Comox Valley REGIONAL DISTRICT

Staff Report

DATE: August 6, 2020

FILE: 3060-20/DP 3A 20
3060-20/DP 4A 20

TO: Chair and Directors
Electoral Areas Services Committee

FROM: Russell Dyson
Chief Administrative Officer

Supported by Russell Dyson
Chief Administrative Officer

R. Dyson

RE: **Development Permit (Shoreline Protection) – Coal Hills, Island Highway (West Fraser Mills Ltd. and Province of British Columbia);**
That part of Lot 1 District Lot 154, Nanaimo District, Sections 31 and 32, Township 1 and District Lot 28, Nelson District, Plan EPP15507 as shown on Plan EPP56910, PID 030-110-254;
Block B, District Lot 155, Nanaimo District, No PID

Purpose

To consider Development Permits (DPs) under the Shoreline Protection Devices Guidelines related to the proposed land alterations to the shoreline at the Union Bay Coal Hills site (Appendices A, B and C).

Recommendations from the Chief Administrative Officer:

1. THAT the Board approve Development Permit DP 3A 20 (Union Bay Coal Hills) on property described as That part of Lot 1 District Lot 154, Nanaimo District, Sections 31 and 32, Township 1 and District Lot 28, Nelson District, Plan EPP15507 as shown on Plan EPP56910, PID 030-110-254, for the development of shoreline protection devices;

   AND FINALLY THAT the Corporate Legislative Officer be authorized to execute the permit.

2. THAT the Board approve Development Permit DP 4A 20 (Union Bay Coal Hills) on property described as Block B, District Lot 155, Nanaimo District for the development of shoreline protection devices;

   AND FINALLY THAT the Corporate Legislative Officer be authorized to execute the permit.

Executive Summary

- The applicants are seeking to conduct remediation work on the Union Bay Coal Hills to address acid rock drainage and metal leaching. The project involves covering the site with a liner that prevents drainage through the stockpile. Shoreline protection devices would help anchor the liner, prevent escape of waste rock, and provide the edge of the liner with protection from erosive forces.
- Alterations to the shoreline require a Development Permit under the shoreline protection devices guidelines. When land alteration involves hardening of the shoreline, the Development Permit can only be approved by the Comox Valley Regional District (CVRD) Board (Board).

- Following the recommendations of Qualified Professionals who evaluated alternative hard and soft shore approaches, the proposed shoreline protection devices involve replacing the existing shoreline with rip rap on the eastern side (due to its orientation against the prevailing wind and wave direction) and western side (due to steep slopes on the site and the immediacy of the neighbour across the watercourse). The alterations to the northern side would use soft shore approaches to create a more natural beach.
- The Area A Advisory Planning Commission (APC) recommended approval of the DP as proposed.
- Staff recommends issuance of the DP on the basis that the scope of work will protect the natural environment and its ecosystems and protect the liner from hazardous conditions.

Prepared by:	Concurrence:	Concurrence:
J. MacLean		***S. Smith***
Jodi MacLean, RPP, MCIP Rural Planner	Ton Trieu, RPP, MCIP Manager of Planning Services	Scott Smith, RPP, MCIP General Manager of Planning and Development Services Branch

Government Partners and Stakeholder Distribution (Upon Agenda Publication)

Applicant	✔

Background/Current Situation

The subject properties (Figures 1 and 2) are the site of the Union Bay Coal Hills: an abandoned stockpile of carbonaceous waste rock, along the shores of Baynes Sound and Washer Creek (Hart Creek) left over from a former coal washing and port facility. It is a Contaminated Site as defined by the *Contaminated Sites Regulation* and has been prioritized for remediation under the Ministry of Forests, Lands, Natural Resource Operations and Rural Development's Crown Contaminated Sites Program. The applicants are seeking to conduct remediation work to address acid rock drainage and metal leaching from the site by capping the stockpile with a bituminous geomembrane liner, shoreline protection devices and a rainwater management system that would prevent drainage through the stockpile.

The scope of project work involves the following:

- Clearing and grubbing the surface of the stockpile;
- Grading and compacting to lower slopes and create level pathways and trenches;
- Install the bituminous geomembrane liner, anchored in the trenches;
- Install shoreline protection devices;
- Cover liner with geotextile filter, drainage rock, and soil; and
- Vegetate with native grasses (Figure 3).

The shoreline protection devices are proposed to be composed of (1) rip rap along the eastern and western sides and (2) a re-graded sand/cobble beach with anchored logs on the north side. Because this will involve land alterations along the shoreline for the purposes of preventing the erosion of both the land and the geomembrane liner, a development permit is required.

Development Permit

In accordance with Section 83 of the Official Community Plan (OCP), Bylaw No. 337 being the "Rural Comox Valley Official Community Plan Bylaw No. 337, 2014", a proposal to harden a

shoreline, including replacement and/or maintenance of an existing hard shoreline requires board approval of the DP. The guidelines require such an application to include a professional report addressing the necessity of the proposed alterations, an evaluation of potential negative impacts to the natural environment and adjacent properties, a biophysical assessment and a landscape plan.

Objectives and Guidelines
It is the objective of these DP guidelines to encourage shoreline resiliency by following soft shore (e.g. "Greenshore") principles:

- Conserve or restore natural coastal or riparian processes (e.g. sediment transfer);
- Maintain habitat function and diversity;
- Prevent pollutants from entering the aquatic or riparian environment; and
- Avoid or reduce cumulative impacts on the shoreline environment, including coastal or riparian processes.

Soft shore measures typically involve re-grading the foreshore/backshore areas to allow for a more gradual dissipation of wave energy and the use of large woody debris (such as anchored logs) and vegetative plantings to assist in energy absorption and to contribute nutrients and habitat for aquatic life. Hardened shorelines (e.g. vertical walls, sloped revetments, etc.) will often deflect wave energy to unprotected openings, reduce space for habitat, and interrupt natural coastal processes (e.g. sediment transport, spawning, etc.).

The DP guidelines state that proposals to harden a shoreline, including replacement and/or maintenance of an existing hard shoreline with similar hard design elements shall require board approval of the development permit.

Application
According to the application (Appendices A, B and C), the acid rock drainage and metal leaching is the result of rainwater draining through the stockpile. The shoreline protection measures along the edges of the Coal Hills are required for the purposes of protecting the edges from erosive forces and for containing the waste rock within the property. These shoreline measures were originally designed with rip rap revetment, but to address the DP guidelines the applicant commissioned a study to review potential soft shore alternatives. The report prepared by Paul Hoo, P.Eng., of Moffat & Nichol, found opportunity for soft shore measures on the northern facing shoreline. The report characterizes this north-facing shoreline as being subject to less wave action (relative to the eastern facing shoreline) due to its orientation relative to waves and currents and as a receiving environment for some sediment from Washer Creek (Hart Creek). Here, the report recommends creating a cobble beach with a layer of sand and pea-sized rock, which is suitable for forage fish habitat, supplemented with anchored logs and vegetated sand dunes (predominately American dune grass, *Leymus mollis*).

However, the report ruled out soft shore measures on the eastern facing shoreline due to its orientation relative to prevailing wind direction, waves and longshore current. Soft shore measures here would necessitate a significant amount of fill to create a long, low-grade beach. However, to maintain the recommended level of safety with that area's longshore sediment transport, the beach would require continual interventions to supplement additional fill that is not being sufficiently replenished.

