



Queensborough Dike Shoreline Protection – Location 2

Construction Environmental Management Plan

City of New Westminster

23 March 2023

317071-00039

Advisian
Worley Group

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Abbreviations and Acronyms

Acronym/Abbreviation	Definition
AIA	Archaeological Impact Assessment
AISR	Aquatic Invasive Species Regulations
BC	British Columbia
BMPs	Best Management Practices
CCG	Canadian Coast Guard
CCME	Canadian Council of Ministers of the Environment
CEMP	Construction Environmental Management Plan
CEPA	<i>Canadian Environmental Protection Act</i>
CFMP	Chance Find Management Procedure
The City	The City of New Westminster
CNWA	<i>Canadian Navigable Waters Act</i>
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Fisheries and Oceans Canada
DFO-FFHPP	Fish and Fish Habitat Protection Program
ECCC	Environment and Climate Change Canada
EM	Environmental Monitor
EMA	<i>Environmental Management Act</i>
EMBC	Emergency Management BC
ENV	BC Ministry of Environment and Climate Change Strategy
FLNRORD	Ministry of Forests, Lands and Natural Resources Operations and Rural Development
HADD	Harmful Alteration, Disruption or Destruction
HWL	High water line
LoA	Letter of Advice
MCTS	Marine Communications and Traffic Services
NAVWARN	Navigational Warning
NPP	Navigation Protection Program

Acronym/Abbreviation	Definition
NTU	Nephelometric Turbidity Units
PEP	Provincial Emergency Program
QP	Qualified Professional
RAs	Regulatory Authorities
RFR	Request for Review
SARA	<i>Species at Risk Act</i>
TC	Transport Canada
WHMIS	Workplace Hazardous Materials Information System
WSA	<i>Water Sustainability Act</i>
WQG	Water Quality Guidelines

1 Introduction

1.1 Background

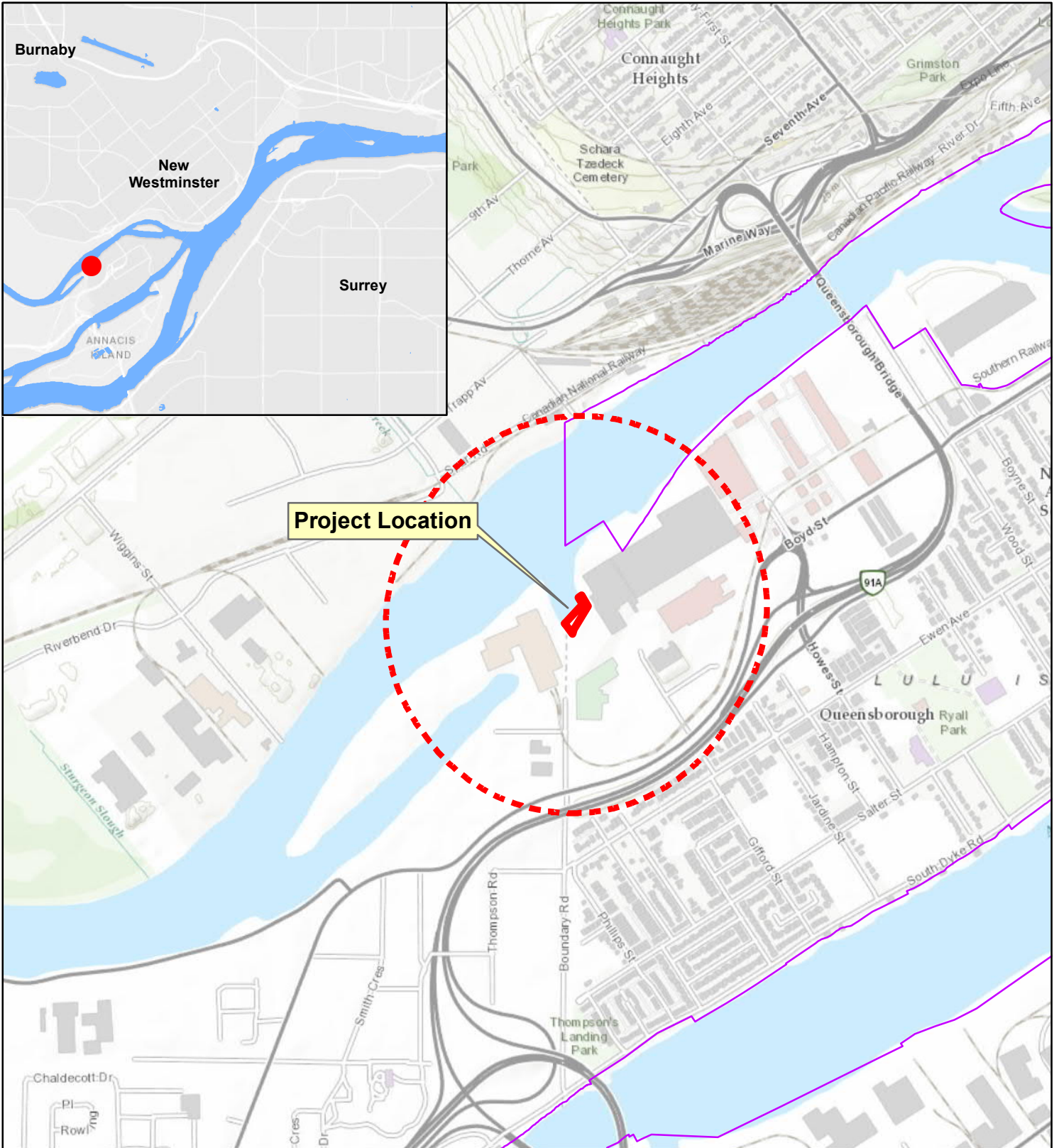
The City of New Westminster (the City) is planning to rehabilitate and stabilize an existing shoreline (the Project) along the Queensborough Dike located on the Fraser River in British Columbia (BC). The Project is located at 49° 11.17 'N, 122° 57.25' within the Queensborough neighbourhood of New Westminster, BC, on northeast Lulu Island, approximately 1,100 m west of the Queensborough bridge (the Project site, Figure 1-1). Lulu island is located between the north and south arms of the Fraser River.

Worley Canada Services Ltd., operating as Advisian, was retained by the City to develop a shoreline rehabilitation design and to provide environmental permitting and management for the proposed activities. This document serves as the Construction Environmental Management Plan (CEMP) for the Project and includes the environmental management and compliance requirements with relevant Regulatory Authority (RA) requirements, outlined in Table 2-1.

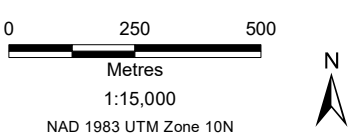
1.2 Project Location and Study Area

The Project aims to rehabilitate and stabilize the shoreline on northeast Lulu Island, which is a 100 m wide shoreline. To consider potential Project generated effects, the Project footprint was considered to be the footprint of the rehabilitated shoreline and the Project Site was considered as the Project footprint plus a 10 m buffer. Location of the Site is presented in Figure 1-1; Project footprint details are summarized in Section 3.1. A habitat assessment was completed in September 2020 to describe the existing conditions (Advisian 2022)

Imagery Source: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
 Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS user community



- Legend**
- Site Location
 - Study Area
 - VFP Boundary



CITY OF NEW WESTMINSTER QUEENSBOROUGH SHORELINE			
SITE LOCATION			
Date: 30-MAY-22	Drawn by: KR	Edited by: KR	App'd by: AC
 <small>Worley Group</small>		Project No. 317071-00039	
		FIG No 1-1	
		REV 0	
<small>*This drawing is prepared solely for the use of our customers as specified in the accompanying report. Worley Canada Services Ltd. assumes no liability to any other party for any representations contained in this drawing.*</small>			

2 Legislation, Regulations, and Guidelines

Legislation, regulations, and guidelines applicable to the Project are described in this section. The latest revisions of the Acts and Guidelines will be applied to the CEMP where necessary; however, the CEMP is an iterative document and may be amended as deemed appropriate. Copies of the permits and approvals received for this Project will be kept onsite to be presented upon request to Regulatory Authorities (RA).

