Kenyon Creek at Redrooffs Road
Sechelt, BC

Environmental Overview Assessment

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PGL ENVIRONMENTAL CONSULTANTS

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Table of Contents

LIST OF FIGURES

LIST OF TABLES

In text

Appended

LIST OF APPENDICES

List of Acronyms

BEC	-	Biogeoclimatic Ecosystem Classification
CDC	-	BC Conservation Data Centre
COSEWIC	-	Committee on the Status of Endangered Wildlife in Canada
CSP	-	Corrugated Steel Pipe
CWHxm1	-	Eastern Very Dry Maritime Subzone of the Coastal Western Hemlock
DFO	-	Fisheries and Oceans Canada
ENV	-	BC Ministry of Environment and Climate Change Strategy
EOA	-	Environmental Overview Assessment
HADD	-	harmful alteration, disruption, or destruction
MOE	-	BC Ministry of Environment (currently ENV)
MOTI	-	Ministry of Transportation and Infrastructure
PGL	-	PGL Environmental Consultants
QEP	-	Qualified Environmental Professional
SAR	-	Species at Risk
SARA	-	*Species at Risk Act*
SEI	-	Sensitive Ecosystem Inventory
WSA	-	*Water Sustainability Act*
WQG	-	water quality guidelines

1.0 INTRODUCTION AND BACKGROUND

The Ministry of Transportation and Infrastructure (MOTI) retained PGL Environmental Consultants (PGL) to complete an Environmental Overview Assessment (EOA) of proposed flood damage remediation works (the Project) to Redrooffs Road at Kenyon Creek on the Sunshine Coast (the Site; Figure 1). The Site is located within the territories of the shíshálh Nation.

In November 2021 there was an atmospheric river extreme rainfall event that led to widespread flooding in southwestern British Columbia. During the extreme rainfall event, an existing 0.9m circular concrete culvert conveying Kenyon Creek under Redrooffs Road was plugged by debris, which paired with high creek flow volumes, resulted in Kenyon Creek overtopping Redrooffs Road. Following the rainstorms, five temporary culverts were installed as emergency works to alleviate the flooding, and riprap was also placed heavily along both sides of the roadway embankment to provide erosion protection. Following the installation of the temporary culverts, the road was rebuilt with a slight vertical crest to accommodate the culverts with sufficient cover. Redrooffs Road was paved, as an interim measure until the permanent culvert repair design is implemented.

Interim works were subsequently completed on September 20, 2022, to remove an obstruction from the inlet of the original culvert to maintain flow of Kenyon Creek under Redrooffs Road. Works were completed as under a Notification of Authorized Changes under the Water Sustainability Regulation, tracking number 100393058, and construction monitoring was completed by Barsanti Environmental Services Ltd.

The MOTI has flagged the Site as a priority for repair works. Detailed design drawings are at 50% completion and are being reviewed by the Project team. The proposed repair works include:

- Removing the five temporary culverts installed under emergency works during the flooding event;
- Installing two 35m-long, concrete box culverts (two-barrel culvert crossing). The culverts are designed side-by-side, with one 2.4m wide x 2.4m high, and the other 2.1m wide x 2.1m high, and completed with fish baffles (refer to appended civil engineering drawings);
- Installing one 13m-long, 0.90m-diameter, high-density polyethylene overflow culvert;
- Placing 50kg class (550mm thickness) riprap aprons (armoring) at the culvert inlets and outlets (6m-long riprap armoring at inlets, 12m-long armoring at outlets) dressed with fisheries gravels on top of 150mm-thick, medium-weight, non-woven geotextile fabric; and
- Regrading embankments and repaving of Redrooffs Road according to finalized civil engineering drawings.

Construction of the Project is scheduled to begin in 2023 following receipt of regulatory approvals. An estimated permitting and construction schedule is provided in Table A. Details outlining permitting requirements and timing of construction within reduced-risk timing windows for fish and wildlife are described in Section 6.0.

Table A: Estimated Project Timeline

Development Task	Proposed Start	Proposed Finish
Permitting[1]		
Water Sustainability Act Change Approval Application	January 2023	May 2023
Fisheries Act Request for Project Review	January 2023	May 2023
Fish and Wildlife Salvage Applications (Ministry of Forests)	February 2023	May 2023
Construction		
Preparation	July 26, 2023	October 31, 2023
Instream/riparian work[2]	August 1, 2023	October 31, 2023
Other work conducted away from streams including road repair work provided Erosion and Sediment Control measures are in place and are maintained.	August 1, 2023	No end date

1.1 Objectives

The objective of this EOA was to complete a biological inventory of the Site, including an assessment of the terrestrial, aquatic, and riparian environment. It is noted that an EOA had been submitted in advance of the temporary emergency works that were conducted in 2022. This report is updated to include results of interim works and the proposed permanent repair works.

This EOA provides:

- A description of the terrestrial and aquatic conditions in and around the Project footprint, including a review of vegetation, wildlife, fish and fish habitat, and Species at Risk (SAR) that may interact with the proposed works; and
- Guidance to avoid and mitigate impacts to environmental resources, including recommendations for the Project design.

The outcomes of this report are intended to serve the dual purpose of supporting detailed design processes as well as environmental regulatory submissions. Our approach consisted of a desktop review of pertinent resources and a reconnaissance-level field assessment.

This report is organized into 10 sections:

- Section **1** introduces the proposed Project and objective of this report;
- Section **2** provides a brief overview of the Site's conditions;
- Section **3** outlines the scope of work and describes the methods with which data was collected to prepare this report;
- Section **4** describes the regulatory framework for the proposed Project;

[1] For the permitting section in this table, the proposed start and finish refer to when the application will be submitted to the regulatory agencies and when PGL expects to receive the permit.
[2] Instream works can be conducted prior to the start date if streams are dry upon the confirmation of a Qualified Environmental Professional.

- Section **5** describes the environmental conditions at the Site and observations from field visits;
- Section **6** outlines the potential permit, approvals, and timelines for the works occurring and associated least-risk work windows;
- Section **7** briefly summarizes the findings and recommendations for optimal avoidance and mitigation measures; and
- Sections **8, 9,** and **10** provide standard limitations, closing remarks, and referenced material used to compile this report.

2.0 SITE OVERVIEW

The Site is located at the Kenyon Creek stream crossing (watershed code: 900-124100) at Redrooffs Road, just east of Kenyon Road, in Sechelt, BC (UTM Zone 10U 0438021, 5481199). The Site includes an 8m waterfall to the north (upstream) of Redrooffs Road, bordering the Project footprint, prior to Kenyon Creek flowing south through the temporary culverts under Redrooffs Road. The Site had a pre-existing culvert that was infilled during high-rain and flood events in the fall of 2021. Temporary Corrugated Steel Pipe (CSP) culverts and road access were installed to provide access to residential properties on Kenyon Road beyond the Site. A large, deep pool had formed approximately 2m deep, flooding the vegetation in a 20m x 20m area on the upstream side of Redrooffs Road. The debris obstructions in the original concrete culvert were cleared on September 20, 2022.

Current land use observed on and near the Site included roadways (Redrooffs Road) and two large-lot, rural, residential properties. One lot lies directly to the northwest, at the top of a steep slope, and one lot lies to the south side of Redrooffs Road and west of Kenyon Creek. The lot to the south is under development as a multi-home residential community. The Site is located on the eastern border of the municipality of Halfmoon Bay. The proposed replacement culverts will be constructed to convey Kenyon Creek from the northwest to southeast beneath Redrooffs Road, while maintaining the functionality and quality of the watercourse and the habitat of present and potential species.

3.0 SCOPE OF WORK

To complete the EOA, PGL:

- Reviewed orthophotographic/aerial imagery and available base maps of the Site, paying particular attention to watercourses, potential habitat areas, and general land uses and disturbance;
- Identified fish-bearing watercourses near the Site, as indicated by internet-based federal and provincial databases (Habitat Wizard, Fisheries and Oceans Canada (DFO) - Aquatic Species at Risk map [DFO, 2020]);
- Reviewed Environment Canada's Sensitive Ecosystems Inventory (SEI) of the Sunshine Coast and Adjacent Islands Mapping Index and associated report catalogue;
- Reviewed distribution and habitat suitability characteristics for SAR provided by the BC Conservation Data Centre (CDC) (see Appendix 2 for SAR status definitions), BC Species and Ecosystems Explorer and iMapBC;
- Visited the Site and conducted a habitat assessment; and
- The Site visit was conducted by Qualified Environmental Professional (QEP) Katharine Scotton, B.Sc., R.P.Bio., and field technician Hayley Howes, B.Sc., on May 25, 2022. The weather conditions during the Site visit was 12˚C and overcast with occasional light drizzle.

The information obtained from the identified resources, in combination with our Site visit, was sufficient to complete our EOA.