On the western side, along the banks of Washer Creek (Hart Creek), the report identifies evidence of erosion due to high flows and meandering nature of the watercourse. In order to keep the capped stockpile in such proximity to the river/shore line where steep slopes exist, combined with the immediacy of the neighbouring lot across the river, the report concludes that soft shore measures

would not be possible and recommends maintaining the existing creek flow cross section supplemented with a rip rap revetment.

Information requirements
In accordance with the information requirements of the DP guidelines, the applicants have submitted several reports prepared by qualified professionals at Keystone Environmental, Moffat & Nichol, and Geopacific Consulting Engineers that address designs and impacts of the shoreline protection measures.

The rip rap structure (Figure 4) would consist of large boulders (~1.5 metre sized) laying overtop of smaller boulders (at least 0.7 metres) underground, itself laying on top of a geotextile fabric. This design allows the rip rap structure to be keyed into the beach to inhibit movement and scour. It would reach a maximum height of 4.8 metres above sea level (measured from the geodetic datum), in accordance with the calculated designated flood level (accounting for sea level rise to 2100 and a 1-in-200 year storm surge), at an approximately 1.75H:1V to 3H:1V slope. To ensure long term stability under static and seismic conditions, a report was submitted titled *Riprap Stability Assessment* prepared by Kevin Bodnar, P.Eng. of Geopacific Consulting Engineers.

The softshore measures being taken on the northern side would follow a Green Shores-style approach. It would re-grade a foreshore area to a more gradual slope with cobble underlying a thin layer of sand and pea gravel. Vegetated sand dunes would be placed between the higher high water large tide level and the designated flood level, on top of the cobble and against anchored logs (Figure 4). According to the qualified professionals, this design would both prevent pollutants from entering the aquatic environment and be suitable for forage fish spawning.

A Biophysical Assessment prepared by Dave Langill, R.Bio., and Warren Appleton, R.P. Bio., of Keystone Environmental was submitted. This report identifies the habitat values of the entire project area, potential impacts and recommended mitigation and offsetting measures. First, to add habitat values to the entire site, the report provides recommendations for planting of a native seed grass mixture (predominately fescue and oatgrass with some yarrow and camas) over top of the bituminous geomembrane liner – plantings here must be restricted to those with root depths less than 0.4 metres (Figure 3). Second, in the shoreline protection devices, dune grass would be planted on the sand dunes and in parts of the rip rap where gaps between rocks can be filled with sand. Third, due to the impact of the proposed work and as a restoration measure, the report recommends the construction of 660 square metres of intertidal marsh (predominately Pickleweed, Seashore saltgrass and Seaside plantain) near the outlet of the creek.

Rainwater Management is addressed in a report prepared by Thuy Wong, P.Eng., of Keystone Environmental. Surface water will be accommodated with swales along the level pathways. Water that infiltrates through the vegetation and soil will be accommodated by longitudinal French drains, a perimeter toe drain and outfalls in the rip rap, designed to accommodate a 1-in-100 year, 24-hour storm event (accounting for an expected 21% precipitation increase due to climate change).

Keystone Environmental also submitted a Post-Construction Monitoring Plan. The plan recommends reviewing the shoreline protection areas every year in early spring. The soft shore measures are dynamic (expected to shift) but should be reviewed for signs of scour and log displacement. The rip rap should be reviewed for signs of scour, stone displacement, settling, material accumulation and unwanted vegetation growth. Additional monitoring recommended to occur, periodically as prescribed by the Qualified Professionals, in relation to the project includes visual inspections of the soil cover for signs of erosion and stability and to eliminate undesirable vegetation; air quality monitoring at venting locations (in the rip rap areas); water quality samplings

to review acidity, dissolved metals and sulphate; and documenting the change in the intertidal iron-stained area.

Construction and phasing
The DP guidelines require consideration of how the project will be constructed. Shoreline protection devices that extend onto the foreshore requires authorizations from Fisheries and Oceans Canada (DFO) and Ministry of Forests, Lands and Natural Resource Operations and Rural Development (FLNR). Because the scope of the proposed work involves alterations of foreshore and leaves rip rap straddling both sides of the shoreline, the applicants are concurrently applying to DFO and FLNR for all relevant permits and approvals, including those under the *Fisheries Act*, *Water Sustainability Act*, and the *Wildlife Act*. Should anticipated approvals be received, the work is scheduled to commence March 2021 with re-grading of the stockpile and installation of the liner. The installation of the shoreline protection devices is expected to occur in fall 2021.

Policy Analysis
Sections 488(1) and 490 of the *Local Government Act* (RSBC, 2015, c. 1) (LGA) allow a local government to designate DPAs and establish guidelines within the OCP for numerous purposes, including for the protection of the natural environment, its ecosystems and biological diversity, and the protection of development from hazardous conditions. Section 491(1) and (2) specifies that this type of DP may specify areas of land that must remain free of development, except in accordance with any conditions contained in the permit; specified natural features or areas to be preserved, protected, restored or enhanced; require works to be constructed to preserve, protect, restore or enhance natural water courses or other specified natural features; and require protection measures, including that vegetation or trees be planted or retained in order to (i) preserve, protect, restore or enhance fish habitat or riparian areas, (ii)control drainage, or (iii)control erosion or protect banks. Pursuant to Bylaw No. 337, development on commercial and industrial lots requires the DP relating to form and character. Pursuant to Bylaw No. 337, land alterations or construction on shorelines requires the DP relating to shoreline protection devices.

Options
The Board could approve or modify the draft DPs (Appendices B and C). The Board may decline to issue the DP if it is found to not be consistent with the DP guidelines. Given the above discussion, planning staff recommends approval of the DP.

Financial Factors
Applicable fees have been collected for these two applications under the "Comox Valley Regional District Planning Procedures and Fees Bylaw No. 328, 2014."

Legal Factors
This report and the recommendations contained herein are in compliance with the LGA and CVRD bylaws.

Regional Growth Strategy Implications
The subject properties is designated as a Settlement Nodes in the Regional Growth Strategy (RGS), Bylaw No. 120, being the "Comox Valley Regional District Regional Growth Strategy Bylaw No. 120, 2010". The area beyond the shoreline (i.e. the foreshore) is outside of the boundaries of the RGS. It is among the objectives of the RGS to frame environmental protection and policies around the principles of precaution, connectivity and restoration.

Intergovernmental Factors
The subject properties are owned by FLNR and they have assigned Keystone Environmental Ltd. to act as agent for the purposes of this application. The agents are applying concurrently for requisite authorizations from FLNR and DFO

Interdepartmental Involvement
This DP has been circulated to internal departments for review and comments. No concerns were identified.

Citizen/Public Relations
Public notification is not required for a DP application. On July 14, 2020, the Area A APC reviewed this application; the APC recommended approval of proposal, as proposed, citing "The 'soft shore' option would have a more drastic negative effect on the sea floor as it would have to extend out a long way to be effective; and the proposed work (capping and armouring) will allow the area to be opened up for safe public use as parkland, while protecting aquatic life from future leaching."