2.1 Regulatory Environment

Legislation relevant to the Project includes, but is not limited to:

- *Fisheries Act* (Section 34.4[1]), prohibition against causing the death of fish, by means other than fishing
- *Fisheries Act* (Section 35[1]), prohibition against causing the harmful alteration, disruption or destruction of fish habitat
- *Fisheries Act* (Section 36), pollution prevention provisions dealing with the deposit of deleterious substances into waters frequently by fish (administered under Environment and Climate Change Canada [ECCC])
- *Canadian Navigable Waters Act* (CNWA) governs the protection of navigable waters
- *Environmental Management Act (EMA)*
- *Species at Risk Act* (SARA) (Sections 32, 33, 58[1]) governs the protection of endangered or threatened species
- *Canadian Environmental Protection Act, 1999* (CEPA)
- *Water Sustainability Act* (WSA) governs the protection, management, and efficient use of water in BC
- Riparian Areas Protection Regulation (BC Reg. 178/2019) - to protect the many and varied features, functions and conditions that are vital for maintaining stream health and productivity
- *BC Wildlife Act* (RSBC 1996, Chapter 488) protects endangered or threatened species in BC
- BC Spill reporting Regulations, as part of the *BC Environmental Management Act*
- BC Riparian Areas Protection Regulation

Permitting requirements that are anticipated for the Project are summarized in Table 2-1. Permits will be obtained by the City or the Contractor.

2.2 Federal Permitting Requirements

2.2.1 *Fisheries Act*

Fisheries and Oceans Canada is the RA for Section 35 of the *Fisheries Act*, which prohibits causing Harmful Alteration, Disruption or Destruction (HADD) of fish habitat. In addition, Section 36 of the *Fisheries Act* includes provisions for the prevention of pollution associated with the deposit of deleterious substances into waters frequented by fish.

Project activities for Project Site will be submitted to DFO-FFHPP to undergo a project Request for Review (RFR) process to determine whether the Project will generate HADD. It is expected that a Letter of Advice (LoA) will be received outlining recommended mitigation and monitoring measures that will be incorporated into this CEMP.

2.2.2 Species at Risk Act

The status of individual species is reviewed by the independent Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Once a species has been designated by COSEWIC it is considered for legal protection under the SARA. Once listed, the SARA provides legislated protection to recognize threatened, endangered, or extirpated species and requires that responsible government agencies design and implement an approved recovery plan.

Three sections of the SARA have relevance to the Project:

- Section 32 prohibits the killing, harming, harassing, or capturing of a threatened, endangered, or extirpated species;
- Section 33 prohibits the damage or destruction of the residence of a threatened, endangered, or extirpated species; and
- Section 58 prohibits the damage or destruction of any part of designated critical habitat of a threatened, endangered, or extirpated species.

Project activities are not expected to result in negative effects to species at risk; mitigations and environmental monitoring measures will be developed and implemented for protection of species at risk that may be passing through the Project site (see Sections 5.4 and 5.6).

2.2.3 Aquatic Invasive Species Regulations

The Aquatic Invasive Species Regulations (AISR) are enforced through the *Fisheries Act* and the RA is DFO-FFHPP. The mandate of the AISR (DFO 2019b) is to:

- Prevent the spread and introduction of aquatic invasive species into Canadian waters; and
- Management of invasive species once introduced.

Within the AISR there are requirements to prevent the threat of invasive species through rules around importation, possession, transportation, release and introduction.

Project activities are expected to be completed with land-based equipment and is not expected to generate impacts to aquatic invasive species. The Contractor will be responsible for equipment to be clean and does not introduce, transport, possess, or import invasive species to aquatic or land-based areas. Project mitigations regarding equipment maintenance will be developed and implemented to ensure that the Project prevents the threat of invasive species (see Section 5.4).

2.2.4 Canadian Navigable Waters Act

The Navigation Protection Program (NPP), administered by Transport Canada (TC), enforces the CNWA and is responsible for administering and processing applications for approval. The CNWA protects marine

safety by regulating works in navigable waters. Works to construct, place, alter, rebuild, remove, or decommission works that are in, on, over, under, through, or across any navigable water, whether temporary or permanent, may be required to apply for an approval through TC or seek authorization through the public resolution process.

Project activities are not expected to generate an interference to navigation and are expected to meet the criteria for minor works under the *Minor Works Order*. Under the *Minor Works Order*, Project details are required to be submitted to create a 'notification of a minor work' to inform nearby communities and Indigenous groups.

The Contractor will be expected to be in compliance with established navigational communication procedures, including those outlined within the *Minor Works Order*. It is still expected that the Project would provide necessary notifications via the national navigational warnings (NAVWARN) administered through the Canadian Coast Guard (CCG) Marine Communications and Traffic Services (MCTS) Program. In addition, all marine based construction equipment must be in compliance with the federal Collision Regulations.

2.2.5 Migratory Bird Conventions Act

The *Migratory Birds Convention Act* (MBCA) provides legal framework for governing the Migratory Bird Regulations (MBRs). Under Section 6(a) of the MBRs: "*no person shall disturb, destroy, or take a nest, egg, nest shelter, eider duck shelter or a duck box of a migratory bird.*"

Some construction activities can inadvertently harm, kill, disturb, or destroy migratory birds, nests or eggs, and this is collectively referred to as *incidental take*. Incidental take could lead to an investigation and prosecution, particularly if no reasonable attempt was made to avoid or reduce the risks of incidental take when it occurred and when there was a reasonable knowledge of the potential harm to, or presence of migratory birds, nests, and eggs in an area.

ECCC is the RA for the MBCA and prior engagement with ECCC is not required. Negative environmental effects to migratory birds are not considered likely as the Project. The Contractor will be expected to respect the regional nesting period for the area and consult a Qualified Environmental Professional (QEP) prior to any activities that may affect birds and their active nests (if any) and prior to any planned tree removal activity in and around the regional nesting period for the area (A1: late march to mid-august) (ECCC 2018b).

2.3 Provincial Regulatory Requirements

2.3.1 Water Sustainability Act

The *Water Sustainability Act* (WSA) is administered by BC's Ministry of Forests, Lands and Natural Resources Operations and Rural Development (FLNRORD). WSA provides for the protection, management, and efficient use of water throughout BC. This includes the protection of streams and associated habitats as it pertains to public safety, land, or other property, with consideration to environmental impacts. A change approval is required to make changes in and about a stream and come with terms and conditions to outline measures required to protect the aquatic ecosystem, hydraulic integrity of the stream channel, or rights of water uses and landowners downstream. Alternatively, for specified low risk changes in and

about a stream that meet the criteria of an authorized change as described in the Water Sustainability Regulation, a notification is required a minimum of 45 days prior to beginning the proposed work. Conditions may be set out by a habitat officer in response to the notification. The Project Site is located within provincial jurisdiction. Project activities details have been submitted to FLNRORD to apply for a Change Approval. Conditions may be set out by the habitat office and will be incorporated into the mitigation and monitoring measures for the Project activities.

2.3.2 Wildlife Act

In British Columbia, all native bird species are protected under the *Wildlife Act* [RSBC 1996]. Section 34 of the Act states:

A person commits an offence if the person, except as provided by regulation, possesses, takes, injures, molests or destroys

- a. a bird or its egg,
- b. the nest of an eagle, peregrine falcon, gyrfalcon, osprey, heron or burrowing owl,
- c. the nest of a bird not referred to in paragraph (b) when the nest is occupied by a bird or its egg.

Section 34 (b) lists a group of bird species whose nests are protected year-round regardless of whether or not they are occupied.

Certain species are exempt from the *Wildlife Act*. The Designation and Exemption Regulation (BC Reg. 168/90) section 11.3 (1) and 11.3 (2) under the *Wildlife Act* includes an exemption from Section 34 of the *Wildlife Act* if the bird species affected are listed in schedule C, specifically:

11.3 (1) A person is exempt from section 34 of the Wildlife Act with respect to possessing, taking, injuring, molesting or destroying a bird or its egg or a nest occupied by a bird or its egg if the bird is not designated as wildlife, a threatened species or an endangered species.

(2) Despite subsection (1), a person is exempt from section 34 of the Wildlife Act with respect to taking, injuring, molesting or destroying a bird or its egg or a nest occupied by a bird or its egg if the bird is listed in Schedule C.

Schedule C of the Designation and Exemption Regulation lists birds of the following species, their nests, or eggs:

- All species of the genus *Corvus* - crows, except *Corvus corax* - Common Raven
- *Pica pica* - Black-billed Magpie
- *Sturnus vulgaris* - European Starling
- *Passer domesticus* - House Sparrow
- *Columbia livia* - Rock Dove
- *Molothrus ater* - Brown-headed Cowbird

2.3.3 Heritage Conservation Act

Archaeology sites in BC, known or as-yet unrecorded, located on public or private lands, are protected under the *Heritage Conservation Act* (HCA) and may not be altered or changed in any manner without a permit. The HCA, administered by the Archaeology Branch of FLNRORD, protects archaeology sites either designation as a provincial heritage site, or automatically protected by virtue of having historic or archaeological value.