4.0 REGULATORY CONTEXT

Redrooffs Road is managed by MOTI and thus falls primarily under the purview of provincial government; however, federal and regional legislation also apply. The proposed Project is subject to integrated and multi-scalar laws, regulations, guidelines, best practices, and standards. Temporary emergency works were conducted on September 20, 2022, with a Notification of Authorized Changes under the Water Sustainability Regulation, tracking number 100393058. This EOA is an updated report to the previous version submitted in advance of the temporary emergency works and includes the proposed permanent culvert replacement and bank armouring works. The following pieces of environmental legislation are most relevant to this Project:

- Provincial *Water Sustainability Act* (WSA): The purpose of the WSA is to safeguard ground and surface water in BC through licensing its diversion or extraction and prohibiting changes in and about a stream (inclusive of wetlands and some ditches) without prior approval (Government of BC, 2014). Works in and near Kenyon Creek (e.g., bank armouring, culvert replacement, and road re-surfacing) and other aquatic features affiliated with the Site typically require a Notification or Change Approval under the WSA, based on the nature of the works. The WSA and associated approvals and permits are administered by the Ministry of Forests);
- Federal *Fisheries Act*: Prohibits the harmful alteration, disruption, or destruction of fish habitat (HADD) or the unauthorized death of fish, and is administered by Fisheries and Oceans Canada (DFO; Government of Canada, 1985). The *Fisheries Act* applies to any proposed activities in or around fish habitat, inclusive of aquatic features that discharge to fish habitat. Proposed works that align with a DFO Code of Practice can typically proceed with a Notification. Where works are not covered by a Code of Practice, or cannot meet the required mitigation measures included in the Code of Practice, a Request for Project Review should be submitted to DFO to determine if the Project is likely to result in a HADD; and
- Federal *Species at Risk Act* (SARA): There are two primary mechanisms by which the SARA may interact with the proposed works: (i) protecting land identified as critical habitat for SAR; and (ii) protecting SAR and their residences (e.g., a nest or den) from harm (Government of Canada, 2022). The SARA typically only applies on federally administered land[3], or through an Order-in-Council, or where the provincial government has implemented protections. As such, the SARA has limited purview on the Site. However, we have assumed the MOTI wishes to satisfy the management intent of the SARA where practical.

Table B provides a high-level overview of other laws, regulations, guidelines, best practices, and standards that may also apply in select circumstances. It is the responsibility of MOTI and contractors to understand how these guidelines apply to the proposed works and achieve compliance with immovable regulatory requirements.

[3] Except for aquatic SAR and migratory bird SAR, for which protection is extended to non-federal land.

Table B: Applicable Legislation, Regulations, and Guidelines for the Site

Federal Legislation	Provincial Legislation	Guidelines
Fish and Fish Habitat		
• *Fisheries Act* (Canada), 1985 (Government of Canada, 1985a)	• *Riparian Areas Protection Act*, 1997 (Government of BC) • *Riparian Areas Protection Regulation*, 2019 (Government of BC) • *BC Water Sustainability Act,* 2014 (Government of BC 2014)	• Land Development Guidelines for the Protection of Aquatic Habitat, 1993 (DFO and MELP 1992) • A Users' Guide for Changes in and About a Stream in BC (Gov. of BC, 2022a) • Requirements and Best Management Practices for Making Changes In and About a Stream in BC (Gov. of BC, 2022b) • Guidelines for Reduced Risk Instream Work Window (MOE, 2006)
Wildlife		
• *Migratory Birds Convention Act* (Canada), 1994 (Government of Canada 1994a) • *Species at Risk Act* (Canada), 2002 (Government of Canada 2002) • *Wildlife Act (Canada)*, 1985, (Government of Canada 1985b)	• *BC Wildlife Act,* 1996 (Government of BC 1996)	• Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia (BC MOE 2014a) • Guidelines for Amphibians and Reptile Conservation during Urban and Rural Land Development in BC (BC MOE 2014b) • Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia 2013 (BC MOE 2013) • Guidelines to Reduce Risk to Migratory Birds (Government of Canada, 2021) • Best Management Practices Guidelines for Pacific Water Shrew in Urban and Rural Areas (DRAFT) (Craig, Vennesland and Welstead, 2010)
Water Quality		
• *Canadian Environmental Protection Act*, 1999 (Government of Canada, 1999)	• *BC Environmental Management Act,* 2003 (Government of BC 2003) • *BC Water Sustainability Act,* 2014 (Government of BC 2014)	• Approved Water Quality Guidelines (BC), 2022 (BC ENV 2021) • Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME 2022) • A Users' Guide for Changes in and About a Stream in BC (Gov. of BC, 2022a) • Requirements and Best Management Practices for Making Changes In and About a Stream in BC (Gov. of BC, 2022b)

Federal Legislation	Provincial Legislation	Guidelines
Soil		
• *Canadian Environmental Protection Act*, 1999 (Government of Canada, 1999)	• None	• Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (CCME 2022)
Vegetation		
• None	• *BC Weed Control Act, 1985 (Government of BC 1996)*	• Best Management Practices for Managing Invasives on Roadsides (MOTI, 2019)
Other		
• None	• *BC Forest and Range Practices Act,* 1996 (Government of BC 2002) • *BC Heritage Conservation Act,* 1996 (Government of BC 1996)	• Archaeological Impact Assessment Guidelines, Rev. 1998 (Gov. of BC 1989)

5.0 ENVIRONMENTAL CONDITIONS

PGL completed a desktop review of available resources prior to the Site visit. A summary of both desktop and field observations is provided in the following sections.

5.1 Vegetation and Ecological Conditions

The Site lies within the Eastern Very Dry Maritime Subzone of the Coastal Western Hemlock (CWHxm1) Biogeoclimatic Ecosystem Classification (BEC) Zone.

All descriptions of BEC subzone characteristics provided below are derived from *A Field Guide to Site Identification and Interpretation for the Vancouver Forest Region* (Green and Klinka, 1994).

5.1.1 CWHxm1 (Eastern Very Dry Maritime; Coastal Western Hemlock Subzone)

The CWHxm1 BEC subzone is confined to a small area on South-Eastern Vancouver Island and the Sunshine Coast. This is the smallest and most at-risk zone in the province and is a conservation concern. The climate is warm and dry in the summer. Winters are typically mild and more moist, with almost no snowfall.

Undisturbed forests are dominated by Douglas-fir (*Pseudotsuga menziesii*), grand fir (*Abies grandis*), and western redcedar (*Thuja plicata*). Minor arbutus (*Arbutus menziesii*) may occur on very dry sites. The shrub and herb layers are dominated by salal (*Gaultheria shallon*), dull Oregon grape (*Mahonia nervosa*), oceanspray (*Holodiscus discolor*), baldhip rose (*Rosa gymnocarpa*), snowberry (*Symphoricarpos alba*), western trumpet honeysuckle (*Lonicera ciliosa*), vanilla leaf (*Achlys triphylla*), and various lilies. The moss layer includes Oregon beaked moss (*Kindbergia oregana*) and electrified cat's-tail moss (*Rhytidiadelphus triquetrus*).

5.1.2 Invasive Alien Plant Program Observations

PGL searched for recorded invasive species within and around the Site using the Invasive Alien Plant Program webmap, which did not identify any invasive plant species recorded within 500m of the Site. It is noted that invasive species were observed during the field visit as described in Section 5.1.3.1.

5.1.3 Onsite Vegetation Observations

The following subsections describe the vegetation conditions observed at the Site.

The Site had been disturbed due to the Fall 2021 extreme rain events and emergency repair works. Kenyon Creek was not able to pass effectively through the existing culvert, which resulted in water impoundment between the waterfall and Redrooffs Road up to 2m deep. The water impoundment submerged the base of trees. Dominant tree species included mature western red cedar, with lesser douglas-fir, red alder (*Alnus rubra*), western hemlock (*Tsuga heterphylla*), bitter cherry (*Prunus emarginata*), and bigleaf maple (*Acer macrophyllum*). Canopy cover was approximately 40%.

The riparian area upstream of Redrooffs Road was ravine habitat, sloping upwards at an approximate 60% gradient. The ravine habitat consisted of diverse riparian vegetation, including: salmonberry (*Rubra spectabilis*), salal, western skunk cabbage (*Lysichiton americanus*), lady fern (*Athyrium filix*-femina), bracken fern (*Pteridium aquilinum*), sword fern (*Polystichum munitum*), fringe cup (*Tellima grandiflora*), thimbleberry (*Rubus parviflorus*), red huckleberry (*Vaccinium parvifolium*), vine maple (*Acer circinatum*), arbutus, snowberry, dull-Oregon grape, common horsetail (*Equisetum arvense*), Robert's geranium (*Geranium robertianum*), saskatoon berry (*Amelanchier alnifolia*), wall lettuce (*Lactuca muralis*), sedges (*Carex spp*.), Pacific ninebark (*Physocarpus capitatus*), and broad-leaved starflower (*Lysimachia latifolia*). The exposed bedrock of the waterfall supported patches of red columbine (*Aquilegia formosa*) and maiden hair fern (*Adiantum pedatum*).

Vegetation downstream of Redrooffs Road was similar in composition to upstream, but lacked the exposed bedrock associated species. Banks were steep, and canopy cover was approximately 60%.

5.1.3.1 Invasive Plants

Invasive plant species were observed at the Site. Non-native ivy (*Hedera sp.*) was found in small patches along the forest floor, in addition to wall lettuce, Robert's geranium, Himalayan blackberry (*Rubus armeniacus*), Scotch broom (*Cytisus scoparius*), and hedge bindweed (*Calystegia sepium*). Canada thistle (*Cirsium arvense*), considered a noxious weed under the BC *Weed Control Act*, was found on the roadside.

5.1.3.2 Sensitive Ecosystem Inventory

The SEI of the Sunshine Coast and Adjacent Islands Map Index was used to determine the sensitive ecosystem within which the Site is located. Sensitive ecosystems are fragile and/or rare and are ecologically important because of the diversity of species they support. The Project footprint is in a polygon described as **Riparian** habitat with the '**fringe'** subclass. This polygon is bordered by a mature coniferous forest with a secondary woodland component.

Riparian habitats are areas directly adjacent to waterbodies and are easily influenced by erosion, sedimentation, flooding, and/or subterranean irrigation due to proximity to the waterbody (Meidinger *et al*., 2014). **Riparian 'fringe' habitat** is a narrow linear community along open waterbodies where there is little to no floodplain.

Field surveys confirmed that the description in the SEI of the Sunshine Coast and Adjacent Islands Catalogues is generally accurate for the Site.

5.2 Wildlife and Wildlife Habitat

The Site is in the Georgian Depression Ecoprovince. Ecoprovince descriptions can be used to provide general wildlife characteristics and identify expected wildlife species for a particular area. The following fauna descriptions are derived from *The British Columbia Ecoregion Classification* (Demarchi, 2011).

