundations shall be covered and revegetated unless, because of demonstrated impracticality, they have been exempted by the Inspector, and

(c) all scrap material shall be disposed of in a manner acceptable to the Inspector.

8. Watercourses

(a) Watercourses shall be reclaimed to a condition that ensures

(1) long-term water quality is maintained to a standard acceptable to the Chief Inspector,

(2) drainage is restored either to original watercourses or to new watercourses which will sustain themselves without maintenance, and

(3) use and productivity objectives are achieved and the level of productivity shall not be less than existed prior to mining unless the Permittee can provide evidence which demonstrates, to the satisfaction of the Chief Inspector, the impracticality of doing so.

(b) Water which flows from disturbed areas shall be collected and diverted into settling ponds.

9. Roads

(a) All roads shall be reclaimed in accordance with land use objectives unless permanent access is required to be maintained.

(b) Individual roads will be exempted from the requirement for total reclamation under condition 9(a) if either:

(1) the Permittee can demonstrate that an agency of the Crown has explicitly accepted responsibility for the operation, maintenance and ultimate deactivation and abandonment of the road, or

(2) the Permittee can demonstrate that another private party has explicitly agreed to accept responsibility for the operation, maintenance and ultimate deactivation and abandonment of the road and has, in this regard, agreed to comply with all the terms and conditions, including bonding provisions, of this reclamation permit, and to comply with all other relevant provincial government (and federal government) regulatory requirements.

10. Disposal of Fuels and Toxic Chemicals

Fuels, chemicals or reagents which cannot be returned to the manufacturer/supplier are to be disposed of as directed by the Chief Inspector in compliance with municipal, regional, provincial and federal statutes.

11. Fuels and Lubricants

Fuels and Lubricants, if stored on the mine site, shall conform to the requirements of the Ministry of Environment **Field Guide to Fuel Handling, Transportation, and Storage.**

The Permittee shall develop and implement a hydrocarbon management plan that deals with fueling, operational servicing, spill prevention and clean-up for fuels and lubricants stored on the mine site. The plan shall account for the following:

(a) Fuel and lubricants shall be delivered to site as needed to re-supply fuel and oil tanks on mobile and fixed equipment.

(b) Impermeable, oil absorbent matting shall be used when refueling and servicing equipment.

(c) While refueling the operator shall be in control of the refueling nozzle at all times.

(d) If any Petroleum, hydrocarbon or other product (no matter how small) is spilled the contaminated soil/gravels shall be forthwith collected and removed for appropriate disposal.

(e) Fuel or oil leaks on equipment shall be effectively repaired as soon as they are discovered or the equipment shall be removed from the site and not operated until repairs have been made.

(f) An emergency spill containment and clean up kit shall be maintained at the site while it is in operation. The kit shall have the capacity to contain and clean up 100% of a spill from a failure of the largest volume of a fuel or lubricant tank or system plus 10%.

12. Archaeological Find

An Archaeological Chance Find Procedure (ACFP) for this site shall be developed within 3 months of the date of this permit:

(a) A copy of the procedure shall be posted at the Mine Site, and all workmen shall be trained in the implementation of this procedure.

(b) A copy of this procedure shall be filed with the Inspector.

In the event that an archaeological site is encountered during the course of the approved mining activities, the program shall be suspended or modified in such a manner so as to ensure that the site is not damaged, desecrated or otherwise altered and the occurrence shall be reported immediately to the Archaeological Branch of the Ministry Forests, Lands & Natural Resource Operations and, the Ministry of Energy & Mines (Inspector of Mines). Work shall not be resumed until authorized by the joint Ministries.

13. Site Access

The Mine Manager, or in their absence a Designate, shall allow Employees of other Provincial Ministries holding authorizations related to Compliance and Enforcement duties onto the mine site subject to the following conditions:

(a) the Provincial Employee must present the appropriate Ministry identification; and

(b) must clearly state that they are acting on behalf of an Inspector of Mines;

(c) they must be given a site orientation as required by the Health & Safety, and Reclamation Code;

(d) they must sign-in and sign-out as acknowledgement of being on site;

(e) they must be accompanied at all times by the Mine Manager, or qualified person appointed by the Manager, and shall take all necessary measures to ensure the safety and well being of the individual(s); and this condition is not applicable to other Provincial Legislation.

14. Site Stability

(a) The inspector shall be advised in writing at the earliest opportunity of any unforeseen conditions that could adversely affect the extraction of materials, site stability, erosion control or the reclamation of the site.

(b) The stability of the slopes shall be maintained at all times and erosion shall be controlled at all times.

(c) The discovery of any significant subsurface flows of water, seeps, substantial amounts of fine textured, soils, silts and clays, as well as significant adverse geological conditions shall be reported to the inspector as soon as possible and work shall cease until the inspector advises otherwise.

15. Site Security

All site access shall be secured with locking gates and signage provided indicating the mine name, operator' s name and emergency contact number as well as all necessary safety advisories. Gates shall be locked when the quarry is not in operation.

16. Temporary Shutdown

If this sand and gravel pit ceases operation for a period longer than one year the Permittee shall either continue to carry out the conditions of the permit or apply for an amendment setting out a revised program for approval by the Chief Inspector.

17. Safety Provisions

All safety and other provisions of the **Mines Act** shall be complied with to the satisfaction of the Chief Inspector.

18. Monitoring

The Permittee shall undertake monitoring programs, as required by the Inspector of Mines, to demonstrate that reclamation objectives are being achieved.

19. Alterations to the Program

Substantial changes to the program must be submitted to the Inspector of Mines for approval.

20. Notice of Closure

Pursuant to Part 10.6.1 of the Health, Safety and Reclamation Code for Mines in British Columbia, a Notice of Completion of Work shall be filed with the Inspector of Mines not less than seven days prior to cessation of work.

21. Annual Report

Annual reports shall be submitted in a form and containing the information as and if required by the Inspector of Mines.

22. Annual Reclamation Report

By March 31 of every year, an annual reports shall be submitted in a form and containing the information required by the Chief Inspector.

The Manager shall forward to the Inspector each year a copy of the submitted Health and Safety Assessment form.

SITE SPECIFIC CONDITIONS:

1 Annual production shall not exceed 220,000 tonnes per year.

2 This permit authorizes excavation of pit-run material, blasting, crushing, screening and washing.

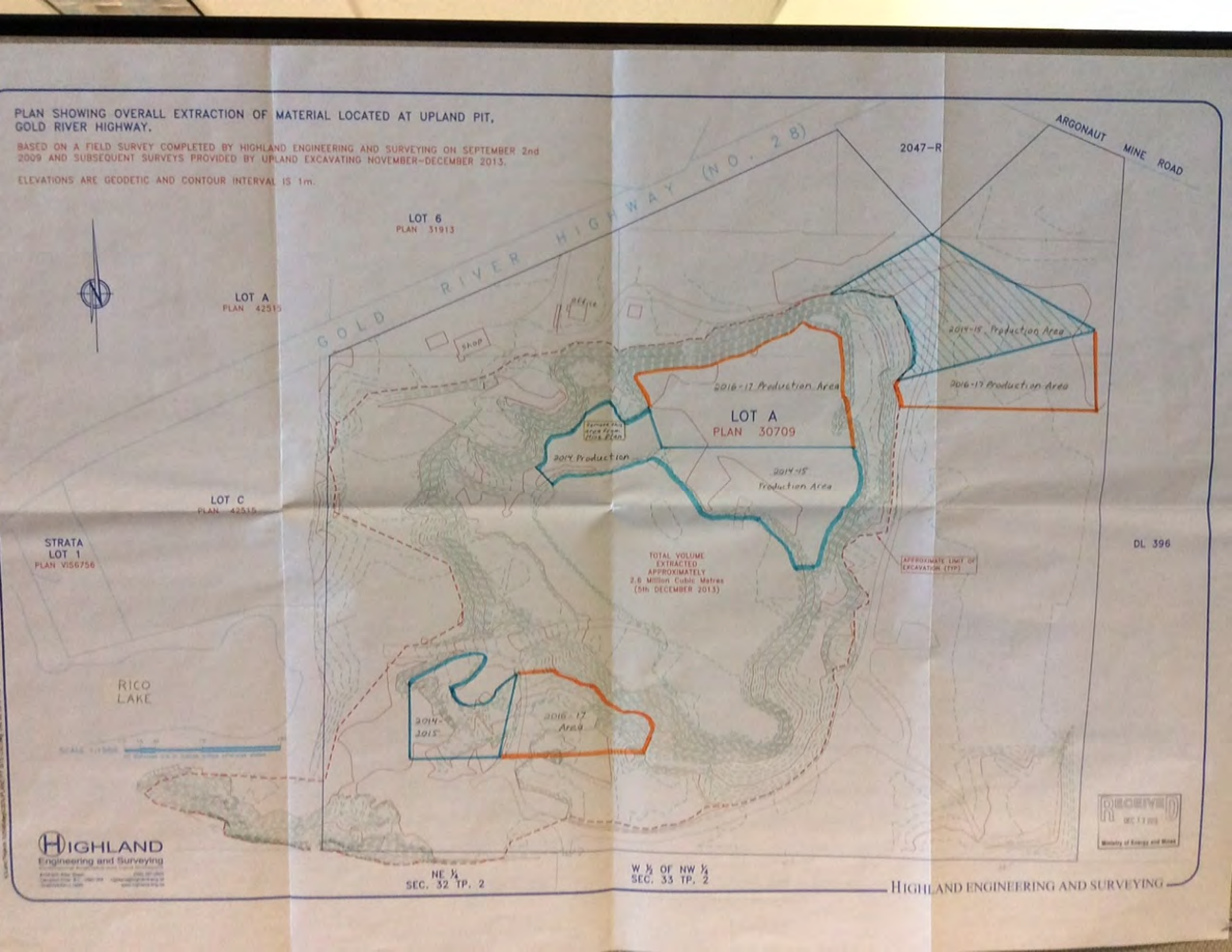
3 Production shall be based upon the Mining Plan submitted to the Ministry of Energy and Mines and received December 13, 2013. No significant departures shall be made from this plan without an updated mining plan being filed with the Ministry.

Appendix B
2013 Mine Plan

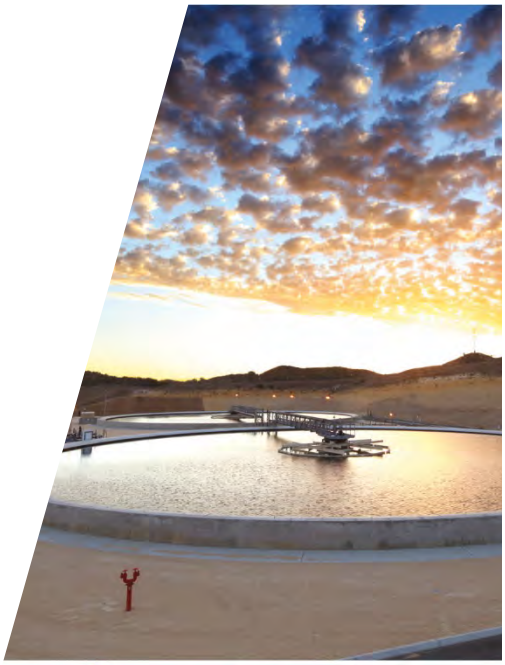
PLAN SHOWING OVERALL EXTRACTION OF MATERIAL LOCATED AT UPLAND PIT, GOLD RIVER HIGHWAY.

BASED ON A FIELD SURVEY COMPLETED BY HIGHLAND ENGINEERING AND SURVEYING ON SEPTEMBER 2nd 2009 AND SUBSEQUENT SURVEYS PROVIDED BY UPLAND EXCAVATING NOVEMBER-DECEMBER 2013.

ELEVATIONS ARE GEODETIC AND CONTOUR INTERVAL IS 1m.



Appendix C
2020 Closure and Reclamation Plan



2020 Reclamation and Closure Report

Upland Sand and Gravel Pit
Campbell River, British Columbia

Upland Contracting

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Symbols and Abbreviations

AMSL	Above Mean Sea Level
BC	British Columbia
BTU	British thermal unit
FOS	Factor of Safety
FWAL	Fresh Water Aquatic Life
Ha	Hectare
km	kilometre
Landfill Criteria	Second Edition Landfill Criteria for Municipal Solid Waste, dated June 2016
m	Metre
m^2	Square Metre
m^3	Cubic Metre
ENV	British Columbia Ministry of Environment
Permit	Permit PR-10807
Pit	Upland Sand and Gravel Pit
Property	Upland Excavating Ltd. – 7295 Gold River Highway
Site	Upland Excavating Ltd. – 7295 Gold River Highway

WQG	Water Quality Guidelines

Definitions

“Pit” refers to the area used for the extraction, processing and stockpiling of sand and gravel.

“Pit Property and Property” refers to the parcel of land within the Site containing the sand and gravel Pit “

“Site” refers to the land owned by Uplands and used for the extraction, processing and storage of aggregate with civic address of 7311 Gold River Highway (sometimes referred to as 7295 Gold River Highway).

“Operation” refers to the active work and processing areas related to the extraction, processing and marketing of sand and gravel and rock and activities related to reclamation of the Pit.

“Original Landfill Area” means the Original Lined Cell and the Original Un-Lined Cell, historically used for the authorized discharge of certain waste materials.

“New Landfill” means the new lined landfill cells and related appurtenances used for the continued authorized discharge of certain waste materials.

1. Introduction

GHD was retained by Upland Contracting Ltd. (Upland) to prepare a Reclamation and Closure Plan for the Upland Sand and Gravel Pit (Pit) located on 7311 Gold River Highway, in Campbell River, British Columbia (BC) (Property). The Property location is shown on Figure 1.1.

The Reclamation and Closure Plan (Plan) has been written in accordance with the Mine Act Permit G-8-114 (Permit), issued to Upland on December 27, 1989, and amended on February 27, 2014, and applicable parts of Sections 10.4.1 and 10.7.4 to 10.7.21 of the Health, Safety and Reclamation Code for Mines in British Columbia (Revised June 2017) (Code).

1.1 Scope

This Plan provides a framework to reclaim the Pit Property in accordance with the Permit and serve as a reference document for closure and reclamation activities at the Site. It is proposed that the Pit will be closed and reclaimed using a phased-approach over the life of the Pit, and that the development, operations and closure of the New Landfill on the Upland property, as authorized by the Operational Certificate No. 107689 (OC) issued by the Ministry of Environment and Climate Change Strategy (ENV), will form part of the reclamation strategy.

This report includes the following scope:

- Present the Site physical characteristics including topography and drainage, geology, hydrogeology, hydrology, and climate.
- Present the Pit closure and reclamation standards, including closure design criteria.
- Present the plan for the progressive reclamation of the Pit during the life of the operation, including the operations and closure of the New Landfill, as part of the reclamation strategy.
- Identify on-Site structures and workings for removal or stabilization.
- Present the methods for surface water management works.
- Present the revegetation plan of the surface disturbances.
- Provide a 5-year progressive closure and reclamation plan.
- Estimate the costs of closure and reclamation activities including the long-term costs for Site and maintenance and monitoring.

2. Site Information

2.1 Site Location

The Property encompasses an area of approximately 48.3 hectares (ha). The Property address is 7311 Gold River Highway (Site or Property) within the city limits of the City of Campbell River (City), BC, approximately 7 kilometres (km) west of city centre. The Property is located on land parcel with the legal description of LOT A, DISTRICT LOT 85, SAYWARD DISTRICT, PLAN 30709 EXCEPT PART IN PLAN EPP15087.

The southern Property boundary coincides with the boundary between the City and the Strathcona Regional District (SRD). The Gold River Highway and McIvor Lake are located to the north and west of the Site.

A site plan is shown on Figure 2.1.

2.2 Regulatory Setting

The Pit operations are conducted in accordance with the Permit. The Permit requires adherence and compliance with the following legislation and guidance documents:

- BC Mines Act
- Environmental Management Act
- Health, Safety and Reclamation Code for Mines in British Columbia (Revised June 2017)
- The BC Landfill Criteria for Municipal Solid Waste (BC ENV, 2016) (Landfill Criteria)

2.2.1 Regulatory Permits

Mine Act Permit

Quarry activities for excavation, blasting, crushing, screening and washing of pit run material are authorized under the Permit. The Permit was issued to Upland on December 27, 1989, amended on February 27, 2014 and allows for the production of 220,000 tonnes per year in accordance with the December 13, 2013 Mine Plan. The Permit stipulates the reclamation requirements for the Pit.

Water Licence

The use of water from Rico Lake for the operations is approved under the Water Licence 51287 issued November 2, 1978, under the Water Act. The water licence allows for diversion of 25,000 gallons per day for the purpose of gravel washing.

Waste Discharge Permit (superseded)

Acceptance and discharge of certain waste materials at the Property has been authorized under Waste Discharge Permit No. PR-10807, issued under the Environmental Management Act. The Waste Discharge Permit was first issued on June 1, 1992. Under the Waste Discharge Permit, the operations has accepted clean wood wastes that are burned in the permitted Burn Area located along the southern boundary of the Property. The Waste Discharge Permit allowed for the discharge of wastes consisting of construction, demolition, and land clearing waste. Land clearing waste includes stumps, trees, selected building demolition debris and residue of combustion from the open burning of wood waste. Permit No. PR-10807 has been superseded by the Operational Certificate issued in August 2019.

Operational Certificate

The OC authorizes the acceptance and discharge of certain waste materials at the Property. On August 1, 2019, Upland was issued an OC under the Environmental Management Act that allows for a modernized landfill cell (referred to as New Landfill) to be developed in the southern portion of the Property. The OC authorizes continued interim discharge to the Original Landfill and requires that

waste from the Original Landfill be relocated to the New Landfill within one year of commencing landfilling operations in the New Landfill.

The New Landfill design, operations and closure details are provided in Landfill Design, Operations and Closure Plan (DOCP) most recently prepared by GHD in 2017. An update to the DOCP is planned for 2020. This and future updates to the Landfill DOCP will be supplied to the Chief Inspector.

2.3 Site Zoning and Adjacent Land Use

The portion of the Site located within the City of Campbell River boundaries is zoned as Industrial Three (I-3) land as defined by the City of Campbell River Zoning Bylaw No. 3250 dated 2006; last amended June 9, 2015.

The current land uses near the Site include residential, industrial and resource extraction activities (logging and gravel extraction). Gold River Highway, also referred to as Highway 28, is located to the north of the Site. The current adjacent land uses are presented in Figure 2.2.

To the north and west of the Site, the land use includes lakeshore residential properties along the McIvor Lake shoreline. To the immediate west of the Site, surrounding Rico Lake, are Upland owned industrial properties, including the K&D Contracting storage yard. There is also a lakeshore residential property west of the Site just north of Rico Lake.

To the northeast of the Site, the property located adjacent to the northeast corner of the Site is Crown land occupied by a telecommunication tower. On the opposite side of Argonaut Road, a number of industrial properties are present including a gravel extraction pit, concrete redi mix manufacturer, wood recycling and processing facility, and the municipal waste management facility.

To the east is an area of industrial land uses including gravel extraction activities; further east is a large undeveloped rural area that extends generally uninterrupted to the Quinsam River.

To the south, the Site is bound by forested Upland Resource land located within the administrative boundaries of the SRD.

2.4 Site Physical Characteristics

The physical characteristics of the Pit Property and adjacent lands including topography, drainage, geology, hydrogeology, and climate are described below.

2.4.1 Topography

The Pit is located on a terrace partially surrounded by mountainous terrain to the south, southwest, and northwest. The terrace gradually slopes towards the Quinsam River located 3.8 km to the southeast of the east Site boundary. The Quinsam River channel is at an elevation approximately 100 m below the Site.

On-Site, the topography is relatively level at approximate elevation 190 mAMSL with the exception of the Pit located in the centre of the Site. The Pit area has been excavated to a depth of approximately 170 mAMSL, 20 m below the surrounding land surface. The final base elevation of the Pit will range from 168 to 169 mAMSL. Along the western Site boundary, above the Pit wall

bedrock is present at 170 to 193.5 mAMSL. Along the western Site boundary the bedrock slopes toward Rico Lake and along the eastern Site boundary towards the adjoining property. The bedrock represents the base of a small mountain near the southwestern Site boundary. The small mountain stands approximately 100 m above the Site. Bedrock outcrops are also present on the northern portion of the adjoining K&D property.

2.4.2 Drainage

The Pit is located within the Quinsam River Watershed. The Quinsam River watershed covers an area of 20,900 ha and is bound to the north and west by a mountainous divide that isolates it from the Campbell River watershed (Blackmun, Lukyn, McLean & Ewart, 1985). The Pit has no surface water outflow and all precipitation that falls into the Pit infiltrations into the Pit floor reaching the underlying groundwater flow system, which flows to the southeast and eventually discharges into the Quinsam River Watershed.

2.4.3 Geology

The Pit is located on part of the Wrangellia Terrane, which includes most of Vancouver Island, the Queen Charlotte Islands and parts of central Alaska. The Wrangellia Terrane is composed mostly of widespread, late Triassic aged flood basalts, including the Karmutsen Formation. The Karmutsen Formation consists mostly of submarine flood basalts up to 6 km in thickness. Vancouver Island is extensively faulted with thrust faults associated with the subduction of the Juan de Fuca Plate under the North American Plate (MOE and Guthrie, 2005) (Greene, Scoates & Weis, 2005).

At several time periods during the Pleistocene Epoch, Vancouver Island was glaciated with ice thicknesses to 2,000 m. During the recession of the last glaciation approximately 14,000 years ago, glacial and glaciofluvial sediments were deposited, and in some cases reworked and redeposited, to make up many of the present surficial deposits of Vancouver Island. These deposits consist of till, which is deposited directly by glacial activity and consist of larger clasts supported in a matrix of fine grained sediment, and of glacial outwash, which consists primarily of poorly sorted, coarse grained (sand and gravel) sediments deposited by glacial melt water (Greene, Scoates & Weis, 2005). The overburden at the site consists of glaciofluvial and outwash deposits of sand and gravel. (McCammon, 1977).