Under Section 12.2 of the HCA, a Heritage Inspection Permit (Permit No. 2021-0324) was obtained by Kleanza for the purposes of performing an Archaeological Impact Assessment (AIA) at the Project Site to identify potential conflicts between archaeological resources and Project activities (Kleanza Consulting Ltd. 2022). The Project Site is situated within the traditional territories of 13 First Nations, including:

- Seabird Island Band
- Stó:lō Nation
- Stó:lō Tribal Council
- Shxw'ow'hamel First Nation
- Skawahlook First Nation
- Soowahlie First Nation
- Semiahmoo First Nation
- scəwáθən məsteyəx (Tsawwassen First Nation)
- xʷməθkʷəy̓əm (Musqueam Indian Band)
- səlilwətaʔ (Tsleil-Waututh Nation)
- kʷikʷəłəm First Nation
- Katzie First Nation
- Kwikwetlem First Nation

Heritage permits were obtained from each First Nation that had a heritage permitting system, and included Stó:lō Nation, xʷməθkʷəy̓əm (Musqueam Indian Band), səlilwətaʔ (Tsleil-Waututh Nation), Kwantlen Lands and Resources Stewardship, and Katzie First Nation. A Stó:lō Nation field technician and xʷməθkʷəy̓əm remote monitor participated with Kleanza's field assessment, completed on October 12, 2021.

The AIA indicated that the Site footprint is situated on an artificial landform, composed of dredged sediments from the Fraser River, and intermixed with various grades of engineered fill, structural remains, and debris. No archaeological resources were identified.

Due to the number and distribution of previously recorded archaeological sites elsewhere along the Fraser River, a formal Chance Find Management Procedure (CFMP) is recommended by Kleanza to be developed and implemented during ground disturbance activities during the Project to manage potential pockets of undetected archaeological deposits contained within the planned Project area. The developed CFMP will be reviewed by the Contractor and be available onsite should archaeological materials be encountered during Project activities.

The City will ensure any and all forthcoming documents are forwarded to the kʷikʷəłəm First Nation and will continue to notify of any updates or activity related to the Project.

Table 2-1 List of Federal, Provincial, Regional, District, and Municipal Legislation and Legal Requirements for the Project

Legislation	Regulatory Authority	Construction Activity	Required Authorization/ Permit/Approval	Permit/Approval Required	Legislation Source
Federal					
<i>Fisheries Act</i>	Fisheries and Oceans Canada (DFO)	Activities that have the potential to result in HADD of fish habitat, or death to fish, as defined under the <i>Fisheries Act</i> .	DFO Letter of Advice (LoA) or <i>Fisheries Act</i> Authorization (FAA)	Yes - RFR to be submitted to DFO. FAA is not expected to be required.	http://laws-lois.justice.gc.ca/PDF/F-14.pdf
<i>Canadian Navigable Waters Act</i>	Transport Canada	In-water works that have the potential to interfere with navigation.	No Interference with Navigation Notification of Work	Yes	http://laws-lois.justice.gc.ca/PDF/N-22.pdf
Provincial					
<i>Water Sustainability Act</i>	Ministry of Forests	Changes in and about a stream.	Changes In and About a Stream – Change Approval	Yes - Project details submitted	https://www.bclaws.ca/civ/document/id/complete/statreg/14015
HCA	Archaeology Branch of BC	Conduct a pre-construction Archaeology Impact Assessment (AIA)	Heritage Inspection Permit for Project Site	Yes	https://www2.gov.bc.ca/gov/content/industry/natural-resource-use/archaeology
Municipal					
Construction Noise By-Law No. 6063	The City	Application to work outside of construction hours stipulated in the by-law.	Noise By-Law Amendment Authorization	Yes	https://www.newwestcity.ca/database/files/library/Consolidated_Bylaw_6063_1992_Construction_Noise.pdf

Notes: HADD: harmful alteration, disruption, or destruction

3 Project Description

3.1 Project Footprint

The Project footprint is described below. Project activities will be limited to the intertidal and areas at the top of the bank (above the high-water line [HWL]).

Project activities will be completed to rehabilitate and repair the scattered shoreline protection. The approximately 100 m of shoreline was observed to show erosion, slope failure, and primarily unprotected. The shoreline is currently being exposed to waves generated by vessel traffic and flooding events of the Fraser River.

The footprint of the new shoreline protection is 960 m²; rock placement will occur above the HWL and in the intertidal zone:

- 127 m² is located above HWL; and
- 833 m² is located in the intertidal zone (between the LWL and HWL)

3.2 Construction Activities

Project activities will occur above and below the HWL and are summarized in Table 3-1 and detailed in drawings presented in Appendix 1.

- 317071-00039-00-MA-DGA-1511_RB: Queensborough Dike Location 2, Shoreline Protection Rehabilitation, Plan and Section

Project activities will include the following:

- Preparation of work area, including removal of existing debris.
- Preparation and grading of the slope, including removal of existing riprap and boulders.
- Placement of geotextile fabric, filter rock, and riprap as per design drawings.
- Revegetation plantings.

Table 3-1 Project Activity Summary

Activity	Description	Approach	Above/ Below HWL	In/out of water
Work area preparation	Any existing vegetation, log, timber, metal, and anthropogenic debris will be removed prior to work commencing.	<p>Debris and vegetation located within the Project footprint will be removed manually by the Contractor.</p> <p>Debris collected will be contained to be disposed of at an offsite facility. The Contractor will be required to remove existing invasive plant species in a manner that will prevent further spread and in accordance with best practices. Native species will be manually removed by cutting, and species identified to be invasive will be removed entirely, including roots.</p>	Above and below	Out
Slope preparation	Existing riprap and boulders will be removed, if required, prior to grading of the slope as per design drawings, after which the shoreline will be prepared to create a uniform surface for placement of geotextile and rock.	<p>Removal of existing rock will be completed by land-based equipment and will be completed in out-of-water tidal conditions from the top of the bank. The rocks will be collected, contained, and disposed offsite or stockpiled for use in the final works if it meets the material specifications.</p> <p>Preparation of the slope is expected to be performed by land-based equipment from the top of the bank to create a uniform surface and will be completed in out-of-water tidal conditions. Where possible, material on the slope will be used to balance cut and fill quantities and minimize the requirement for imported fill; however, if required, the volume of fill required is not expected to exceed 25 m³ at the Project Site. The Contractor is expected to work in sections such that the unprotected slope is not exposed during the tidal cycle.</p>	Above and below	Out
Placement of geotextile and rock	Placement of geotextile, filter rock, riprap, and backfill (as required) as per design drawings.	<p>Placement of geotextile, filter rock, riprap, and fill (if required, see design drawings) is expected to be performed by land-based equipment staged at the top of the bank, and will be completed in out-of-water tidal condition to the extent feasible.</p> <p>The Contractor is expected to complete placement activity in sections such that the unprotected slope is not exposed during the tidal cycle.</p>	Above and below	Out
Vegetation plantings	Planting native vegetation at toe of riprap and top of bank.	<p>Site preparation with existing native soils and vegetation. Mitigations will be implemented to remove and avoid the spread of any invasive species identified. Vegetation will be planted according to tidal heights and preferred conditions in the Project Area.</p>	Above and below	Out

3.3 Construction Schedule

Project activities are scheduled to occur during the DFO recommended least-risk work window for the Project location (Area 29, Steveston/Surrey – Fraser River Estuary Oak Street Bridge/George Massey Tunnel to Mission Bridge: June 16 to February 28 (DFO 2014)). The Project is anticipated to require up to three weeks to complete.

A noise by-law exemption permit will be required for Project activities should daytime tides be unfavourable outside of the permitted working hours of 7:00 am to 8:00 pm on weekdays and 9:00 am to 6:00 pm on Saturdays as stipulated by the City of New Westminster Construction Noise By-Law No. 6063, 1992 (Corporation of the City of New Westminster 1992). The Contractor will apply for a noise by-law exemption permit in the event it is required.

3.4 Equipment

Project activities will be completed primarily from the top of the bank using land-based equipment due to limited access with water-based equipment at the Project location. Construction equipment will be determined by the Contractor and is expected to include excavator(s) and containers for holding debris. Project site access will be expected to be by land. Equipment and material staging areas will be upland (above the HWL) and will be agreed upon between the Contractor and the City.

4 Potential Environmental Effects

The Project has the potential to affect fish and fish habitat from the following activities:

- Site preparation and rock placement
- Use of construction equipment
- Fueling equipment causing accidental hydrocarbon spills

Potential environmental effects generated due to the Project include the following:

- Alteration of fish habitat
- Change to water quality
- Change in fish access and use
- Change in air quality

Appropriate mitigation and monitoring measures have been developed and are described in Section 5.0.