Mule deer (*Odocoileus hemionus*) are very abundant in the Georgian Depression Ecoprovince, both in urban and rural settings. Cougars (*Puma concolor*), American black bears (*Ursus americanus*), and coyotes (*Canis latrans*) are also common throughout, as well as several small mammals, including Virginia opossum (*Didelphis virginiana*) (introduced), Trowbridge's shrew (*Sorex trowbridgii*), shrew-mole (*Neurotrichus gibbsii*), Townsend's mole (*Microtus townsendii*), coast mole (*Scapanus orarius*), Douglas' squirrel (*Tamiasciurus hudsonicus*), and creeping vole (*Microtus oregoni*). It is possible for most of these species to occur on/near the Site, except for the Virginia opossum.

The Georgian Depression Ecoprovince supports the highest diversity of bird species in BC, as roughly 90% of all species known to occur in the province occur here. Approximately 60% of all species known to breed in BC also occur here.

Barn Owl (*Tyto alba*) and Anna's Hummingbird (*Calypte anna*) are only found within the Georgian Depression Ecoprovince in BC. In addition, Purple Martin (*Progne subis*), bushtit (*Psaltriparus minimus*), and Hutton's Vireo (*Vireo huttoni*) breed only within this ecoprovince in BC. It is expected that all these species would occur on/near the Site. Pileated woodpeckers *(Dryocopus pileatus)* commonly breed in this Ecoprovince (Easton, 2015) and are listed under the Migratory Bird Regulation, 2022. Nest cavities of pileated woodpeckers are used by other birds and mammals (secondary cavity nesters) in the years following the creation of the cavities. The nest cavities are therefore important components of the nest web, have year-round protection, and require proof of inactivity for 36 months before removal.

The ecoprovince is home to a variety of reptiles and amphibians, both native and introduced. Some species that may occur on the Site include northwestern gartersnake (*Thamnophis ordinoides*), northwestern salamander (*Ambystoma gracile*), ensatina (*Ensatina eschscholtzii)*, American bullfrog (*Lithobates catesbeiana*) (introduced), and green frog (*Lithobates clamitans)* (introduced).

5.2.1 Onsite Wildlife Observations

Incidental wildlife sightings were recorded during the field survey. Wildlife onsite were identified by visual and/or auditory observation. Species observed included Turkey Vulture (*Cathartes aura*) and the northern alligator lizard (*Elgaria coerulea*).The mature forest and understorey habitat provide suitable nesting and feeding opportunities for a large variety of avian species including raptors, songbirds, and woodpeckers, as well as small mammals such as squirrels and bats. Abundant coarse woody debris present in the riparian area of the Site also offers potential cover habitat for terrestrial species of amphibians, reptiles, and small mammals. Other significant wildlife habitat features were not observed at the Site.

5.3 Aquatic Features and Fish Habitat

Kenyon Creek is the only watercourse within the Project footprint. Kenyon Creek is fed by Trout Lake to the north, which receives water from upslope minor tributaries. Kenyon Creek flows from Trout Lake along the eastbound lane of Highway 101 in a southeast direction prior to heading south towards Redrooffs Road. From Redrooffs Road, Kenyon Creek flows southeast and then outlets to Sargeant Bay in the Salish Sea.

Approximately 30m upstream of Redrooffs Road is a vertical waterfall 8m high and including exposed bedrock and angular boulders. Steep ravine banks surround the north, northwest, and northeast sides of the Project footprint, preventing any drainage other than directly south. The section of Kenyon Creek within the Project footprint follows a step-pool morphology. The original concrete culvert conveying Kenyon Creek under Redrooffs Road was completely submerged on the upstream side, and was only visible from the downstream side, and partially submerged at the creek outlet. Minimal flow was observed from this culvert, indicating a severe blockage within the culvert. The temporary repair work culverts included a primary CSP culvert and four smaller corrugated polyvinyl chloride (PVC) culverts to the east. All temporary culverts were perched approximately 4–5m above the creek on the downstream side of the road. Impounded water on the upstream side resulted in a pool on the north side of Redrooffs Road, submerging vegetation and the bases of trees.

A roadside drainage ditch enters Kenyon Creek from the west on the upstream side of Redrooffs Road. The drainage ditch is shallow and narrow, with grass on the south side, and native shrubs and trees on the north side. The ditch is likely seasonally dry, and only conveys flows during wet weather. Discharge into the main channel of Kenyon Creek is very steep. The ditch is not anticipated to be fish bearing.

A drainage ditch on the south side of Redrooffs Road also provides seasonal flow to Kenyon Creek from the west. This has largely been infilled with riprap for temporary erosion control measures. Upstream of the neighbouring property's driveway to the west, the drainage ditch is narrow, shallow, and vegetated with grass on the north side, and trees and shrubs on the south side.

Water quality within Kenyon Creek was clear, with very low turbidity, and high dissolved oxygen, as summarized in Table C. It is worth noting that pH was below the minimum water quality guidelines (WQG) for freshwater aquatic life (6.5-9.0pH), which could provide sub-optimal conditions for salmonids.

Table C: Water Quality for Kenyon Creek, May 2022

Sample Location	Temperature (°C)	DO (mg/L)	Conductivity (µs/cm)	Turbidity (NTU)	pH
Water Quality Station 1	11.4	13.95	51.4	1.00	6.30

5.3.1 Fish and Fish Habitat

The existing 700m concrete culvert is undersized and at a nearly 6.5% slope under Redrooffs Road, which creates a barrier to upstream fish movement in Kenyon Creek. Non-anadromous salmonids have been observed above the barrier, though these records are dated and unreliable (ENV, 2022). Fish occurrences within Kenyon Creek that have been documented include steelhead (*Oncorhynchus mykiss*), stickleback (*Gasterosteus* sp.), and cutthroat trout (*Oncorhynchus clarkii*) (ENV, 2022). The lower reaches of Kenyon Creek are fish accessible from Sargeant Bay up to Redrooffs Road. Cobbles, boulders, and large woody debris provide optimal fish habitat downstream of Redrooffs Road, in addition to dense canopy cover (>60%). Fish habitat below Redrooffs Road is considered suitable year-round and likely supports resident or anadromous fish species. During survey work in the fall of 2022, engineering crews observed fish within the Project footprint downstream of Redrooffs Road; however, the species of fish was not confirmed.

Other local streams of similar size and character are used by coho salmon (*Oncorhynchus kisutch*) for spawning. Kenyon Creek is suitable for coho salmon up to the culvert at Redrooffs Road.

5.4 Species at Risk

PGL searched the provincial CDC Species and Ecosystems Explorer database for SAR that could potentially occur on the Site. Additionally, the CDC was consulted to identify provincially listed ecosystems at risk within the CWHxm1 subzone with the potential of occurring onsite.

Detailed surveys for focal wildlife, plant, and ecosystems of conservation concern (i.e., listed by the CDC and/or protected under the SARA) were not included in the scope of this overview assessment. Therefore, it is assumed that the listed species and ecosystems that use habitat types provided in or around the Site may potentially occur in this area.

All animals and plants of conservation concern potentially associated with the Site are listed in Tables 1 and 2, respectively, and a description of SAR status definitions is provided in Appendix 2. The provided lists are comprehensive; however, species that utilize habitat conditions not likely present at the Site are acknowledged wherever possible. A detailed habitat suitability assessment would likely result in a smaller, more Site-specific list of potential species.

PGL also reviewed CDC iMap to confirm the presence/absence of known masked sensitive occurrences (occurrences are identified, but species information is not publicly available) and non-sensitive occurrences (species information is publicly available) of SAR and ecosystems at risk and federally designated critical habitat for SAR on or within 2km of the Site. SAR likely to occur include the following:

- Grand fir/Three-leaved foamflower (*Tiarella trifoliata*) – Provincially Red-listed Ecological Community;
- Grand fir/Dull Oregon-grape – Provincially Red-listed Ecological Community;
- Douglas fir/Dull Oregon-grape – Provincially Red-listed Ecological Community;
- Dune Wildrye (*Leymus mollis ssp*.) – Beach Pea (*Lathyrus japonicus*) – Provincially Red-listed Ecological Community;
- Marbled Murrelet (*Brachyramphus marmoratus*) Proposed Critical Habitat;
- Great Blue Heron (*Ardea heordias fannini*), Fannini Subspecies – Provincially Blue-listed;
- Northern Red-legged Frog (*Rana aurora*) – Provincially Blue-listed;
- Coastal cutthroat trout (*Oncorhynchus clarkii clarkii*) – Provincially Blue-Listed; and
- Western painted turtle Pacific coast population (*Chrysemys picta bellii*).

5.4.1 Grand fir/Three-leaved foamflower (CDFmm; CWHxm1)

The Site lies within the BC Red-listed grand fir/three-leaved foamflower ecological community. This community occurs within undulating forest between the Sunshine Coast highway and the coast. Parts of it occur along Kenyon Creek and Colvin Creek, where other portions are in more upland areas (CDC, 2014). Surrounding areas are fragmented by residential development.

Vegetation is summarized by mature and old growth forests dominated by western red cedar, grand fir, with lesser Douglas-fir, and the occasional western hemlock and western flowering dogwood (*Cornus nuttallii*). Bigleaf maple and western yew (*Taxus brevifolia*) may also be present. The understorey consists of dull Oregon-grape, salal, sword fern, three-leaved foamflower, vanilla leaf, western trillium (*Trillium ovatum*), Oregon beaked moss, and palm tree moss (*Leucolepis menziesii*). This ecological community likely exists at the Site.