The following stratigraphic units, in order from shallowest to deepest, characterize the Site geology:

1. A native interbedded sand and gravel unit is present throughout the Site. The thickness of this unit is highly variable and ranges from 0 to at least 47 m thick. The variability is due to the presence of bedrock at surface and underlying the Site.
2. A substantial sand unit was encountered in the central portion of Pit and in the southeast portion of the Site. This sand unit ranges in depth and thicknesses from approximately 12 m to greater than 33 m. This sand unit varies in composition from sand with gravel to silty sand/sandy silt.
3. Bedrock at ground surface and underlying the Site is Karmutsen basalt (igneous rock). Underlying the Pit, the bedrock surface appears to dip steeply west to east.
4. The structure of the overburden unit is consistent with glaciofluvial and outwash depositional sources.

2.4.4 Hydrogeology

In general, the geologic units identified in the previous sections may be grouped into the following hydrogeologic units:

1. A sand and gravel aquifer
2. A shallow aquifer

The hydrogeologic properties and division of these aquifers are discussed below.

Groundwater Divide

There is a notable topographic difference between the bedrock ridge and the remainder of the Site. The ridge is composed of competent bedrock and is interpreted to form a barrier to groundwater flow. East of the bedrock ridge, the principal groundwater flow zone is through the sand and gravel aquifer in a southeasterly direction from McIvor Lake towards the southeast Site boundary. West of the bedrock ridge groundwater flow is controlled by bedrock surface topography. Flow in this area occurs from points of high bedrock elevation within the ridge to areas of low elevation.

Precipitation that falls east of the bedrock ridge infiltrates into the subsurface, flowing to the southeast as saturated flow within the sand and gravel aquifer. Precipitation that falls to the west of the bedrock ridge (watershed and groundwater) will runoff of areas of bedrock outcrop, infiltrate into the subsurface or infiltrated directly into the subsurface and flow through the thin layer of overburden towards areas of low topography.

Sand and Gravel Aquifer (East of the Groundwater Divide)

An unconfined, sand and gravel aquifer is present within the overburden unit in boreholes advanced across the Site. The aquifer consists of coarse grained materials, primarily sand and gravel of varying degrees, with occasional seams of sand and silty sand. Based on the consistency and spatial distribution of borehole locations, this aquifer is continuous across much of the Property (with the exception of the bedrock ridge area in the western portion of Site).

The sand and gravel aquifer is identified as the principal groundwater flow zone at the Property and has been identified in the BC Water Resource Atlas as aquifer 975 IIA (10).

Groundwater elevations within the sand and gravel aquifer, (measured on April 6, 2017), ranged from 172.8 m AMSL along the northern Property boundary to 150.1 m AMSL near the southeastern property boundary. Groundwater within the sand and gravel aquifer flows from northwest to southeast (i.e., from McIvor Lake to the southeast corner of the Site).

The static water elevation within McIvor Lake is significantly higher than the static groundwater elevations within the sand and gravel aquifer on-Site. McIvor Lake recharges the sand and gravel aquifer and is not a receptor of groundwater from the Pit.

Shallow Aquifer

Throughout the investigative activities, a relatively thin, discontinuous zone of shallow saturated overburden materials was encountered along the bedrock ridge (where overburden is present) to the west of the groundwater divide throughout the neighbouring K&D property, as well as in the

southeast corner of the Property (along the eastern flank of the groundwater divide at MW5A/B-15). The following subsections describe the groundwater flow in these areas, which are collectively referred to as the shallow aquifer.

Shallow Aquifer (West of Groundwater Divide)

Shallow groundwater was identified on the K&D property and along the western flank of the bedrock ridge. Based on the presence of the competent bedrock ridge to the east and southeast, groundwater flow within the shallow aquifer is directed from high bedrock to points of lower topography (Rico Lake or McIvor Lake) and is interpreted to be largely controlled by bedrock surface topography.

Bedrock in this area is characterized as being relatively competent, thus, while some infiltration and groundwater flow will occur through bedrock, it will be limited. Primary flow in the bedrock ridge area and west of the Site will be through the overburden soil or, where overburden is not present, by overland flow.

The low hydraulic conductivity measured in the bedrock ridge between the Pit and Rico Lake significantly restricts movement of groundwater between these two features. Any hydraulic relationship between the Pit and Rico Lake is necessarily weak and flow will be from Rico Lake to the Pit. Rico Lake is not a receptor to the sand and gravel aquifer.

Shallow Aquifer (East of the Groundwater Divide)

Groundwater within the shallow aquifer east of the groundwater divide is present within a thin overburden layer overlying competent bedrock. Based on the presence of a mountain to the south, groundwater will likely flow downwards (potentially daylighting as seepage or through overburden materials as unsaturated flow) towards the Pit area where it will ultimately join the principal flow zone, flowing to the southeast. Flow is expected to be limited.

Climate

The Site is located on the east coast of Vancouver Island. This region is marked by wet and mild winters, and warmer drier summers. Based on Environment Canada's Climate Normals measured between 1980 and 2010 at the Campbell River Airport (Climate ID: 1021261), the average annual precipitation is reported to be 1,489 millimetres (mm) with over 75 percent of the precipitation occurring between October and March. November and December experience the most precipitation with an average of 232 and 226 mm, respectively. On average 84 mm worth of snowfall is recorded per year.

3. Reclamation and Closure Plan

The Pit will be reclaimed using a phased approach over the lifespan of the Pit operation. Once a cell has been mined, the area will be reclaimed following the framework of this Plan. In general, reclamation of the Pit will include regrading and stabilization of the slopes, revegetating finished surfaces, provision of stormwater management controls and establishing appropriate end uses as discussed below. As part of the reclamation strategy, importing of common fills for regrading of the Pit side slopes may occur. Reclamation will be carried out to restore the Site's land productivity to no

less than the average capability that existed on the property prior to mining. This includes restoring the habitat by establishing the appropriate vegetation.

The reclamation plan includes the use of certain waste materials authorized for acceptance at the Property. The southern portion of the Property will be developed into an engineered landfill, and subsequent to the Landfill's operating life (approximately 23 years), the area will be closed with final contours consistent with the reclaimed Pit side slopes. Landfill closure activities will include compaction, grading of the landfill surface area and final cover placement and the establishment of vegetation. In addition, fences, gates, surface water control works, passive landfill gas venting system and any other monitoring and control works that may be required will be installed.

3.1 End Land Use Objectives

The land surface within the Pit will be reclaimed to an end land use that considers previous and potential uses. The end land use objective for the Site is to reclaim the land for industrial purposes, consistent with the Permitted Uses of the I-3 zone as defined by the Campbell River Zoning Bylaw 3250 (2006), under Section 5.16.

Portions of the surface lands will be revegetated with local tree, shrub and grass species as specified in Section 3.3.4 of this report to promote land productivity. As part of the reclamation strategy, following the lifespan of the New Landfill, the Landfill will be closed to meet the post-closure land use Landfill Closure Plan and in this Reclamation Plan.

The end land uses for the Site are shown on Figure 3.1.

3.2 Productivity Objectives

Productivity objectives established for the sand and gravel Pit operations are based on the Site end land uses, as stipulated under the Code Section 10.7.5 and the Permit Condition 3. The level of land productivity to be achieved on the reclaimed areas will not be less than existed prior to mining on an average property. The productivity objectives, standards and methods for evaluating each objective are presented in Table 3.1 below.

Table 3.1 Productivity Objectives, Standards and Evaluation Methods

Disturbance	Area (ha)	End Land Use	Productivity Objectives	Standards	Evaluation Method
North – Pit, Operation Areas, and Access Roads	17	Industrial I-3	Restore habitat through the re-establishment of subsoil, topsoil, and self-sustaining native vegetation.	– Vegetation is self-sustaining and comprises of native seed mixes. – Vegetative cover is capable of self-regeneration without continued dependence on fertilizer or re-seeding. – Establishment of a vegetative cover with sufficient density and species diversity to stabilize the surface against the effects of long term erosion.	– Monitoring/field inspections to assess maintenance works, if needed. See Section 3.6 for details.
South – Pit, Operation Areas, and Access Roads	7.5	Industrial I-3	Restore habitat as described in the Closure Plan developed for the New Landfill.	– Vegetation is self-sustaining and comprises native seed mixes. – Vegetative cover is capable of self-regeneration without continued. – Roads shall be maintained in a manner that ensures long-term access to the New Landfill Area including post-closure monitoring areas.	– Monitoring/field inspections to assess maintenance works, if needed. See Section 3.6 for details.

3.3 Reclamation Approach

The Pit closure design has been completed to satisfy the Ministry of Energy and Mines conditions for Mine Closure, which are specified in the Code under conditions 10.6.1 to 10.6.16 and the conditions set out by the Permit. The Landfill Criteria was also considered for aspects of the design pertaining to the Original Landfill and the New Landfill. The final closure design is illustrated on Figure 3.2.

The following are the relevant criteria used in the design of the Pit Closure:

- Buffer zones and berms – Maintain a 15 m or greater buffer zone between the limit of excavation and the property boundary. Maintain a 50 m or greater buffer between the waste management area and the property boundary.
- Site Stability – Maximum 2H:1V pit walls; Maintain slope integrity of the bedrock present between Rico Lake and the Pit.
- Drainage – 0.5% slope of pit floor to prevent pooling; Site drainage to be directed away from the waste management area; engineered mid-slope swales to limit erosion of pit walls; Highland drainage will directed away from the Pit.
- Roads – Maintain a 10 m wide access road with maximum 10% grade to the base of the Pit and the waste management area. Maintain the existing perimeter access road from Gold River Highway around the west side of the Site to the waste management area. All other internal roads will be decommissioned.

3.3.1 Progressive Reclamation/ Sequencing

The objective of the progressive reclamation strategy is to achieve final elevations for the Pit and Operation Areas that complement the end land use and natural drainage of the local area.

As shown on Figure 3.2, a buffer zone of minimum 15 m from top of Pit slope to the north, east, and a portion of the west property boundary will be maintained. Along the south property boundary, a buffer zone of 50 m will be maintained due to the presence of the New Landfill and the buffer zone requirements set out in the Landfill Criteria. Along the west Site boundary, in the vicinity of Rico Lake, existing conditions will be maintained throughout the life of the Pit to ensure slope integrity is maintained between Rico Lake and the Pit.

The final elevation of the top of the Pit will be similar to the existing top of the Pit elevations, which range from 178.2 to 193.9 m AMSL. The Pit side slopes are designed with a maximum slope of 2H:1V. The final contour of the waste management area has been incorporated into the closure design. The final base elevation of the Pit will range from 168 to 169 m AMSL.

The base of the Pit grading has been designed to promote drainage towards the perimeter infiltration trench and away from the waste management area. To limit surficial erosion and small-scale slumping, the Pit side slopes have been designed with graded engineered swales to promote drainage into the Pit and subsequently the underlying aquifer.

The reclamation of the Pit will carried out in a phases approach, starting with the reclamation of the 50 m buffer zone between the New Landfill footprint and the Site boundary, as well as the area currently occupied by the Original Landfill, as discussed in Section 3.5. Subsequently, areas of the

Pit that have been fully mined will be reclaimed sequentially. Mining is planned to be completed sequentially from Area 1 though Area 5 then future reserve areas, although extraction may be supplemented from other site areas depending on market demands.

At the time of closure, if the Pit slopes are steeper that 2H:1V clean fill (existing or imported) will be used to backfill and grade the slopes. Geotechnical assessments of the Pit slopes should be completed at this time.

Figure 3.3 provides an overview of the proposed reclamation sequence for the life span of the Pit.

3.3.2 Revegetation Strategy

The revegetation strategy for the Pit was developed by Current Environmental Ltd and is provided in full in Appendix A.

The Pit will be reclaimed to a self-sustaining state using a combination of methods that will include Site regrading, growing medium placement, and revegetation using appropriate plant species. Revegetation objectives include i) satisfying Permit condition 5 – use of a suitable growing medium and ii) restoring land cover and species types to emulate those of nearby terrestrial ecosystems which include a native assemblage of coniferous trees and shrubs.

The following criteria will be used to identify suitable revegetation areas:

1. Slopes less than 33%.
2. Areas scarified prior to application of growing medium.
3. Application of verified ‘suitable growing medium’.
4. Growing medium with a thickness no less than 150 mm.
5. The seed mix and planting specification for the revegetated areas is provided in Table 3.2 and Table 3.3.

3.3.3 Top Soil Replacement

As part of the Pit operations, native Site topsoil will be removed and stockpiled. During the stockpiling process, native topsoil generally loses its natural soil structure. Soil structure is established in native soils over long periods of time. Soil biotic and abiotic factors like earthworm bioturbation and freeze-thaw processes aggregate soil particles and create air spaces within the soil matrix. These processes slowly create a soil structure that can vary from location to location depending on site-specific parent materials and varied soil forming processes.

Prior to application of growing medium to reclamation areas, the surface of the regraded landscape will be scarified to a depth of 300 mm. Scarification breaks the crust of the surface where compaction may exist and facilitates some minor mixing of growing medium with underlying ‘subsoil’ materials. Scarification significantly enhances the ability of rain water to permeate below the growing medium layer into subsoil materials and increases the ability of plant roots to penetrate deeper into the subsoil layer. In the event that subsoil cannot be scarified, a subsoil layer of suitable material shall be placed prior to growing medium at a depth of 300 mm. The imported subsoil should meet the Canadian Landscape Standard (Current Edition) Growing Medium Type 3P (or equivalent as

approved by the project Biologist – confirmation lab testing on subsoil material may be requested by the Biologist).

Immediately after completion of scarification of reclamation areas, growing medium is to be applied in a continuous layer 150 mm deep. Maximum slopes prior to growing medium application will be 3:1 (33%). Slopes steeper than 3:1 are not conducive to restoration as they are prone to erosion and do not retain growing media. The New Landfill will be closed with maximum slopes 3:1 (33%). Seeding and planting should take place within two weeks of growing medium application. Ideally, the timing of planting/seeding will be in early to mid-spring or early to mid-fall to avoid drought conditions and excessive rainfall.

Maintenance fertilizer applications may be required. After two growing seasons, a follow-up stratified soil sample will be drawn from the growing medium layer and sent to Pacific Soils Analysis Inc. for lab testing (fertility analysis only). Fertilizer will be applied at the rates recommended by the laboratory.

3.3.4 Seeding and Planting

Based on a Site area assessment completed by Current Environmental Ltd on March 16, 2018, the forest inhabiting non-riparian areas in and around the Site are dominated by Douglas fir and coastal western hemlock, typical of drier maritime subzones. As well, there are occurrences of grand fir and big leaf maple in the warmer, and drier, southern areas of the zone such as near the Site.

Constructed wetlands/ponds and shallow, distributed overland flows are recommended for inclusion in the overall site grading and reclamation plan. Dispersed stormwater flows function to increase habitat diversity and long-term plant growth. Where water is already collecting in the Pit floor, maintaining existing shallow ponds should be considered in the restoration plan to create habitat diversity and become a central feature to help support the success of surrounding riparian vegetation plantings and enhance wildlife habitat.

Table 3.2 Seed Mix Specification[1]

Common Name	Scientific Name	% Seed Count	% By weight	Seeding Rate[2] (kg/ha)
Annual ryegrass	*Secale cereale*	17	35	28
Creeping red fescue	*Festuca rubra*	26.5	35	28
Tall fescue	*Schendonorus arundinaceus*	12	15	12
Hard fescue	*Festuca trachyphylla*	16.5	5	4
Blue wildrye	*Elymus glaucus*	4	3	2.4
Brown top (colonial bentgrass)	*Agrostis capillaris*	19	1	0.8
S.C. Red clover	*Trifolium pratense*	6	5	4
Alsike clover	*Trifolium hybridum*	1.5	1	0.8
Total		**100**	**100**	**80**

[1] Based on a *Coastal Reclamation Mix* designed for erosion control and reclamation applications.
[2] Based on median 80 kg/ha from recommended rate of 60-100 kg/ha.

Table 3.3 Planting Specification

Habitat Type	Common Name	Scientific Name	Proportion %	Spacing (m)	Planting Density (plants/ha)
High-land terrestrial	Douglas fir	*Pseudotsuga menziesii*	20	4	143
Riparian/ low-land terrestrial	Western red cedar	*Thuja plicata*	5	4	36
All	Coastal western hemlock	*Tsuga heterophylla*	10	4	72
All	Grand fir	*Abies grandis*	15	4	107
Riparian/ low-land terrestrial	Red alder	*Alnus rubra*	10	4	72
All	Big leaf maple	*Acer macrophyllum*	5	4	36
All	Salal	*Gaultheria shallon*	10	3	127
High-land terrestrial	Thimbleberry	*Rubus parviflorus*	5	3	64
High-land terrestrial	Dull Oregon grape	*Mahonia nervosa*	10	3	127
All	Sword fern	*Polystichum munitum*	5	3	64
High-land terrestrial	Oceanspray	*Holodiscus discolor*	5	3	64
Total			**100**	**-**	**911**

Efforts to re-establish vegetation should take place within the first full growing season following Site closure. Seeding and planting should take place within two weeks of growing medium application. All areas that will not be maintained for future operations will be revegetated, including stockpiles, equipment storage areas, plant facilities, and basins. Planting and seeding will be done in the early spring or autumn to avoid periods of desiccation or heavy rainfall associated with summer and winter seasons, respectively.

3.3.5 Invasive Plant Controls

The Site and surrounding environs are known to support invasive species including Knotweed spp.[3], Scotch broom, and Himalayan blackberry. Knotweed spp. are listed as “Noxious” under the BC *Weed Control Act*[4] because they are known to be highly invasive and must be managed with extreme care to minimize spread to other areas. The *Weed Control Act* includes a “duty to control noxious weeds” that states the occupier of land or premises “must control noxious weeds”.

[3] Invasive knotweed species: Japanese (*Fallopia japonica*), Giant (*F. sachalinensis*), Bohemian (*F. x bohemica*), and Himalayan (*Polygonum polystichum*).

[4] Schedule A. Weed Control Regulation of the BC Weed Control Act. Accessed from <http://www.bclaws.ca/Recon/document/ID/freeside/10_66_85#ScheduleA>

The critical importance of proper handling and disposal of knotweed among other invasive species present on the Site cannot be overemphasized. According to the Coastal Invasive Species Committee (CISC)[5], Upland Contracting Ltd. imports knotweed for deep burial (10 feet) at their Gold River Highway Pit, "which is the recommended practice for responsible disposal". An alternative disposal method to *in-situ* deep burial includes exporting invasive plant materials to an appropriate disposal facility (i.e. CR Waste Management Centre[6]) to ensure it is not spread to other areas.

3.4 Reclamation and Closure Prescriptions

It is the duty of every owner, agent, and manager to institute and carry out a program of closure and reclamation in accordance with prescribed regulatory setting. This reclamation and closure program is based on the standards of the Ministry of Energy and Mines for closure and reclamation, which are specified in the Permit, and Section 10 of the Code.

3.4.1 Treatment of Structures and Equipment

This section describes the treatment method for the structures and equipment that currently exist on-site during Pit reclamation.

- Wash Plant Ponds – Two wash plant ponds are located in the centre of the Pit and two additional ponds are located in the southwestern portion of the Pit, as shown on Figure 2.1. Wash water has been characterized to have similar water quality as groundwater within the underlying sand and gravel aquifer. The wash water ponds will be reclaimed by infiltrating the wash water through the Pit base. Sediment will be sampled for characterization according to the BC CSR Technical Guidance #1. The remaining dry portion of the ponds will be revegetated as outlined in Section 3.3.4.
- Structures – Structures will be removed and concrete foundations will be covered and revegetated (Permit Condition 7). The existing structures on-Site are illustrated on Figure 2.1.
- Debris, Machinery, Equipment and Superstructures – Remaining debris, waste, scrap material, machinery, equipment, and building superstructures that will not be used in the Site's end land use or closure and remedial works must be removed from the property (Permit Condition 7).

3.4.2 Treatment of Contaminated Soil/Gravels

Areas on Site that have experienced leaks/spills of fuels, hydrocarbons, or other product, the affected area must be remediated in compliance with the Site spill protocols developed for the Pit (Permit Condition 11).

3.4.3 Pit Wall

The stability of the slopes of Pit shall be maintained at all times (Permit Condition 14). The final Pit slopes were designed at 2H:1V, which are anticipated to be conservative based on the nature of the material. Slope stability analysis is recommended to be completed in a future update of this report to confirm that the slopes will meet or exceed the minimum static factor of safety of 1.5. In accordance

[5] http://www.coastalisc.com/how-to-control-invasive-plants
[6] https://www.cswm.ca/hazardous-waste/invasive-plants

with Section 10.7.13 (2) of the Code, pit walls constructed of rock are not required to be re- vegetated.

3.4.4 Watercourse Reclamation

There are no natural watercourses on-Site (Permit Condition 8).

3.4.5 Access Road Reclamation

It is anticipated that Site access from the Gold River Highway will continue upon closure and will be the only access point to the Site irrespective of end land use.

Existing roads will be reclaimed to meet the land use objectives (Permit Condition 9), productivity objectives, and left in a manner that ensures long-term physical stability of the Site (Section 10.7.6).

3.4.6 Stormwater Management

Stormwater management controls have been designed to convey stormwater runoff in a manner that limits erosion and sediment loading potential. The drainage plan and stormwater management works are presented in Figure 3.4. Stormwater will infiltrate into the underling aquifer through the base of the Pit, swales and ditches. The stormwater management works for the waste management area have been developed separately in the Landfill DOCP. Landfill stormwater will be managed to promote clean surface water runoff from the Landfill towards the Pit floor for infiltration into the based of the Pit in a manner that limits erosion.