5 Environmental Management

5.1 Project Organization

The responsibility and authority pertaining to environmental management roles of key City personnel, Health, Safety, and Environment personnel, environmental specialists, Environmental Monitor (EM), and the Contractor is described in this section.

5.2 Roles and Responsibilities

Table 5-1 List of Roles and Responsibilities for Environmental Management

Role	Responsibility
Proponent (the City)	Responsible for the overall environmental management of the Project.
	Provide the Contractor with a copy of this CEMP
	Confirm a communication plan is in place with the Contractor for appropriate reporting (e.g. weekly reports, non-compliance).
Environmental Monitor (EM)	EM will be a QEP with experience in marine construction environmental management.
	Provide independent verification of the implementation of the City commitments and obligations and to monitor general environmental compliance.
	Reporting commitments as detailed in Section 6.
	The EM can direct the Project Manager to direct the Contractor to stop a construction activity if the activity is deemed to pose a risk to the environment.
Contractor	Review and adhere to the Chance Find Management Procedure (CFMP).
	Prepare a Spill Prevention and Emergency Response Plan
	Understand and adhere to the CEMP and undertake the following: <ul style="list-style-type: none"> • Induction/training for personnel regarding potential environmental effects, the requirements of the CEMP, and Emergency Response Procedures. • Conduct regular inspections of work procedures and equipment operation to confirm compliance with standard procedures. • Check regular inspections of spill response measures and secondary containment to confirm compliance and containment goals are met.

5.3 Guidelines and Best Management Practices

Guidelines and Best Management Practices (BMPs) that were used in developing this CEMP include:

- Projects Near Water: British Columbia Marine/Estuarine Timing Windows for the Protection of Fish and Fish Habitat (DFO 2014)
- Standards and Best Practices for In-Stream Works (BC MWLAP 2004)
- Requirements and Best Management Practices for Making Changes In and About A Stream in British Columbia (BC FLNRORD 2022)
- BC Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture - Summary Report - August 2019 (BC ENV 2018).
- Water Quality Guidelines for the Protection of Aquatic Life (CCME 1999)
- A User's Guide to Working in or Around Water (BC ENV 2005)
- DFO: Fish and Fish Habitat Protection Policy statement (DFO 2019a)
- DFO: Measures to Protect Fish and Fish Habitat (DFO 2019c)
- Avoiding Harm to Migratory Birds (ECCC 2018a,b)
- A Manual for Integrated Weed Management in British Columbia (BC MoAFF 2002)
- A Field Guide to Noxious Weeds and other Selected Invasive Plants of British Columbia (ISCBC 2014)
- Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia (BC ENV 2014)
- Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia (BC ENV 2013)

5.4 Mitigation Measures

The City should engage a QEP to monitor Project activities in accordance with pertinent permits and approvals and this document. The Contractor should maintain and retain any records associated with, or produced by, actions or activities undertaken to achieve compliance or that indicate non-compliance with this document. The Contractor should provide relevant information to the City to support appropriate documentation as required. These records must be made available at the request of regulatory authorities.

Table 5-2 Activities, Potential Environmental Effects and Proposed Measures to Mitigate Harm to the Environment

Activities	Potential Environmental Effects	Proposed Mitigation and Monitoring Measures	Residual Effects
Fueling equipment, storage	Change in water quality	<ul style="list-style-type: none"> Follow best management practices (BMPs) for works occurring in and around the aquatic environment. The Contractor shall develop and implement a Spill Prevention and Emergency Response Plan to prevent deleterious substances from entering the environment. Storage of fuels shall have secondary containment and be stored in an upland location at a minimum of 30 m from the HWL. Hazardous waste and materials shall be classified and labelled according to the Workplace Hazardous Materials Information System (WHMIS). Hazardous waste and materials shall be stored on a firm working surface that is impervious to leaks. Records are to be maintained indicating the type and quantity of waste being stored along with the date, type and quantity of hazardous waste brought into or removed from the Project Site. 	No residual effects are anticipated.
Use of construction equipment	Change in water quality Change in air quality	<ul style="list-style-type: none"> Project activities will be completed in out-of-water tidal conditions and scheduled within the DFO least-risk window for the area Steveston/Surrey – Fraser River Estuary Oak Street Bridge/George Massey Tunnel to Mission Bridge (June 16 to February 28). The Contractor shall minimize disturbance of the riverbed or intertidal area outside the Project site and avoid transiting of equipment within intertidal habitat. The Contractor shall repair and/or remediate any damage or erosion resulting from disturbance to the foreshore outside of the Project site. Construction equipment will operate from the shore and top of the bank, and minimal in-water works are expected; however, work will be scheduled to occur during the least-risk window to minimize the potential for activities to cause HADD to fish. Work is expected to be conducted using land-based equipment only. However, if required, barges or other vessels used during the Project are not permitted to ground on the foreshore or riverbed or disturb these areas (including through vessel propeller wash), except where disturbance resulting from the use of barge spuds. 	No residual effects are anticipated.

Activities	Potential Environmental Effects	Proposed Mitigation and Monitoring Measures	Residual Effects
		<ul style="list-style-type: none"> The Contractor shall not permit sediment, sediment-laden waters, or other deleterious substances to enter the water during the Project. The Contractor shall carry out physical activities in a manner that prevents induced sedimentation of foreshore and near shore areas and induced turbidity of local waters, and the release of sediment, sediment-laden waters, and turbid waters to the aquatic environment. Project activities will be ceased if there is a risk of physical harm to marine mammals from direct contact. Project activities will only resume once there is no longer risk of injury. Idling of construction equipment and vehicles will be minimized. Vehicles should remain on roadways and not transit through vegetated areas. Machinery and equipment will be maintained in good working order to minimize emissions. 	
Rock placement	<p>Alteration of habitat for fish, molluscs, birds, and other aquatic species that may depend on these habitats.</p> <p>Change in access and use</p>	<ul style="list-style-type: none"> The Contractor (or EM) shall identify any invasive species prior to vegetation clearing. Mitigations will be implemented to remove and avoid the spread of invasive species. The Contractor shall use reasonable efforts to retain existing native riparian vegetation and native soil. Tree removal should be avoided where possible. With the exception of identified invasive species, removal of vegetation shall be performed by cutting. Removal of invasive vegetation will require removal of the whole plant including roots. All construction structures, debris, sediment, and soil will be transported off-site to an Approved Facility or stockpiled for use in the final works if it meets the material specifications. Materials brought onto the Project site to be used for infilling, site preparation, or other uses shall be from sources demonstrated to be clean and free of environmental contamination, invasive species and noxious weeds. The Contractor/the City shall maintain records to verify this. Riprap and rock shall be clean and free of fines and shall be lowered and deposited onto the slope and not dumped or deposited from height. The Contractor shall use an environmentally clean excavator bucket. The bucket and any portion of the excavator arm that will be in contact with or near the water shall be cleaned of any residual hydrocarbons or other contaminants prior to the start of the Project. Sediment and Erosion control (SEC) measures, such as sediment traps and silt fences, will be implemented during land-based construction, as required. The Contractor will confirm the laydown area required for stockpiling riprap, boulder or other construction materials is secure. 	<p>Placement of rock along the shoreline will change the habitat from soft sands to hard substrate; however, revegetation will increase connectivity and quality of habitats at the Project site. No residual effects are anticipated.</p>

Activities	Potential Environmental Effects	Proposed Mitigation and Monitoring Measures	Residual Effects
		<ul style="list-style-type: none"> • There shall be no in-water activity during the fisheries sensitive period from March 1 to June 15, inclusive. • The Contractor shall cease work and notify the City if the Project has impacted fish or fish habitat, including observation of distressed, injured, or dead fish. The event should be reported to DFO through the DFO-Pacific Observe, Record and Report phone line (toll free) at 1-800-465-4336. • All in-water works will cease in the event that spawning activity or evidence of spawning (egg masses) are observed near or attached to the structures until a QEP can provide guidance for the continuation of works. 	
Vegetation Removal and Planting	Change in wildlife and/or fish habitat	<ul style="list-style-type: none"> • The Contractor will use reasonable efforts to retain existing native vegetation and soil. Disturbance or clearing of vegetation should be staged and limited to that required for the Project. • The Contractor should not disturb the riverbed or intertidal area outside the Project area and avoid transiting of equipment within intertidal habitat. • Tree removal should be avoided where possible. All trees set for removal will be marked. Trees shall be felled by a qualified professional. • Buffers or exclusion zones shall be implemented, in the event a sensitive species or feature (e.g., nests) are identified, to mitigate wildlife disturbance. Note that the nest of an eagle, peregrine falcon, gyrfalcon, osprey, heron or burrowing owl are protected year-round regardless of whether or not the nest is occupied. Such features shall be surveyed ahead of Project activities. • All workers will be made aware of their obligation to report migratory birds and their nests. Nests shall be reported to the Contractor and disturbance to the nest shall not occur unless a qualified wildlife professional is consulted for appropriate avoidance or mitigation measures. • If construction is to occur during the bird nesting window, a non-intrusive nest sweep and raptor/owl survey will be conducted by a QEP. Construction will begin no later than seven (7) days following the survey. All bird nests protected under the MBCA will be avoided and protected with a no-activity set-back distance determined by the QEP. • Permanent vegetation removal will occur only in the Project footprint. • Additional details are provided in the Rehabilitation and Effectiveness Monitoring Plan for the Project. • Only native plant species will be sourced and planted on site. 	No residual effects are anticipated.