5.4.2 Douglas fir/Dull Oregon-grape

The Site is within 2km of the BC Red-listed Douglas fir/dull Oregon-grape ecological community. This is a coniferous forest ecosystem found on southeastern Vancouver Island, the Gulf Islands, and the Sunshine Coast of BC. This community occurs within dry, sloped sites up to 380m above sea level. Recent development has cause widespread fragmentation and prevention of a once functioning matrix ecosystem (CDC, 2012).

These forests are dominated by Douglas fir, grand fir, and western red cedar in the canopy, with lesser bigleaf maple and red alder. Western flowering dogwood may occur as a co-dominant species. The shrub layer includes dull Oregon-grape, salal, ocean spray, baldhip rose, western trumpet honeysuckle, red huckleberry, common snowberry, trailing snowberry (*Symphoricarpos hesperius*), trailing blackberry (*Rubus ursinus*), broad-leaved starflower, sword fern, vanilla leaf, and bracken fern. The moss layer consists of Oregon beaked-moss, electrified cats-tail moss, and step moss (*Hylocomium splendens*).

5.4.3 Grand fir/Dull Oregon-grape

The Site is within 2km of the BC Red-listed grand fir/dull Oregon-grape ecological community. This ecosystem occurs on mildly sloped, well drained soils (CDC, 2014). These forests are dominated by coniferous trees such as Douglas-fir, grand fir, western redcedar, with lesser western flowering dogwood, and western yew. Cascara (*Rhamnus purshiana*) and bigleaf maple may be present with low cover. The understorey consists of sala, dull Oregon-grape, baldhip rose, oceanspray, red huckleberry, saskatoon berry, bearded fescue (*Festuca subulata*), sword fern, western trillium, three-leaved foamflower, sweet-scented bedstraw (*Galium triflorum*), vanilla leaf, twinflower (*Linnaea borealis*), Oregon beaked moss, palm tree moss, and step moss.

5.4.4 Dune Wildrye (*Leymus mollis ssp.*) – Beach Pea (*Lathyrus japonicus*)

The Site is within 2km of BC Red-listed Dune Wildrye/Beach Pea ecological community. This is an herbaceous community, restricted to the coastal sand dunes of eastern Vancouver Island, the Gulf Islands, and the Sunshine Coast, where ocean currents influence the deposition and accumulation of sandy materials (CDC, 2009).

5.4.5 Marbled Murrelet (*Brachyramphus marmoratus)*

Marbled Murrelets are listed as Threatened by the Committee on Status of Endangered Wildlife in Canada and are provincially Red-listed, which means they are legally designated or being considered for legal designation as Endangered or Threatened within the Province of BC (Berger, 2004).

Marbled Murrelet proposed marine critical habitat has been applied across the outer marine areas of the Sunshine Coast by the federal Recovery Team. Marbled Murrelet are small seabirds that require old growth forest habitat for nesting. They will fly up to 65km inland from their foraging areas of saltwater to find suitable nesting habitat; but most nests are located within 30km of the sea (Environment Canada, 2014). Suitable nesting habitat for Marbled Murrelet was not identified at the Site, as the mature trees were not old enough to provide nesting platforms in the upper canopy.

5.4.6 Great Blue Heron (*Ardea heordias fannini*), Fannini Subspecies

The Site is located within 2km of observed Great Blue Heron (Fannini subspecies) nest locations on the north side of Redrooffs Road in the forest of Sargeant Bay Provincial Park. The colony was found in mature red alder and bigleaf maple in a small ravine.

This subspecies may nest colonially in a wide range of species; they include, but are not limited to, tall Sitka spruce, western red cedar, western hemlock, pine, red alder, and black cottonwood (Campbell et al. 1990). Foraging habitat includes aquatic ecosystems less than 0.5m deep, such as: marine intertidal areas, estuaries, riparian areas, wetlands, freshwater lakes, and muskegs (CDC, 2020). These areas are most often within 5km of nest sites, which would put the Project footprint within potential foraging habitat.

5.4.7 Northern Red-legged Frog (*Rana aurora*)

The Site is located within 2km of an observed population of the Northern red-legged frog found in Sargeant Bay Provincial Park. This amphibian is listed as a species of Special Concern by the Committee on Status of Endangered Wildlife in Canada and are provincially Blue-listed. Habitat degradation and fragmentation are the two major causes of population declines within their BC range.

Like other amphibians, the red-legged frog may migrate between breeding sites in aquatic habitats, to upland foraging areas in the summer, and overwintering areas in the late fall and winter months (CDC, 2008). Although specific dispersal distances are unknown, this may place the Project footprint within the active habitat of this species.

5.4.8 Coastal Cutthroat Trout

Coastal cutthroat trout require small, low-gradient coastal streams and estuarine habitats, most often within 150km from the mouth of a river. They prefer well-shaded, sub-18˚C streams. Most individuals are anadromous, though some will spend the entirety of their life cycle in freshwater. Spawning occurs on small gravel substrates. Fry will typically move into larger waterbodies, before migrating to sea within their first one to three years of life, typically spending two to five months here in late spring or early summer. Overwintering occurs in freshwater streams the remainder of the year (CDC, 1995). Habitat for coastal cutthroat exists immediately downstream of the Project works area, which provides suitable spawning and rearing habitat. Stocking of coastal cutthroat trout occurs regularly in Trout Lake, upstream of the Site. It is likely that fish are occasionally swept downstream through the Project area, though survival over the 8m waterfall is unknown.

5.4.9 Western Painted Turtle Pacific Coast Population

The Site is located within 2km of critical habitat for the Pacific Coast population of painted turtle in Canada (*bellii* subspecies), federally identified as the western painted turtle, or provincially as the northern painted turtle – Pacific Coast population. The turtle occurs in the Fraser Valley, Sunshine Coast, Texada Island, and southern Vancouver Island. The sub-species is provincially Red-listed and Threatened under the SARA and by Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Western painted turtle prefer slow moving watercourses, shallow ponds and lakes, oxbows, marshes and sloughs with muddy substrates and emergent vegetation. They require emergent logs, rocks, or vegetation for basking, and well-drained, bare, sand or gravel banks and shorelines for nesting (COSEWIC, 2016). There is the possibility that western painted turtle can disperse into the forested area within the Project works area; however, suitable habitat does not occur within or immediately adjacent to the proposed Project works area. Proposed works are not anticipated to interact with or negatively affect western painted turtle.

6.0 PERMIT APPROVALS AND TIMELINES

Anticipated environmental permits and approvals required for this Project include:

- **WSA Change Approval**: Bank stabilization works will require a WSA Change Approval. Bank stabilization and an extension of the riprap aprons is proposed for the repair and culvert works;
- ***Fisheries Act* Request for Review:** Works are expected to occur proximal to, and within, the wetted perimeter of Kenyon Creek, which is a known fish-bearing watercourse. To confirm compliance with provisions of the *Fisheries Act* and SARA, a Request for Project Review should be submitted to DFO. The proposed works are not anticipated to require authorization under the *Fisheries Act.* The DFO Request for Project Review is expected to require 60 to 90 days for a response from DFO; and
- **Fish and Wildlife Salvage Permits:** As works are expected to occur within fish and wildlife habitat, relevant salvage permits should be secured prior to the commencement of activities. Fish and wildlife salvage permits (provincial and federal) should be submitted a minimum of 60 days prior to the start of works. These include:
  - A *Fisheries Act* fish salvage permit;
  - A *Wildlife Act* general wildlife permit (salvage); and
  - A *Wildlife Act* fish salvage permit.

The following permits and approvals are not anticipated:

- A *Land Act* Crown Land Use Permit;
- A WSA Short Term Use Approval (groundwater extraction); and
- A *Fisheries Act* Authorization.

6.1 Timing Windows

Reduced-risk work windows for fish and wildlife anticipated to be present at the Site during the proposed work are summarized in Table D.

Table D: Reduced-Risk Work Windows for Fish and Wildlife in BC

Species	Least Risk Window	Reference
Cutthroat Trout, Rainbow Trout and Steelhead	August 1–October 31	MOE, 2006
Pacific Salmon	July 15–September 15	MOE, 2006
Bald Eagle	September 1–December 31	BC MOE 2014a
Herons	September 15–January 15	BC MOE 2014a
Raptors	October 1–February 28	BC MOE 2014a
Songbirds	September 1–February 28	BC MOE 2014a
Amphibians (salvage)	August 1–October 31	FLNRORD, 2016

For steelhead and cutthroat trout, it is assumed that spawning generally occurs in reaches of the watershed with more abundant pebbles and gravels with cool flowing water. Coho salmon may also use Kenyon Creek. Spawning habitat for these species exists downstream of Redrooffs Road. Species occurrence records are old, and species confirmation is recommended to ensure the appropriate reduced-risk instream work windows are applied. Given the potential fish species present, instream work should be limited to August 1 – September 15.

Disturbance activities for avian species are not limited to clearing of vegetation. Construction noise may also cause a nest abandonment, resulting in an offense under the *Wildlife Act*. Raptor nests were not observed onsite; however, suitable habitat exists for raptors to establish nests, and pre-work surveys should be completed within 100m of the work area. For songbird species, the breeding season begins in early spring and extends through late summer. Breeding activity depends on the weather and resource conditions from year to year, so caution should be used when planning activities that fall outside the reduced-risk windows. If work cannot be avoided outside the reduced-risk window, a QEP should be consulted to conduct pre-clearing nest surveys to determine the risk of breeding activity, establishment of buffers, and ongoing monitoring.

Given the above reduced-risk windows and the known and assumed uses of the Site by the fish and wildlife, a general work window of August 1 – September 15 is appropriate for instream works. Clearing and site preparation work prior to August 31 will require pre-clearing nest surveys; however, most species should be completing breeding by early August.

6.1.1 Working Outside of Reduced-Risk Timing Windows

It is anticipated that instream and riparian works may extend past the reduced-risk timing window, based on MOTI's requirement to conduct extensive instream works on multiple sites on the Sunshine Coast (not described in this EOA) that are a priority for bank stability and public safety. The works will not extend past October 31 to protect amphibian and trout species potentially present within the Site.