Attachments: Appendix A – "Application summary prepared by Keystone Environmental"
Appendix B – "Development Permit 3A 20"
Appendix C – "Development Permit 4A 20"

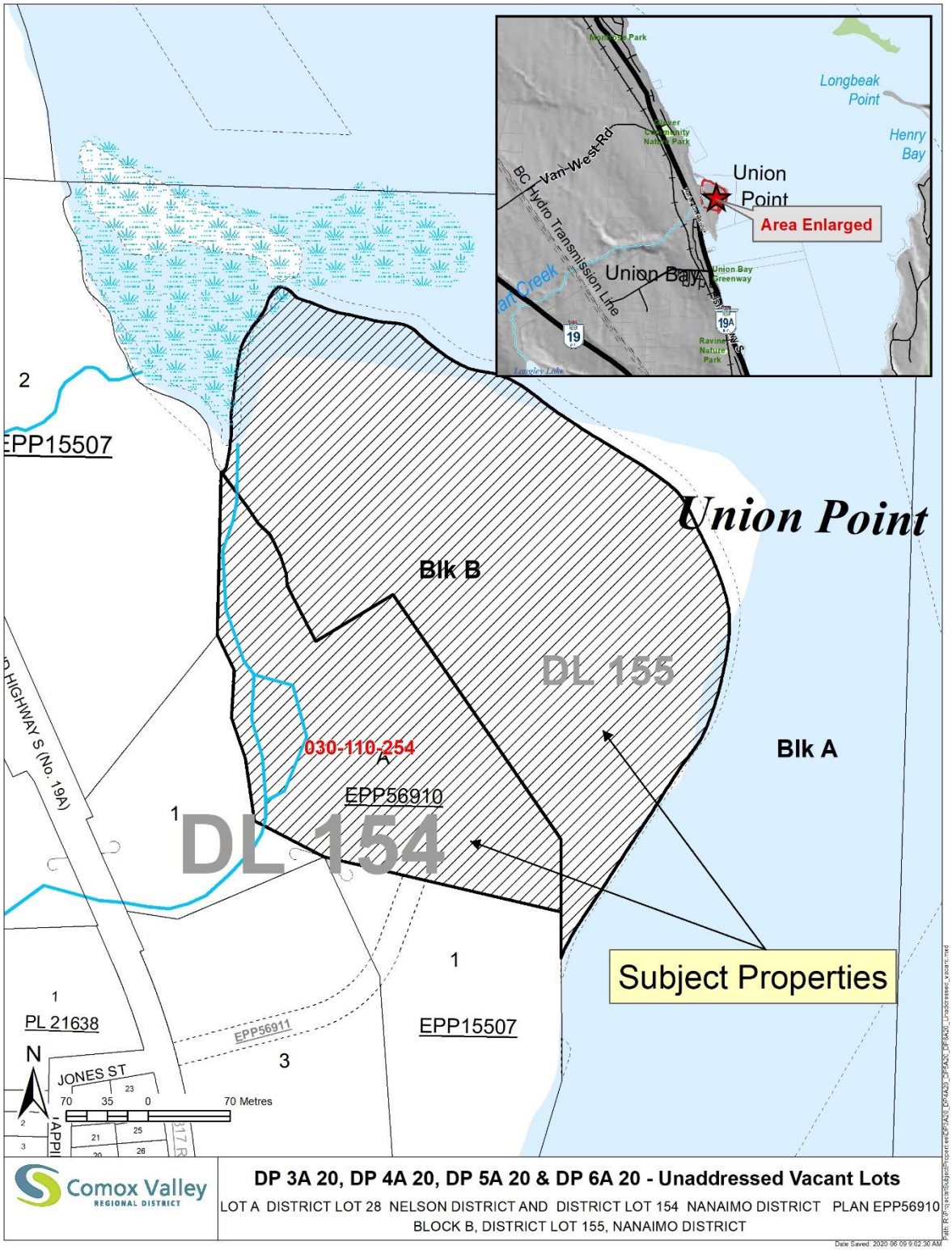

Figure 1: Subject Properties

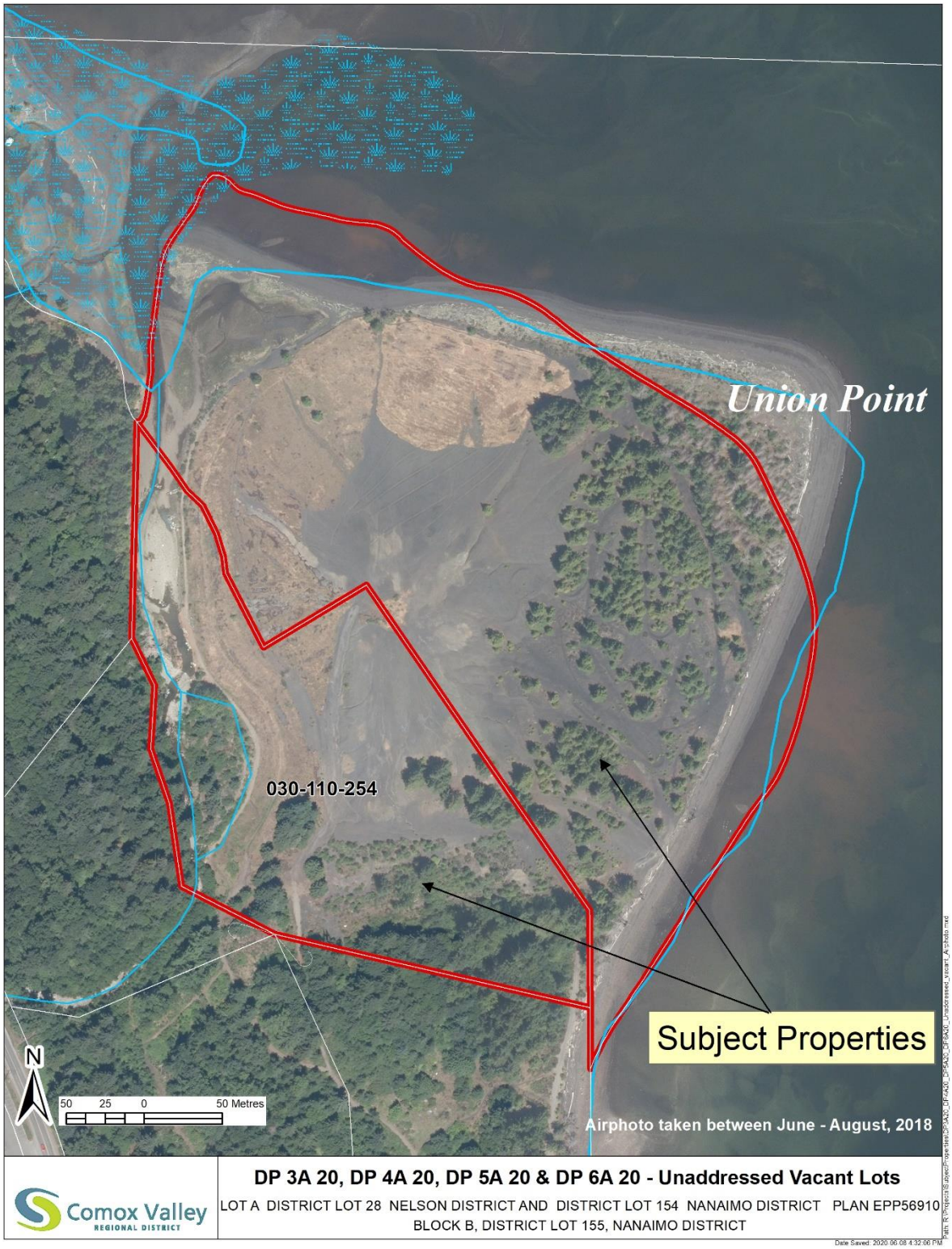

Figure 2: Air Photo

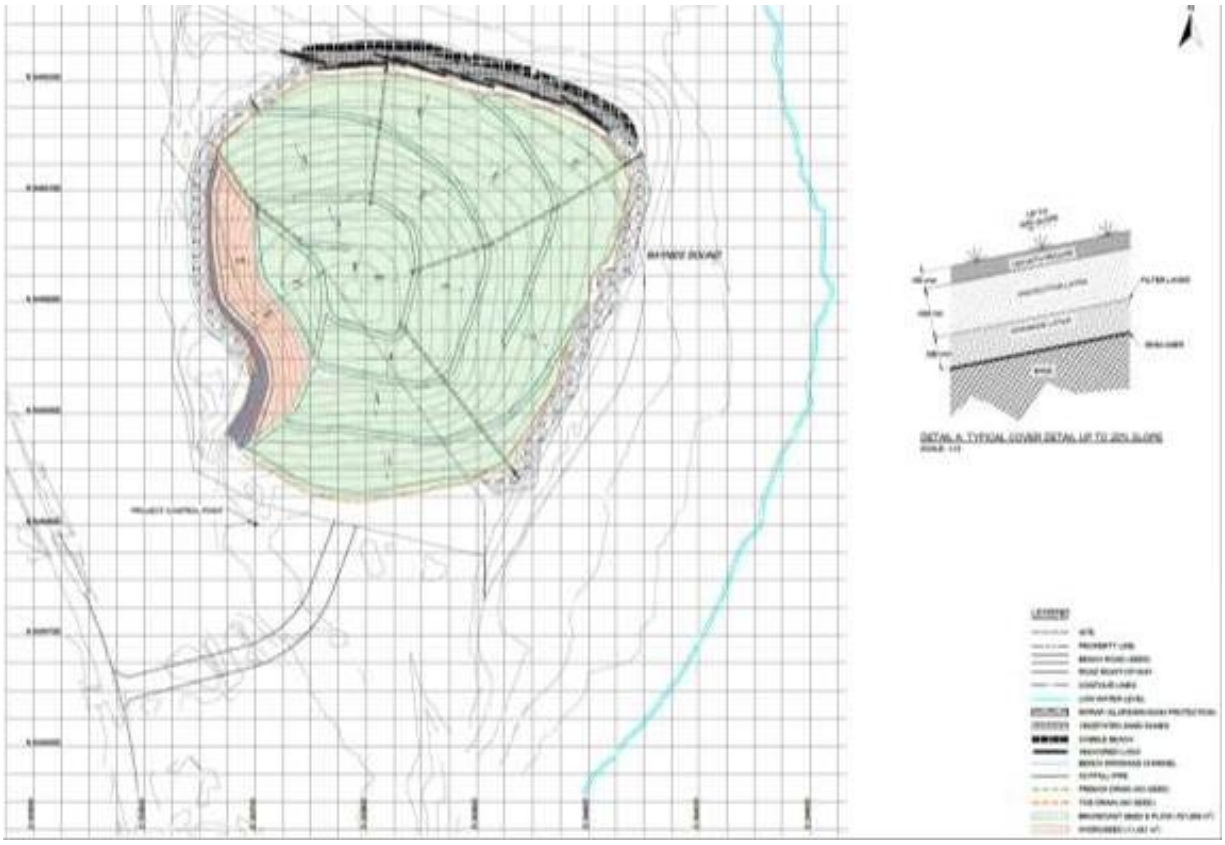

Figure 3: Proposed Final Site Plan

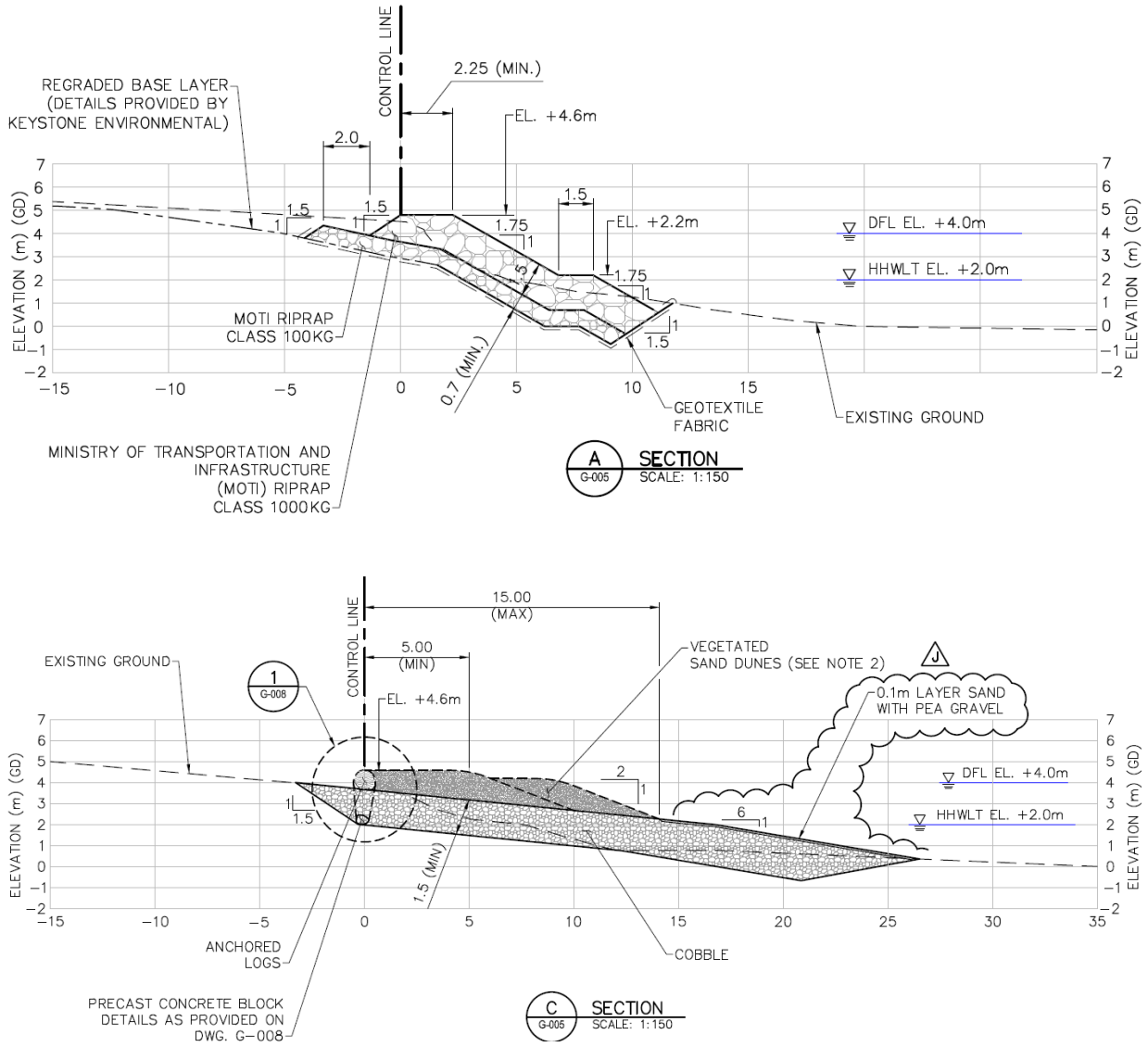

Figure 4: Example Cross-sections illustrating Rip Rap design (A) and Softshore design (C)

Keystone Environmental
Knowledge-Driven Results

May 13, 2020

Ms. Brianne Labute
Policy and Planning Analyst
Comox Valley Regional District
600 Comox Road
Courtenay, BC V9N 3P6

Dear Ms. Labute:

Re: Supporting Documents for Development Permit Application
Remediation Works for Union Bay Coal Pile
Union Bay, BC
Our Project No.: 13470

Please find attached the supporting documents for the Development Permit (DP) application for the Remediation Works of the Union Bay Coal Pile in Union Bay, BC (the Site), in accordance with the requirements of the Rural Comox Valley Official Community Plan (Bylaw No.337).