Stormwater management works for the final closure design include:

- Mid-slope engineered swales constructed on the pit wall surface to intercept runoff and prevent erosion of soils. Swales will be spaced approximately every 15 m of vertical separation.
- Perimeter infiltration ditch 1.0 m wide and 1.0 m in depth to collect and infiltrate stormwater run-off from the base of the Pit.
- Pit floor grading to promote positive drainage towards the perimeter ditch and away from the waste management area.
- Grading of the highland area of the Site to promote drainage away from the Pit.

The sizing of the infiltration ditch should be confirmed in a future update of this report based on environmental design flood criteria determined by a Professional Engineer in consultation with other Qualified Professionals. A schematic cross-section of the Pit walls is shown on 3.5.

3.5 Five-Year Reclamation Plan

Two areas have been identified for reclamation activities over the next 5 years. Reclamation Area 1 is located along the southern boundary of the Site south of the New Landfill and Reclamation Area 2 includes the original landfill area and surroundings. The planned reclamation areas for the next five years are depicted in Figure 3.6.

Reclamation Area 1 currently consists of a small strip of land (50 m wide) used for material stockpiles and an access road. It is proposed that this area be reclaimed prior to operation of the

New Landfill as this will provide the vegetated buffer required for a waste management area. The haul route will be maintained for Landfill operational use.

Reclamation Area 2, which includes the Original Landfill Area, will be closed and reclaimed by relocating all historically discharged waste materials to the New Landfill.

The above mentioned reclamation activities will be detailed in an annual report submitted to the chief inspector. The report will include environmental and closure monitoring progress of the Upland Pit.

Table 3.4 2020 to 2025 Reclamation Activities

Year	Location	Activity	Task
2020	--	--	--
2021	Reclamation Area 1	Reclamation Annual Reporting	Establishment of 50 m buffer zones and 2H:1V Pit slopes Revegetate surface 2020 Reclamation Report
2022	Reclamation Area 2	Reclamation Annual Reporting	Relocation of waste and reclamation of Original Landfill Area 2021 Reclamation Report
2023	--	Annual Reporting	2022 Reclamation Report
2024	--	Annual Reporting	2023 Reclamation Report

3.6 Long-Term Maintenance and Monitoring

The long-term monitoring program at the Property will include annual field inspections of the Pit side slopes, revegetated areas, and stormwater management works to evaluate maintenance needs, as required. The monitoring programs outlined below shall demonstrate that reclamation, productivity and design objectives are being met.

- Pit side slope monitoring will consist of visual slope stability inspections to identify the presence of any cracks or features indicative of instability. Maintenance may include improvements to mid slope drainage swales.
- Revegetated areas will consist of visual vegetation inspections to assess if the vegetation is adequately established and reaching a self-sustaining state. Maintenance may include fertilizing, irrigating and re-seeding of the vegetation, and maintaining invasive plant controls, as required. Monitoring plots may be established to represent overall site conditions from all habitat types. Guidelines for monitoring plot site selection, distribution, and other considerations can be referenced from Environment Canada (1999)[7].
- Stormwater management works will be visually inspected to assess drainage is adequate to meet to the land use and productivity objectives. Maintenance may include removal of sediment build up and occasional minor re-grading.

Inspections will be conducted by a trained field inspector and reviewed by a Qualified Professional. Photographs and measurements will be recorded to compare with subsequent observations to

[7] Environment Canada (1999). Terrestrial Vegetation Biodiversity Monitoring Protocols. EMAN Occasional Paper Series Report No. 9. EMAN Coordinating Office. Accessed from <http://publications.gc.ca/collections/collection_2014/ec/En36-2-9-1999-eng.pdf>.

evaluate changes in any previously identified features and assess maintenance activities, as required. Monitoring results and maintenance activities will be included in the Annual Reclamation Report.

3.7 Reclamation and Closure Cost Estimate

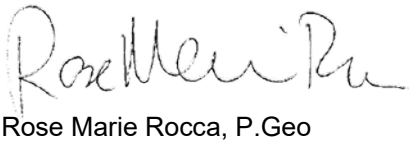
A comprehensive cost estimate for reclamation and closure has been prepared with consideration of the following:

- Pit infilling and grading to meet a productive end land use
- Pit preparation activities
- Implementation and construction of stormwater management works
- Implementation of the revegetation management works
- Long-term maintenance and monitoring programs
- Contingencies

As shown in the attached Table 1, the approximate one-time cost for the reclamation and closure of the Pit is $1,305,000, and the cost of long-term maintenance and monitoring is approximately $66,000 per year.

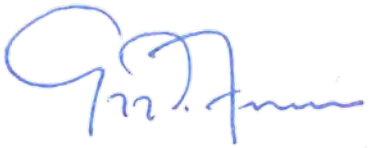
All of Which is Respectfully Submitted,

GHD

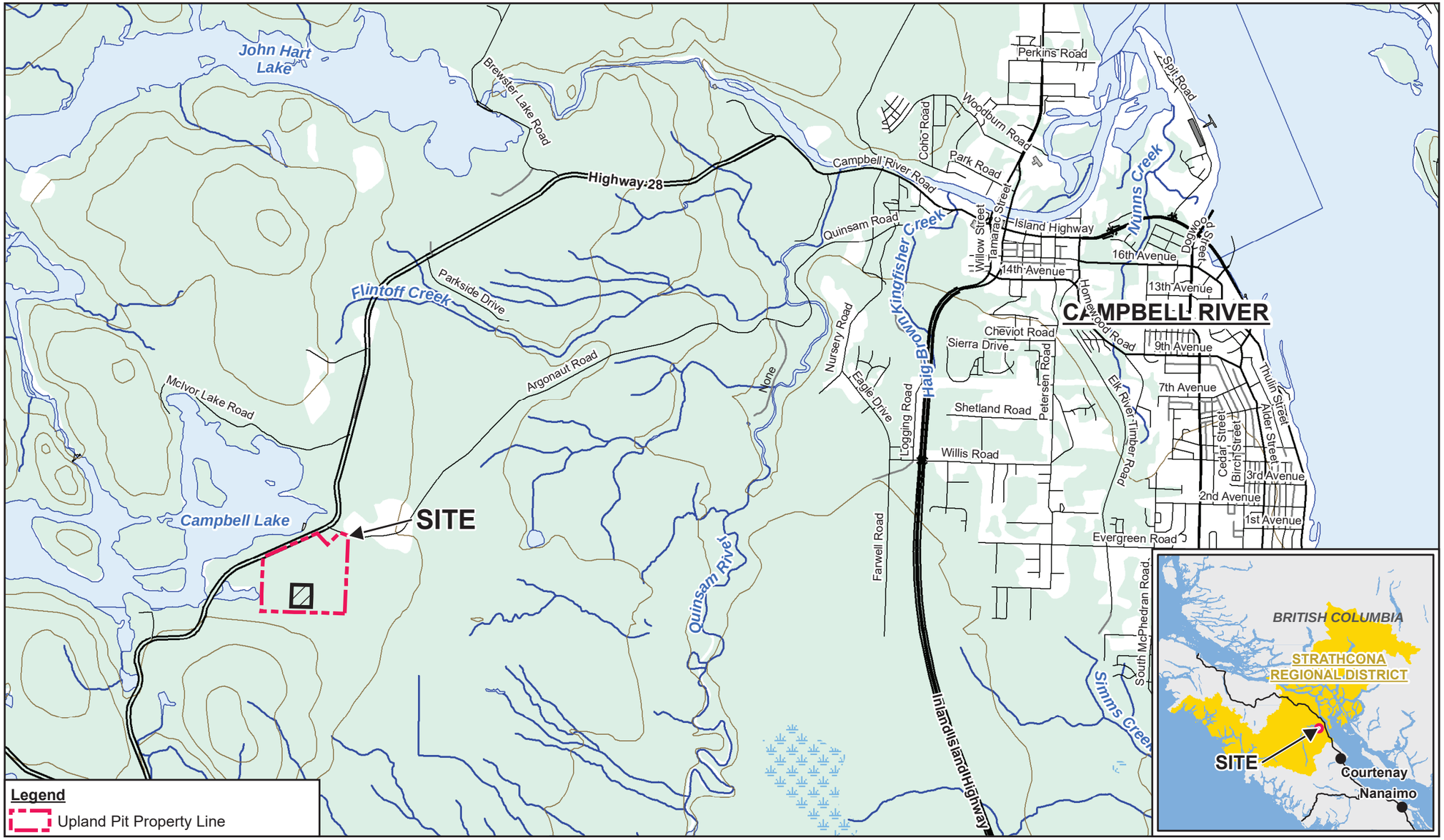


Rose Marie Rocca, P.Geo

Roxanne Hasior, B.A.Sc., EIT



Gregory D. Ferraro, P.Eng.



0 500 1,000 1,500
Meters

Coordinate System:
NAD 1983 UTM Zone 10N

UPLAND CONTRACTING
SAND AND GRAVEL PIT
2020 RECLAMATION AND CLOSURE PLAN

11188156
Apr 3, 2020

SITE LOCATION MAP

FIGURE 1.1

GIS File: Q:\GIS\PROJECTS\11188000s\11188156\Layouts\004\11188156-00(004)GIS-OT001.mxd

LEGEND

- 165.00 — EXISTING MAJOR CONTOURS (m AMSL)
- EXISTING MINOR CONTOUR (m AMSL)
- PIT PROPERTY LINE
- EXISTING LAKE
- EXISTING ACCESS ROADWAY
- LIMIT OF WASTE FOR NEW LANDFILL
- QUARRY EXCAVATION LIMITS
- ORIGINAL LANDFILL LINED CELL
- ORIGINAL LANDFILL UNLINED AREA
- LIMIT OF EXCAVATION FOR NEW LANDFILL
- APPROXIMATE LIMIT OF ROCK QUARRY

A B C D

1 2 3

1A 1B 1C 1D

2A 2B 2C 2D

3A 3B 3C 3D

LOT 6
PLAN 31913

McIVOR LAKE

ARGONAUT ROAD

2047-R

GOLD RIVER HIGHWAY

LOT A
PLAN 30709

OFFICE

WEIGH SCALE

SHED

SHOP

LOT A
PLAN 42515

CONCRETE STOCKPILE

ASPHALT STOCKPILE

RW-98020

STRATA LOT 1
PLAN VIS6756

K&D CONTRACTING LTD.

LOT C
PLAN 42515

STRATA LOT 2
PLAN VIS6756

WASH PLANT

AERATION POND

INFILTRATION POND

UNLINED AREA

RICO LAKE

50.0m
BUFFER ZONE

ORIGINAL LINED CELL

SOURCE: TOPOGRAPHICAL SURVEY DATED DEC. 18, 2018 PROVIDED BY UPLAND CONTRACTING.

0 40 80 120m

UPLAND CONTRACTING
SAND AND GRAVEL PIT
2020 MINE PLAN

SITE PLAN

11188156

Apr 29, 2020

FIGURE 2.1

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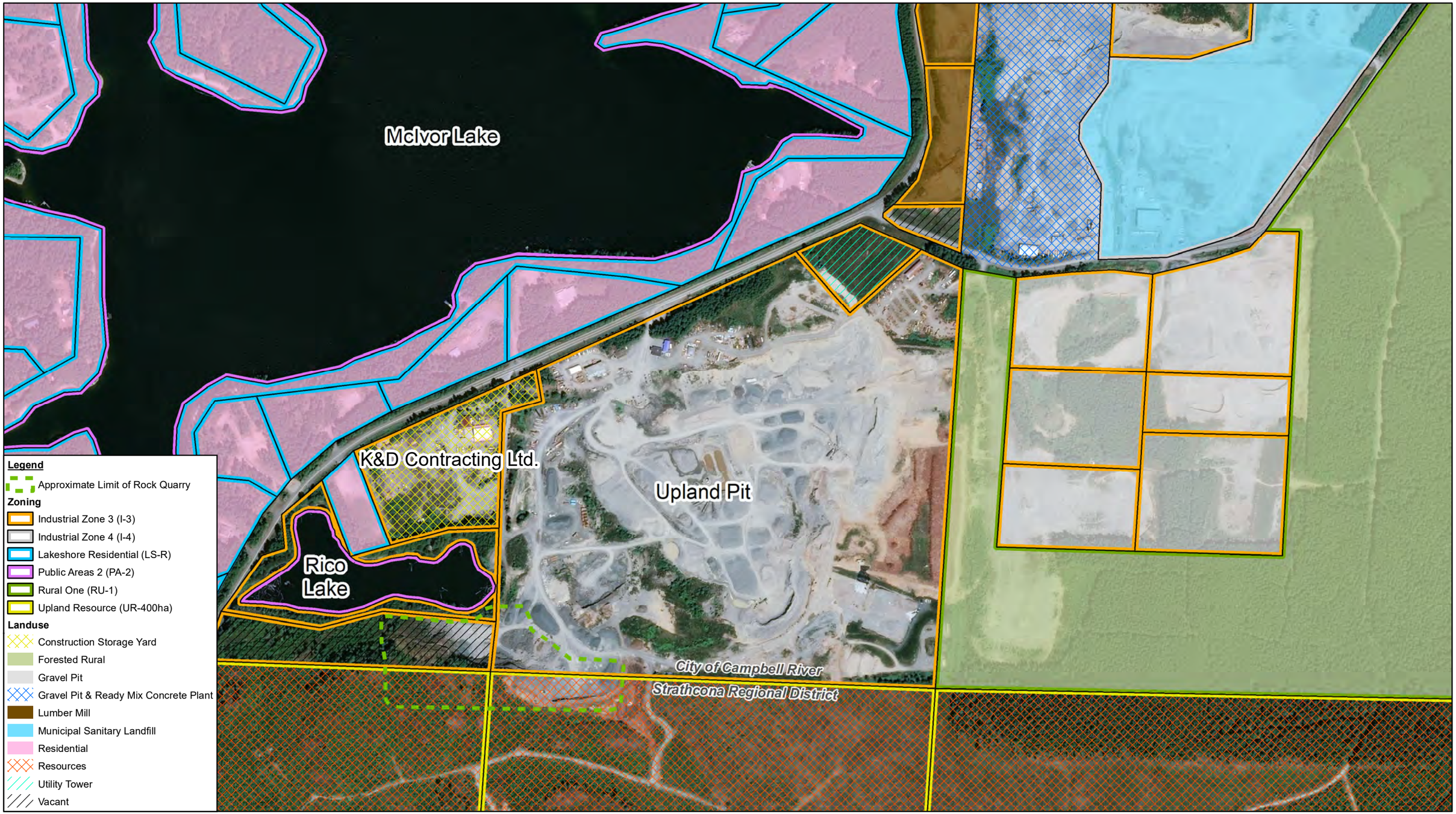

0 60 120 180
Meters

Coordinate System:
NAD 1983 UTM Zone 10N

UPLAND CONTRACTING
SAND AND GRAVEL PIT
2020 RECLAMATION AND CLOSURE PLAN

11188156
Apr 30, 2020

ADJACENT LAND USES

FIGURE 2.2

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LEGEND

- 165.00 — EXISTING MAJOR CONTOURS (m AMSL)
- EXISTING MINOR CONTOUR (m AMSL)
- PIT PROPERTY LINE
- EXISTING LAKE
- EXISTING ACCESS ROADWAY
- LIMIT OF SOLID WASTE LANDFILL
- QUARRY EXCAVATION LIMITS
- PERIMETER INFILTRATION DITCH
- ENGINEERED EROSION CONTROL SWALE
- ENGINEERED EROSION CONTROL SWALE
- APPROXIMATE LIMIT OF ROCK QUARRY
- POTENTIAL FUTURE INDUSTRIAL DEVELOPMENT AREA - 50m BUFFER FROM WASTE MANAGEMENT AREA

A B C D

1 2 3

1A 1B 1C 1D

2A 2B 2C 2D

3A 3B 3C 3D

LOT 6
PLAN 31913

McIVOR LAKE

ARGONAUT ROAD

2047-R

LOT 6

GOLD RIVER HIGHWAY

OFFICE

WEIGH SCALE

SHOP

LOT A
PLAN 42515

LOT A
PLAN 42515

RW-98020

STRATA LOT 1
PLAN VIS6756

STRATA LOT 2
PLAN VIS6756

K&D CONTRACTING LTD.

LOT C
PLAN 42515

PERIMETER INFILTRATION DITCH

PIT ACCESS ROAD

ENGINEERED EROSION CONTROL SWALE

PERIMETER INFILTRATION DITCH

50.0m BUFFER ZONE

ENGINEERED EROSION CONTROL SWALE

AERATION POND

INFILTRATION POND

RICO LAKE

50.0m BUFFER ZONE

SOURCE: TOPOGRAPHICAL SURVEY DATED DEC. 18, 2018 PROVIDED BY UPLAND CONTRACTING.

0 40 80 120m

N

GHD

UPLAND CONTRACTING
SAND AND GRAVEL PIT
2020 RECLAMATION AND CLOSURE REPORT

11188156

Apr 29, 2020

PIT END LAND USE

FIGURE 3.1

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LEGEND

- 165.00 — EXISTING MAJOR CONTOURS (m AMSL)
- EXISTING MINOR CONTOUR (m AMSL)
- PIT PROPERTY LINE
- EXISTING LAKE
- EXISTING ACCESS ROADWAY
- LIMIT OF SOLID WASTE LANDFILL
- QUARRY EXCAVATION LIMITS
- PERIMETER INFILTRATION DITCH
- ENGINEERED EROSION CONTROL SWALE
- APPROXIMATE LIMIT OF ROCK QUARRY

A B C D

1 2 3

1A 1B 1C 1D

2A 2B 2C 2D

3A 3B 3C 3D

LOT 6
PLAN 31913

McIVOR LAKE

ARGONAUT ROAD

2047-R

GOLD RIVER HIGHWAY

LOT 6
PLAN 31913

LOT A
PLAN 42515

WEIGH SCALE

OFFICE

SHED

SHOP

LOT A
PLAN 42515

RW-98020

STRATA LOT 1
PLAN VIS6756

K&D CONTRACTING LTD.

LOT C
PLAN 42515

PERIMETER INFILTRATION DITCH

PIT ACCESS ROAD

ENGINEERED EROSION CONTROL SWALE

PERIMETER INFILTRATION DITCH

STRATA LOT 2
PLAN VIS6756

ENGINEERED EROSION CONTROL SWALE

AERATION POND

INFILTRATION POND

RICO LAKE

50.0m BUFFER ZONE

SOURCE: TOPOGRAPHICAL SURVEY DATED DEC. 18, 2018 PROVIDED BY UPLAND CONTRACTING.

0 40 80 120m

N

GHD

UPLAND CONTRACTING
SAND AND GRAVEL PIT
2020 RECLAMATION AND CLOSURE REPORT

11188156

Apr 29, 2020

PIT FINAL CONDITIONS

FIGURE 3.2

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LEGEND

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- EXISTING MINOR CONTOUR (m AMSL)
- PIT PROPERTY LINE
- EXISTING LAKE
- EXISTING ACCESS ROADWAY
- ADDITIONAL ACCESS ROAD
- LIMIT OF SOLID WASTE LANDFILL
- QUARRY EXCAVATION LIMITS
- ORIGINAL LANDFILL LIMITS
- UNLINED AREA
- APPROXIMATE LIMIT OF ROCK QUARRY

A B C D 1 2 3

1A 1B 1C 1D 2A 2B 2C 2D 3A 3B 3C 3D

LOT 6
PLAN 31913

McIVOR LAKE

ARGONAUT ROAD

2047-R

GOLD RIVER HIGHWAY

LOT A
PLAN 30709

RECLAMATION AREA 3

OFFICE

WEIGH SCALE

SHED

SHOP

LOT A
PLAN 42515

CONCRETE STOCKPILE

ASPHALT STOCKPILE

RECLAMATION AREA 4

RECLAMATION AREA 5

RECLAMATION AREA 7

WASH PLANT

AERATION POND

INFILTRATION POND

RW-98020

STRATA LOT 1
PLAN VIS6756

K&D CONTRACTING LTD.

LOT C
PLAN 42515

STRATA LOT 2
PLAN VIS6756

RICO LAKE

RECLAMATION AREA 6

UNLINED AREA

RECLAMATION AREA 2

RECLAMATION AREA 1

50.0m
UFFER ZONE

ORIGINAL LINED CELL

SOURCE: TOPOGRAPHICAL SURVEY DATED DEC. 18, 2018 PROVIDED BY UPLAND CONTRACTING.

0 40 80 120m

UPLAND CONTRACTING
SAND AND GRAVEL PIT
2020 RECLAMATION AND CLOSURE PLAN

GENERALIZED PIT RECLAMATION SEQUENCE

11188156

Apr 29, 2020

FIGURE 3.3

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LEGEND

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- EXISTING MINOR CONTOUR (m AMSL)
- PIT PROPERTY LINE
- EXISTING LAKE
- EXISTING ACCESS ROADWAY
- LIMIT OF SOLID WASTE LANDFILL
- QUARRY EXCAVATION LIMITS
- PERIMETER INFILTRATION DITCH
- ENGINEERED EROSION CONTROL SWALE
- APPROXIMATE LIMIT OF ROCK QUARRY

A B C D

1 2 3

1A 1B 1C 1D

2A 2B 2C 2D

3A 3B 3C 3D

LOT 6
PLAN 31913

McIVOR LAKE

ARGONAUT ROAD

2047-R

GOLD RIVER HIGHWAY

LOT 6
PLAN 31913

OFFICE

WEIGH SCALE

SHED

SHOP

LOT A
PLAN 42515

LOT A
PLAN 42515

RW-98020

STRATA LOT 1
PLAN VIS6756

K&D CONTRACTING LTD.

LOT C
PLAN 42515

STRATA LOT 2
PLAN VIS6756

RICO LAKE

PERIMETER INFILTRATION DITCH

PIT ACCESS ROAD

A
FIG. 3.5

A'
FIG. 3.5

ENGINEERED EROSION CONTROL SWALE

PERIMETER INFILTRATION DITCH

ENGINEERED EROSION CONTROL SWALE

AERATION POND

INFILTRATION POND

50.0m
BUFFER ZONE

SOURCE: TOPOGRAPHICAL SURVEY DATED DEC. 18, 2018 PROVIDED BY UPLAND CONTRACTING.