Conducting instream works past September 15 extends past the Pacific salmon reduced-risk window, which is recommended to prevent interference during the spawning season. However, as the existing culvert and waterfall are a barrier to upstream fish passage, it is unexpected that Pacific salmon spawn upstream of the works. The work zone will be isolated when conducting works outside of the reduced-risk timing window; therefore, if salmon are present downstream of the Site, they will not require access to the work zone or relocation upstream of the Site. Additional mitigation measures to reduce potential impacts to spawning salmon downstream of the works include completing the initial diversion of the stream prior to September 15 and increasing monitoring frequency to the minimum of daily inspection. All instream works (regardless of timing) must be isolated, with flow bypassed around the Site.

It is also noted that if the watercourse is dry, work may take place in the dry stream channel outside of the reduced-risk instream work window, provided other species (birds and amphibians) have also been considered and risks have been mitigated. Works away from streams and riparian habitat, including the proposed road works, can occur outside of the reduced-risk timing window.

7.0 CONCLUSIONS AND RECOMMENDATIONS

PGL conducted an EOA to identify environmental conditions at a temporary culvert carrying Kenyon Creek under Redrooffs Road, in Sechelt, BC. Temporary culvert replacement works occurred during emergency operations after the flooding of Fall 2021. Replacement of the temporary culverts and associated roadway has been flagged as a priority for MOTI. Improvements to fish passage and prevention of potential future failures has been considered.

The most prominent environmental features at the Site include ideal substrates for fish spawning (i.e., gravel and cobbles of varying sizes) and physical features for fish habitat, (i.e., plunge pools, shady overhanging banks) which are located downstream of Redrooffs Road. These provide habitat for potential SAR such as coastal cutthroat trout and any other salmonids that may be present.

Instream and riparian work proposed for the Project will require several regulatory permits and approvals, as outlined in Section 6. Restoration of the work areas will be required to maintain a no-net-loss of habitat for both the provincial and federal permitting processes.

The most suitable period for conducting instream and riparian works for the proposed Project is August 1–September 15, taking into consideration the potential fish and wildlife species present at the Site and their life histories. However, works may be conducted outside of the least-risk instream work window if the watercourse is dry, or until October 31 if additional mitigation measures are applied—including completing the initial diversion of the stream prior to September 15 and increasing monitoring frequency.

Based on PGL's assessment, four key categories for environmental due diligence measures to reduce the risk to fish and wildlife species and their habitats have been identified: Planning and Design, Pre-Construction, Construction Mitigation, and Post-Construction The categories and recommended measures are as follows:

Planning and Design

- Culvert design specifications should include:
  - Provision for fish passage under Redrooffs Road, such as the use of open-bottomed structures or fish baffles;
  - If culverts are used, culverts must meet the Fish-stream Crossing Guidebook (FLNRORD and DFO, 2012) design criteria;
    - Average water velocity within the culverts should not exceed 0.9m/s (Dane, 1978);
  - Alignment similar to that of the natural stream channel while also aiming for the shortest culvert length (do not skew alignment greater than 30˚ to the stream); and
  - Adequate water depth and velocity to allow adult and juvenile fish passage, including creation of a thalweg within natural bottomed culvert (if provided).
- Access for maintenance equipment to remove accumulated debris or conduct repairs and restoration; and
- Ensure culvert positioning does not block roadside drainages ditches at Redrooffs Road.

Pre-Construction

- Preparation of a Construction Environment Management Plan to identify Best Management Practices, construction specific mitigation, erosion and sediment control plan, environmental monitoring requirements, and emergency plans as per Standard Specifications for Highway Construction, Section 165 – Protection of the Environment (MOTI, 2020);
- Preparation of regulatory permits and approvals (Section 6); and
- Preparation of an Invasive Plant Management Plan.

Construction Mitigation

- Conduct instream and riparian work during the most suitable reduced-risk window of August 1–September 15 (dependent on fish species confirmation);
- Follow Construction Environment Management Plan and Standard Specifications for Highway Construction, Section 165 – Protection of the Environment (MOTI, 2020);
- Delineate Environmentally Sensitive Areas;
- Ensure water quality and quantity is maintained upstream and downstream of the work area, including the use of temporary bypasses;
- Retain a QEP experienced in identifying, handling, and salvaging fish and wildlife, to conduct fish salvage and wildlife salvages (if needed);

- Retain a QEP to conduct raptor and pileated woodpecker nest surveys prior to Site preparation;
- Retain a QEP to conduct pre-clearing/disturbance nest surveys prior to Site preparation (clearing and grubbing) and noise generating activities if occurring outside the breeding bird least-risk window (September 1–February 28 for songbirds), or as directed by the QEP;
- Full-time monitoring of instream works by a QEP; and
- Removal of invasive plant species and seed contaminated soils and disposal at a certified facility.

Post-Construction

- Conduct a one-year post-construction monitoring assessment that includes:
  - Structural stability;
  - Fish passage and water flow;
  - Planting and/or seed growth success; and
  - Fish habitat use.

8.0 STATEMENT OF LIMITATIONS AND CONDITIONS FOR REPORT

8.1 Complete Report

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to PGL by the Client, communications between PGL and the Client, and any other reports, proposals or documents prepared by PGL for the Client relative to the specific site described herein, all of which together constitute the Report.

In order to properly understand the suggestions, recommendations and opinions expressed herein, reference must be made to the whole of the Report. **PGL is not responsible for use by any part of portions of the Report without reference to the whole report.**

8.2 Basis of Report

The Report has been prepared for the specific site and purposes that are set out in the contract between PGL and the Client. The findings, recommendations, suggestions, or opinions expressed in the Report are only applicable to the site and purposes in relation to which the Report is expressly provided, and then only to the extent that there has been no material alteration to or variation from the information provided or available to PGL.

8.3 Use of the Report

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. No other party may use or rely upon the Report or any portion thereof without PGL's written consent, and such use shall be on terms and conditions as PGL may expressly approve. Ownership in and copyright for the contents of the Report belong to PGL. Any use which a third party makes of the Report, is the sole responsibility of such third party. **PGL accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report.**

9.0 CLOSING

We trust our report meets your needs. If you have any questions, please contact Katharine Scotton or Stewart Brown at 604-235-8021 and 604-895-7612, respectively.

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Per:

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Lead Consultant

HAH/KKS/CSB/neg/mtl/neg
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Figures

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Subject Site

Road Centreline

Watercourse

Parcel boundary and site features are approximate and are presented for discussion purposes only.

0 1:3,000 160 m

2021 orthoimage and street map from ESRI
Road and watercourse data from BC Open Data
NAD 1983 UTM Zone 10N

SITE LOCATION

Kenyon Creek Crossing at Redrooffs Road,
Sechelt, BC

MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE

PGL ENVIRONMENTAL CONSULTANTS

File No.:	Dwg No.:	FIGURE
0346-65.01	EOA_0010	1
Date: JUL 2022	Drawn by: RSS	

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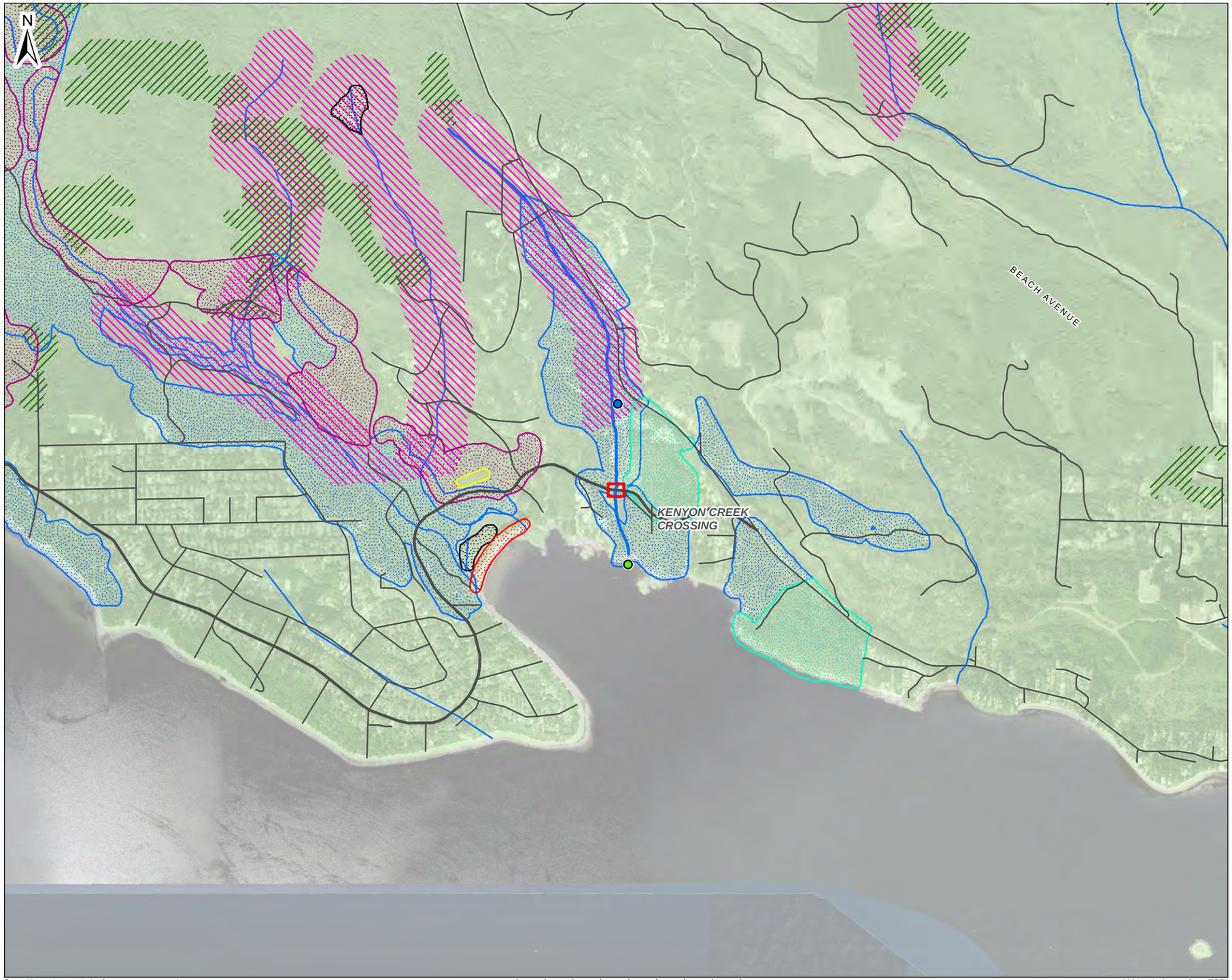