5.5 Spill Prevention

It is recommended that the Contractor prepare a Spill Prevention and Emergency Response Plan. The Contractor should have spill response procedures in place and include specific instructions regarding applicable contacts and appropriate response actions in the event of a spill. The purpose of these plans is to establish policies, procedures, and an organizational hierarchy for response to emergencies that could occur during the Project. The Spill Prevention and Emergency Response Plan should include the following:

- Procedures and methods to prevent spillage of deleterious substances or construction debris into the aquatic environment.
- Reportable incidents should be documented and investigated by the City to determine the cause. The incident reports will be prepared by the Contractor. Additional mitigation or updates to this document will be implemented to prevent the recurrence of any similar event.
- Fuel and maintenance of equipment should be conducted to minimize and prevent spills to the aquatic environment. If fueling is to occur in or near the aquatic environment, secondary containment shall be used.
- Fuel tanks used for refuelling should be equipped with secondary containment of 110% of the fuel stored.
- Fuel transfer lines should be equipped with check valves to prevent spillage in case of equipment failure.
- Equipment should have vegetable-based hydraulic fluid.
- Fuel-carrying equipment should be accompanied with spill prevention, containment, and clean-up materials that are suitable for the volume of fuels carried.
- Hydraulic, fuel, and lubrication systems of equipment used in or near the water should be inspected periodically to ensure that the systems are in good condition and free of leaks.
- Equipment should be maintained and in good working order to prevent leaking or spilling of deleterious substances into the aquatic environment (e.g., hydraulic fluid, diesel, gasoline). The Contractor will document a maintenance program to confirm construction equipment is in good working order.
- Workers should be trained in the spill prevention and response requirements during site induction and subsequent toolbox talk sessions.
- A boom will be available on site in the event of a spill, and all equipment should have a spill kit readily available. The Contractor personnel are to be trained in the deployment of this emergency spill equipment.

5.6 Monitoring Measures

The City will be represented by a QEP and an EM for environmental performance of work crews during the Project. The EM(s) will work under the supervision of the QEP and will be responsible for ensuring adherence to this CEMP and any additional regulatory requirements.

The environmental team will engage with the City to establish a monitoring schedule. The duration of the EM visit may not warrant a full day of presence and will be determined by the planned scope of work, the

environmental observations, and in agreement with the City. If there are no observations of visual turbidity or non-compliances observed, then the EM will visit the site intermittently throughout the construction to confirm project activities are in compliance regulatory requirements and with this CEMP. On site presence is expected to be a minimum of two to three times a week for a half day and during the commencement of Project activities at the Project Site.

5.6.1 General Monitoring

The primary responsibilities of the EM will be to:

- Conduct semi-regular (minimum two to three times a week) monitoring
- Conduct monitoring full time during start-up and during all in-water Project activities or sensitive activity.
- Undertake additional monitoring during higher risk activities, such as equipment encroachment near aquatic environments, or those associated with emergency events.
- Communicate with the onsite Contractor and provide information to support decisions and to avoid or respond to potential environmental effects or incidents.
- Ensure all BMPs and mitigation measures are in place to avoid and minimize environmental impact on the land and on fish and fish habitat of the stream.
- Visual monitoring of construction for signs of stressors on terrestrial or aquatic species, fish kills, any fish spawning/migration activity, or HADD to fish and fish habitat. All works will cease in the event fish kill/injury or HADD to aquatic or terrestrial wildlife is observed near the works until a QEP can provide guidance for the continuation of works.
- Routinely check to verify that all equipment in use at Project site is in good working condition.
- Routinely check to determine that the required emergency response materials, including the spill kits, are onsite during Project construction.
- Ensure erosion and sediment control measures are implemented, where required, and constructed, installed, and maintained for the full duration of in-water Project activities.
- Confirm that the CEMP is being adhered to.
- Report any non-compliance or unplanned events immediately to the City.

5.6.2 Visual Monitoring

Visual monitoring during construction will be ongoing for signs of stressors on aquatic species, fish kills, or any fish spawning/migration activity. All in-water Project activities will cease in the event of schooling herring, fish kill/injury, stress, or HADD to aquatic wildlife observed near works until a Qualified Professional (QP), FLNRORD, and DFO can provide guidance for the continuation of work.

5.6.3 Turbidity Monitoring

Project activities are expected to be completed in out-of-water tidal conditions. However, in the event there are concerns/considerations for effects to water quality based on visual monitoring, turbidity compliance monitoring will be conducted based on provincial (BC ENV 2018) and federal (CCME 2014) WQG for turbidity. These are summarized in Table 5-3.

Should compliance monitoring be required, turbidity will be measured, as a minimum, once per day at 30 m from the construction activity, provided it is safe to do so. If construction activities do not allow for safe access, turbidity measurement will be taken at the closest safe distance. To confirm compliance, the EM will select a reference/control site nearby that is not affected by the Project to act as the background concentration. A measurement at the control site will be taken within 1 hour of the compliance measurement, and on the same tidal cycle.

Table 5-3 Turbidity Guidelines and Criteria

Guideline	Criteria
ENV Approved WQG	<ol style="list-style-type: none"> 1) When background is less than or equal to 50 nephelometric turbidity units (NTU), induced turbidity shall not exceed 5 NTU above the background values. 2) When background is greater than 50 NTU, induced turbidity shall not exceed the background values by more than 10% of the background value.
Canadian Council of Ministers of the Environment (CCME)	<ol style="list-style-type: none"> 1) For Clear Flow Water: maximum increase of 8 NTUs from background levels for a short-term exposure (e.g. 24-hour period). Maximum average increase of 2 NTUs from background levels for a longer-term exposure (e.g. 30-day period). 2) For High Flow or Turbid Waters: maximum increase of 8 NTUs from background levels at any one time when background levels are between 8 NTUs and 80 NTUs. Should not increase more than 10% of background levels when background is >80 NTUs.

5.6.4 Sediment Erosion Control

The Contractor will be responsible for implementing and maintaining sediment and erosion controls. The EM will verify appropriate controls have been put in place.

5.6.5 Weed Management

To prevent the inadvertent establishment and spread of weeds and invasive plants, particularly noxious weeds (according to the BC *Weed Control Act*), the following procedures will be conducted:

- All equipment will be thoroughly inspected and cleaned (free of dirt and vegetative material) prior to arrival on the Project site *and* prior to leaving the Project site.
- The preferred method, near water, for weedy vegetation removal is by hand or mechanical means prior to flowering or seed-set. Where these options are not feasible or are unlikely to be effective, appropriate herbicide selection and use will be conducted by qualified personnel operating in accordance with the *Integrated Pest Management Act*. If herbicide is used, mechanical brushing or mowing will only be conducted seven days before or after treatment.
- Best effort will be made to avoid using aggregate, borrow, and other material containing invasive plants. Where not possible to avoid, infested sources of material will be documented, reported, and monitored for control.
- Species-specific weed control will be determined following discussion with a qualified professional. All noxious and invasive species of concern will be documented and reported. Noxious and invasive species of concern previously identified at the Project sites include (ISCBC 2014):
 - Himalayan blackberry (*Rubus armeniacus*)

- Vegetation material and soil containing invasive plants will be disposed of at a designated disposal site.
- Certificate of seed analysis will be obtained for all seed mixes prior to application to reduce the risk of introducing a weed species to the area. Native vegetation species are to be selected, where possible, when revegetation is conducted or when vegetation is required for prevention/control of soil erosion. Ideal mixtures include species that are locally adapted, non-persistent, and quick to establish.
- Re-establishment of vegetation will be conducted as soon as practical after ground disturbance, where appropriate.