The legal plan for the Site is attached to this letter as Attachment H. The title certificates for the Site is attached to Attachment I. The letter of appointment from the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNR), the registered owner of the Site, is attached in Attachment K. A Site Profile already exists for the site (current Site ID No. 23289, formerly filed under Site ID No. 4291, Victoria/Regional File: 26250-20/4291). The attached Site Registry Report in Attachment J was obtained on January 16, 2020.

The Cumberland coal mine developed Union Bay as a port for processing mined coal. Cumberland transported the rock and low-grade coal as slurry down a metal lined flume, which settled out at the end of Union Point to form the existing Coal Pile. Cumberland deposited approximately one million cubic metres of low-grade coal and rock on the near shore and intertidal zone at Union Bay. The Coal Pile occupies approximately 13 hectares of Crown Lease land. Environmental investigations found the discharge from the Coal Pile to the marine environment contained acidity, sulphate, various dissolved metals and other elements, and toxicity testing of groundwater and seep water indicated high toxicity to marine organisms tested (i.e., fish, sand dollars, sea urchins and mussels) with iron being the primary toxicant.

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Engineering Solutions
Assessment & Protection

The purpose of the Remediation Works is to achieve improvement of the receiving environmental conditions surrounding the Coal Pile. Improvement of these conditions is anticipated to be achieved by reducing infiltration of precipitation through the Coal Pile with the installation of an engineered cover, consisting of low-permeability bituminous geomembrane (BGM) liner and vegetated soil cover and vegetated geocell in areas of steeper slopes.

The nature and development of the remediation works are complex. The overall design of the remediation works is presented in the attached report titled "*Detail Design Plan, Remediation Works, Union Bay Coal Pile, Union Bay, BC*" (Attachment A). Additional supporting documents are also attached as required under Bylaw No. 337.

As defined in Bylaw No. 337, the proposed Remediation Works at the Site fall under three DP areas:

- Aquatic and riparian habitat – the proposed remediation works is located within 30 m of Hart Creek and Baynes Sound.
- Shoreline protection devices – the proposed remediation works includes installation of shoreline protection devices to protect the engineered cover along Hart Creek and Baynes Sound.
- Steep slopes area (hazardous conditions) – a portion of the remediation works is located on an area with greater than 30% slope for a vertical distance of more than 3 m.

The following sections are presented to guide the CVRD in finding the relevant information for the development permit application process for these particular DP areas.

1. AQUATIC AND RIPARIAN HABITAT DEVELOPMENT PERMIT AREA REQUIREMENTS

Requirements	Document Reference	Notes
Biophysical Assessment		
Site Plan	Attachment B: Biophysical Assessment Appendix A Drawing 20-13470-CVRD-01	
Project Description	Attachment B: Biophysical Assessment Section 2, Section 8	Project refers to coal pile remediation works described in Section 2; additional habitat offsetting works described in Section 8.
Development Alternatives	Attachment B: Biophysical Assessment Section 2	Green Shores™ soft shoreline approaches used where possible.
Sensitive Feature Inventories	Attachment B: Biophysical Assessment Section 4.5 Section 9 and Appendix E	Sensitive features include the Hart Creek riparian zone and vegetated buffer. Critical habitat not identified at Site.
Assessment of Impacts	Attachment B: Biophysical Assessment Section 5	
Measures to Preserve / Protect / Enhance	Attachment B: Biophysical Assessment Section 6	
Erosion and Sediment Control Measures	Attachment B: Biophysical Assessment Section 6 and Appendix F Attachment A: Detail Design Plan Appendix A: CEMP Section 5.6 and Appendix A and Appendix F, Section 313800	
Planting Plan	Attachment B: Biophysical Assessment Section 9 and Appendix A	
Detailed riparian area assessment	Attachment B: Biophysical Assessment Appendix E	Applies to non-tidal portions of Hart Creek.
Post-Construction Recommendations	N/A	To be provided within 60 days of Project completion

Requirements	Document Reference	Notes
Site Design		
Site Design	Attachment B: Biophysical Assessment Section 2 and Appendix A	
Vegetation Buffer		
Landscape / Planting Plan	Attachment B: Biophysical Assessment Section 9 and Appendix A	
Buffer around sensitive features	Attachment B: Biophysical Assessment Section 9 and Appendix A	
Replanting to separate sensitive habitat from development	Attachment B: Biophysical Assessment Section 9 and Appendix A	
Removal of invasive from buffer	Attachment B: Biophysical Assessment Section 9 and Appendix A	
Retention of large woody debris	Attachment B: Biophysical Assessment Section 9	
Rainwater treatment pond and engineered wetlands	N/A	Remediation works do not include treatment pond or engineered wetlands.
Site Drainage Plan		
Site Drainage Plan	Attachment A of this letter – Detail Design Plan – Drawing 18-13470-14 to 20	Surface runoff will be collected and conveyed via lateral surface swales, longitudinal sub-surface piping (French drains), and perimeter sub-surface piping (toe drains) to the discharge points. The swales will incorporate detention features such as vegetation and check dams in order to decrease discharge flow rates to the receiving watercourse and environment. Infiltrated flows will be detained and conveyed through the Drainage Layer which will be connected to the longitudinal and perimeter sub-surface piping to the discharge points.

Requirements	Document Reference	Notes
Driveways, parking areas, and pathways	N/A	No proposed driveways, parking areas, and pathways are included in the remediation work. Access road to the Site was constructed in 2019 and will be completed in 2020.
Contour alterations	Attachment A of this letter – Detail Design Plan – Drawings 18-13470-04 through 18-13470-06.	The grading plan has been developed to limit coal pile disturbance and subsequently reduce the buried unspent coal exposure to the atmosphere. Therefore, the grading plan profile will be generally consistent with the existing coal pile profile, which is a parabolic dome, with an off-centred apex. The total area to be graded, as delineated by the black dashed outline in Dwg 18-13470-05, is approximately 111,200 square meters. Approximately 75% of this area will require minor grading (less than ± 1 m elevation adjustment).
Impervious surface area	Attachment A of this letter – Detail Design Plan – Appendix H Stormwater Management Detail Design (SWMDD) – Section 5 Pre and Post Remediation Condition Numerical Model	The Remediation Works does not incorporate hard, impervious surface, such as asphalt pavement or concrete. Although the BGM liner is placed to reduce the infiltration of precipitation through the Coal Pile, the remediation plan includes absorbent landscaping above the liner to provide flow quantity control. This absorbent landscaping includes 900mm of vegetated soil cover, which provides stormwater retention through the Cover System, such as evaporation-transpiration and interflow.