0 40 80 120m

N

GHD

UPLAND CONTRACTING
SAND AND GRAVEL PIT
2020 RECLAMATION AND CLOSURE PLAN

DRAINAGE AREA MAP AND STORMWATER MANAGEMENT WORKS

11188156

Apr 29, 2020

FIGURE 3.4

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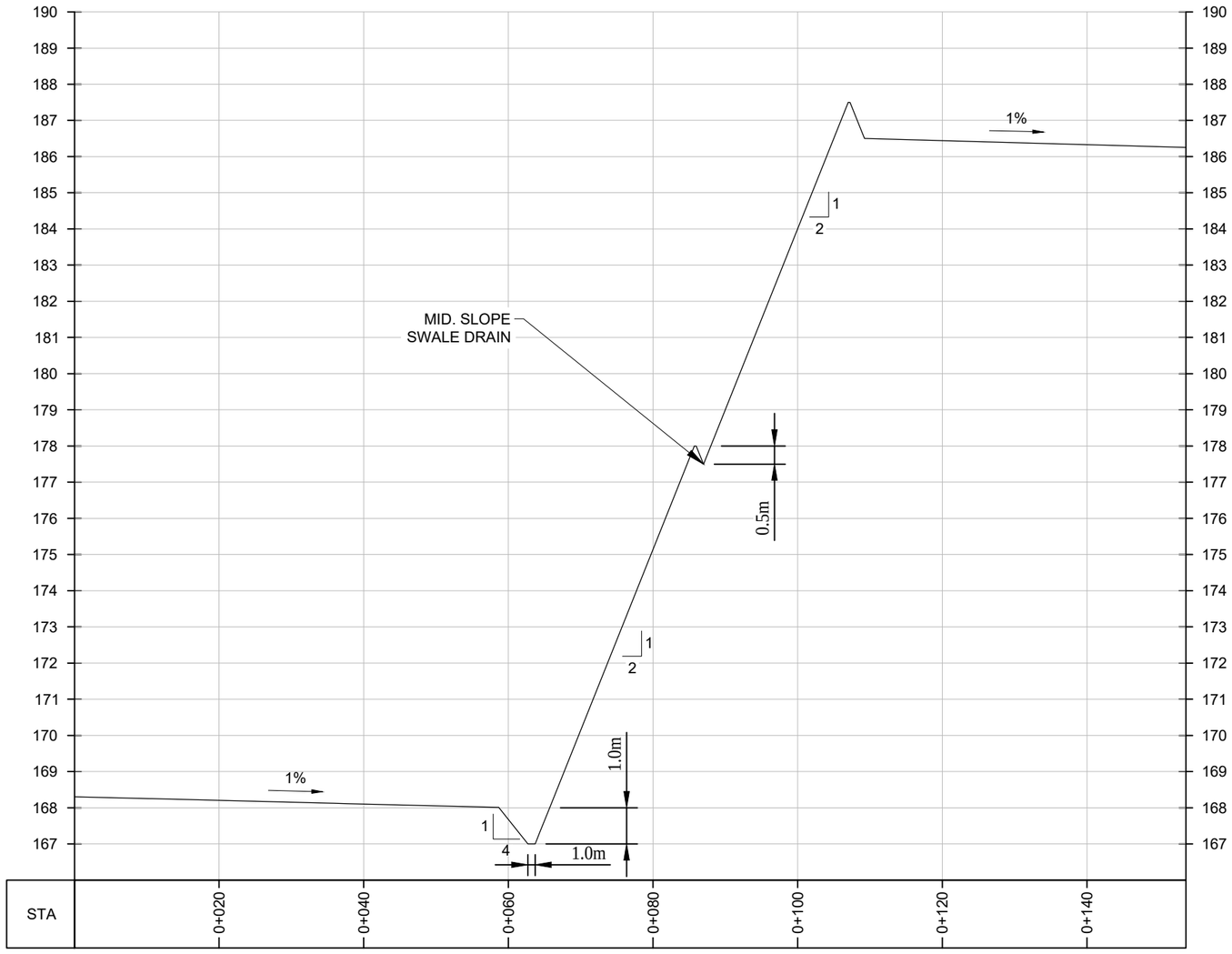

SECTION A-A'

1:750 H
1:300 V

FIG. 3.4

SOURCE: TOPOGRAPHICAL SURVEY DATED DEC. 18, 2018 PROVIDED BY UPLAND CONTRACTING.

0 7.5 15 22.5m

UPLAND CONTRACTING
SAND AND GRAVEL PIT
2020 RECLAMATION AND CLOSURE PLAN

FINAL CONDITIONS AT MINE CLOSURE SURFACE WATER MANAGEMENT SCHEMATIC

11188156

Apr 29, 2020

FIGURE 3.5

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LEGEND

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- EXISTING MINOR CONTOUR (m AMSL)
- PIT PROPERTY LINE
- EXISTING LAKE
- EXISTING ACCESS ROADWAY
- LIMIT OF SOLID WASTE LANDFILL
- QUARRY EXCAVATION LIMITS
- ORIGINAL LANDFILL LIMITS
- UNLINED AREA
- LIMIT OF EXCVATION FOR LANDFILL
- RECLAMATION AREA 1
- RECLAMATION AREA 2

A B C D

1 2 3

1A 1B 1C 1D

2A 2B 2C 2D

3A 3B 3C 3D

LOT 6
PLAN 31913

McIVOR LAKE

ARGONAUT ROAD

2047-R

GOLD RIVER HIGHWAY

LOT A
PLAN 30709

OFFICE

WEIGH SCALE

SHED

SHOP

LOT A
PLAN 42515

CONCRETE STOCKPILE

ASPHALT STOCKPILE

RW-98020

STRATA LOT 1
PLAN VIS6756

K&D CONTRACTING LTD.

LOT C
PLAN 42515

STRATA LOT 2
PLAN VIS6756

WASH PLANT

AERATION POND

INFILTRATION POND

RICO LAKE

UNLINED AREA

50.0m
BUFFER ZONE

ORIGINAL LINED CELL

SOURCE: TOPOGRAPHICAL SURVEY DATED DEC. 18, 2018 PROVIDED BY UPLAND CONTRACTING.

0 40 80 120m

UPLAND CONTRACTING
SAND AND GRAVEL PIT
2020 RECLAMATION AND CLOSURE PLAN

11188156

Apr 29, 2020

FIVE-YEAR PLAN CLOSURE AND RECLAMATION OBJECTIVES FIGURE 3.6

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Cost Estimate
2020 Reclamation and Closure Report
Upland Sand and Gravel Pit
Campbell River, British Columbia

Activity	Task/Item	Unit	Price per Unit	Estimated Quantity	Cost	Price per m^2	Annual Cost
Site Preparation	Treatment of structures and equipment	L.S.	$ 25,000.00	1	$ 25,000.00	$ 0.07	
	Treatment of contaminated soils	m^3	$ 200.00	500	$ 100,000.00	$ 0.28	
Closure	Re-grade of pit floor	m^2	$ 2.00	200,000	$ 400,000.00	$ 1.11	
Stormwater Management	Construction of mid-slope swale	lm	$ 20.00	2,500	$ 50,000.00	$ 0.14	
	Slope stabilization (vegetative mats or rip rap)	lm	$ 100.00	2,500	$ 250,000.00	$ 0.69	
	Construction of perimeter ditch	lm	$ 60.00	2,500	$ 150,000.00	$ 0.42	
Revegetation	Topsoil	m^3	$ 7.00	15,000	$ 105,000.00	$ 0.29	
	Hydroseeding	m^2	$ 2.00	100,000	$ 200,000.00	$ 0.56	
	Invasive plant control placement	L.S.	$ 25,000.00	1	$ 25,000.00	$ 0.07	
Long-term Monitoring	Engineer field inspections of slopes and stormwater management works						$3,000.00
	Biologist field inspections of revegetated areas						$2,000.00
Long-Term Maintenance	Administration						$2,500.00
	Access Road Maintenance/Repair						$5,000.00
	Vegetation Maintenance						$15,000.00
	Erosion/Surface Water Repair						$20,000.00
Reporting	2020 Reclamation Report						$7,500.00
Contingency (20%)							$11,000.00
Total					**$1,305,000**	**$3.63**	**$66,000**

Appendices

Appendix A
Revegetation Management Plan and Specifications

Appendix A Current Environmental Ltd. Revegetation Management Plan and Specifications

1.1 Revegetation Plan

The Site will be reclaimed to a self-sustaining state using a combination of methods that will include Site regrading, growing medium placement, and revegetation using appropriate plant species. Planting objectives include restoring land cover and species types to emulate those of nearby terrestrial ecosystems which include a native assemblage of coniferous trees and shrubs. The appropriate plant species outlined herein were determined by Current Environmental Ltd. during a Site assessment to determine potential aquatic receptors at the Pit (March 16, 2018).

1.1.1 Top Soil Replacement

Use of a suitable growing medium is core to a resilient revegetation plan. The existing Sand and Gravel Permit G-8-114 requires the following:

5. Use of Suitable Growth Medium

   (a) On all lands to be revegetated, the growth medium shall satisfy land use, productivity, and water quality objectives. Topsoil and overburden (to rooting depth) shall be removed from operational areas prior to any disturbance of the land and stockpiled separately on the property for use in reclamation programs, unless the Permittee can provide evidence which demonstrates, to the satisfaction of the Chief Inspector, that reclamation objectives can otherwise be achieved.

   (b) No topsoil shall be removed from the property without the specific written permission of the Inspector of Mines.

Prior to new Upland Pit operations commencing, native site topsoil will be removed and stockpiled. During the stockpiling process, native topsoil generally loses its natural soil structure. Soil structure is established in native soils over long periods of time. Soil biotic and abiotic factors like earthworm bioturbation and freeze-thaw processes aggregate soil particles and create air spaces within the soil matrix. These processes slowly create a soil structure that can vary from location to location depending on site-specific parent materials and varied soil forming processes.

A critical effect of soil structure in native soils of eastern Vancouver Island is increased permeability, which aids in rain water availability to plants. Rain water can easily permeate through the surface of healthy native soils, making the water available to plants deeper in the soil profile and for longer periods of time during a growing season. By contrast, stockpiled soils that have lost their structure through mechanical disturbance and compaction can be highly impermeable when spread back onto a reclamation site. In other words, the loss of soil structure in stockpiled soils poses a significant risk to the effectiveness of a reclamation program by rendering stockpiled soils unsuitable for plant growth when spread out after stockpiling. The loss of soil structure as a result of stockpiling needs to be addressed through the use of admixtures.

The risks associated with the loss of soil structure can be mitigated relatively easily through the use of admixtures that coarsen soil texture. In general, if stockpiled soils have over about 30% fines (combined silts and clays) by weight, they are likely to form a hard, impenetrable surface when spread out after being stockpiled. In this situation, if sand is screened into the stockpiled topsoil to bring the percentage of fines down to the range of 20%, the risk of compaction and hardening (i.e. from rainfall and/or machinery movement) is significantly reduced.

Although sand as an admixture to topsoil can significantly reduce the risk of compaction and hardening, sand has the net effect of reducing fertility. Fertility can be addressed through the addition of fertilizers, but chemical fertilizers are easily leached. Ideally, growing medium with less than 20% fines (high sand content) will have an organic content of between 10 and 20% by dry weight to help with the retention of nutrients. If wood is used to increase the organic content, soil will require long term additions of nitrogen fertilizers. Well-composted organics are far more effective as an admixture to raise the percentage of organics (without compromising fertility) in a growing medium, but they often cost more than wood products.

As the above discussion suggests, some understanding of the current texture and organic content of stockpiled topsoil will help in understanding which admixtures are required to mitigate risks and to develop a ‘suitable growing medium’ (i.e. an amended topsoil that meets specifications). The following stepwise process will be followed to test existing stockpiled topsoil, develop a recipe for admixtures and then apply the resulting growing medium to the site:

1. Site topsoil will be stripped from the surface after vegetation clearing and stockpiled in the location shown in Figure 4.2.
2. Three stratified soil samples will be drawn from stockpiled topsoil at the Upland Pit site and sent to Pacific Soils Analysis Inc. in Richmond, BC for Lab Analysis.
3. The results of the lab analysis will be used to determine if sand, fertilizer and/or compost will need to be screened into the stockpiled topsoil prior to spreading on site. Appropriate proportions of admixtures will be prescribed in order to produce a growing medium product that meets growing medium specification provided in Attachment A.
4. After screening-in of admixtures (if required), growing medium will again be sampled (three stratified samples from the finished product piles) and sent to Pacific Soils Analysis for confirmation lab analysis.
5. Upon receiving confirmation that screened growing medium meets the specification in Appendix D, growing medium (or unamended stockpiled topsoil) will be spread in reclamation areas during decommissioning of the pit area. Note that if the second round of lab tests shows deficiencies in the properties of screened growing medium, sand and/or compost may be applied to the surface and tilled in – this can help to avoid delays in the reclamation process and the cost of re-screening growing medium.
6. After spreading growing medium on-site and prior to seeding and planting, chemical fertilizers will be applied at the rate recommended by Pacific Soils Analysis Inc. through their lab test reporting.
7. Upon the completion of fertilizer applications, the site will be ready for seeding and planting as prescribed in Section 1.1.2 of this report.

Prior to application of growing medium to reclamation areas, the surface of the regraded landscape will be scarified to a depth of 300 millimetres (mm). Scarification breaks the crust of the surface where compaction may exist and facilitates some minor mixing of growing medium with underlying ‘subsoil’

materials. Scarification significantly enhances the ability of rain water to permeate below the growing medium layer into subsoil materials and increases the ability of plant roots to penetrate deeper into the subsoil layer. In the event that subsoil cannot be scarified, a subsoil layer of suitable material shall be placed prior to growing medium at a depth of 300 mm. The imported subsoil should meet the Canadian Landscape Standard (Current Edition) Growing Medium Type 3P (or equivalent as approved by the project Biologist – confirmation lab testing on subsoil material may be requested by the Biologist).

Immediately after completion of scarification of reclamation areas, growing medium is to be applied in a continuous layer 150 mm deep. **Maximum slopes prior to growing medium application will be 3:1 (33%)**. Slopes steeper than 3:1 are not conducive to restoration as they are prone to erosion and do not retain growing media. Seeding and planting should take place within two weeks of growing medium application. Ideally, the timing of planting/seeding will be in early to mid-spring or early to mid-fall to avoid drought conditions and excessive rainfall. Please refer to Section 1.1.2 for more detail on seeding and planting prescriptions.

Maintenance fertilizer applications may be required. After two growing seasons, a follow-up stratified soil sample will be drawn from the growing medium layer and sent to Pacific Soils Analysis Inc. for lab testing (fertility analysis only). Fertilizer will be applied at the rates recommended by the lab.

1.1.2 Seeding and Planting

The Site resides near the northern extent of the Coastal western hemlock (very dry maritime eastern variant) CWHxm1 biogeoclimatic zone. This zone is restricted to elevations between sea level and 900 m in areas subject to the rainshadow of Vancouver Island and the Olympic Range, and is characterized by warm, dry summers with temperatures moderated by proximity to the ocean; and mild, wet winters with very little snowfall.[1] According to Pojar, Klinka, & Demarchi (1991)[2], CWH forest cover is dominated by mixtures of western hemlock and western red cedar with increases in the frequency of Douglas fir south of roughly 53°N latitude (the Site is located near 50°N latitude). Other floristic features of this CWH ecosystem include a sparse herb layer and predominance of several moss species.

Although coastal western hemlock is often the dominant species in this BGC zone the forest inhabiting non-riparian areas in and around the Site are dominated by Douglas fir and coastal western hemlock, typical of drier maritime subzones. As well, there are occurrences of grand fir and big leaf maple in the warmer, and drier, southern areas of the zone such as near the project Site.

Documented wetlands near the Site are somewhat disturbed by past land-uses but include characteristics of provincially blue-listed (special concern) red-cedar/slough sedge[3] ecological community at risk. In general, forested areas surrounding the Site have been disturbed by recent and historical timber harvesting with clearings as recent as 5-10 years ago. Recovering forest types are dominated by young Douglas fir and western red cedar canopy species with an understory of salal, dull-Oregon grape, and red huckleberry -typical of coarse, well-draining soil types. Older nearby stands of intact vegetation near the site are approximately 40-60 years old and contain the aforementioned species in addition to coastal western hemlock. These observed species and existing soil types have been used in part to inform reclamation prescriptions.

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[1] Ministry of Forests and Range. (2009). CWHxm1 - Moist Maritime Coastal Douglas fir Subzone. Biogeoclimatic Ecosystems Classification Program. Research Branch. Retrieved from <http://www.for.gov.bc.ca/rco/research/eco/bec_web/docs/CWHxm1.htm>.

[2] Pojar, J., Klinka, K., & Demarchi, D. (1991). *Ecosystems of British Columbia. Chapter 6: Coastal Western Hemlock Zone. .* Victoria, B.C. 330 pp.: BC Ministry of Forests. Research Branch. Special Report Series.

[3] *Thuja plicata/ Carew obnupta* Ecological Community. Provincially blue-listed (B.C. List Status) and Globally Unranked (Global Conservation Status). Retrieved from <http://a100.gov.bc.ca/pub/eswp/search.do>

Constructed wetlands/ponds and shallow, distributed overland flows are recommended for inclusion in the overall site grading and reclamation plan. Dispersed stormwater flows function to increase habitat diversity and long-term plant growth, while channelized or ditched drainages do not, and should be avoided unless they are intended to divert flows around areas of contamination. If areas of contaminated soils exist, the methods for capping or containment will have implications on the type and thickness of growing media (Section 1.1.1). Where water is already collecting in the pit floor, maintaining existing shallow ponds should be considered in the restoration plan to create habitat diversity and become a central feature to help support the success of surrounding riparian vegetation plantings and enhance wildlife habitat.

The following criteria will be used to identify suitable replanting areas:

1. Slopes less than 33%.
2. Areas scarified prior to application of growing medium.
3. Application of verified ‘suitable growing medium’ as described in Section 1.1.1.
4. Growing medium with a thickness no less than 150 mm.

A combination of native vegetation planting and hydroseeding mix dispersal will be used to cover and colonize reclaimed Site areas according to species suitability to microhabitats formed during Site re-grading and the plant’s ability to tolerate harsh environmental conditions likely associated with the reclaimed Site. As much as possible, the reclaimed Site must be restored to mimic surrounding natural areas (e.g. slopes, aspects, soils, and drainage patterns) for species selections, based on those surrounding areas, to succeed.

Tree and shrub plantings will be installed according to specifications in Attachment B. Tree stock will be in form of plugs while understory shrubs stock will be in one gallon pots or plugs according to availability from a native plant nursery. Pending results of topsoil analysis (Item 3 of Section 1.1.1. above) tree and understory plugs may be installed alongside fertilizer tablets at application rates specified by manufacturer.

Cool-season perennial hydroseed mixes contain grasses and legumes that germinate early in the season and undergo maximum growth in the summer and autumn. Ideally, the selected species will thrive in a wide variety of soil types and nutrient conditions, provide erosion resistance, and combat invasive species incursions. Soil amendments described in Section 1.1.1 are critical to support the successful establishment and long-term productivity of all planted stock. Hydro seeding specifications are provided in Attachment C.

The following cool-season fescue and legume-based grass hydroseed mix is designed to provide fast growing vegetative cover that will assist in erosion protection and site stabilization. This seed mix will have the greatest chance of success if planted in the spring and be followed immediately by tree and shrub planting as described below. Reclamation seed mixes typically contain non-native species that are best suited for early establishment and resistance against aggressive, long-term establishment of invasive shrub species. These characteristics are a trade-off against using native seed mixes that are, however, eventually offset by the establishment of native shrubs and tree species that will eventually dominate the site and replace the grasses through natural succession.

The seed mix and planting specification for the revegetated areas is provided in Table 1.1 and Table 1.2 below.

Table 1.1 Seed Mix Specification[4]

Common Name	Scientific Name	% Seed Count	% By weight	Seeding Rate[5] (kg/ha)
Annual ryegrass	*Secale cereale*	17	35	28
Creeping red fescue	*Festuca rubra*	26.5	35	28
Tall fescue	*Schendonorus arundinaceus*	12	15	12
Hard fescue	*Festuca trachyphylla*	16.5	5	4
Blue wildrye	*Elymus glaucus*	4	3	2.4
Brown top (colonial bentgrass)	*Agrostis capillaris*	19	1	0.8
S.C. Red clover	*Trifolium pratense*	6	5	4
Alsike clover	*Trifolium hybridum*	1.5	1	0.8
Total		**100**	**100**	**80**

Table 1.2 Planting Specification

Habitat Type	Common Name	Scientific Name	Proportion %	Spacing (m)	Planting Density (plants/ha)
High-land terrestrial	Douglas fir	*Pseudotsuga menziesii*	20	4	143
Riparian/ low-land terrestrial	Western red cedar	*Thuja plicata*	5	4	36
All	Coastal western hemlock	*Tsuga heterophylla*	10	4	72
All	Grand fir	*Abies grandis*	15	4	107
Riparian/ low-land terrestrial	Red alder	*Alnus rubra*	10	4	72
All	Big leaf maple	*Acer macrophyllum*	5	4	36
All	Salal	*Gaultheria shallon*	10	3	127
High-land terrestrial	Thimbleberry	*Rubus parviflorus*	5	3	64
High-land terrestrial	Dull Oregon grape	*Mahonia nervosa*	10	3	127
All	Sword fern	*Polystichum munitum*	5	3	64
High-land terrestrial	Oceanspray	*Holodiscus discolor*	5	3	64
Total			**100**	**-**	**911**

[4] Based on a *Coastal Reclamation Mix* designed for erosion control and reclamation applications.

[5] Based on median 80 kg/ha from recommended rate of 60-100 kg/ha.