5.6.6 Wildlife

The nesting period for migratory birds at the Project site is from late-March to mid-August, but some species can nest outside this period (ECCC 2018a). All clearing activities will be conducted outside the nesting period. If clearing during the nesting period were to occur, the Project sites will be surveyed for migratory birds and bird behaviour indicative of nests prior to any construction activity. The survey will be conducted no more than seven days prior to commencement of activities and must be repeated if construction does not initiate as planned (within seven days). If activities are halted for more than seven days within this period, the survey must be repeated. The survey must be performed by a wildlife QEP.

6 Reporting

6.1 Reporting Frequency

A weekly Environmental Monitoring summary should be prepared by the EM summarizing Project progress. The monitoring reports will be submitted to the City and will be available for submission to other regulatory authorities, including the Ministry of Forests or DFO-FFHPP, if requested.

6.2 General Reporting

A monitoring report will be weekly. The EM will have detailed notes from each day they are present on site which will inform the reports. The reports will, at a minimum, contain:

- Project site area and task description.
- Name(s) of EM on-site.
- Date of the work report period covered and date the report was submitted.
- Weather conditions.
- Equipment used and its state of repair.
- Report on construction activities by area and include a description, photos and status.
- Pertinent water quality and sampling data results.
- Environmental meeting notes (including tailgate) and key issues discussed.
- Design updates and construction activities for that period.
- Mitigation measures implemented during that period as well as any future proposed activities.
- Outstanding environmental issues and/or non-compliances, including corrective actions.
- Environmental incident reports.
- Photo record of construction activities, particularly those identified as potentially harmful to the environment.
- Water sampling data and/or exceedances, as deemed relevant.

6.3 Incident and Non-Compliance Event Reporting

The Contractor will be responsible for reporting any incidents to the City and pertinent RAs in collaboration with the Project Manager, the QEP, and the EM as soon as possible (within 24 hours).

Table 6-1 contains contact information for all incident reporting requirements. Additional reporting requirements of regulatory agencies for incident and non-compliance events are outlined in the sections below.

Table 6-1 Incident Reporting Contact Information

Name	Role	Organization	Phone Number	E-Mail
Fisheries and Oceans Canada (DFO)	Observe, Record, and Report (ORR)	DFO	1-800-465-4336	DFO.ORR-ONS.MPO@dfo-mpo.gc.ca
Environment and Climate Change Canada (ECCC)	Environmental Emergency Reporting (Pollution Incident)	ECCC	1-800-663-3456	---
	Canadian Wildlife Service	ECCC	1-800-668-6767	ec.enviroinfo.ec@canada.ca
Canadian Coast Guard (CCG)	Reporting a Pollution Incident (Marine-Based)	CCG	1-800-889-8852	---
ENV 24-Hour Emergency Reporting	---	BC ENV	1-800-663-3456	---
Emergency Management BC (EMBC)/Provincial Emergency Program (PEP)	---	EMBC/PEP	604-660-2421 1-800-663-3456	---
NAVWARN	---	CCG	1-250-627-3070	https://www.marinfo.gc.ca/enav/pacific-pacifique/pacific-pacifique-n4-eng.php
Emergency Medical Services	---	Police, Fire, Ambulance	911	---
kʷikwəłəm First Nation	Stewardship interests	kʷikwəłəm First Nation	--	referrals@kwikwetlem.com

7 Adaptive Management

During the Project, it may be necessary to modify methodology and address site conditions not initially foreseen. Should adaptive measures be required, the EM on site, in conjunction with the Contractor and the City will develop the update to the methodology. The EM will then evaluate any additional potential environmental effects or regulatory requirements. Mitigation measures will be updated.

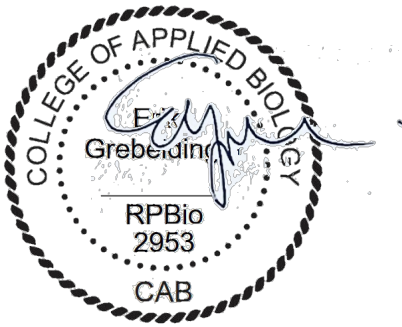
The City will include referrals@kwikwetlem.com on any correspondence regarding methodological modifications or other adaptive management considerations.

8 Closure

We trust that this letter meets your current needs. Please do not hesitate to contact the undersigned if you have any questions or concerns.

Sincerely,

Approved by:



Erika Grebeldinger, M.Sc., R.P.Bio.
Senior Marine Biologist

Helen Ambrose
Senior Coastal Engineer, Project Manager

Environment & Water
Advisian | US & Advisian Americas

Enc

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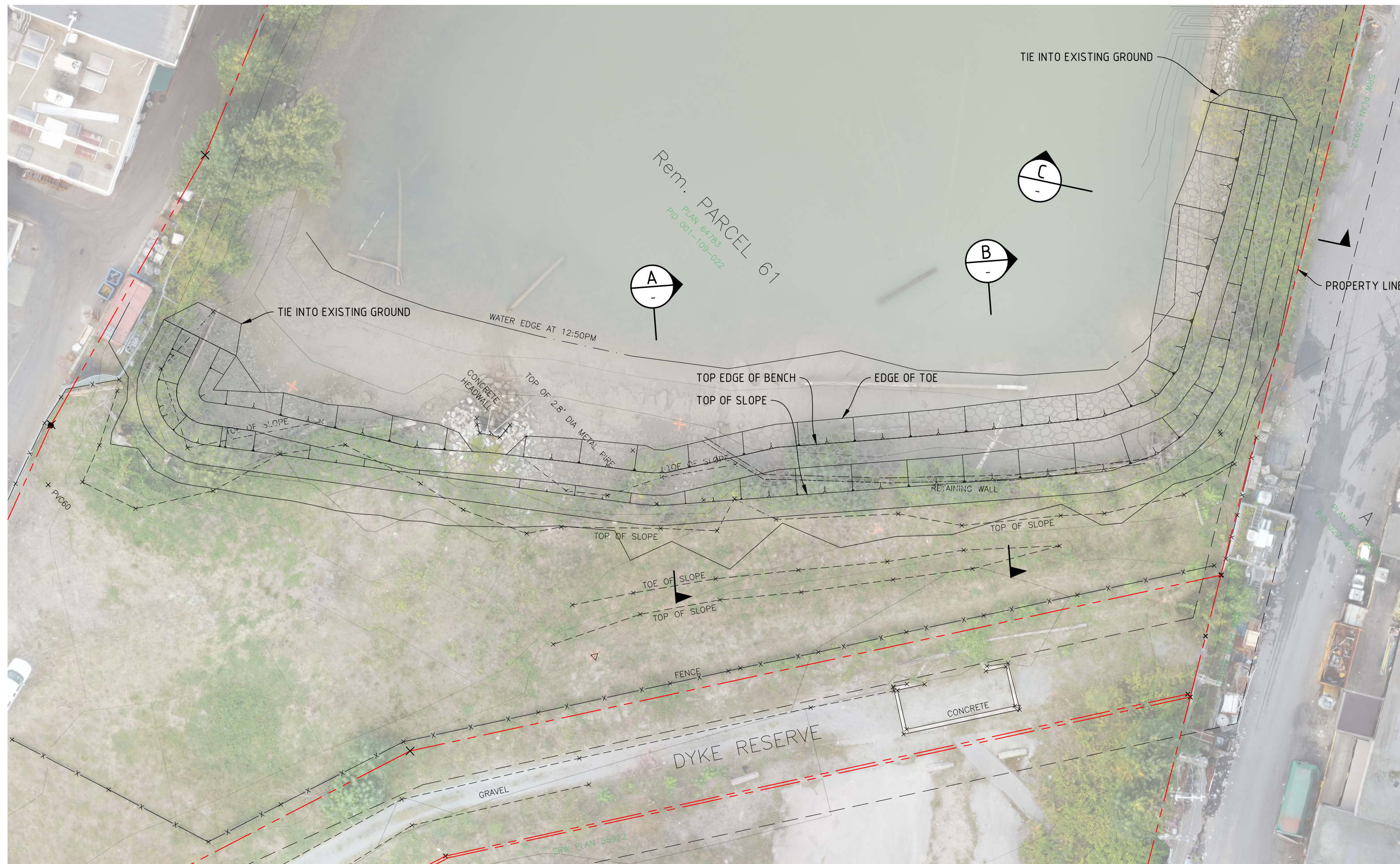
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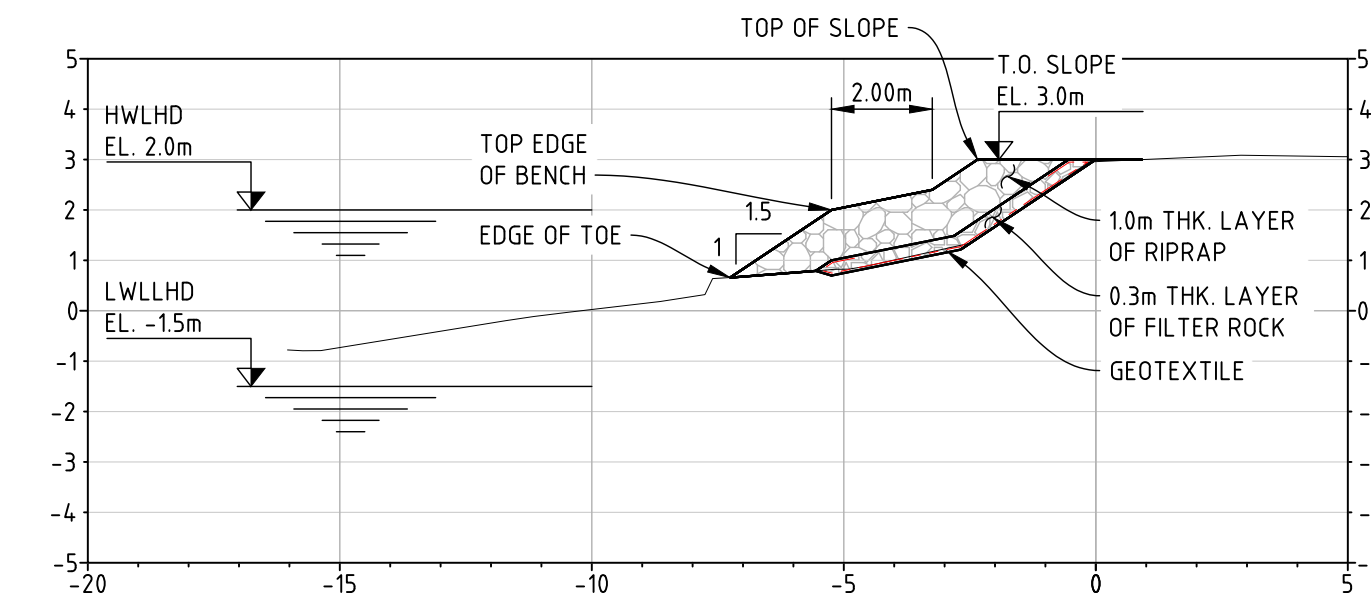
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Appendix 1 Design Drawing