2. SHORELINE PROTECTION DEVICES

Requirements	Document Reference	Notes
BCLS Recent Survey		
BCLS recent survey	Attachment G of this letter – Drawing 20-13470-DP-01	
Detailed Design of the Shoreline Protection Devices		
Necessity of the proposed devices	Attachment F of this letter – Union Bay Coal Pile Green Shores Design	The east facing shoreline is exposed to significant wave action from Baynes Sound and is recommended to be a riprap structure. Significant wave heights along the east shoreline are estimated to range from 0.92 m to 1.57 m in a 200-year storm event. The largest waves during a storm will be between 1.8 and 3.1 metres in height. Wave action of this magnitude categorizes as a severe wave exposure. Only a manmade structure or shore protection, e.g., in the form of large rock would be able to withstand this level of wave exposure. The north shoreline is slightly more resilient to wave action than the eastern shoreline due largely to the direction of wave approach to shore. The shoreline profile is very wide and flat in this area and receives much of the coarser sediments from Hart Creek, which helps offset loss of sediments due to wave erosion. During storm conditions and high-water levels due to storm surge and/or high tides, the wave exposure along the northern shoreline can be nearly as severe as for the eastern shoreline. The recommended solution that can provide a stable protection of the shoreline is a cobble beach type protection. For the west side of the coal pile, Hart Creek meanders along the toe of the coal pile, at times located nearby the limits of the property to the west of the pile. Observed site conditions along Hart Creek indicate the impact of high creek flows have eroded the existing banks. For the Hart Creek shoreline, evaluation of soft shoreline design alternatives also considered the level of design and associated maintenance and repair. Due to the close proximity of the creek to the adjacent property to the west, it is recommended that shoreline improvement would be located such that the existing creek flow cross sectional area be maintained.

Requirements	Document Reference	Notes
Evaluation of potential negative impacts to environment and adjacent properties, mitigation recommendations	Attachment F of this letter – Union Bay Coal Pile Green Shores Design	
Description of construction details, materials, methods	Attachment A of this letter – Detail Design Plan – Section 5.3 Slope Protection Plan Attachment A of this letter – Detail Design Plan – Drawings G-001 through G-008 Attachment A of this letter – Detail Design Plan – Appendix F – Sections 310516, 313710, and 313800	The shore protection design incorporates soft shore (i.e., Green Shore) principles. The northern portion of the Coal Pile includes anchored logs, vegetated sand dunes, and a cobble beach area. The eastern and western sides of the Coal Pile require rip rap based on the environmental loads and effects; however, the voids of the rip rap will be planted.
Inspection details of the proposed works to be conducted by an engineer qualified to carry out shoreline protection device design (during construction)	Attachment A of this letter – Detail Design Plan – Drawings G-002 and G-003	
Inspection details of the proposed works to be conducted by an engineer qualified to carry out shoreline protection device design (post-construction)	Attachment E – Post-construction Monitoring Plan – Attachment 2 Moffatt & Nichol Post Construction Monitoring of Shoreline Protection	
Biophysical Assessment (see Section 1 Aquatic and Riparian Habitat Development Permit Area Requirements)		
Landscape Plan (see Section 1 Aquatic and Riparian Habitat Development Permit Area Requirements)		

Requirements	Document Reference	Notes
Archaeological Assessment		
Archaeological Assessment	Attachment C of this letter - Archaeological Impact Assessment Attachment C of this letter - Archaeological Investigations at DjSf-25 and DjSf-26	
Post Development Compliance Report		
Post Development Compliance Report	N/A	Post Development Compliance Report will be prepared at the completion of the works

3. STEEP SLOPES DEVELOPMENT PERMIT AREA (HAZARDOUS CONDITIONS)

Requirements	Document Reference	Notes
Site Survey		
Site Survey	Attachment A of this letter – Detail Design Plan – Drawings 18-13470-02	
Slope Analysis	Attachment G of this letter – Drawing 20-13470-DP-02	
Geotechnical Report		
Existing surface and subsurface conditions (soil depths, groundwater levels, depth to rock)	Attachment A of this letter – Detail Design Plan – Appendix G Geopacific Geotechnical Report (February 25, 2020) – Section 4 Subsurface Conditions	
Existing surface and subsurface conditions (slope stability)	Attachment A of this letter – Detail Design Plan – Appendix G Geopacific Geotechnical Report (February 25, 2020) – Section 5.2 Slope Stability Analysis Attachment A of this letter – Detail Design Plan – Appendix G Geopacific Revised Slope Stability (June 1, 2018) Attachment A of this letter – Detail Design Plan – Appendix G Geopacific Revised Slope Stability (November 22, 2018)	
Suitability for reuse of existing soils and rock including optimal moisture content, maximum angle of repose	Attachment D of this letter - Field Density Report Nuclear Densometer Attachment A of this letter – Detail Design Plan – Appendix G Geopacific Geotechnical Report (February 25, 2020) – Section 5.2 Slope Stability Analysis	

Requirements	Document Reference	Notes
Hazards (Liquefaction)	Attachment A of this letter – Detail Design Plan – Appendix G Geopacific Geotechnical Report (February 25, 2020) – Section 5.3 Liquefaction Analysis Attachment A of this letter – Detail Design Plan – Appendix C Densification	Gravel columns are proposed for ground densification at the north and east ends of the Coal Pile due to the presence of potentially liquefiable sands. A ground densification analysis was completed to determine the required width of the densification ("seismic berm") to mitigate lateral spread and to provide a densification specification, indicating densification methods and performance requirements. The Contractor will densify the soils beneath the specified areas to a minimum Electronic Piezo-Cone Penetration Tip Resistance (qc). The performance specification allows a Contractor to specify the gravel column spacing, diameter, and equipment requirements that they require to achieve the performance specification. The specification indicates that ground improvement is required from 1 metre below finished grade to a depth of -10 metre geodetic elevation. From 0 to 1 m below finished grade, beach sand will be placed.
Hazards (Storm surge, sea level rise, creek run-off, waves)	Attachment A of this letter – Detail Design Plan – Appendix E Moffatt & Nichol Shoreline Protection Design – Section 2.7	The proposed shoreline protection is designed to protect the toe of the engineered cover from erosion due to the creek run-off, tidal and wave actions.
Potential impacts of development	Remedial Options Feasibility Report, Union Bay Waste Coal Pile, Union Bay, BC – Sections 9.5 Cover Only	Document reference available upon request Based on a one-dimensional numerical modelling, the engineered cover will reduce infiltration through the coal pile to less than 1% of the mean annual precipitation (baseline condition 515 mm/year) and reduce iron concentration on the foreshore area (baseline average of 233 mg/L) to less than 5 mg/L in 2 years.
Erosion control and mitigation measures during construction	Attachment A of this letter – Detail Design Plan – Appendix A CEMP – Section 5.6 and Appendix A Erosion and Sediment Control Plan	

Requirements	Document Reference	Notes
Erosion control and mitigation measures after construction	Attachment E of this letter - Post-Construction Monitoring Plan – Sections 2.1 and 2.2	
Recommendations for safety, site protection, development and mitigation	Attachment A of this letter – Detail Design Plan – Appendix F – Sections 013523, 013526, and 015713	
Recommendations for vegetation protection, enhancement or retention	Attachment E of this letter - Post-Construction Monitoring Plan – Sections 2.1.3	
Siting plan for buildings and other structures, utilities, services and impervious surfaces	N/A	Remediation works do not include proposed buildings or other structures, utilities, services and impervious surfaces
Plans and analyses for watercourse channelling and drainage systems	Attachment A of this letter – Detail Design Plan – Drawing 18-13470-14 to 20 Attachment A of this letter – Detail Design Plan – Appendix H Stormwater Management Detail Design (SWMDD)	Remediation works do not include proposed watercourse channelling.
Measures to safeguard adjacent properties and structures	Attachment A of this letter – Detail Design Plan – Appendix F – Sections 013526 and 015713	
Grading Plan		
Existing topography	Attachment A of this letter – Detail Design Plan – Drawing 18-13470-02	
Proposed topography and limit of grading	Attachment A of this letter – Detail Design Plan – Drawing 18-13470-09	
Cross sections	Attachment A of this letter – Detail Design Plan – Drawing 18-13470-10	
Cut and fill areas	Attachment A of this letter – Detail Design Plan – Drawing 18-13470-05	