- Subject Site
- Proposed Critical Habitat - Western Painted Turtle
- Proposed Critical Habitat - Marbled Murrelet (Fine-Filtered)
- Proposed Critical Habitat - Marbled Murrelet (Blanket)
- Douglas-fir/Dull Oregon-grape
- Dune Wildrye - Beach Pea
- Grand Fir/Dull Oregon-grape
- Grand Fir/Three-leaved Foamflower
- Great Blue Heron
- Northern Red-legged Frog
- Road Centreline
- Watercourse
- Cutthroat Trout, Steelhead Trout, Stickleback
- Cutthroat Trout

Parcel boundary and site features are approximate and are presented for discussion purposes only.

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2021 orthoimage from ESRI
Road and environmental feature data from BC Open Data
NAD 1983 UTM Zone 10N

SPECIES AT RISK CRITICAL HABITAT

Kenyon Creek Crossing at Redrooffs Road, Sechelt, BC

MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE

PGL ENVIRONMENTAL CONSULTANTS

File No.:	Dwg No.:	FIGURE
0346-65.01	EOA_0020	2
Date: JUL 2022	Drawn by: RSS	

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Tables

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Table 1
SAR Animals
Kenyon Creek at Redrooffs Road, Sechelt, BC, Ministry of Transportation and Infrastructure,
PGL File: 346-65.01

Scientific Name	English Name	BC list	COSEWIC	SARA
Bivalves				
Musculium partumeium	Swamp Fingernailclam	Blue		
Musculium transversum	Long Fingernailclam	Blue		
Ostrea lurida	Olympia Oyster	Blue	SC (May-11)	SC (Jun-03)
Sphaerium occidentale	Herrington Fingernailclam	Blue		
Sphaerium patella	Rocky Mountain Fingernailclam	Red		
Sphaerium striatinum	Striated Fingernailclam	Blue		
Gastropods				
Allogona townsendiana	Oregon Forestsnail	Red	E (Apr-13)	E (Jan-05)
Carychium occidentale	Western Thorn	Blue		
Deroceras hesperium	Evening Fieldslug	Red	Data Deficient (Nov-03)	
Galba bulimoides	Prairie Fossaria	Blue		
Galba dalli	Dusky Fossaria	Blue		
Galba parva	Pygmy Fossaria	Blue		
Galba vancouverensis	Vancouver Fossaria	Red		
Gyraulus crista	Star Gyro	Blue		
Haliotis kamtschatkana	Northern Abalone	Red	E (Apr-09)	E (Jan-00)
Hemphillia dromedarius	Dromedary Jumping-slug	Red	T (May-14)	T (Jan-05)
Hemphillia glandulosa	Warty Jumping-slug	Red	SC (Apr-13)	SC (Jan-05)
Nearctula sp. 1	Threaded Vertigo	Blue	SC (Apr-10)	SC (Jul-12)
Physella propinqua	Rocky Mountain Physa	Blue		
Physella virginea	Sunset Physa	Blue		
Planorbula campestris	Meadow Rams-horn	Blue		
Pristiloma johnsoni	Broadwhorl Tightcoil	Blue		
Promenetus umbilicatellus	Umbilicate Sprite	Blue		
Prophysaon coeruleum	Blue-grey Taildropper	Blue	T (Apr-16)	T (Feb-19)
Stagnicola caperata	Wrinkled Marshsnail	Blue		
Stagnicola traski	Widelip Pondsnail	Blue		
Insects				
Anarta edwardsii	Edwards' Beach Moth	Red	E (May-21)	E (Feb-11)
Argia emma	Emma's Dancer	Blue		
Argia vivida	Vivid Dancer	Blue	SC (May-15)	SC (Feb-19)
Bombus occidentalis	Western Bumble Bee	Blue	T (May-14)	
Callophrys eryphon sheltonensis	Western Pine Elfin, *sheltonensis* subspecies	Blue		
Callophrys johnsoni	Johnson's Hairstreak	Red		
Callophrys mossii mossii	Moss' Elfin, *mossii* subspecies	Red		
Cercyonis pegala incana	Common Wood-nymph, *incana* subspecies	Red		
Chlosyne hoffmanni	Hoffman's Checkerspot	Red		
Cicindela hirticollis	Hairy-necked Tiger Beetle	Blue		
Coenonympha tullia insulana	Common Ringlet, *insulana* subspecies	Red		
Copablepharon fuscum	Sand-verbena Moth	Red	E (Nov-13)	E (Jul-05)
Danaus plexippus	Monarch	Red	E (Nov-16)	SC (Jun-03)
Enallagma clausum	Alkali Bluet	Blue		
Epargyreus clarus	Silver-spotted Skipper	Blue		
Epargyreus clarus californicus	Silver-spotted Skipper, *californicus* subspecies	Red		
Erynnis propertius	Propertius Duskywing	Red		
Erythemis collocata	Western Pondhawk	Blue		
Euphydryas editha taylori	Edith's Checkerspot, *taylori* subspecies	Red	E (May-11)	E (Jun-03)
Euphyes vestris	Dun Skipper	Blue	T (Apr-13)	T (Jun-03)
Hesperia colorado oregonia	Western Branded Skipper, *oregonia* subspecies	Red	E (Nov-13)	
Icaricia icarioides blackmorei	Boisduval's Blue, *blackmorei* subspecies	Blue		
Icaricia saepiolus insulanus	Greenish Blue, *insulanus* subspecies	Red	E (May-12)	E (Jun-03)

Table 1
SAR Animals
Kenyon Creek at Redrooffs Road, Sechelt, BC, Ministry of Transportation and Infrastructure,
PGL File: 346-65.01

Scientific Name	English Name	BC list	COSEWIC	SARA
Octogomphus specularis	Grappletail	Red	SC (May-21)	
Omus audouini	Audouin's Night-stalking Tiger Beetle	Red	T (Nov-13)	T (Jun-18)
Ophiogomphus occidentis	Sinuous Snaketail	Blue		
Pachydiplax longipennis	Blue Dasher	Blue		
Papilio indra	Indra Swallowtail	Red		
Parnassius clodius claudianus	Clodius Parnassian, *claudianus* subspecies	Blue		
Parnassius clodius pseudogallatinus	Clodius Parnassian, *pseudogallatinus* supspecies	Blue		
Parnassius smintheus olympiannus	Rocky Mountain Parnassian, *olympiannus* subspecies	Blue		
Speyeria zerene bremnerii	Zerene Fritillary, *bremnerii* subspecies	Red		
Sympetrum vicinum	Autumn Meadowhawk	Blue		
Tanypteryx hageni	Black Petaltail	Blue		
Tramea lacerata	Black Saddlebags	Red		
Amphibians				
Anaxyrus boreas	Western Toad	Yellow	SC (Nov-12)	SC (Jun-18)
Aneides vagrans	Wandering Salamander	Blue	SC (May-14)	SC (Feb-18)
Ascaphus truei	Coastal Tailed Frog	Yellow	SC (Nov-11)	SC (Jun-03)
Dicamptodon tenebrosus	Coastal Giant Salamander	Blue	T (May-14)	T (Jun-03)
Lithobates pipiens	Northern Leopard Frog	Red	E (Dec-21)	E (Jun-03)
Rana aurora	Northern Red-legged Frog	Blue	SC (May-15)	SC (Jan-05)
Rana pretiosa	Oregon Spotted Frog	Red	E (May-11)	E (Jun-03)
Mammals				
Aplodontia rufa	Mountain Beaver	Yellow	SC (May-12)	SC (Jun-03)
Cervus elaphus roosevelti	Roosevelt Elk	Blue		
Corynorhinus townsendii	Townsend's Big-eared Bat	Blue		
Eptesicus fuscus	Big Brown Bat	Yellow		
Eschrichtius robustus	Grey Whale	Blue	SC / E / Not at Risk (May-04)	SC (Jul-05)
Eumetopias jubatus	Steller Sea Lion	Blue	SC (Nov-13)	SC (Jul-05)
Gulo gulo	Wolverine		SC (May-14)	SC (Jun-18)
Gulo gulo luscus	Wolverine, *luscus* subspecies	Blue	SC (May-14)	SC (Jun-18)
Gulo gulo vancouverensis	Wolverine, *vancouverensis* subspecies	Red	SC (May-14)	SC (Jun-18)
Lasionycteris noctivagans	Silver-haired Bat	Yellow		
Lasiurus cinereus	Hoary Bat	Yellow		
Lepus americanus washingtonii	Snowshoe Hare, *washingtonii* subspecies	Red		
Mirounga angustirostris	Northern Elephant Seal	Red	Not at Risk (May-86)	
Mustela frenata altifrontalis	Long-tailed weasel, *altifrontalis* subspecies	Red		
Mustela richardsonii anguinae	Ermine, *anguinae* subspecies	Blue		
Myodes gapperi occidentalis	Southern Red-backed Vole, *occidentalis* subspecies	Red		
Myotis californicus	Californian Myotis	Yellow		
Myotis evotis	Long-eared Myotis	Yellow		
Myotis lucifugus	Little Brown Myotis	Yellow	E (Nov-13)	E (Dec-14)
Myotis volans	Long-legged Myotis	Yellow		
Myotis yumanensis	Yuma Myotis	Yellow		
Oreamnos americanus	Mountain Goat	Blue		
Pekania pennanti	Fisher			
Scapanus townsendii	Townsend's Mole	Red	E (Nov-14)	E (Jan-05)
Sorex bendirii	Pacific Water Shrew	Red	E (Apr-16)	E (Jun-03)
Sorex navigator brooksi	Western Water Shrew, *brooksi* subspecies	Blue		
Sorex rohweri	Olympic Shrew	Red		
Sorex trowbridgii	Trowbridge's Shrew	Blue		
Ursus arctos	Grizzly Bear	Blue	SC (May-12)	SC (Jun-18)