1.1.2.1 Timing and Monitoring

Efforts to re-establish vegetation should take place within the first full growing season following Site closure. Seeding and planting should take place within two weeks of growing medium application. All areas that will not be maintained for future operations will be revegetated, including stockpiles, equipment storage areas, plant facilities, and basins. Planting and seeding will be done in the early spring or autumn to avoid periods of desiccation or heavy rainfall associated with summer and winter seasons, respectively.

Following planting, a monitoring period of 3-5 years will be implemented to ensure planting success and identify any deficiencies such as erosion, plant failures, invasive species incursions, etc. Monitoring plots will be established to represent overall site conditions from all habitat types (i.e. multiple 20 x 20 m stand-alone quadrats representing up to approximately 10% of the total restored area). Guidelines for monitoring plot site selection, distribution, and other considerations can be referenced from Environment Canada (1999)[6].

A minimum survival percentage must be established prior to monitoring (e.g. minimum 80 % survival). Annual monitoring reports will be required to describe reclamation successes and failures and make recommendations for improvements. The monitoring period will only be considered complete when minimum survival rates, including successful reallocation of replacement plantings for any die-off, and combat against invasive species incursions have been confirmed to be self-sustaining.

It is expected that some natural revegetation by early pioneer species such as red alder will occur; however, given the high concentration of invasive plant species surrounding the Site that are likely to re-colonize bare soils, natural recruitment must not be depended upon as a reclamation strategy. Furthermore, natural recruitment often results in low species diversity and long time-scales for natural succession to build up species richness.

1.1.3 Invasive Plant Controls

The Site and surrounding environs are known to support invasive species including Knotweed spp.[7], Scotch broom, and Himalayan blackberry. Knotweed spp. are listed as “Noxious” under the BC *Weed Control Act*[8] because they are known to be highly invasive and must be managed with extreme care to minimize spread to other areas. The *Weed Control Act* includes a “duty to control noxious weeds” that states the occupier of land or premises “must control noxious weeds”.

The critical importance of proper handling and disposal of knotweed among other invasive species present on the Site cannot be overemphasized. According to the Coastal Invasive Species Committee (CISC)[9], Upland Contracting Ltd. imports knotweed for deep burial (10 feet) at their Gold River Highway Pit, "which is the recommended practice for responsible disposal". An alternative disposal method to

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[6] Environment Canada (1999). Terrestrial Vegetation Biodiversity Monitoring Protocols. EMAN Occasional Paper Series Report No. 9. EMAN Coordinating Office. Accessed from <http://publications.gc.ca/collections/collection_2014/ec/En36-2-9-1999-eng.pdf>.

[7] Invasive knotweed species: Japanese (*Fallopia japonica*), Giant (*F. sachalinensis*), Bohemian (*F. x bohemica*), and Himalayan (*Polygonum polystichum*).

[8] Schedule A. Weed Control Regulation of the BC Weed Control Act. Accessed from <http://www.bclaws.ca/Recon/document/ID/freeside/10_66_85#ScheduleA>

[9] http://www.coastalisc.com/how-to-control-invasive-plants

in-situ deep burial includes exporting invasive plant materials to an appropriate disposal facility (i.e. CR Waste Management Centre[10]) to ensure it is not spread to other areas.

For any identified surface presence of knotweed it must be eradicated under the supervision of a Qualified Environmental Professional (QEP) able to manage the treatment, removal, and disposal of knotweed from the Site using current best management practices. Removal plans must include disposal, safety considerations, replanting, erosion and sediment control, and follow-up monitoring requirements.

In areas where Scotch broom is to be removed but no earthworks are planned (e.g. no regrading requirements) the broom should be close-cut with hand tools, opposed to pulling out the roots as the latter method can energize the seed bank and result in increased growth. The timing of broom removal is ideally done in spring while the plant is in bloom, before seed pods begin to form. Conversely, blackberry can be both cut or pulled anytime by hand or machine. In areas where these two species are comingled close-cutting with hand tools will be the default removal method.

As indicated above, in-situ deep-burial at the Site is an appropriate disposal method of harvested, invasive material, while end-hauling to CR Waste Management Centre is also acceptable. If transported by truck to the waste management centre, invasive plant material may be gathered in heavy plastic bags making sure that no plant parts poke through the bags, and the load be covered by a tarp to ensure no losses en-route. The receiving landfill operator must be informed ahead of time that the load contains invasive plant material and not yard waste so the centre can arrange proper handling.

Importation of additional invasives in top-soil and on machinery used in final site reclamation will be avoided where all equipment entering/leaving the site will be washed and all equipment used to remove invasive species (including hand tools) following each removal effort will also be cleaned. All imported materials required for site reclamation must be free of invasive species. The post-reclamation monitoring program will include invasive species identification and recommendations for additional control measures as needed.

CURRENT ENVIRONMENTAL

WARREN FLEENOR, R.P. BIO. PRINCIPAL

And

Dusty Silvester, R.B. TECH

[10] https://www.cswm.ca/hazardous-waste/invasive-plants

Attachment A
Topsoil and Finish Grading

1 GENERAL

1.1 DESCRIPTION

.1 Section 32 91 21 refers to those portions of the work that are unique to the supply and placement of growing medium and subsequent finish grading. In this Section, the term "growing medium" is used in place of the generic and commonly used term "topsoil" to imply a mixture of ingredients designed to achieve specific growing medium properties. The term "topsoil" in this Section is used where appropriate to identify a component of growing medium, or on-site natural soil material. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

.2 Provide all labour, materials, equipment and services required for supply and placement of growing medium and finish grading including but not limited to all reclamation areas. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

1.2 RELATED SECTIONS

.1 Section 32 92 19 – Hydraulic Seeding

.2 Section 32 93 01 – Planting Trees, Shrubs and Ground Covers

1.3 REFERENCES

.1 Canadian Landscape Standard, Current Edition (CLS-CE)

1.4 SOURCE QUALITY CONTROL

.1 Advise Landscape Architect of sources of growing medium to be utilized 14 days in advance of starting work.

.2 Growing medium properties and handling shall meet CLS-CE (see Section 6 CLS-CE).

.3 Contractor/Owner is responsible for soil analysis and amendment requirements to supply suitable growing medium, as specified by testing agency. Soil analysis and amendment costs shall be included in the price for the work.

.4 Submit to the Landscape Architect a copy of the soil analysis report from Pacific Soil Analysis Inc. 5-11720 Voyageur Way, Richmond, BC, V6X 3G9. p. 604- 273-8226. The analysis shall be of tests done on the proposed growing medium from stratified samples taken from the supply source. Costs of the initial and all subsequent tests to ensure compliance with the specifications shall be borne by the Contractor/Owner.

.5 The analysis shall include the testing laboratories' recommendations for texture amendments, organic content amendments, fertilizer additions and other required modifications to ensure the proposed growing medium meets the requirements of the specifications.

.6 Carry out growing medium preparation and placement such that the final product matches the standard established by the approved samples which have incorporated the recommendations for amendment by the laboratory.

1.5 MEASUREMENT AND PAYMENT

.1 No measurement will be made for work specified in this Section. Payment for all work under this section is to be included in the applicable lump sum prices in the Tender Form, or as otherwise paid for by the Owner.

1.6 PRODUCT HANDLING

.1 Do not work or move growing medium or additives when they are excessively wet, extremely dry, frozen or in any manner which may adversely affect their structure.

.2 Protect stockpiled topsoil and/or growing medium and additives against extreme wetting by rain or other agents, and against contamination by weeds, insects or any other contaminant.

.3 Deliver fertilizer and other chemicals in manufacturer's original containers. Protect against damage and moisture until incorporated into work.

2 Products

2.1 GROWING MEDIUM

.1 Growing medium for planted and seeded areas: mixture of mineral particulate, micro-organisms and organic matter which provides suitable medium for supporting intended plant growth.

.1 Reclamation Growing medium

.1 To meet CLS-CE Type 2P standard, with the following modification:

.1 Clay and Silt Combined – Maximum 25% (Page 84 of the CLS-CE is provided at the end of this specification section for reference of the 2P soil type requirements).

.2 Nutrient levels to be determined via Growing medium analysis (as specified above in Section 1.4) for this project.

.2 Contain no toxic elements or growth inhibiting materials.

.3 Free from:

.1 Debris and stones over 50 mm diameter.

.2 Course vegetative material, 10mm diameter and 100 mm length, occupying more than 2% of soil volume.

.4 Consistency: friable when moist.

2.2 SOIL AMENDMENTS

.1 Peatmoss:

.1 To meet CLS-CE standards (See section 6 CLS-CE)

.2 Commercially Prepared Compost:

.1 to meet CLS-CE standards (See section 6 CLS-CE)

2.3 INORGANIC COMPONENTS AND AMENDMENTS

.1 Sand:

.1 To meet CLS-CE standards (See section 6 CLS-CE) with the following exception:

.1 70-100% passing a USBS No. 8 (2.36mm) sieve

.2 0-65% passing a USBS No. 35 (0.5mm) sieve

.2 Fertilizer:

.1 Types, formulations, and rates of application of fertilizers and liming agents shall be as recommended by a laboratory soil specialist and based on test results of the growing medium.

.2 Fertilizers shall be to specification for the project and approved by the Landscape Architect.

.3 Substitutions or variations in fertilizers and methods shall be made only upon pre-approval by the Landscape Architect.

.4 Fertilizers shall meet the requirements of the Canada Fertilizers Act, be in granular, pellet or pill form, dry and free flowing and have a guaranteed N-P-K analysis.

.5 Fertilizers shall be packed in standard waterproof containers and clearly marked with the name of the manufacturer, weight and analysis.

.6 Fertilizers shall be stored in a weatherproof storage place that will ensure it stays dry with its effectiveness unimpaired.

.7 Receipts and empty bags should be retained for review by the Landscape Architect as verification of application of specified fertilizer.

2.4 GROWING MEDIUM NUTRIENTS AND TEXTURE

.1 Growing medium shall require not more than 0.5kg/m^2 (0.10lb/ft^2) of dolomite lime to reach the required pH level.

.2 Fertility (nitrogen, phosphorus and potassium) and pH may be modified either during mixing and screening, or after growing medium is placed.

.3 Salinity- the saturation extract conductivity shall not exceed 3.0 milliohms/cm at 25°C (77°F). If higher it shall be leached with fresh water through irrigation or precipitation prior to planting.

.4 Boron- the concentration in the saturation extract shall not exceed 1.0ppm.

.5 Sodium- the sodium absorption ratio (SAR) as calculated by analysis of the saturation extract shall not exceed 8.0.

.6 Total Nitrogen shall be 0.2% to 0.6% by weight.

.7 Available Phosphorus shall be 20 to 250ppm.

.8 Available Potassium shall be 50 to 1000ppm.

.9 Carbon to nitrogen Ratio shall not exceed 40:1.

3 Execution

3.1 PREPARATION OF EXISTING GRADE

.1 Verify that grades are correct. If discrepancies occur, notify Landscape Architect and do not commence work until instructed by Landscape Architect.

.2 Prepare subgrade surface for topsoil placement by eliminating uneven areas and low spots and ensuring positive drainage except where noted on plans.

.3 Remove virtually all debris, roots, branches, weeds, stones in excess of 50 mm diameter and other deleterious materials. Remove soil contaminated with calcium chloride, toxic materials and petroleum products. Remove debris which protrudes more than 75 mm above surface. Remove plastics and other foreign (i.e.: garbage) products. Dispose of removed material off site in accordance with governing laws.

.4 Course cultivate (scarify) entire area which is to receive topsoil to depth of 300 mm. Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.2 MIXING PREPARED GROWING MEDIUM

.1 Screen Topsoil with mechanical screening equipment. Thoroughly mix topsoil with recommended additives during screening process to produce a Growing medium as specified.

.2 No hand mixing shall occur unless approved by Landscape Architect.

.3 Do not screen or mix Growing medium on paved or finished gravel areas of the site.

3.3 PREPARATION

.1 Ensure proper positive drainage of rough grading in all reclamation areas prior to growing medium placement except where noted in plans.

3.4 PLACING AND SPREADING OF GROWING MEDIUM

.1 Place growing medium only after Landscape Architect has approved subgrade.

.2 Prior to growing medium placement install required drainage medium in planters as specified.

.3 Subgrade must be unfrozen and free of standing water at time of placement.

.4 Do not disturb drainage medium (pipes or other apparatus) during soil placement.

.5 For all reclamation areas areas:

.1 Place growing medium in loose lifts, not to exceed 150 mm each and allowed each lift to settle, or compacted with a water filled landscape roller, such that it is firm against deep footprints, prior to planting.

.2 Growing medium must not otherwise be mechanically compacted.

.3 Do not over-compact or attempt placement when growing medium is saturated.

.6 Manually spread growing medium around trees, shrubs and other obstacles.

3.5 SOIL AMENDMENTS

.1 Where required by confirmation lab testing, thoroughly mix soil amendments and fertilizer, as recommended by soils analysis, into the top 50 mm of the soil.

3.6 FINISH GRADING

.1 Finish grade Growing medium areas and other landscape features (ie: granular paths, parking areas, concrete pads, etc.) to contours and spot elevations as indicated on drawings or as directed by Landscape Architect.

.2 Grade to eliminate rough spots and low areas and ensure positive drainage, except where indicated on plans. Prepare loose friable surface by means of cultivation and subsequent raking.

.3 Consolidate growing medium to required bulk density using equipment approved by Landscape Architect. Leave surfaces smooth, uniform and firm against deep foot printing.

3.7 ACCEPTANCE

.1 Landscape Architect will field review and test growing medium in place and determine acceptance of material, depth of growing medium and finish grading. Approval of growing medium material subject to soil testing and analysis. Planting is not to occur until Growing medium properties and finished grades have been approved by Landscape Architect.

3.8 SURPLUS MATERIAL

.1 Dispose of materials not required off site.

END OF SECTION

Table T-6.3.5.3. Properties of Growing Media for Level 2 "Groomed" and Level 3 "Moderate" Areas

LEVELS 2 and 3 Areas: Routine, high to moderate standard of maintenance is anticipated. Automatic irrigation is recommended, however such areas can be adequately irrigated through consistent use of manual irrigation equipment. The textural classification for these growing media by the Canadian system of soil classification is "loamy sand" to "sandy loam". These growing media accommodate a wide selection of plants; they create a balance between good drainage and water retention and are suited to moderate, normal maintenance practices. "On-slab" areas should be treated as LEVEL 1 areas, with corresponding increase in sand content and decrease in silts and clays. Note: Trees and large shrubs areas may also have Type 2L growing medium.			
Growing Medium Types:	**2L**	**2H**	**2P**
Applications:	Low traffic Lawn Areas Trees & Large Shrubs	High Traffic Lawn Areas	Planting Areas
Texture:	Percent of Dry Weight of Total Growing Medium		
Coarse Gravel • Larger than 19mm • Smaller than 40mm	0 – 1%	0 – 1%	0 – 1%
All Gravel • Larger than 2mm • Smaller than 40mm	0 – 5%	0 – 5%	0 – 5%
	Percent of Dry Weight of Growing Medium Excluding Gravel		
Sand: • Larger than 0.05mm • Smaller than 2mm	50 – 70%	70 – 90%	40 – 80%
Silt: • Larger than 0.002mm • Smaller than 0.05mm	10 – 25%	0 – 15%	10 – 25%
Clay: • Smaller than .002mm	0 – 25%	0 – 15%	0 – 25%
Clay and Silt Combined	Maximum 35%	Maximum 15%	Maximum 35%
Organic Content: (by weight)	3-10%	3-5%	10-20%
Acidity (pH):	6.0-7.0	6.0-7.0	4.5-6.5
Drainage:	Percolation shall be such that no standing water is visible 60 minutes after at least 10 minutes of moderate to heavy rain or irrigation.		

Attachment B
Planting Trees, Shrubs & Ground Covers

1 General

1.1 DESCRIPTION

.1 Provide all labour, materials, equipment and services required for supply and planting of trees, shrubs and ground covers as specified in contract documents. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

1.2 RELATED WORK

.1 Section 32 91 21 – Topsoil and Finish Grading

.2 Section 32 92 19 – Hydraulic Seeding

1.3 REFERENCE STANDARDS

For all references, refer to latest standard edition, unless otherwise noted.

.1 Except as modified by governing codes and by this Specification, conform to the applicable provisions and recommendations of the Canadian Landscape Standard, Current Edition (CLS-CE). Any discrepancies between the drawing and the CLS-CE should be brought to the Landscape Architects attention.

.2 Conform to the British Columbia laws pertaining to horticultural inspection and commercial fertilizer.

1.4 SOURCE QUALITY CONTROL

.1 Obtain approval of plant material at source from Landscape Architect prior to digging.

.2 Acceptance of plant material at its source does not prevent rejection on site prior or after planting operations.

.3 Imported plant material must be accompanied with necessary permits and import licenses. Conform to federal and provincial regulations where required.

1.5 SCHEDULING

.1 Obtain approval from Landscape Architect of schedule 10 days in advance of anticipated shipment of plant material. No work under this section shall proceed without approval of plant material.

.2 The scheduling of delivery shall be such that plant material spends a minimal amount of time in storage on site, minimum movement and compaction and compaction of growing medium, and prompt mulching and watering operations. Coordinate work schedule with scheduling of other trades on-site.

.3 Trees, shrubs, and perennials should only be planted during periods that are normal for such work as determined by local weather conditions, when seasonal conditions are likely to ensure successful adaptation of plants to their new location.

1.6 PRODUCT DATA

.1 Provide product data for:

.1 Fertilizer.

.2 Anti-desiccant.

.3 Guying assembly including clamps, collar, guying wire, anchors and wire tightener.

.4 Mulch.

1.7 SEARCH AREA FOR PLANT MATERIAL

.1 Search area for availability of plant material shall include the Pacific Northwest.

1.8 HANDLING, DELIVERY, STORAGE AND PROTECTION

.1 Transport, unloading, handling, storage, and protection of trees and plants to be in compliance with Section 9 of the Canadian Landscape Standard CE to ensure proper protection.

.2 Plant material shall at no time be dropped or handled roughly. Take particular care to avoid damage and/or drying out prior to planting.

.3 Immediately store and protect plant material which will not be installed within 1hr after arrival at site in storage location approved by Landscape Architect.

.4 Protect plant material from damage during transportation:

.1 When delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.

.2 When delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle.

.5 Protect stored plant material from frost, wind and sun and as follows:

.1 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in topsoil and watering to full depth of root zone.

.2 For pots and containers, maintain moisture level in containers. Heel-in fiber pots.

.3 For balled-and-burlapped and wire basket root balls, place to protect branches from damage. Maintain moisture level in root zones.

1.9 WARRANTY

.1 The Contractor/Owner hereby warrants that plant material as itemized on the plant list or any substitutions will remain free of defects in accordance with GC24, for one (1) full growing season from the date of Substantial Performance. September 30 constitutes the end of the growing season.

.2 Contractor/Owner to guarantee all materials and workmanship for warranty period. Guarantee includes replacing all plants determined by Landscape Architect to be dead or failing at end of warranty period. Replacements to be made at next appropriate season, and conditions of warranty will apply to all replacement plants for one full growing season.

.3 End-of-warranty inspection will be conducted by Landscape Architect.

.4 Landscape Architect reserves the right to extend Contractor's/Owner’s warranty responsibilities for an additional growing season if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

.5 Warranty does not apply to plants or other products damaged after Total Performance by causes beyond Contractor’s/Owner’s control, such as vandalism, “acts of God”, “excessive wear and tear”, or abuse.

1.10 REPLACEMENTS

.1 During warranty period, remove from site any plant material that has died or failed to grow satisfactory as determined by Landscape Architect.

.2 Replace dead or failed plant material as it is removed from the site.

.3 Extend warranty replacement plant material for period equal to the original warranty period.

.4 Continue such replacement and warranty until plant material is acceptable to Landscape Architect.

1.11 MEASUREMENT AND PAYMENT

.1 Payment for trees will be for each of a size and species specified in the Reclamation Plan. Payment for shrubs and ground cover will be for each shrub or ground cover of a size and species as shown in the Reclamation Plan Payment includes all preparatory work, supply and planting the trees, shrubs, and groundcovers as applicable and other incidentals, but excluding mulch.

2 Products

2.1 PLANT MATERIAL

.1 Species: Selection of species to be as specified in the Reclamation Plan. Should specified species not be available, Landscape Architect to be notified so that an alternative choice can be made. Do not make substitutions without approval of Landscape Architect.

.2 Plants to be true to name, type and form, and representative of their species of variety.

.3 Type of root preparation, sizing, grading and quality: comply with Metric Guide Specification for Nursery Stock and CLS-CE.

.4 Source of plant material: grown in local hardiness zone in accordance with Agriculture Canada Plant Hardiness Zone Map.

.5 All plants to be commercially grown (nursery stock) in accordance with the current edition of the *Canadian Standards for Nursery Stock.*

.6 Plant material quantity: Provide plant material as indicated on plan at the specified spacing. Should a discrepancy exist between the plant list quantity and the numbers shown on the plan, the plan shall be considered correct. Notify the Landscape Architect if irregularities are found.

.7 Plant material to have normal, well-developed branches, vigorous fibrous root systems and to be healthy, vigorous plants free of defects or injuries, decay, abrasions of the bark, disease, insects and all forms of infestation or objectionable disfigurements.

.8 Plant material to be root pruned regularly, but not later than one growing season prior to arrival on site.

.9 Trees to have straight trunks (unless uncharacteristic of species), well and characteristically branched for species except where specified otherwise.

.10 Trees larger than 200 mm in caliper: half root pruned during each of two successive growing seasons, the latter at least one growing season prior to arrival on site.

.11 Bare root stock to be nursery grown, in dormant stage, not balled and burlapped or container grown.

.12 Collected stock to be maximum 40 mm in caliper, with well-developed crowns and characteristically branched; no more than 40% of overall height may be free of branches.

2.2 WATER

.1 Free of impurities that would inhibit plant growth.