Requirements	Document Reference	Notes
Rainwater Management Plan		
Water quality characteristics of proposed flows and suggestions of appropriate methods to deal with any quality concerns	Attachment A of this letter – Detail Design Plan – Appendix H Stormwater Management Detail Design (SWMDD) – Section 2.2 Quality Control Attachment A of this letter – Detail Design Plan – Drawing 18-13470-14 to 20	Quality control will be provided through the implementation of a vegetated cover, check dams, sub-surface piping, and armouring (riprap protection) at inlet and discharge points. Swales will be vegetated, and check dams will be placed every 25 m to slow the runoff down prior to entering the longitudinal French drains. These swales provide water quality improvements through infiltration and filtering.
Catchment areas	Attachment A of this letter – Detail Design Plan – Drawing 18-13470-13	
Flow routes	Attachment A of this letter – Detail Design Plan – Drawing 18-13470-14	
Drainage capacities	Attachment A of this letter – Detail Design Plan – Appendix H Stormwater Management Detail Design (SWMDD) – Appendix A Summary of Stormwater Calculations	
Designated flood level	Attachment A of this letter – Detail Design Plan – Appendix E - Moffatt & Nichol Shoreline Protection Design – Section 2.7.7	
Quality Constraints	Attachment A of this letter – Detail Design Plan – Appendix H Stormwater Management Detail Design (SWMDD) – Section 2.2 Attachment A of this letter – Detail Design Plan – Appendix A CEMP – Section 5.6 and Appendix A Erosion and Sediment Control Plan Attachment A of this letter – Detail Design Plan – Appendix F – Section 313800	Minimal change to stormwater quality under the proposed conditions (total suspended solids source loading, pH, or additional contaminants) is anticipated compared to existing conditions. Quality control will be provided through the implementation of a vegetated cover, check dams, sub-surface piping, and armouring (riprap protection) at inlet and discharge points. Prior to the start of construction of the remediation and until the vegetation has fully established, erosion and sediment control measures should be implemented to provide quality control.

Requirements	Document Reference	Notes
Hydraulic Constraints	Attachment A of this letter – Detail Design Plan – Appendix H Stormwater Management Detail Design (SWMDD) – Section 2.1	The quantity control measure will maintain existing drainage patterns where possible and will control the peak post-remediation stormwater flows for the 1-in-100-year design storm. The stormwater management strategy to provide quantity control is to use absorbent landscaping which provides stormwater retention through the Cover System, such as evaporation-transpiration and interflow. The proposed remediation works includes absorbent landscaping within a 900 mm Cover System. Surface runoff will be collected and conveyed via lateral surface swales, longitudinal sub-surface piping (French drains), and perimeter sub-surface piping (toe drains) to the discharge points. The swales will incorporate detention features such as vegetation and check dams in order to decrease discharge flow rates to the receiving watercourse and environment. Infiltrated flows will be detained and conveyed through the Drainage Layer which will be connected to the longitudinal and perimeter sub-surface piping to the discharge points. The stormwater management infrastructure has been designed to meet the 1-in-100-year, 24-hour storm event. Based on the effects of climate change the design of the stormwater management infrastructure, swales, French drain, toe drain, and outfalls can convey the increase in flow due to climate change. The proposed stormwater management infrastructure are located above the designated flood level plus 0.8 m of free board. When and if the wave action or flood level exceeds the outfall elevation, the water will inundate the outfall pipe. This will likely cause the backup of water in the toe drain system. This backup is temporary in nature and under severe storm events, most of the water will be draining off the surface onto the riprap.

Requirements	Document Reference	Notes
Rainwater routing using piped and open systems	Attachment A of this letter – Detail Design Plan – Drawing 18-13470-14	
Rainwater controls for infiltration or groundwater recharge	Attachment A of this letter – Detail Design Plan – Drawing 18-13470-14	On slopes less than 20%, infiltration of rainwater will be limited to 900 mm below final grade, above the BGM liner, and will not contribute to groundwater recharge. Rainwater that infiltrates through the soil cover above the BGM liner will be directed towards the French drains and discharged through one of the outfalls. On slopes greater than 20%, infiltration of rainwater will be limited within the geocell above the BGM liner and will not contribute to groundwater recharge. The surface runoff and infiltrated rainwater in this area will discharge to the riprap to Hart Creek.
Impacts of irrigation on short/long term stability of slopes	N/A	Occasional irrigation with water spray truck may be conducted within the first 60 days of seeding. Irrigation will be carried out to avoid dry periods of five days or greater and ensure sufficient watering to prevent grass and underlying growing medium from drying out (saturate to 100 mm soil depth). Water used for irrigation purposes will be controlled to prevent water ponding or runoff that may erode soils. This short-term irrigation is not expected to impact the stability of any slope. Long-term irrigation is not planned for the Site.
Protection of drainage swales and major event flow routes	Attachment A of this letter – Detail Design Plan – Drawing 18-13470-17 and 18	The following measures will be put in place to protect drainage swales from erosion: Swales will be vegetated The average swale slope is 2%, which resulted in a maximum stormwater flow velocity of 0.76 m/s in the swale Check dams will be placed every 25 m along the swales French drain and toe drain trench will be filled with drain rocks for protection.

Requirements	Document Reference	Notes
Proposed roof and footing drains for individual lots, on-site treatment or connections to storm sewers	Attachment A of this letter – Detail Design Plan – Section 5.2.2	The remediation works will not include any roof or footing drains, on-site treatment, nor connections to storm sewers. A 300 mm thick granular drainage layer will be placed immediately above the BGM liner. The drainage layer is continuous throughout the proposed cover and will follow the proposed contours of the cover material. A different configuration using geocells will be installed on areas with slopes exceeding 20%. Swales along the bench road are designed to break the flow along the slope of the coal pile, on and below the surface of the cover material. Precipitation that infiltrates through the absorbent landscaping and enters the drainage layer will encounter the bottom of the swale and bench road. Due to preferential pathways, the water in the drainage layer at the bench road, will likely follow the swale slope towards the French drain. The drainage layer is directly connected to the French drain. This design will minimize the inundation of the downhill portions of the drainage layers.
Proposed means of controlling short term erosion	Attachment A of this letter – Detail Design Plan – Appendix A CEMP – Section 5.6 and Appendix A Erosion and Sediment Control Plan Attachment A of this letter – Detail Design Plan – Appendix F – Section 313800	For short-term erosion protection, the site Contractor is required to develop a site-specific Erosion and Sediment Control (ESC) plan for the various stages of remediation works that meet the requirements of the construction environmental management plan (CEMP). The objective of the ESC is to minimize sediments from migrating from the Coal Pile. The ESC plan will be required to clearly outline the applicable regulations, construction timing, monitoring requirements, Contractor responsibilities with respect to sampling, maintenance, mitigation measures and decommissioning.
Proposed means of controlling long-term erosion (engineered cover system)	Attachment A of this letter – Detail Design Plan – Drawing 18-13470-23 Vegetation and Seeding Plan	Most of the surface of the cover system will be vegetated for long-term erosion protection. The areas that are not vegetated include the French drain and toe drain trenches that are filled with drain rocks and along the shoreline.