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SAR Animals
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PGL File: 346-65.01

Scientific Name	English Name	BC list	COSEWIC	SARA
Birds				
Accipiter gentilis laingi	Northern Goshawk, *laingi* subspecies	Red	T (Apr-13)	T (Jun-03)
Aechmophorus occidentalis	Western Grebe	Red	SC (May-14)	SC (Nov-17)
Aeronautes saxatalis	White-throated Swift	Blue		
Ammodramus savannarum	Grasshopper Sparrow	Red		
Ammospiza nelsoni	Nelson's Sparrow	Red	Not at Risk (May-98)	
Ardea herodias fannini	Great Blue Heron, *fannini* subspecies	Blue	SC (Mar-08)	SC (Feb-10)
Asio flammeus	Short-eared Owl	Blue	T (May-21)	SC (Jul-12)
Athene cunicularia	Burrowing Owl	Red	E (Apr-17)	E (Jun-03)
Bartramia longicauda	Upland Sandpiper	Red		
Botaurus lentiginosus	American Bittern	Blue		
Brachyramphus marmoratus	Marbled Murrelet	Blue	T (May-12)	T (Jun-03)
Branta bernicla	Brant	Blue		
Branta canadensis occidentalis	Canada Goose, *occidentalis* subspecies	Red		
Buteo lagopus	Rough-legged Hawk	Blue	Not at Risk (May-95)	
Buteo swainsoni	Swainson's Hawk	Red		
Butorides virescens	Green Heron	Blue		
Calcarius pictus	Smith's Longspur	Blue		
Calidris canutus	Red Knot	Red	E / T (Nov-20)	T / E (Feb-10)
Cardellina canadensis	Canada Warbler	Blue	SC (Nov-20)	T (Feb-10)
Chondestes grammacus	Lark Sparrow	Blue		
Chordeiles minor	Common Nighthawk	Yellow	SC (May-18)	T (Feb-10)
Coccothraustes vespertinus	Evening Grosbeak	Yellow	SC (Nov-16)	SC (May-19)
Coccyzus americanus	Yellow-billed Cuckoo	Red		
Contopus cooperi	Olive-sided Flycatcher	Blue	SC (May-18)	T (Feb-10)
Cygnus columbianus	Tundra Swan	Blue		
Cypseloides niger	Black Swift	Blue	E (May-15)	E (May-19)
Dolichonyx oryzivorus	Bobolink	Blue	T (Apr-10)	T (Nov-17)
Eremophila alpestris strigata	Horned Lark, *strigata* subspecies	Red	E (May-18)	E (Jul-05)
Euphagus carolinus	Rusty Blackbird	Blue	SC (Apr-17)	SC (Mar-09)
Falco mexicanus	Prairie Falcon	Red	Not at Risk (May-96)	
Falco peregrinus	Peregrine Falcon		SC (Apr-07)	SC (Jan-00)
Falco peregrinus anatum	Peregrine Falcon, *anatum* subspecies	Red	Not at Risk (Dec-17)	SC (Jun-12)
Falco peregrinus pealei	Peregrine Falcon, *pealei* subspecies	Blue	SC (Dec-17)	SC (Jun-03)
Falco rusticolus	Gyrfalcon	Blue	Not at Risk (May-87)	
Fratercula cirrhata	Tufted Puffin	Blue		
Fratercula corniculata	Horned Puffin	Red		
Fulmarus glacialis	Northern Fulmar	Red		
Glaucidium gnoma swarthi	Northern Pygmy-owl, *swarthi* subspecies	Blue		
Hirundo rustica	Barn Swallow	Blue	SC (May-21)	T (Nov-17)
Hydroprogne caspia	Caspian Tern	Blue	Not at Risk (May-99)	
Icteria virens	Yellow-breasted Chat	Red	E (Nov-11)	E (Jun-03)
Larus californicus	California Gull	Blue		
Limnodromus griseus	Short-billed Dowitcher	Blue		
Limosa haemastica	Hudsonian Godwit	Red	T (May-19)	
Megascops kennicottii	Western Screech-Owl	No Status	T (May-12)	T (Jan-00)
Megascops kennicottii kennicottii	Western Screech-Owl, *kennicottii* subspecies	Blue	T (May-12)	T (Jan-05)
Melanerpes lewis	Lewis's Woodpecker	Blue	T (Apr-10)	T (Jul-12)
Melanitta americana	Black Scoter	Blue		
Melanitta perspicillata	Surf Scoter	Blue		
Nannopterum auritum	Double-crested Cormorant	Blue	Not at Risk (May-78)	
Numenius americanus	Long-billed Curlew	Blue	SC (May-11)	SC (Jan-05)

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PGL File: 346-65.01

Scientific Name	English Name	BC list	COSEWIC	SARA
Nycticorax nycticorax	Black-crowned Night-heron	Red		
Oporornis agilis	Connecticut Warbler	Blue		
Oreoscoptes montanus	Sage Thrasher	Red	E (Dec-21)	E (Jun-03)
Patagioenas fasciata	Band-tailed Pigeon	Blue	SC (May-21)	SC (Feb-11)
Pelecanus erythrorhynchos	American White Pelican	Red	Not at Risk (May-87)	
Phalaropus lobatus	Red-necked Phalarope	Blue	SC (Nov-14)	SC (May-19)
Pinicola enucleator carlottae	Pine Grosbeak, *carlottae* subspecies	Blue		
Pluvialis dominica	American Golden-Plover	Blue		
Pooecetes gramineus affinis	Vesper Sparrow, *affinis* subspecies	Red	E (May-18)	E (Dec-07)
Progne subis	Purple Martin	Blue		
Ptychoramphus aleuticus	Cassin's Auklet	Red	SC (Nov-14)	SC (May-19)
Recurvirostra americana	American Avocet	Blue		
Setophaga castanea	Bay-breasted Warbler	Red		
Setophaga virens	Black-throated Green Warbler	Blue		
Sterna forsteri	Forster's Tern	Red	Data Deficient (May-96)	
Strix occidentalis	Spotted Owl	Red	E (Mar-08)	E (Jun-03)
Synthliboramphus antiquus	Ancient Murrelet	Blue	SC (Nov-14)	SC (Aug-06)
Tringa incana	Wandering Tattler	Blue		
Tyto alba	Barn Owl	Red	T (Nov-10)	T (Jun-18)
Uria aalge	Common Murre	Red		
Uria lomvia	Thick-billed Murre	Red		
Urile penicillatus	Brandt's Cormorant	Red		
Fish				
Acipenser medirostris	Green Sturgeon	Blue	SC (Nov-13)	SC (Aug-06)
Acipenser transmontanus	White Sturgeon		E / T (Nov-12)	E (Jan-00)
Acipenser transmontanus pop. 4	White Sturgeon (Lower Fraser River Population)	Red	T (Nov-12)	
Catostomus sp. 4	Salish Sucker	Red	T (Nov-12)	T (Jan-05)
Cottus aleuticus pop. 1	Coastrange Sculpin, Cultus Population	Red	E (Nov-19)	T (Jun-03)
Gasterosteus aculeatus pop. 2	Little Quarry Lake Benthic Threespine Stickleback	Red	T (Nov-15)	
Gasterosteus aculeatus pop. 3	Little Quarry Limnetic Threespine Stickleback	Red	T (Nov-15)	
Gasterosteus sp. 16	Vananda Creek Limnetic Stickleback	Red	E (Apr-10)	E (Jun-03)
Gasterosteus sp. 17	Vananda Creek Benthic Stickleback	Red	E (Apr-10)	E (Jun-03)
Gasterosteus sp. 2	Enos Lake Limnetic Stickleback	Red	E (May-12)	E (Jan-05)
Gasterosteus sp. 3	Enos Lake Benthic Stickleback	Red	E (May-12)	E (Jan-05)
Gasterosteus sp. 4	Paxton Lake Limnetic Stickleback	Red	E (Apr-10)	E (Jun-03)
Gasterosteus sp. 5	Paxton Lake Benthic Stickleback	Red	E (Apr-10)	E (Jun-03)
Hybognathus hankinsoni - Pacific group	Brassy Minnow - Pacific Group	Blue		
Oncorhynchus clarkii clarkii	Cutthroat Trout, *clarkii* subspecies	Blue		
Rhinichthys cataractae - Chehalis lineage	Nooksack Dace	Red	E (Dec-18)	E (Jun-03)
Salvelinus confluentus	Bull Trout	Blue	SC (Nov-12)	
Salvelinus confluentus pop. 28	Bull Trout - South Coast Population	Blue	SC (Nov-12)	SC (Aug-19)
Spirinchus sp. 1	Pygmy Longfin Smelt	Red	Data Deficient (Nov-04)	
Thaleichthys pacificus	Eulachon	Blue	E / T (May-11)	
Reptiles				
Charina bottae	Northern Rubber Boa	Yellow	SC (Apr-16)	SC (Jan-05)
Chrysemys picta	Northern Painted Turtle		E / SC (Apr-06)	E / SC (Dec-07)
Chrysemys picta pop. 1	Northern Painted Turtle - Pacific Coast Population	Red	T (Sep-21)	E (Dec-07)
Contia tenuis	Common Sharp-Tailed Snake	Red	T (Dec-21)	E (Jun-03)
Dermochelys coriacea	Leatherback Sea Turtle	Red	E (May-12)	E (May-17)

Citation: B.C. Conservation Data Centre. 2022. BC Species and Ecosystems Explorer. B.C. Minist. of Environ. Victoria, B.C. Available: http://a100.gov.bc.ca/pub/eswp/ (accessed May 19, 2022).