.2 Contractor to supply.

2.3 STAKES

.1 Pressure treated wood, pointed one end, 50 to 70 mm dia x 2400 mm

2.4 GUYING COLLAR

.1 Tube: plastic, 13mm diameter, nylon reinforced.

2.5 FABRIC WEBBING

.1 ArborTie by Deep Root, 20 mm wide, flat woven polypropylene or approved equal.

2.6 TRUNK PROTECTION

.1 Plastic: perforated spiraled strip or collar tube.

.2 Burlap: clean, minimum 2.5 kg/m2 mass and 150 mm wide, and twine fastener.

2.7 MULCH

.1 The type and application of mulch shall be Commercially Prepared Compost:

.1 See section 10 CLS-CE.

.2 Leaf mold, compost, shredded garden waste, well composted bark or mild, well composted manures are preferred as mulches.

.2 Composted organic mulches such as compost, leaf mulch, composted bark mulch, or well-rotted manure can be worked into the soil with thorough cultivation when they are sufficiently decayed. These mulches will provide an organic soil amendment that improves the structure, fertility and moisture-holding capacity of the soil.

.3 Sawdust, fresh bark mulch and other pure wood products restrict soil development and deplete soil nutrients during decomposition process – these are not suitable for use and will be rejected by the Landscape Architect.

2.8 FERTILIZER

.1 See section 6 Growing Medium - CLS-CE.

2.9 ANTI-DESSICANT

.1 Wax-like emulsion.

3 Execution

3.1 PRE-PLANTING OPERATIONS

.1 Ensure plant material is acceptable to Landscape Architect. For trees, provide Landscape Architect five (5) days' notice to review trees at nursery/holding area prior to installation.

.2 Prune damaged roots and branches from plant material.

.3 Apply anti-desiccant to conifers and deciduous trees in leaf in accordance with manufacturer's instructions.

.4 All plants to be planted with identification labels intact. Nursery labels to be removed after installation has been accepted.

.5 All plants to be specified according to the Canadian Nursery Landscape Association Canadian Standards for Nursery Stock and Section 12 Container Grown Plants from the CLS-CE.

3.2 EXCAVATION AND PREPARATION OF PLANTING BEDS

.1 Preparation of reclamation areas is specified in Section 32 91 21 – Topsoil and Finish Grading.

.2 For individual planting holes:

.1 Stake out location as per planting plan and obtain approval from Landscape Architect prior to excavating.

.2 Verify existence and location of all on-site utilities and services with Owner's representative any obtain approval prior to excavation.

.3 Notify Landscape Architect immediately of any conflicts with utilities and to obtain directions as to proceed.

.4 Excavate to depth and width as indicated.

.5 Remove subsoil, rocks, roots, debris and toxic material from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material.

.6 Remove water which enters excavations prior to planting, and grade local drainage away from tree pits. Notify Landscape Architect if water source is ground water.

3.3 PLANTING

.1 For bare root stock, place 50 mm backfill soil in bottom of hole. Plant trees and shrubs with roots placed straight out in hole.

.2 For jute burlapped root balls, cut away top one third of wrapping and wire basket without disturbing root ball. Do not pull burlap or rope from under root ball.

.3 For container stock or root balls in non-degradable wrapping, remove entire container or wrapping without damaging root ball.

.4 When planting is complete, give surface of watering saucer a dressing of fertilizer at a rate recommended in the soil analysis report for trees, shrubs and groundcovers. Mix fertilizer thoroughly with top layer of planting soil then apply watering.

3.4 TRUNK PROTECTION

.1 Install trunk/tree protection on deciduous trees and conifer seedlings.

.2 Install trunk protection prior to installation of tree supports when used.

3.5 TREE SUPPORTS

.1 Install tree supports if requested by the Landscape Architect.

.2 Install all stakes, clamps, anchors, collar, tighteners and guying wire such that no damage is done to tree.

.3 Use two stake tree supports for deciduous trees less than 3 m and evergreens less than 2 m.

.1 Place stakes to compensate for prevailing wind and minimum 150 mm from trunk.

.2 Drive stake minimum 150 mm beneath root ball into undisturbed soil. Ensure stake is secure, vertical and sound.

.3 Install fabric guying web to manufacturers' specifications.

.4 After tree supports have been installed, remove broken branches with clean, sharp tools.

.5 Owner will remove tree stakes when trees are stable.

3.6 MULCHING

.1 Obtain approval of planting prior to applying mulch.

.2 Ensure soil settlement has been corrected prior to mulching.

.3 Loosen soil in planting pits and remove debris and weeds. Spread mulch as indicated.

.4 Spread mulch to a minimum of 50 mm after settlement. Mulch material susceptible to blowing shall be moistened and mixed 5:1 with growing medium prior to placement.

.5 When planting in the fall season place mulch immediately after planting. When planting in the spring place mulch after the soil has warmed up.

.6 Ensure mulch is not placed against trunk; also, ensure tree trunk flare is visible at soil surface.

3.7 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Begin the following maintenance operations immediately following planting and continue until final acceptance of work by Landscape Architect.

.1 Pest control shall follow the principles of integrated pest management, as per the Integrated Pest Management Act.

.2 Remove dead or broken branches from plant material.

.3 Keep trunk/seedling protection, tree supports and flagging in proper repair and adjustment.

.4 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

.5 Plants that have settled shall be reset to proper grade.

3.8 ACCEPTANCE

.1 Plant quantities, species, sizes, quality and locations are as shown in the Reclamation Plans or as otherwise approved. All substitutions are approved and noted; a list of these substitutions shall be provided to the Owner at the time of acceptance.

.2 Planted material will be accepted by Landscape Architect sixty (60) days after total planting completion provided that plant material exhibits healthy growing condition and is free from disease, insects and fungal organisms.

.3 Plant material installed while dormant, or less than sixty (60) days prior to frost will be accepted in following spring, thirty (30) days after start of growing season provided that acceptance conditions are fulfilled.

3.9 MAINTENANCE DURING WARRANTY PERIOD

.1 From time of Acceptance by Landscape Architect to end of Warranty Period, perform following maintenance operations.

- .1 Apply pesticides in accordance with Federal, Provincial and Municipal regulations as and when required to control insects, fungus and disease. Obtain product approval from Landscape Architect prior to application.
- .2 Apply fertilizer in early spring at lab's suggested rate.
- .3 Remove dead, broken or hazardous branches from plant material.
- .4 Keep trunk protection, seedling protection, tree supports and flagging in proper repair and adjustment.
- .5 Remove trunk protection, tree supports and level watering saucers at end of warranty period.
- .6 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.
- .7 Submit annual written reports to Landscape Architect identifying:
  - .1 Maintenance work carried out.
  - .2 Development and condition of plant material.
  - .3 Preventative or corrective measures required which are outside Owner's responsibility.

3.10 CONDITIONS FOR TOTAL PERFORMANCE

.1 Landscape Architect will issue Certificate of Total Performance only when the following conditions exist:

- .1 Growing medium quality, fertility levels, depths and surface conditions area as specified in Reclamation Plan.
- .2 All plants are of species and varieties specified and planted in locations shown in the Reclamation Plan.
- .3 All plants are healthy and turgid.
- .4 All tree seedlings are adequately protected.
- .5 All pruning is complete to the satisfaction of Landscape Architect.
- .6 All planted areas are free of weeds.
- .7 Mulch is in place as required.
- .8 Un-mulched areas are cultivated to leave a loose, friable, water-permeable surface.

END OF SECTION

Attachment C
Hydraulic Seeding

1 General

1.1 DESCRIPTION

.1 Provide all labour, materials, equipment and services required for supply and application of grass seed by hydraulic methods. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

.2 This section is based on the 'Canadian Landscape Standard' Current Edition (CLS-CE) published by the B.C. Society of Landscape Architects and the B.C. Nursery Trades Association.

1.2 RELATED WORK

.1 Section 32 91 21 – Topsoil and Finish Grading

.2 Section 32 93 01 – Planting Trees, Shrubs and Ground Covers

1.3 SECTION 32 93 01 – PLANTING OF TREES, SHRUBS AND GROUND COVERS REFERENCE STANDARDS

For all references, refer to latest standard edition, unless otherwise noted.

.1 Except as modified by governing codes and by this Specification, conform to the applicable provisions and recommendations of the CLS-CE. Any discrepancies between the drawing and the CLS-CE should be brought to the Landscape Architects attention.

.2 Canadian System of Soil Classification.

1.4 SCHEDULING

.1 Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

.2 Schedule all operations to ensure optimum environmental protection, grading, growing medium placement and seeding operations as outlined in the Specifications. Organise scheduling to ensure minimum movement and compaction of growing medium, and prompt seeding and watering operations. Coordinate work schedule with scheduling of other trades on-site such that no damage occurs to materials before or after placement.

.3 Seed after frost has left ground and before June 1, or between August 31 and October 15.

.4 Carry out seeding during periods that are most favourable for establishment of healthy stand of grass. Seed only during calm weather and on soil that is free of frost, snow and standing water, when seasonal conditions are likely to ensure successful germination and continued growth of all varieties of seed in the seed mix.

1.5 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for:

.1 Seed.

.2 Fertilizer.

.2 Samples:

.1 Provide samples of all materials required, handle and ship in such a manner that they are representative of material or product sampled.

.3 Certifications:

.1 Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.4 Test Reports:

.1 Certified test reports showing compliance with specified performance characteristics and physical properties.

1.6 QUALITY ASSURANCE

.1 Qualifications:

.1 Landscape Contractor: to be a Member in Good Standing of the Canadian Nursery Landscape Association, (CNLA) or Qualified contractors with demonstrated local landscape construction experience.

.2 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation or Qualified contractors with demonstrated local landscape construction experience.

.3 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Turf Maintenance designation or Qualified contractors with demonstrated local landscape construction experience.

1.7 HANDLING, DELIVERY AND STORAGE

.1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:

.1 Labelled bags of fertilizer identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number.

.2 Fertilizer must be dry.

.3 Storage and Handling Requirements:

.1 Store fertilizer in dry, weatherproof storage place and protect from damage by heat, moisture, rodents or other cause until time of seeding in accordance with manufacturer's recommendations.

.2 Replace defective or damaged materials with new.

.4 Store all grass seed, hydraulic mulch, fertilizers and related materials, where required, in dry, weatherproof storage place and protect from damage by heat, moisture, rodents or other cause until time of seeding. Do not remove or deface labels or other identification.

1.8 SITE EXAMINATION

.1 Do not carry out landscape work in areas or over surfaces that are not properly prepared. Examine site before starting work to verify all surfaces are properly prepared.

1.9 DRAINAGE CONTROL

.1 Provide proper water management and drainage of site during construction. Include silt traps, erosion control measures, temporary water collection ditches, as well as their adequate maintenance during construction period as indicated in the Reclamation Plan.

1.10 WASTE MANAGEMENT AND DISPOSAL

.1 Do not dispose of unused fertilizer into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

1.11 WARRANTY

.1 Contractor/Owner to guarantee all materials and workmanship for a period until Acceptance by Landscape Architect, unless specified otherwise in Reclamation Plan.

.2 Guarantee includes replacing all seeded areas determined by Landscape Architect to be dead or failing at Acceptance. Replacements to be made at next appropriate season, and conditions of guarantee will apply to all replacement seeded areas established, as per conditions for Acceptance.

.3 Guarantee will not apply to seeded areas damaged after date of Total Performance by causes beyond Contractor's control, such as vandalism, "acts of God', "excessive wear and tear", or abuse.

1.12 MEASUREMENT AND PAYMENT

.1 Payment for mechanical seeding includes the necessary equipment and supply and application of grass seed and maintenance.

.2 Payment for all work under this section is to be included in the applicable lump sum prices in the Tender Form or as otherwise paid for by the Owner.

2 Products

2.1 GRASS SEED

.1 Canada "Certified" grass seed, "Canada No. 1 Grass Mixture" in accordance with Government of Canada "Seeds Act" and "Seeds Regulations.

.2 Seed mix (species and proportion by weight) as noted in the Reclamation Plan.

.3 In packages individually labelled in accordance with "Seeds Regulations" and indicating name of supplier.

2.2 HYDRAULIC MULCH

.1 Hydraulic mulch to consist of fibre or other material designed for hydraulic seeding and dyed for ease of application.

.2 Hydraulic mulch to be capable of dispersing rapidly in water to form homogeneous slurry and remaining in such state when agitated or mixed with other specified materials. When applied, hydraulic mulch to be capable of forming absorptive mat, which will allow moisture to percolate into underlying soil and to contain no growth or germination inhibiting factors.

Mulch to be dry, free of weeds and all other foreign material, and to be supplied in packages bearing manufacturers' label clearly indicating weight and product name.

2.3 TACKIFIER

.1 Mulch may contain a colloidal polythacuride (or equivalent) tackifier, which is to be adhered to mulch to prevent separation during shipment and to avoid chemical agglomeration during mixing in hydraulic mulching equipment.

2.4 WATER

.1 Free of impurities that would inhibit germination and growth.

2.5 FERTILIZER

.1 Refer to Section 32 91 21 – Topsoil and Finish Grading.

3 Execution

3.1 PROTECTION OF EXISTING CONDITIONS

.1 Protect structures, signs, guide rails, fences, plant material, utilities and other surfaces not intended for spray.

.2 Immediately remove any material sprayed where not intended as directed by Landscape Architect.

3.2 PREPARATION OF SURFACES

.1 Do not perform work under adverse field conditions such as frozen soil, excessively wet or dry soil or soil covered with snow, ice or standing water or when wind exceeds 10 km/h.

.2 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; to approved off-site disposal area.

.3 Verify that grades are correct. If discrepancies occur, notify Landscape Architect and do not commence work until instructed by Landscape Architect.

.4 Loosen surface areas that are excessively compacted by means of thorough scarification's, discing or harrowing, to minimum 150 mm depth.

.5 Fine grade surface free of humps and hollows to smooth, even grade, elevations indicated to tolerance of plus or minus 25 mm, surface draining naturally unless indicated otherwise in Reclamation Plan.

3.3 RATES OF APPLICATION

.1 Rates of applications of fertilizers, seed mixtures, mulch and other components to be based on analysis of season, climate, terrain, soil, and establishment and maintenance conditions affecting project.

3.4 APPLICATION FOR HYDRAULIC SEEDING

.1 Thoroughly mix seed, fertilizer and hydraulic mulch in water slurry and distribute normally over surface area with approved hydraulic mulcher.

.2 Measure quantities of each material to be charged into hydraulic seeder / mulcher tank accurately either by mass or by commonly accepted system of mass-calibrated volume measurements. Add materials to tank while it is being filled with water and in following sequence: seed, fertilizer, and where applicable, mulch. Thoroughly mix materials into homogeneous water slurry and distribute uniformly over surface area with hydraulic seeder / mulcher.

.3 Keep seeds for grass and legumes in separate containers prior to seeding.

.4 If required, add legume seed to grass mixture at time of seeding. Inoculated legume seed with standard product humus culture before mixing with grass seed. Protect inoculated seed from exposure to sunlight for periods of over on-half hour. Use seed within eight hours from inoculation to be re-inoculated.

.5 After charging, do not add water or other material to mixture in hydraulic mulcher.

.6 Do not leave seed, fertilizer, mulch and water slurry in tank for more than 4 h. Slurry left in tank over maximum time to not be used for seeding, dispose off-site.

.7 If required, apply wild flower seed following grass hydroseeding.

3.5 PROTECTION

.1 Carry out hydraulic seeding with care to ensure fertilizer in solution does not come in contact with foliage of any trees, shrubs or other susceptible vegetation. Do not spray seed or mulch on objects not expected to grow grass.

.2 Protect existing site equipment, roadways, landscaping, reference points, monuments, markers and structures from damage.

.3 Promptly rectify any overspray or damage that occurs during hydraulic seeding.

3.6 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Begin the following maintenance operations immediately following seeding and continue until final acceptance of work by Landscape Architect.

- .1 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.
- .2 Fertilize during warranty periods monthly or as required for healthy growth.
- .3 Control weeds by mechanical means utilizing acceptable integrated pest management practices.
- .4 Adjust protection barrier as necessary to protect against deterioration due to pedestrian or other traffic as needed.

3.7 FINAL ACCEPTANCE

.1 Seeded areas will be accepted by Landscape Architect provided that:

- .1 Areas are uniformly established, and grass is free of rutted, eroded, bare or dead spots and free of weeds.

.2 Areas have been fertilized.

.2 Areas seeded in fall will be accepted in following spring, two months after start of growing season provided acceptance conditions are fulfilled.

3.8 MAINTENANCE DURING WARRANTY PERIOD

.1 From time of Acceptance by Landscape Architect to end of Warranty Period, perform following maintenance operations.

.1 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.

.2 Fertilize during warranty periods monthly or as required for healthy growth.

.3 Control weeds by mechanical means utilizing acceptable integrated pest management practices.

3.9 CONDITIONS FOR TOTAL PERFORMANCE

.1 Landscape Architect will issue Certificate of Total Performance only when following conditions exist:

.1 Growing medium quality, fertility levels, depths and surface are as specified in Reclamation Plan.

.2 Grasses are of required varieties, free of varieties other than those specified.

.3 Grass areas are relatively free of weeds.

.4 Grass is sufficiently established that its roots are growing into underlying growing medium.

.5 Specified maintenance procedures have been carried out.

3.10 CLEANING

.1 Progress Cleaning:

.1 Leave Work area clean at end of each day.

.2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.

.2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

Greg Ferraro
Greg.Ferraro@ghd.com
604.214.0510

www.ghd.com

Appendix D
Legal Survey Plan

SUBDIVISION PLAN OF PART OF THE WEST PART OF LOT 85 (D.D. 10038) SAYWARD DISTRICT

SCALE : 1 inch = 300 feet

LEGEND

- ⊕ C.P. Cor. indicates Standard concrete Monument found
- ● I.P. indicates standard Iron Post set
- ● O.I.P. indicates iron survey post found
- ● I.P. indicates iron survey post set

Bearings are astronomic and derived from Plan 1583 R

PLAN

Deposited in the Land Registry Office at Victoria British Columbia this day of

REGISTRAR

D L 85

McIVOR LAKE

REM D.L. 85

1583 R

PLAN 2047 R

BLOCK A

706

A
121.3 Ac

This plan lies within the Regional District of Comox-Strathcona

Approved under the Land Registry Act this 12th day of MAY, 1977

Approving Officer
District of Campbell River

Approved under the Land Registry Act this 26th day of MAY, 1977

District Highways Manager
Ministry of Highways and Public Works

UPLAND EXCAVATING (1971) LTD.

President

I, D. YOUNG of Campbell River, British Columbia Land Surveyor make oath and say that I was present at and did personally superintend the survey represented by this plan and that the survey and plan are correct. The said survey was completed on the 12th day of April, 1977

BC.S

Sworn before me this 27th day of April, 1977

A Commissioner for taking oaths in British Columbia

D. YOUNG & ASSOCIATES
LAND SURVEYORS
HWY 19 NO. HIGHWAY
CAMPBELL RIVER, B.C.
287-4665
7702?
DON Young

CAMPBELL RIVER DEVELOPMENTS LTD.

Appendix E
List of Products

Upland Sand and Gravel Pit
PRODUCT LIST

BANK AND PROCESSED AGGREGATES

BANK PIT RUN	(NO SPEC)
SELECT PIT RUN	(BLENDED)
3" (75mm) SGSB	(MMCD)
3" (75mm) CGSB	(MMCD)
3/4" (19mm) ROAD CRUSH	(MMCD)
1" CLEAN ROAD CRUSH	M.O.T. (MMCD)
2" CLEAN ROAD CRUSH	M.O.T. (MMCD)
3/4" CLEAN ROAD CRUSH	M.O.T. (HYDRO)

WASHED AGGREGATES (CSA H23.1 SPEC.)
3/16" (5mm) CONCRETE SAND
BC HYDRO BEDDING SAND (5mm)

GOLF COURSE SAND	(USGA SPEC)

5mm BIRDSEYE

5mm FRACTURE	(PAVING STONE AGGREGATE)
3/8" REGULAR WASHED	(FRACTURE)
3/8" SPECIAL WASHED	(ROUND)
3/4" WASHED FRACTURED	(DRAIN ROCK)
1" (25mm) ROCK	(FRACTURED)
1" (25mm) NATURAL ROUND	(DRAIN ROCK)
1" - 8" OVERSIZE ROCK UNWASHED	(ROUND)
1" - 8" WASHED FISHERY ROCK	(ROUND)
1"-3" WASHED FISHERY ROCK	(ROUND)
1"-3" UNWASHED ROCK	(ROUND)
3"-8" UNWASHED ROCK	(ROUND)
3"-8" WASHED FISH ROCK	(ROUND)
1" (25mm) MINUS NAVY JACK	(CONCRETE MIX)
1/2"(13mm) MINUS NAVY JACK	(CONCRETE MIX)

5mm SALT/SAND ROAD DE-ICER 8%

QUARRY PRODUCTS

5/16" CRUSHER FINES	(BLUE)

3/4" MINUS BLUE CHIP CRUSH
3/8" - 3/4" CLEAR BLUE CHIP ROCK

1/4" - 3/4" CLEAR CRUSH	(GREY)
5/16" CRUSHER FINES	(GREY)
3/4" GREY CRUSH	(DRIVEWAY CHIP)
3/4" -1 1/2" CLEAR QUARRY	(RAIL BALLAST)

3" CLEAR QUARRY
3"-6" CLEAR QUARRY
3"-9" CLEAR QUARRY ROCK

3"- 4" JAWED QUARRY ROCK	(NO SPEC)
3"-6" JAWED QUARRY ROCK	(NO SPEC)

3" MINUS QUARRY ROCK
6" MINUS QUARRY ROCK

RIP RAP (SORTED)	(CLASS 100)
RIP RAP (SORTED) 1' - 3	(CLASS 500)
RIP RAP (SORTED) 2' - 3	(CLASS 1000)
RIP RAP (SORTED) 3' +	(CLASS 2000)

LANDSCAPE ROCK

INSULATION ROCK 3/4"-2"	(BC HYDRO APPROVED)

TYPE 10 4"-14"

RECYCLED AGGREGATE PRODUCTS
RAP (RECYCLED ASPHALT PRODUCT)
SCREENED TOP SOIL
CRUSHED CONCRETE (3/4" MINUS)

NON RETAIL AGGREGATE
Asphalt
7/8" Fracture Rock
3/8 Special Unwashed
InField Mix for We Wai Kai
3/4" Wash Plant Raw Feed
1" Wash Plant Raw Feed
5/16" 1 1/2" Course Filter Rock
Linner Padding
3" to 12" Oversize
Magni
pipe bedding
snc spoils
5"-6" rock

Appendix F
Site Physical Characteristics

Appendix F Site Physical Characteristics

1. Site Physical Characteristics

The Site physical characteristics are detailed in GHD's report entitled Hydrogeology and Hydrology Characterization Report, (HHCR), GHD May 2017. A summary of the Site's physical characteristics is provided below.