Requirements	Document Reference	Notes
Proposed means of controlling long-term erosion (shoreline)	Attachment A of this letter – Detail Design Plan – Drawing G-001 through G-008	For shoreline protection, the northern portion of the Coal Pile includes anchored logs, vegetated sand dunes, and a cobble beach area. The eastern and western sides of the Coal Pile require rip rap based on the environmental loads and effects; however, the voids of the rip rap will be planted.
Hydrogeological considerations (existing condition)	Remedial Options Feasibility Report, Union Bay Waste Coal Pile, Union Bay, BC – Section 3	Document reference is available upon request. Discussion on site climate, geology, hydrogeology, tidal influence, groundwater flow models, Hart Creek flows, groundwater chemistry, delineation, and groundwater geochemistry were presented in the document reference.
Monitoring of groundwater regimes	Attachment E of this letter – Post-construction Monitoring Plan – Section 2.3 Intertidal Stain Area Monitoring	Monitoring of the groundwater regime will initially be conducted by visual inspection of the spatial extent of the iron staining. If staining appears to be increasing in size, groundwater monitoring program will be implemented on a semi-annual basis. Contingency measures will be considered if condition continue to worsen after 5 to 10 years.
Energy dissipation into existing ravines at source and down slope where concentration or erosion may occur	Attachment A of this letter – Detail Design Plan – Drawing 18-13470-14 and 20 Attachment A of this letter – Detail Design Plan – Drawing G-001 through G-008	Surface runoff discharge over the cover system will be directed to five outfall locations. The down-gradient area of these outfalls is protected by riprap.

We trust that this is the information you require at this time. Should you have any questions, please contact the undersigned.

Sincerely,

Keystone Environmental Ltd.

Dave Langill, R.P.Bio.
Biologist

Richard Johns, P.Eng.
Department Head, Engineering

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ATTACHMENTS:

- Attachment A: Detail Design Plan, Remediation Works, Union Bay Coal Pile, Union Bay, BC
- Attachment B: Biophysical Assessment, Union Bay Coal Pile Remediation Project, Union Bay, BC
- Attachment C: Archeological Works
- Attachment D: McElhanney Field Density Report Nuclear Densometer
- Attachment E: Post-Construction Monitoring Plan
- Attachment F: Union Bay Coal Pile Green Shores Design
- Attachment G: Drawings
- Attachment H: Legal Plan
- Attachment I: Land Title Certificates
- Attachment J: Site Registry
- Attachment K: FLNR Letter of Appointment

Comox Valley REGIONAL DISTRICT

Appendix B
Development Permit

DP 3A 20

TO: Her Majesty the Queen in Right of the Province of British Columbia as Represented by the Ministry of Forests, Lands and Natural Resource Operations

1. This Development Permit (DP 3A 20) is issued subject to compliance with all of the bylaws of the Comox Valley Regional District applicable thereto, except as specifically varied or supplemented by this permit for the **purposes of installation of shoreline protection devices and related land alterations.**

2. This Development Permit applies to, and only to, those lands within the Comox Valley Regional District described below:

Legal Description:	**That part of Lot 1 District Lot 154, Nanaimo District, Sections 31 and 32, Township 1 and District Lot 28, Nelson District, Plan EPP15507 as shown on Plan EPP56910**		
Parcel Identifier (PID):	**030-110-254**	**Folio:**	**771.10821.030**
Civic Address:	**unaddressed lot along Island Highway**		

3. The land described herein shall be developed strictly in accordance with the following terms and conditions and provisions of this permit:

   i. THAT development shall take place in accordance with the Detail Design Plan prepared by Keystone Environmental, attached as Schedule B;

   ii. THAT development shall take place in accordance with the Biophysical Assessment and Riparian Area Report Assessment Report prepared by Warren Appleton, R.P.Bio., Dave Langill, R.P.Bio., and Richard Johns, P.Eng., of Keystone Environmental, attached as Schedule C;

   iii. AND THAT the Post-Construction Monitoring Plan, attached as Schedule D and prepared by Keystone Environmental, be implemented.

4. This Development Permit (DP 3A 20) shall lapse if construction is not substantially commenced within two (2) years of the Comox Valley Regional District Board's resolution regarding issuance of the development permit (see below). Lapsed permits cannot be renewed; however, a new application for a second development permit can be applied for in order to complete the remainder of the work.

5. This Development Permit is ***not*** a Building Permit.

CERTIFIED as the **DEVELOPMENT PERMIT** issued by resolution of the board of the Comox Valley Regional District on _____.

_____
Jake Martens
Deputy Corporate Legislative Officer

Certified on _____

Attachments: Schedule A – "Subject Property"
Schedule B – "Detail Design Plan"
Schedule C – "Biophysical Assessment and Riparian Area Report Assessment Report"
Schedule D – "Post-Construction Monitoring Plan"

To view the schedules, please visit the following FTP link.

Comox Valley
REGIONAL DISTRICT

Appendix C
Development Permit

DP 4A 20

TO: Her Majesty the Queen in Right of the Province of British Columbia as Represented by the Ministry of Forests, Lands and Natural Resource Operations

1. This Development Permit (DP 4A 20) is issued subject to compliance with all of the bylaws of the Comox Valley Regional District applicable thereto, except as specifically varied or supplemented by this permit for the **purposes of installation of shoreline protection devices and related land alterations.**

2. This Development Permit applies to, and only to, those lands within the Comox Valley Regional District described below:

   Legal Description: **Block B, District Lot 155, Nanaimo District**

   Parcel Identifier (PID): **Folio: 771.27069.000**

   Civic Address: **unaddressed lot along Island Highway**

3. The land described herein shall be developed strictly in accordance with the following terms and conditions and provisions of this permit:

   i. THAT development shall take place in accordance with the Detail Design Plan prepared by Keystone Environmental, attached as Schedule B;

   ii. THAT development shall take place in accordance with the Biophysical Assessment and Riparian Area Report Assessment Report prepared by Warren Appleton, R.P.Bio., Dave Langill, R.P.Bio., and Richard Johns, P.Eng., of Keystone Environmental, attached as Schedule C;

   iii. AND THAT the Post-Construction Monitoring Plan, attached as Schedule D and prepared by Keystone Environmental, be implemented.

4. This Development Permit (DP 4A 20) shall lapse if construction is not substantially commenced within two (2) years of the Comox Valley Regional District Board's resolution regarding issuance of the development permit (see below). Lapsed permits cannot be renewed; however, a new application for a second development permit can be applied for in order to complete the remainder of the work.

5. This Development Permit is ***not*** a Building Permit.

CERTIFIED as the **DEVELOPMENT PERMIT** issued by resolution of the board of the Comox Valley Regional District on _____.

_____
Jake Martens
Deputy Corporate Legislative Officer

Certified on _____

Attachments: Schedule A – "Subject Property"
Schedule B – "Detail Design Plan"
Schedule C – "Biophysical Assessment and Riparian Area Report Assessment Report"
Schedule D – "Post-Construction Monitoring Plan"

To view the schedules, please visit the following FTP link.