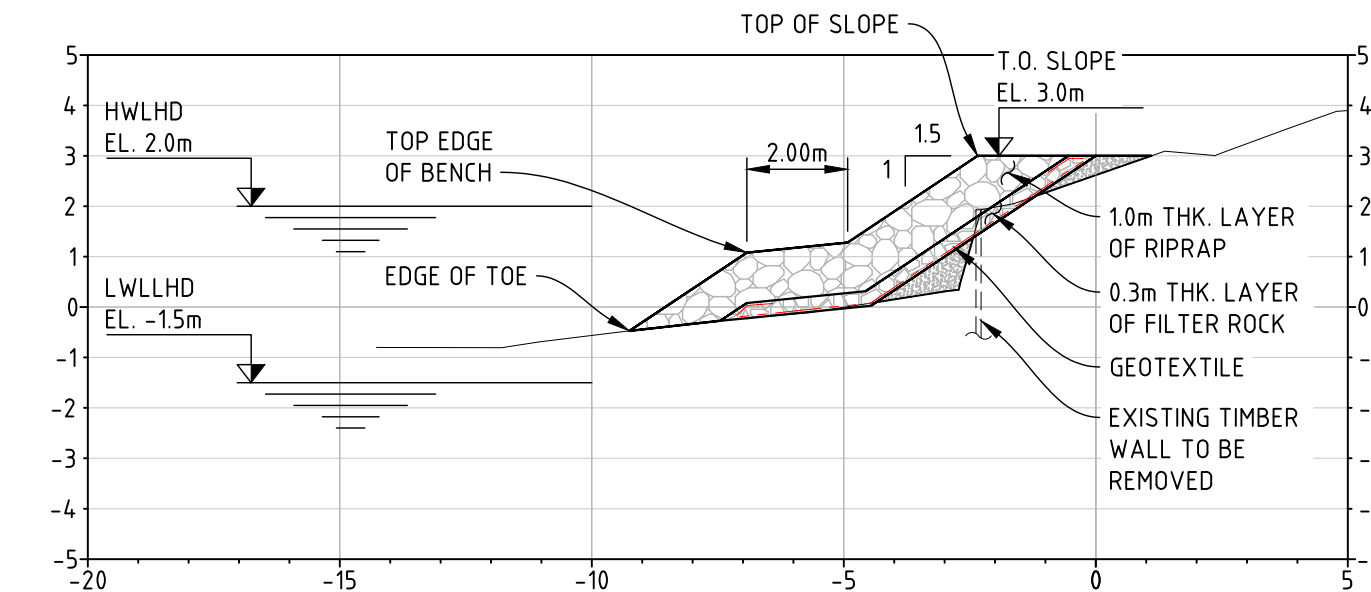


PLAN
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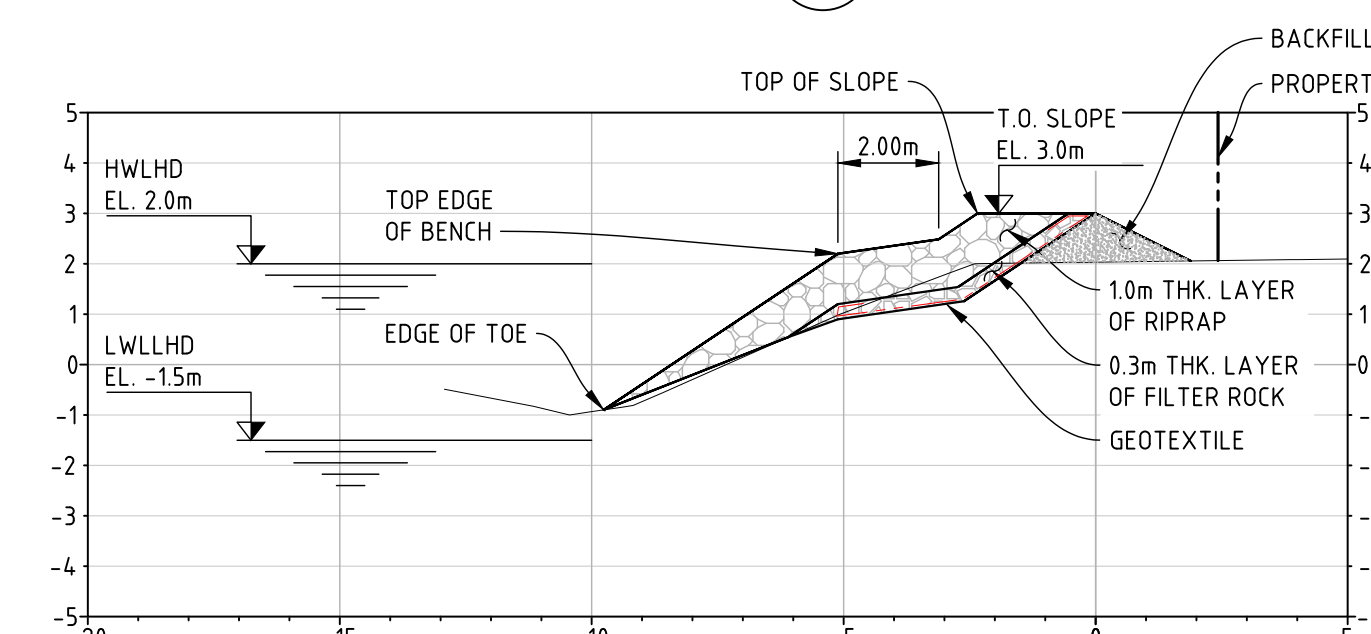


SECTION A
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NOTE: RIPRAP SLOPE IS 15:1 TYP.



SECTION B
1:150



SECTION C
1:150

DESIGN CRITERIA:

- 1.0 GENERAL**
- 1.1 THE REVETMENT HAS BEEN DESIGNED IN ACCORDANCE WITH THE PRINCIPLES OUTLINED IN THE FOLLOWING DOCUMENTS:
- SHORELINE PROTECTION MANUAL (SPM) 1984
 - COASTAL ENGINEERING MANUAL (CEM) 2006
 - GUIDELINES - SHORELINE PROTECTION (FRASER RIVER) INSPECTION, MAINTENANCE, DESIGN AND REPAIR (VER 1.0), VANCOUVER FRASER PORT AUTHORITY, JAN 2020.