1.1 Site Topography and Drainage

The Site is located on a terrace partially surrounded by mountainous terrain to the south, southwest, and northwest. The terrace gradually slopes towards the Quinsam River located 3.8 kilometres (km) to the southeast of the east Site boundary. The Quinsam River channel is at an elevation approximately 100 meters (m) below the Site.

On-Site, the topography is relatively level at approximate elevation 190 mAMSL with the exception of the Pit located in the centre of the Site. The Pit area has been excavated to a depth of approximately 170 mAMSL, 20 m below the surrounding land surface. Along the western Site boundary, above the Pit wall where gravel extraction has not occurred, a ridge of elevated surface topography, created by an elevated bedrock ridge, discussed below, is present. Further to the west, the bedrock ridge dips towards Rico Lake. Along the eastern Site boundary surface topography dips to the east towards the adjoining property also operating as a gravel extraction pit.

Prominent topographic features on and in the vicinity of the Site include a small mountain near the southwestern Site boundary that stands approximately 100 m above Site, a large bedrock outcrop at the base of this mountain and multiple bedrock outcrops delineating a bedrock ridge extending from the base of this small mountain to the northern portion of the adjoining K&D property and continuing northwest of the Site towards McIvor Lake.

No permanent surface water features are located on Site.

Local drainage information is based on topography and watershed information provided by BC Water Resource Atlas, on-site topographic data, and the results of the HHCR (GHD, May 2017). The area in the vicinity of the Site is divided between two watersheds: The Campbell River Watershed and the Quinsam River Watershed.

The Campbell River watershed covers an area of 182,000 hectare (ha) and is intersected by three manmade dams which form Upper Campbell Lake, Campbell Lake and John Hart Lake. The Quinsam River watershed covers an area of 20,900 ha and is bound to the north and west by a mountainous divide that isolates it from the Campbell River watershed (Blackmun, Lukyn, McLean & Ewart, 1985). The last segment of the Quinsam River (approximately 25 km long) flows east and then north toward the confluence with Campbell River. The Site is located approximately 4 km west of this portion of the Quinsam River.

Two lakes are located in close proximity to the Site. McIvor Lake, which is contiguous with Campbell Lake, is located approximately 50 to 150 m north of the northern Site property boundary. Rico Lake is located approximately 10 to 15 m west of the western Site property boundary and approximately 280 m west of the Landfill.

Lost Lake (also known as Hidden Lake) is located 2 km to the northeast of the Site. Lost Lake drains through Cold Creek which feeds the Quinsam Hatchery before discharging into the Quinsam River to the northeast of the Site. The Cold Creek watershed is located northeast of the Site.

To the east and southeast of the Site, there are several ephemeral creeks that provide drainage locally. These creeks drain into the Quinsam River, which is located approximately 4 km to the east of the Landfill footprint. To the southwest of Site, two ephemeral creeks are located south of the Site. The first, flows west to east-southeast and was identified approximately 100 m south of the southern Site boundary flowing to an area 375 m south of the southern Site boundary where it infiltrates into a gravel borrow area. The second creek was identified approximately 310 m south of the southern Site boundary flowing from west to southeast where it flows into a tributary of the Quinsam River. Both water courses flow from an elevation of approximately 219 to 185 mAMSL. Both water courses are sourced from a small wetland swamp located approximately 300 m southwest of the Site on a plateau within the highlands. Recharge of the wetland swamp is inferred to occur via run-off from the surrounding highlands. Flow from the wetland swamp is likely seasonal.

The Site is located in the Quinsam River Watershed, with the exception of a southwest portion of the Site located outside of the Pit. The Pit has no surface water outflow and all precipitation that falls into the Pit infiltrations into the Pit floor reaching the groundwater flow system, which flows to the southeast and eventually discharges into the Quinsam River Watershed.

1.2 Geology

The Site is located on the eastern portion of central Vancouver Island approximately 7 km southwest of Campbell River, BC. Vancouver Island is part of the Wrangellia Terrane, which includes most of Vancouver Island, the Queen Charlotte Islands and parts of central Alaska. The Wrangellia Terrane is composed mostly of widespread, late Triassic aged flood basalts, including the Karmutsen Formation. The Karmutsen Formation consists mostly of submarine flood basalts up to 6 km in thickness. Vancouver Island is extensively faulted with thrust faults associated with the subduction of the Juan de Fuca Plate under the North American Plate (MOE and Guthrie, 2005) (Greene, Scoates & Weis, 2005). The outcrop of rock on the southwestern portion of the Site and the bedrock encountered in boreholes advanced below the overburden is Karmutsen basalt.

At several time periods during the Pleistocene Epoch, Vancouver Island was glaciated with ice thicknesses to 2,000 metres. During the recession of the last glaciation approximately 14,000 years ago, glacial and glacio-fluvial sediments were deposited, and in some cases reworked and redeposited, to make up many of the present surficial deposits of Vancouver Island. These deposits consist of till, which is deposited directly by glacial activity and consist of larger clasts supported in a matrix of fine grained sediment, and of glacial outwash, which consists primarily of poorly sorted, coarse grained (sand and gravel) sediments deposited by glacial melt water (Greene, Scoates & Weis, 2005). The overburden at the site consists of glacio-fluvial and outwash deposits of sand and gravel. (McCammon, 1977).

The understanding of the Site geology presented in the following sections is based on field investigations and documents reviewed by GHD. Field investigations included, but were not limited to, borehole advancement, test pit excavations, examination of the Pit sidewalls and outcrop identification. Field investigations are detailed in the HHCR (GHD, May 2017). Documents reviewed included regional mapping, previous reports, and well completion logs from nearby private water supply wells.

With the exception of the southwest portion of Site, stratigraphy on-Site is characterized as follows (in order from shallowest to deepest):

1. A native interbedded sand and gravel unit is present throughout the Site. The thickness of this unit is highly variable due to the sharp easterly dip of the bedrock surface along the western portion of the Site. This bedrock dip is described in greater detail below. In the south-eastern portion of the Site, the sand and gravel unit is greater than 47 m thick (based on the Pit sidewall geology).

   A substantial sand unit was encountered in the central portion of Site and in the southeast portion of Site. This sand unit ranges in depth and thicknesses from approximately 12 m to greater than 33 m. This sand unit varies in composition from sand with gravel to silty sand/sandy silt.

   Water supply well records from the north to northeast of the Site indicate the presence of sand and gravel beneath the maximum depths reached during the HHCR investigations (GHD, May 2017).

2. Fractured bedrock composed of igneous basaltic rock underlies the unconsolidated overburden.

The structure of the overburden unit is consistent with glacio-fluvial and outwash depositional sources.

The overburden stratigraphy in the southwestern area of the Site, and the adjoining properties west of Site, where bedrock is present at surface or shallow depths is variable but can be generally characterized as follows:

1. On the property west of the Site (K&D property) the following stratigraphy was encountered:
   a. Granular fill consisting primarily of sand and gravel was encountered in several of the investigative locations. A maximum thickness of 4.7 m was encountered.
   b. A thin topsoil layer underlain by sand with varying degrees of silt and/or gravel was encountered beneath the fill materials or where fill was absent, at surface.
   c. Bedrock composed of igneous basaltic rock was encountered at surface or at a maximum depth of 11.6 m.
2. In the southwest corner of the Site above the Pit area, the following stratigraphy was encountered:
   a. A discontinuous, interbedded sand and silt unit consisting of layers of sand with silt, silty sand, or silt with clay was observed underlying a sand and gravel fill unit. The thickness of the interbedded layers was approximately 2.1 m. The interbedded unit was not present 85 m east of the southeast corner and is thus, discontinuous.
   b. Bedrock composed of igneous basaltic rock underlies the unconsolidated overburden in the south-western corner of the Site.

Bedrock within the Pit area of the Site consists of fine grained, porphyritic, igneous rock of the Karmutsen Formation which varies in colour from blueish black to dark grey and green to dark grey and pink to dark brown (Golder 2014). Fractures of various sizes, densities and orientations (vertical, horizontal, and oblique) were observed in bedrock encountered in the central portion of the Pit area. Evidence of weathering (i.e. iron staining) and secondary mineralization was observed in some fractures. Bedrock in the southwest corner and west of the Site is relatively competent with few water bearing fractures.

Bedrock topography is highly variable near the Site. Bedrock ranges from at surface near the southwest and west Site boundaries and the northern portion of the adjoining K&D property, to greater than 47.9 mBGS near the eastern Site boundary.

Bedrock extends from the base of the small mountain near the southwest Site boundary to the northern portion of the adjoining K&D property.

A sand and gravel filled trough or scour channel in the bedrock surface appears to extend northeast from Rico Lake. It is interpreted that Rico Lake is located within a depression in the local bedrock surface.

East of Rico Lake, bedrock is inferred to plunge steeply towards the Pit area to approximately 150 mAMSL in the west side of the Pit. The bedrock surface continues to dip sharply to the east and was not encountered during the field investigations in the eastern-most portions of the Site.

1.3 Hydrogeology

In general, the geologic units identified in the previous sections may be grouped into the following hydrogeologic units:

1. A sand and gravel aquifer
2. A shallow aquifer

The hydrogeologic properties and division of these aquifers are discussed in the following sections.

There is a notable topographic difference between the bedrock ridge and the remainder of the Site. The ridge is composed of competent bedrock and is interpreted to form a barrier to groundwater flow. East of the bedrock ridge, the principal groundwater flow zone is through the sand and gravel aquifer in a southeasterly direction from McIvor Lake towards the southeast Site boundary. West of the bedrock ridge groundwater flow is controlled by bedrock surface topography. Flow in this area occurs from points of high bedrock elevation within the ridge to areas of low elevation.

Precipitation that falls east of the bedrock ridge infiltrates into the subsurface, flowing to the southeast as saturated flow within the sand and gravel aquifer. Precipitation that falls to the west of the bedrock ridge (watershed and groundwater) will runoff of areas of bedrock outcrop, infiltrate into the subsurface or infiltrated directly into the subsurface and flow through the thin layer of overburden towards areas of low topography.

An unconfined, sand and gravel aquifer is present within the overburden unit in boreholes advanced across the Site. The aquifer consists of coarse grained materials, primarily sand and gravel of varying degrees, with occasional seams of sand and silty sand. Based on the consistency and spatial distribution of borehole locations, this aquifer is continuous across much of the Site (with the exception of the bedrock ridge area in the western portion of Site).

The sand and gravel aquifer is identified as the principal groundwater flow zone at the Site and has been identified in the BC Water Resource Atlas as aquifer 975 IIA (10).

Groundwater elevations within the sand and gravel aquifer, (measured on April 6, 2017), ranged from 172.8 mAMSL along the northern Site boundary to 150.1 mAMSL near the southeastern property boundary. Groundwater within the sand and gravel aquifer flows from northwest to southeast (i.e. from McIvor Lake to the southeast corner of the Site).

The static water elevation within McIvor Lake is significantly higher than the static groundwater elevations within the sand and gravel aquifer on-Site. McIvor Lake recharges the sand and gravel aquifer and is not a receptor of groundwater from the Site.

Throughout the investigative activities, a relatively thin, discontinuous zone of shallow saturated overburden materials was encountered along the bedrock ridge (where overburden is present) to the west of the groundwater divide throughout the K&D property, as well as in the southeast corner of the Site (along the eastern flank of the groundwater divide at MW5A/B-15). The following subsections describe the groundwater flow in these areas which are collectively referred to as the shallow aquifer.

Shallow groundwater was identified on the K&D property and along the western flank of the bedrock ridge. Based on the presence of the competent bedrock ridge to the east and southeast, groundwater flow within the shallow aquifer is directed from high bedrock to points of lower topography (Rico Lake or McIvor Lake) and is interpreted to be largely controlled by bedrock surface topography.

Bedrock in this area is characterized as being relatively competent, thus, while some infiltration and groundwater flow will occur through bedrock, it will be limited. Primary flow in the bedrock ridge area and west of the Site will be through the overburden soil or, where overburden is not present, by overland flow.

The low hydraulic conductivity measured in the bedrock ridge between the Pit and Rico Lake significantly restricts movement of groundwater between these two features. Any hydraulic relationship between the Pit and Rico Lake is necessarily weak and flow will be from Rico Lake to the Pit. Rico Lake is not a receptor to the sand and gravel aquifer.

Groundwater within the shallow aquifer east of the groundwater divide is present within a thin overburden layer overlying competent bedrock. Based on the presence of a mountain to the south, groundwater will likely flow downwards (potentially daylighting as seepage or through overburden materials as unsaturated flow) towards the Pit area where it will ultimately join the principal flow zone, flowing to the southeast. Flow is expected to be limited.

1.4 Climate

The climate of the east coast of mid Vancouver Island, where the Site is located, is marked by wet and mild winters, and warmer drier summers.

Data associated with climatic conditions for the Site were based upon Environment Canada's Climate Normals measured between 1980 and 2010 at the Campbell River Airport (Climate ID: 1021261). The average annual precipitation is reported to be 1,489 millimetres (mm) with over 75 percent of the precipitation occurring between October and March. November and December experience the most precipitation with an average of 232 and 226 mm, respectively. On average 84 mm worth of snowfall is recorded per year.

The Pacific Climate Impacts Consortium Plan2Adapt tool was used to estimate the potential climate impacts that may be observed in the Campbell River area during the life of the Landfill as a result of climate change. The tool was used to model current climate change predictions in terms of precipitation rates. The model results for the Strathcona Region are summarized in the table below.

Plan2Adapt tool estimated change in precipitation (2050)

		Projected Change from 1961-1990 Baseline to 2050s (2040-2069) Study Period	
	Season	Ensemble Median	Range (10th to 90th Percentile)
Precipitation (%)	Annual	+6%	-1% to +10%
	Summer	-14%	-23% to +1%
	Winter	+6%	-4% to +13%

about GHD

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Greg Ferraro
Greg.Ferraro@ghd.com
604.214.0510

www.ghd.com

Blasting Operations Definitions

21.1 Definitions

In this Part

"blaster" means a person who is the holder of a valid blaster's certificate issued by the Board or acceptable to the Board;

"blaster of record" means the blaster who is designated to be in charge of a blasting operation;

"blasting area" means an area extending at least 50 m (165 ft) in every direction from a place where explosive materials are being prepared or fixed, or where an unexploded charge is known or believed to exist;

"blasting log" means a written record of loading details, and the site examination after the blast;

"blasting operation" includes preparing, placing, and firing a charge, handling a misfire, and destroying or disposing of explosive materials;

"bootleg" means the remnant of a blast hole which did not properly break when the blast was initiated; also called socket, butt or button;

"charge" means explosive materials which may or may not contain a primer, and which are placed for the purpose of detonation;

"danger area" means an area in which there may be danger to persons or property from flying material or other hazardous condition resulting from a blast;

"dangerous incident" means an accident or near miss occurrence caused by or as a result of the use of explosives, and also includes an unexpected result or problem with explosive products;

"day box" means an unlicensed facility, not used for overnight storage, constructed to Type 6 magazine specifications pursuant to the *Explosives Act* (Canada);

"detonator" or "detonator products" includes those explosives commonly called blasting caps, or electric caps, or other similar devices used to detonate commercial explosives;

"electric detonator" means a detonator, other than an electronic detonator, designed for, and capable of, initiation by means of an electric current, including, for example, a resistorized electric detonator;

"electric igniter" means a device designed for, and capable of, initiating deflagration in another explosive by means of an electric current;

"electronic detonator" means a detonator that uses stored electrical energy as a means of powering a programmable electronic timing delay element, whether or not the detonator is wireless;

"initiating device" means a blasting machine, non-electric starter, fuse lighter and any other device used to initiate a deflagration or detonation but does not include a detonator or electric igniter;

"explosive" means a substance that is made, manufactured or used to produce an explosion or detonation, including but not limited to blasting explosives, pyrotechnic devices and accessories containing explosives;

"igniter cord" means a small diameter wire coated with an incendiary composition used to ignite a series of safety fuse assemblies;

"isolated location" means an area where people other than the workers involved in the work project are not likely to be, and excludes frequently travelled roads, or a recreation area when it is likely to be used by people;

"magazine" means a structure used for the unattended storage of either detonators or explosives, and which meets the regulations and standards of the *Explosives Act* (Canada);

"misfire" means a charge, or part of a charge, that failed to completely detonate or deflagrate, as applicable;

"primer" means an explosive to which a detonator is attached or into which a detonator is inserted;

"radio frequency transmitter" means an AM, CB, FM and VHF radio, TV, radar, cellular telephone, wireless or remote control device, global positioning system, radio navigational beacon and any other electronic transmitting device that radiates radio frequency waves;

"safety fuse assembly" means a manufactured blasting accessory consisting of a precut length of safety fuse, an igniter cord connector, and a detonator;

"shunt" means the act of closing an electrical circuit to prevent or minimize the potential for an electrical charge or current to unintentionally reach an explosive by

(a) using an electrically conductive, non-ferrous clip or foil,

(b) twisting together the lead wires or leg wires,

(c) using a shorting pin, or

(d) using other means recommended by the manufacturer;

"springing" means a blasting technique which opens up a pocket at the bottom of a blast hole so that successive larger charges may be loaded and blasted;

"stemming" means placing inert material in the portion between the top of the explosive column and the collar of a blast hole, intended to confine the explosive gases for an effective blast.

[Amended by B.C. Reg. 14/2019, effective June 3, 2019.]

General Requirements

21.2 Employer's responsibility

Nothing in this Part relieves an employer of the responsibility to provide adequate direction and instruction of workers, and to assign work only to those workers who are competent.

21.3 Dangerous incident reports

(1) If a blasting accident occurs which causes personal injury, or if there is any other dangerous incident involving explosives, whether or not there is personal injury, the employer must

(a) report the incident immediately to the Board, and

(b) forward a written report of the incident to the Board without undue delay.

(2) The written report of the incident must contain

(a) the date, time and location of the incident,

(b) the names and certificate numbers of all blasters involved,

(c) the names and occupations of any persons injured,

(d) the types of explosives, including detonators, and initiating device used,

(d.1) the instrument used to test the electric blasting circuit,

(e) a factual account of events including the blaster's log records,

(f) the names of all employers responsible for workers present at the worksite when the incident occurred, and

(g) the action taken by each employer referred to in paragraph (f).

[Amended by B.C. Reg. 14/2019, effective June 3, 2019.]

21.4 Blasting log

(1) The blaster of record must record in a log the preblast loading details and the results of the postblast site inspection.

(2) Blasting logs must be maintained at the blasting site, available for inspection by an officer, workers and worker representatives.

(3) The employer must ensure that blasting logs are kept for at least 5 years after completion of the blasting operation.

(4) The blaster must maintain a personal log of all blasting work that the blaster has performed.

21.5 Authority to blast

(1) Only the holder of a valid blaster's certificate issued by the Board or acceptable to the Board is permitted to conduct or direct a blasting operation, and then only if the work involved is within the scope of that certificate.

(2) All work within the blasting area must be done under the authorization of the designated blaster of record responsible for that area.

(3) A blaster may be assisted by persons who do not hold blaster's certificates, but the blaster must have authority over the assistants and must exercise visual supervision over them and be responsible for their work during explosive loading, priming, fixing or firing.

21.6 Other legislation

Repealed. [B.C. Reg. 312/2003, effective October 29, 2003.]

21.7 Training

A worker engaged in loading, unloading, or conveying explosives must be trained in the proper means for handling the explosives, the hazards of fire and mishandling and the procedures to follow in the event of a fire or explosion.

Certification

21.8 Qualifications

A candidate for a blaster's certificate must

(a) be at least 18 years of age,

(b) demonstrate a satisfactory knowledge of the English language, both written and spoken,

(c) be physically capable of safely carrying out the duties of a blaster, and

(d) forward written proof acceptable to the examining officer that

(i) the candidate has had at least 6 months experience in blasting operations as an assistant to a blaster, and/or

(ii) the candidate's character, knowledge, qualifications and experience would make the candidate competent to handle explosives.

Note: Blaster's certificates will normally be issued for a period of 5 years, and may be endorsed with any restriction that the Board deems necessary.

21.9 Misrepresentation

A person must not make, or assist in making, any false representation for the purpose of obtaining a blaster's certificate for any person.

21.10 Examination

Only persons authorized by the Board may conduct examinations for blaster's certificates.

21.11 Recording certificates

The employer must ensure that the details on the certificate of a blaster are recorded and understood before permitting the certificate holder to carry out the duties of a blaster.

21.12 Custody of certificates

(1) A blaster must retain his or her certificate and must keep it in a safe place at the worksite while carrying out the duties of a blaster.

(2) The blaster's certificate must be produced for inspection on the request of an officer.

(3) A copy of a blaster's certificate is not acceptable as proof of certification.

21.13 Suspension of duties

If, in the opinion of the employer, the holder of a blaster's certificate has failed to comply with any of the blasting requirements in this Regulation, manufacturer's recommendations or recognized safe blasting practices, the employer must immediately investigate the incident and may suspend the blaster from performing the duties of a blaster.

21.14 Submitting reports

The employer must submit to the Board a report of the investigation carried out under section 21.13.

21.15 Suspension of certificates

An officer may seize and forward to the Board a blaster's certificate if there is reason to believe that the safety of any person may be or has been endangered by the blaster.

Note: Part 2 of the *Workers Compensation Act* gives authority to the Board to cancel or suspend a certificate or place other conditions on its

use if the Board has reasonable grounds for believing that a person who holds a certificate has breached a term or condition of the certificate or has otherwise contravened Part 2 of the Act, or this Regulation. When the Board has taken or is considering taking action under Part 2 of the Act, the person affected will be provided with an opportunity to make representation to the Board, and will be advised in writing of the reasons for any decision.

Storage

21.16 Detonators

(1) Detonator products must not be kept in a store or receptacle in which explosives or safety fuses, fuse lighters, igniter cords or connectors are stored.

(2) At the loading site, detonator products must be stored separately from other explosives, and in a crush resistant box which is clearly identified.

21.17 Worksite storage

Explosives at the worksite must be guarded or contained in secured day boxes until used or returned to storage magazines.

21.18 Communication

(1) The employer must ensure that the location of a magazine in which explosives are stored, and any restrictions on access or activity around the magazine area, are clearly communicated to all workers.

(2) A day box and receptacle used for day storage of explosives on a work site must, when they contain explosives, display signs indicating the presence of explosives in a conspicuous manner, and the signs must be removed when they are empty.

(3) A vehicle containing explosives while in a workplace must display signs indicating the presence of explosives in a conspicuous manner, visible from all sides of the vehicle, and the signs must be removed when the vehicle no longer contains explosives.

21.19 Magazine condition

(1) The interior of an explosives magazine must be kept scrupulously clean and must be constructed, covered or lined to prevent the exposure of any ferrous metals or gritty materials.

(2) Precautions must be taken to exclude moisture from an explosives magazine.

(3) Any article or substance likely to cause a fire or explosion must be kept out of and at a safe distance from an explosives magazine.

21.20 Cord

(1) Detonating cord must be stored separately, or with explosives other than detonators.

(2) Igniter cord must be stored separately from fuses, detonators, or explosives.

21.21 Separate handling

Blasting explosives and detonator products must be kept and handled separately until the last most practicable moment, before bringing them together.

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Transportation

21.22 Vehicle operation

(1) A vehicle being used to transport explosives must be in sound mechanical condition, suitable for, and capable of, safely transporting explosives.

(2) Passengers, other than those assigned to assist in handling explosives, are not permitted on a vehicle transporting explosives.

21.23 Flammable materials

Reasonable quantities of flammable or combustible materials may be carried by a conveyance transporting explosives at the workplace provided such materials are contained in a manner which will not cause or transmit a fire or explosion, and are adequately separated from any explosives containers on the conveyance.

21.24 Transportation of explosives

(1) Explosives carried in a vehicle must be in a fully enclosed, locked, fire resistant fixed container or compartment, separate from the passenger compartment.

(2) Detonators and electric igniters must be transported in their original containers as shipped by the manufacturer.

(3) Detonators must be adequately separated from other explosives during transport.

[Amended by B.C. Reg. 14/2019, effective June 3, 2019.]

21.25 Mobile drill rigs

The transportation of explosives on a mobile drilling rig is only permitted if

(a) explosives and detonators are carried in separate containers built to type 6 or type 10 magazine standard and capacities, with 2 hooded locks, and

(b) the explosives and detonator containers are

(i) located at least 60 cm (2 ft) apart, with the doors or lids facing at least 90° apart,

(ii) located above the vehicle deck in a manner which protects the containers from contact with roadside objects and the drilling equipment,

(iii) located so the contents are not endangered by any heat source on the drill unit,

(iv) kept locked when outside the blasting area, and securely closed when in the blasting area, except when opened for depositing or removing their contents, and

(v) attended by the blaster of record, or a qualified person designated by the blaster, at all times when explosives are being carried.

[Amended by B.C. Reg. 188/2011, effective February 1, 2012.]

21.26 Water transport

Repealed. [B.C. Reg. 312/2003, effective October 29, 2003.]

21.27 Contact with metal

Contact between packages containing explosives and exposed ferrous metal in a conveyance must be prevented by the use of wood, tarpaulin, or other suitable dunnage materials.

21.28 Emergency procedures

Before explosives are transported, the employer must establish suitable written emergency procedures, and must ensure that all workers who may be affected are adequately instructed in the procedures.

21.29 Safe operation

A person operating a vehicle that is transporting explosives

(a) must operate the vehicle in a safe manner, consistent with prevailing road and weather conditions, and

(b) must not drive faster than 90 km/h (55 mph).

[Amended by B.C. Reg. 312/2003, effective October 29, 2003.]

21.30 Vehicle load limit

A vehicle transporting explosives must not be operated or permitted to operate if the load to be transported exceeds 80% of the manufacturer's rated carrying capacity for the vehicle.

21.31 Firefighting equipment

(1) A conveyance transporting explosives must be equipped with at least 2 fire extinguishers, of a type capable of quickly extinguishing gasoline, oil, or electrical fires.

(2) The fire extinguishers must be readily available for use and must have

(a) a minimum 5 BC rating for a vehicle with up to 2 000 kg (4 400 lbs) gross vehicle weight (GVW) rating, and

(b) a minimum 10 BC rating for a vehicle with more than 2 000 kg (4 400 lbs) GVW rating.

21.32 Trailer transportation

Explosives must not be transported in a trailer, or in any type of semitrailer unless it is equipped with power brakes operable from the tractor cab.

21.33 Railroad and highway crossings

The operator of a vehicle transporting explosives must, before crossing

(a) a railroad track protected by an automatic signal device, reduce the speed of the vehicle and establish that the crossing can be made in safety, and

(b) a main highway, or a railroad track that is not protected by an automatic signal device, completely stop the vehicle and only proceed when the way is safely clear.

21.34 Prior servicing

Explosives must not be loaded on or in a vehicle unless the vehicle has been fully serviced.

21.35 Overnight parking

(1) When a vehicle carrying or containing explosives is to be parked overnight, the premises in which the vehicle will be parked must not be used for any other purpose which may involve any substance likely to cause explosion or fire.

(2) Such premises must be away from habitation and buildings that contain flammable materials.

(3) Repealed. [B.C. Reg. 312/2003, effective October 29, 2003.]

Handling Explosives

21.36 General

Explosive materials must be stored, transported, handled and used in the manner recommended by the manufacturer.

21.37 Defective explosives

Explosive materials or accessories which have deteriorated, or are believed to be defective, must not be used and must be handled and disposed of in a safe manner following the manufacturer's recommendations.

21.38 Cold temperatures

If the sensitivity of an explosive is affected by cold temperatures the explosive may be brought to a working temperature in a manner recommended by the manufacturer, but must not be warmed near an open fire or a steam boiler nor by direct contact with steam or hot water.

21.39 Abandoned explosives

Explosive materials and accessories must not be abandoned, but must be placed in suitable storage or disposed of in accordance with the manufacturer's instructions.

21.40 Ignition sources prohibited

(1) Smoking is prohibited within 15 m (50 ft) of where explosives are stored, being handled, or are in loaded holes.

(2) Open flame ignition sources must not be permitted within 15 m (50 ft) of where explosives are stored, being handled, or are in loaded holes, unless the blaster of record gives consent.

21.41 Containers

(1) Containers, known or suspected to contain explosives or explosive residue, must be handled with care to prevent undue impact or exposure to excessive heat or flame.

(2) All empty explosives containers must be disposed of by burning or as recommended by the manufacturer.

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Drilling

21.42 Predrilling requirements

Before drilling begins

(a) in a previously blasted area, the surface to be drilled must be exposed and examined for misfired explosives,

(b) faces or slopes must be cleared of loose material, or otherwise stabilized to prevent slides or falls of rock, and

(c) the location of utility services must be determined and clearly marked.

21.43 Drilling prohibitions

Drilling must not take place within

(a) 15 cm (6 in) of any part of a bootleg, or

(b) 6 m (20 ft) of any part of a hole containing explosives, unless prior written permission has been obtained from the Board.

21.44 Drill hole size

Each drill hole to be loaded with explosives must be of sufficient diameter to permit free insertion of the explosives to the bottom of the hole without ramming, pounding, cutting, or undue pressure.

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Loading

21.45 Priming

A primer must not be made up until immediately before placing the explosives.

21.46 Carrying

Persons must not carry explosive materials in their clothing.

21.47 Cartridges

Wrappers must not be removed from cartridge explosives.

21.48 Loading tools

Explosives must not be loaded into a hole except with a loading tool made of wood, plastic or other non-sparking material.

21.49 Electrical storms

If there is any sign of thunder or lightning storm activity, all blasting activity must be suspended and the danger area must be cleared and guarded if explosives are present at the blast site.

21.50 Guarding loaded holes

(1) Except as permitted by section 21.84, a hole which has been loaded, whether primed or not, but not fired by the end of the working day must not be left unattended.

(2) A worker, whose sole responsibility is the security of the explosives, must be posted to ensure that loaded holes are not tampered with while the work crew is absent from the site.

21.51 Vehicles

Except as permitted by section 21.84, a vehicle or other mechanized equipment must not be driven over a loaded hole.

21.52 Springing holes

After a hole is "sprung" ample time must be left for the hole to cool before further loading or placing of explosives or explosive accessories takes place.

21.53 Connecting detonating cord

(1) When detonating cords are used, the cords must only be interconnected or attached to trunk cords at the last most practicable moment after all holes are loaded.

(2) When detonating cords are used to prime a charge, the cord must be cut from the supply reel before, or as soon as possible after the charge is placed.

(3) Detonators or detonator connectors must not be attached to a detonating line until everything is in readiness for the blast.

21.54 Shock tubes

(1) Non-electric shock tubes loaded into holes must not be pulled or snapped.

(2) Shock tube starters must not be fastened to the firing line until all holes are loaded and ready to be blasted.

21.55 Pneumatic loading

(1) Explosives may only be loaded pneumatically if the procedures and equipment used will prevent buildup of static electricity or hazards from stray electric currents.

(2) Prior written permission of the Board must be obtained before any pneumatic loading is carried out at a hole which contains an electric detonator or electronic detonator.

[Amended by B.C. Reg. 14/2019, effective June 3, 2019.]

Safety Fuse Initiation

21.56 Safety fuse assemblies

(1) Only safety fuse assemblies with antistatic protection may be used for safety fuse blasting.

(2) Safety fuse assemblies less than 1 m (3.3 ft) in length must not be used.

(3) Safety fuse assemblies must be handled with care to avoid pinching or kinking and damaged fuse assemblies must not be used.

21.57 Lighting safety fuse

(1) When lighting a single safety fuse assembly a match may be used.

(2) When multiple safety fuses are to be lit, a suitable safety fuse lighting device must be used to ensure that a minimum 90 cm (3 ft) fuse length safety factor is maintained.

(3) When multiple safety fuse assemblies are to be lit, a suitable lighting device, such as igniter cord, must be used, and once the igniter cord is lit the blast area must be vacated.

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Electrical Initiation

21.58 Stray currents

(1) Precautions must be taken to prevent premature initiation of electric detonators, electronic detonators and electric igniters from sources of electricity.

(2) Electric blasting circuits must be kept on the ground with bare connections sufficiently elevated to prevent current leakage.

[Amended by B.C. Reg. 14/2019, effective June 3, 2019.]

21.59 Extraneous currents

Electric detonators or electric igniters must not be used when extraneous current exceeds 50 milliamps.

[Amended by B.C. Reg. 14/2019, effective June 3, 2019.]

21.60 Static electricity

(1) Precautions must be taken during handling of electric detonators, electronic detonators and electric igniters to prevent premature initiation

caused by static electricity.

(2) Detonator leg wires must not be thrown in the air or dragged along the ground.

[Amended by B.C. Reg. 14/2019, effective June 3, 2019.]

21.61 Radio frequency precautions

(1) If the electric blasting circuit is equipped with an electric detonator, minimum distances from radio frequency transmitters as detailed in *Institute of Makers of Explosives, Safety Guide for the Prevention of Radio Frequency Radiation Hazards in the Use of Commercial Electric Detonators (Blasting Caps) Safety Library Publication No. 20, December 2011* as amended from time to time, must be maintained.

(1.1) If the blasting system is equipped with an electronic detonator or electric igniter, minimum distances from radio frequency transmitters as recommended by the manufacturer must be maintained.

(2) If the minimum distance has not otherwise been determined, electric blasting circuits are not permitted within

(a) 100 m (330 ft) of a CB radio or other mobile or portable radio frequency transmitter, and

(b) 1 000 m (3,300 ft) of an AM or FM radio, TV, or other fixed radio frequency transmitter.

[Amended by B.C. Reg. 14/2019, effective June 3, 2019.]

21.62 Mobile transmitters

(1) If absolute control of radio frequency transmitters cannot be maintained, for example, on public highways, warning signs must be posted to alert vehicle operators to turn off their transmitters.

(2) When electric blasting circuits are being connected, traffic control persons must be posted to instruct vehicle operators to turn radio frequency transmitters off.

[Amended by B.C. Reg. 14/2019, effective June 3, 2019.]

21.63 Testing electric blasting circuits

(1) The blaster of record must ensure that each electric blasting circuit is tested before firing.

(2) In seismic blasting, the blaster of record must ensure that each electric blasting circuit is tested after the blast hole is loaded with explosives and before a plug is placed into the hole.

(3) If the electric blasting circuit is equipped with an electric detonator or electric igniter, the blaster of record must ensure that before firing,

(a) the resistance of the circuit is measured using a blasting galvanometer or another instrument specifically designed for testing electric detonators and circuits containing them, and

(b) the resistance is recorded in the blasting log.

[Enacted by B.C. Reg. 14/2019, effective June 3, 2019.]

21.63.1 Confirming electronic detonator integrity

The blaster of record must ensure that before firing with the use of an electronic detonator, the signal integrity of the detonator is confirmed and recorded in the blasting log.

[Enacted by B.C. Reg. 14/2019, effective June 3, 2019.]

21.64 Capacity of blasting machines

(1) Repealed. [B.C. Reg. 312/2003, effective October 29, 2003.]

(2) The capacity of a blasting machine must be clearly marked on the blasting machine and must not be exceeded.

[Amended by B.C. Reg. 312/2003, effective October 29, 2003.]

21.65 Firing from power lines

When firing is done from a power line, an approved blasting safety switch must be used, and the switch kept locked and inaccessible to anyone except the blaster.

Firing

21.66 Blaster's responsibility

(1) The blaster must take precautions for the protection of persons and property, including proper loading and stemming of holes, and where necessary, the use of cover for the blast or other effective means of controlling the blast or resultant flying material.

(2) The blaster must ensure that the danger area is clear of workers and is kept clear during the blasting period.

(3) The blaster must post workers who have the sole responsibility of guarding against entry into the danger area of the blast site, and the workers must be instructed as to their duties and responsibilities.

(4) Whistles, signs or other signals may not be used in place of the guards required by subsection (3).

(5) Before sounding the warning signals, the blaster must clear the danger area and post guards as required by subsections (2) to (4), and must ensure that all persons have reached a place of safety.

21.67 Firing lines

The firing lines must not be attached to the initiating device or electric blasting circuit until all charges are placed, connected and ready to be fired.

[Amended by B.C. Reg. 14/2019, effective June 3, 2019.]

21.68 Firing all holes

(1) Charges must be fired in logical sequence.

(2) If any detonation could affect other charges placed nearby, all of the charges must be fired in one operation.

21.69 Blasting signals

(1) The blaster must ensure that an audible signalling device, distinct from other signalling devices in the area, is used to give the following warning signals:

(a) preceding the blast, 12 short whistle signals must be sounded at one second intervals;

(b) two minutes must elapse after the last warning signal before initiating the blast;

(c) following the blast and after the area has been inspected and found safe, one prolonged whistle signal of at least 5 seconds duration must be sounded, to signify that permission is granted to return to the blasting area.

(2) Subsection (1) does not apply to oil and gas downhole explosives operations, avalanche control, single underground headings, buried seismic work in isolated locations or other circumstances deemed appropriate by the Board, in which case the blaster must ensure that alternative warning procedures acceptable to the Board are used.

(3) Subsection (1)(b) does not apply with respect to the 2 minute warning in congested areas if alternative warning procedures acceptable to the Board are developed and implemented.

[Amended by B.C. Reg. 14/2019, effective June 3, 2019.]

21.70 Posting warning procedures

The employer must ensure that the warning procedure and blasting signals to be used at the workplace are posted conspicuously at each blasting operation, and workers must be instructed in this information.

Returning to the Blast Site

21.71 After the blast

After a blast is initiated, the blaster of record must not permit anyone to enter the blasting area until

(a) the area has been examined by the blaster of record for misfires and other hazards,

(b) the "all clear" has been sounded, and

(c) the blaster of record gives permission for work to proceed.

[Amended by B.C. Reg. 14/2019, effective June 3, 2019.]

21.72 Electrical blasting

After a blast is electrically initiated the blaster must not enter the blasting area until

(a) the blaster has disconnected the firing lines from the initiating device and has shunted the lead wires, or

(b) if the blast was initiated from a power line, the blaster has disconnected the firing lines and locked the switch open.

[Amended by B.C. Reg. 14/2019, effective June 3, 2019.]

21.73 Misfires

(1) If there is evidence or suspicion of a misfire after a blast is initiated, the blaster of record must not permit anyone to enter the danger area until the later of the following:

(a) if an electric detonator or electric igniter was used to initiate the blast, 15 minutes after the blaster of record disconnects the firing lines from the initiating device and shunts the lead wires;

(b) if shock tube initiation was used to initiate the blast, 15 minutes after the blaster of record disconnects the lead-in-line from the initiating device;

(c) if an electronic detonator was used to initiate the blast, 30 minutes after the blaster of record disconnects the firing lines from the initiating device and shunts the lead wires;

(d) if a safety fuse was used to initiate the blast, 30 minutes after the estimated time of detonation;

(e) the waiting period stated in the manufacturer's instructions.

(2) If there is evidence or suspicion of a misfire after a blast is initiated and a charge is known or suspected to be burning, the blaster of record must not permit anyone to enter the danger area until the later of the following:

(a) one hour after the smoke clears;

(b) the waiting period stated in the manufacturerâ€™s instructions.

[Enacted by B.C. Reg. 14/2019, effective June 3, 2019.]

Misfire Procedures

21.74 Blast site examination

The blaster must make a thorough examination of the blast site after charges have been fired to determine that there are no unexploded charges remaining.

21.75 Unfired explosives

(1) If there is evidence or suspicion of misfired charges or undetonated explosives

(a) all loose unfired explosives must be collected and destroyed in a safe manner, and

(b) the blaster must direct the hand removal of as much broken material as possible before metallic tools or equipment are used.

(2) Metallic equipment must not be used during misfire procedures unless

(a) the blaster directs the use of the equipment,

(b) the area is adequately illuminated, and

(c) everyone, except the blaster and the equipment operator, is removed from the area.

21.76 Removing loose material

(1) Removal of loose material must be done cautiously, with regard for possible undetonated explosive materials or misfired holes.

(2) Loose rock must be scaled from faces in the work area and the area stabilized before other work resumes.

21.77 Marking and detonating

(1) Each misfired charge must be clearly marked and the area cordoned off.

(2) No attempt must be made to remove an unexploded charge and no other work may take place within the blasting area, until the misfired charge has been successfully detonated by rewiring or repriming with a fresh primer.

21.78 Safety fuse reblast

If a misfired charge contains a safety fuse and is reblasted, workers must not return to the blast site until 30 minutes after the detonation.

21.79 No relighting

Relighting a safety fuse is prohibited.

21.80 Drilling for refiring

When drilling is necessary to expose a misfired charge the blaster must

(a) accurately determine the angle of the misfired hole,

(b) direct the angle and depth of the hole being drilled, and

(c) ensure that the hole being drilled is at least 60 cm (2 ft) from any part of the misfired charge.

21.81 Extracting explosives

(1) It is prohibited to extract, or attempt to extract, a primer or explosive of the nitroglycerine type from a loaded hole.

(2) Only if the hole does not contain a detonator may a blaster or person authorized by the blaster remove ammonium nitrate, water gel or emulsion type explosives from a blast hole, and the removal procedure must be carried out with caution, using moderate air or water pressure or a combination thereof, with a blowpipe made of non-metallic construction.

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Upland Contracting Ltd. OFFICE -Emergency Contact List

Company	Name	Title	Address	Alternate	Cell	Office	Email
Upland Contracting Ltd.	Mark Stuart	Owner	7295 Gold River Hwy		250-287-0738	250-286-1148	mark.stuart@uplandgroup.ca
Upland Contracting Ltd.	Brad Maxwell	Construction Manager	Campbell River, BC		250-203-5011	250-286-1148	brad.maxwell@uplandgroup.ca
Upland Contracting Ltd.	Graham Knutson	Controler	V9H 1P1		250-287-0077	250-286-1148	graham.knutson@uplandgroup.ca
Upland Contracting Ltd.	Doug Wynd	Company Safety			250-203-6894	250-286-1148	doug.wynd@uplandgroup.ca
Police				911			
Fire				911			
Ambulance				911			
Medi-Vac	E&B Helicopters		Campbell River			250-287-4421	
Additional Helicopters	Grizzly Helicopters		Campbell River			250-923-4622	
Additional Helicopters	West Coast Helicopters		Campbell River			250 286 8863	
Poison Control						1800 567 8911	
BC HYDRO EMERGENCY						1800 224 9376	
TELUS EMERGENCY						1800 980 0030	
FORTIS EMERGENCY						1800 663 9911	
BC WILDFIRE SERVICE						1800 663 5555	
PROVICIAL EMERGENCY	(SPILLS)					1800 663 3456	
CONSERVATION OFFICER						1877 952 7277	