2.0 DESIGN WAVES AND DESIGN CURRENT

- 2.1 THE SITE IS EXPOSED TO WAVES GENERATED BY VESSEL TRAFFIC AND FLOOD CURRENT IN FRASER RIVER. DESIGN WAVES AND DESIGN CURRENTS ARE AS FOLLOWS:

DESIGN CRITERIA	VALUE
BOAT WAKE WAVES	H = 1.2m T = 3.0s
FLOOD CURRENT	V = 4.5 m/s

3.0 PROJECT DATUMS AND TIDE ELEVATIONS

- 3.1 ALL ELEVATIONS ARE IN METRES AND ARE REFERENCED TO GEODETIC DATUM (GD). CONVERSIONS BETWEEN GEODETIC DATUM AND CHART DATUM (CD) ARE AS FOLLOWS:

$$CD = GD + 15 \text{ m}$$

- 3.2 TIDE ELEVATIONS ARE AS FOLLOWS:

DESCRIPTION	ABBREVIATION	ELEVATION (m GD)
HIGH WATER LEVEL, HIGH DISCHARGE	HWLHD	2.0
LOW WATER LEVEL, LOW DISCHARGE	LWLLD	-1.5

GENERAL NOTES:

- 1.0 GENERAL**
- 1.1 HORIZONTAL DATUM: UTM NAD83, ZONE 10 NORTH.
- 1.2 TOPOGRAPHIC SURVEY COMPLETED BY UNDERHILL GEOMATICS, SEPTEMBER 30, 2020.
- 1.3 ALL LOCATIONS AND ELEVATIONS OF EXISTING ELEMENTS AS SHOWN ON THE DRAWINGS ARE APPROXIMATE VALUES ONLY, AND ARE SUBJECT TO CONSTRUCTION VARIATIONS. THE CONTRACTOR SHALL VISIT THE SITE OF THE WORK, TAKE THEIR OWN MEASUREMENTS OF ALL EXISTING STRUCTURES, GROUND AND OTHER WORK, MAKE THEIR ESTIMATE OF ACTUAL JOB CONDITIONS AND THE CORRECTNESS OF THE INFORMATION GIVEN. ALL DIMENSIONS AND DETAILS SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. DISCREPANCIES SHALL PROMPTLY BE BROUGHT TO THE ATTENTION OF THE ENGINEER.

2.0 SITE PREPARATION

- 2.1 REMOVE ALL EXISTING LOGS, TIMBER, BOULDERS, PILES, METAL DEBRIS AND OTHER DELETERIOUS MATERIALS WITHIN 300mm OF EXISTING SITE GRADE, WITHIN THE WORK AREA.
- 2.2 STRIP AND REMOVE ORGANIC SURFACE MATERIALS FROM THE EXISTING SHORELINE BANKS WITHIN THE WORK AREA.
- 2.3 DISPOSE OF ALL REMOVED MATERIALS OFF SITE, IN ACCORDANCE WITH MUNICIPAL, PROVINCIAL, AND FEDERAL REGULATIONS.
- 2.4 CONTRACTOR IS RESPONSIBLE FOR IDENTIFYING BURIED SERVICES AND UTILITIES.
- 2.5 CONTRACTOR RESPONSIBLE FOR REINSTATING SURFACE IN WORK AREA AS CLOSE AS POSSIBLE TO EXISTING CONDITIONS POST CONSTRUCTION.

SLOPE PROTECTION:

1.0 ROCK MATERIALS

- 1.1 ALL ROCK MATERIALS SHALL BE APPROVED BY THE ENGINEER/OWNER PRIOR TO INSTALLATION.
- 1.2 ALL ROCK MATERIALS SHALL BE ROUGH ANGULAR QUARRIED STONE OF A DENSE, HARD, DURABLE CHARACTER, FREE OF ORGANIC MATERIALS, UNFILLED JOINTS, SEAMS OR OTHER DEFECTS, RESISTANT TO BREAKDOWN BY HANDLING, FROST ACTION OR WEATHERING, AND NOT SUBJECT TO DETERIORATION IN SEA WATER. AS A MINIMUM, ROCK SHALL MEET THE FOLLOWING:

TEST #	TEST	REQUIREMENT
1	ABSORPTION (ASTM C127)	NOT MORE THAN 2.0%
2	ABRASION, 1000 REVOLUTIONS (ASTM C535)	NOT MORE THAN 20.0% LOSS
3	MAGNESIUM SULFATE SOUNDNESS, (ASTM C88)	NOT MORE THAN 15.0% LOSS
4	PETROGRAPHIC EXAMINATION	ABSENCE OF WEAKNESS OR MATERIALS THAT COULD RESULT IN SIGNIFICANT STONE ALTERATION AND REDUCTION IN DURABILITY
5	DEGRADATION (ASTM D3744)	NO INDEX LESS THAN 35

- 1.3 THE ROCK SHALL HAVE A UNIT MASS NOT LESS THAN 2650 kg/m³, I.E. A SPECIFIC GRAVITY NOT LESS THAN 2.65 (SD).
- 1.4 THE ROCK SHALL BE GRADED BETWEEN THE LIMITS SPECIFIED, WITH THE LONGEST DIMENSION OF ANY PIECE NOT GREATER THAN 2.5 TIMES ITS LEAST DIMENSION.

$$D = 1000 \times \left(\frac{W}{2650} \right)^{1/3}$$

WHERE MASS (W) IS IN KG AND D IS THE NOMINAL SIZE IN MM.

1.6 RIPRAP SHALL MEET THE FOLLOWING GRADATION:

MASS (kg)	PERCENT LESS THAN (BY WEIGHT)	NOMINAL SIZE (mm)
1324	100	800
662	60-100	630
497	50-75	572
331	25-50	500
103	0-15	338
41	0	250

1.7 FILTER ROCK SHALL MEET THE FOLLOWING GRADATION:

MASS (kg)	PERCENT LESS THAN (BY WEIGHT)	NOMINAL SIZE (mm)
72	100	300
9	60-100	150
1	30 - 50	75
-	0 - 25	38
-	0	25

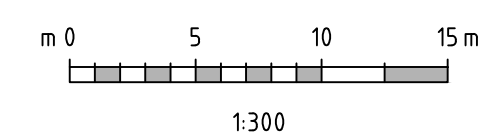
1.8 BACKFILL SHALL MEET THE FOLLOWING GRADATION:

MASS (kg)	PERCENT LESS THAN (BY WEIGHT)	NOMINAL SIZE (mm)
9	100	150
1	80-100	75
-	40 - 60	25
-	0 - 30	10
-	0	1

- 1.9 GEOTEXTILE SHALL BE NONWOVEN, STAPLE FIBER, NEEDLEPUNCHED, POLYPROPYLENE GEOTEXTILE. GEOTEXTILE SHALL BE RESISTANT TO UV DEGRADATION AND BIOLOGICAL AND CHEMICAL ENVIRONMENTS NORMALLY ENCOUNTERED IN COASTAL ENVIRONMENT. GEOTEXTILE SHALL MEET THE FOLLOWING MINIMUM VALUE REQUIREMENT:

TEST #	TEST	REQUIREMENT
1	TENSILE STRENGTH (ASTM D 4632)	1560 N
2	ELONGATION AT FAILURE (ASTM D 4632)	50%
3	PUNCTURE RESISTANCE (ASTM D 4883)	530 N
4	BURST STRENGTH (ASTM D-3786)	3450 kPa

GEOTEXTILE SHALL BE GEOTEX 1601 OR APPROVED EQUIVALENT.



REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	QAR	REF DRAWING No	REFERENCE DRAWING TITLE
B	12-JAN-22	RE-ISSUED FOR CLIENT REVIEW	AAL	-	GY	JRG	JRG	AJP		
A	01-DEC-20	ISSUED FOR CLIENT REVIEW	AAL	-	GY	-	JRG	-		

D SHEET SCALE SHOWN

ENGINEERING AND PERMIT STAMPS (As Required)

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PRELIMINARY
DO NOT USE FOR CONSTRUCTION
Last Saved: Jan. 12/22 3:41pm

CUSTOMER

NEW WESTMINSTER

WORLEY PROJECT No
317071-00039

Advisian
Worley Group

**QUEENSBOROUGH DIKE LOCATION 2
SHORELINE PROTECTION REHABILITATION
PLAN AND SECTIONS**

DRG No
317071-00039-00-MA-DGA-1511

REV
B

USER NAME: aaron.lehsham

LOCATION: U:\YVR\317071\00039_CNV_SHPROGNW\1T_DRAWINGS\15_1_AND_E\01_COASTAL\317071-00039-00-MA-DGA-1510-1510DWG

PLOT DATE & TIME: 12/12/2022 3:43:15 PM

SAVE DATE & TIME: 12/12/2022 3:41:21 PM