Search Criteria: Municipality: District of Sechelt; Biogeoclamatic unit: Coastal Western Hemlock Very Dry Martitime (CWHxm)

Note: Marine mammals (e.g., whales) were excluded from this list due to the Sites being terrestrial based with no offshore marine component.

[1] See Appendix 2 for definitions and status descriptions.

Species not likely to occur based on available habitat.

Table 2
SAR Plants
Kenyon Creek at Redrooffs Road, Sechelt, BC, Ministry of Transportation and Infrastructure, PGL
File: 346-65.01

Scientific Name	English Name	BC List	COSEWIC	SARA
Nonvascular Plants				
Bartramia aprica	rigid apple moss	Red	E (Nov-09)	E
Callophrys mossii mossii	Moss' Elfin, *mossii* subspecies	Red		
Entosthodon fascicularis	banded cord-moss	Blue	SC (May-15)	SC
Fabronia pusilla	silver hair moss	Red	E (May-12)	E
Fissidens pauperculus	poor pocket moss	Red	E (May-11)	E
Pinus contorta / Sphagnum spp. *Very Dry Maritime*	lodgepole pine / peat-mosses Very Dry Maritime	Blue		
Rhododendron groenlandicum / Kalmia microphylla / Sphagnum spp.	Labrador-tea / western bog-laurel / peat-mosses	Blue		
Seligeria acutifolia	acuteleaf small limestone moss	Red	E (May-18)	E
Syntrichia laevipila	twisted oak moss	Blue	SC (Nov-14)	SC
Tsuga heterophylla / Buckiella undulata	western hemlock / flat-moss	Blue		
Tsuga heterophylla - Pseudotsuga menziesii / Eurhynchium oreganum	western hemlock - Douglas-fir / Oregon beaked-moss	Red		
Dicots				
Abronia latifolia	yellow sand-verbena	Blue		
Callitriche heterophylla var. *heterophylla*	two-edged water-starwort	Unknown		
Calystegia soldanella	beach bindweed	Blue		
Camissonia contorta	contorted-pod evening-primrose	Red	E (Apr-06)	E (Dec-07)
Castilleja levisecta	golden paintbrush	Red	E (Nov-07)	E (Jun-03)
Castilleja victoriae	Victoria's owl-clover	Red	E (Apr-10)	E (Jul-12)
Claytonia washingtoniana	Washington springbeauty	Red		
Corispermum hookeri var. *pseudodeclinatum*	British Columbia bugseed	Unknown		
Crassula connata	Erect Pigmyweed	Blue		
Hosackia gracilis	seaside bird's foot lotus	Red	E (Nov-10)	E (Jun-03)
Lathyrus littoralis	silky beach pea	Red	T (Apr-13)	
Limnanthes macounii	Macoun's meadow-foam	Red	T (Nov-04)	T (Aug-06)
Lomatium dissectum	fern-leaved desert-parsley	Red		
Lupinus microcarpus var. *microcarpus*	dense-flowered lupine	Red	E (May-05)	E (Aug-06)
Meconella oregana	white meconella	Red	E (May-05)	E (Feb-11)
Microseris bigelovii	coast microseris	Red	E (Apr-06)	E (Aug-06)
Nuttallanthus texanus	Texas toadflax	Blue		(Dec-07)
Orthocarpus bracteosus	rosy owl-clover	Red	E (May-04)	E
Plagiobothrys figuratus ssp. *figuratus*	fragrant popcornflower	Red	E (Mar-08)	E (Jul-05)
Polygonum paronychia	black knotweed	Blue		(Feb-10)
Psilocarphus elatior	tall woolly-heads	Red	E (May-18)	E
Pyrola aphylla	leafless wintergreen	Blue		(Jun-03)
Ranunculus alismifolius var. *alismifolius*	water-plantain buttercup	Red	E (Apr-09)	E
Ranunculus californicus	California buttercup	Red	E (Nov-08)	E (Jun-03)
Sabulina pusilla	dwarf sandwort	Red	E (May-04)	E (Feb-11)
Sanicula arctopoides	bear's-foot sanicle	Red	T (Nov-15)	T (Jul-05)
Sanicula bipinnatifida	purple sanicle	Red	T (May-01)	T (Jun-03)
Sericocarpus rigidus	white-top aster	Blue	SC (Apr-09)	SC (Jun-03)
Silene scouleri ssp. *scouleri*	coastal Scouler's catchfly	Red	E (May-03)	E (Jun-03)
Trifolium depauperatum var. *depauperatum*	poverty clover	Blue		(Jan-05)
Trifolium dichotomum	Macrae's clover	Red		
Triphysaria versicolor ssp. *versicolor*	bearded owl-clover	Red	E (Nov-11)	E
Utricularia ochroleuca	ochroleucous bladderwort	Blue		(Jun-03)
Monocots				
Allium amplectens	slimleaf onion	Blue		
Carex tumulicola	foothill sedge	Yellow	E (Mar-08)	E
Festuca rubra ssp. *mediana*	dwarf red fescue	Yellow		(Feb-10)
Sisyrinchium idahoense var. *segetum*	Idaho blue-eyed-grass	Red		
Ferns				
Dryopteris arguta	coastal wood fern	Blue	SC (May-21)	SC
Polystichum californicum	California Sword-fern	Red		(Jun-03)
Woodwardia fimbriata	giant chain fern	Blue		

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Search Criteria: Municipality: District of Sechelt; Biogeoclamatic unit: Coastal Western Hemlock Very Dry Maritime (CWHxm)

[1] See Appendix 2 for definitions and status descriptions.

Species not likely to occur based on available habitat.

Table 3
Ecological Community
Kenyon Creek at Redrooffs Road, Sechel , BC, Ministry of Transportation and Infrastructure,
PGL File: 346-65.01

Scientific Name	English Name	BC List
Ecological Community		
Arbutus menziesii / Arctostaphylos columbiana	arbutus / hairy manzanita	Red
Carex lasiocarpa - Rhynchospora alba	slender sedge - white beak-rush	Red
Carex lyngbyei Herbaceous Vegetation	Lyngbye's sedge herbaceous vegetation	Red
Carex macrocephala Herbaceous Vegetation	large-headed sedge Herbaceous Vegetation	Red
Carex sitchensis - Oenanthe sarmentosa	Sitka sedge - Pacific water-parsley	Blue
Deschampsia cespitosa - Sidalcea hendersonii	tufted hairgrass - Henderson's checker-mallow	Red
Deschampsia cespitosa ssp. *beringensis - Hordeum brachyantherum*	tufted hairgrass - meadow barley	Red
Distichlis spicata - Sarcocornia pacifica	seashore saltgrass - Pacific swampfire	Red
Eleocharis palustris Herbaceous Vegetation	common spike-rush Herbaceous Vegetation	Blue
Festuca roemeri - Koeleria macrantha	Roemer's fescue - junegrass	Red
Juncus arcticus - Plantago macrocarpa	arctic rush - Alaska plantain	Red
Leymus mollis ssp. *mollis - Lathyrus japonicus*	dune wildrye - beach pea	Red
Myrica gale / Carex sitchensis	sweet gale / Sitka sedge	Red
Picea sitchensis / Rubus spectabilis Dry	Sitka spruce / salmonberry Dry	Red
Picea sitchensis / Rubus spectabilis Very Dry Maritime	Sitka spruce / salmonberry Very Dry Maritime	Red
Pinus contorta / Sphagnum spp. *Very Dry Maritime*	lodgepole pine / peat-mosses Very Dry Maritime	Blue
Populus tremuloides / Malus fusca / Carex obnupta	trembling aspen / Pacific crab apple / slough sedge	Red
Populus trichocarpa - Alnus rubra / Rubus spectabilis	black cottonwood - red alder / salmonberry	Blue
Populus trichocarpa / Salix sitchensis	black cottonwood / Sitka willow	Blue
Pseudotsuga menziesii / Polystichum munitum	Douglas-fir / sword fern	Red
Pseudotsuga menziesii - Tsuga heterophylla / Gaultheria shallon Dry Maritime	Douglas-fir - western hemlock / salal Dry Maritime	Red
Rhododendron groenlandicum / Kalmia microphylla / Sphagnum spp.	Labrador-tea / western bog-laurel / peat-mosses	Blue
Ruppia maritima Herbaceous Vegetation	beaked ditch-grass Herbaceous Vegetation	Red
Salix sitchensis - Salix lasiandra var. *lasiandra / Lysichiton americanus*	Sitka willow - Pacific willow / skunk cabbage	Red
Sarcocornia pacifica - Lysimachia maritima	American glasswort - sea-milkwort	Red
Schoenoplectus acutus Deep Marsh	hard-stemmed bulrush Deep Marsh	Blue
Selaginella wallacei / Cladina spp.	Wallace's selaginella / reindeer lichens	Blue
Sidalcea hendersonii Tidal Marsh	Henderson's checker-mallow Tidal Marsh	Red
Thuja plicata / Carex obnupta	western redcedar / slough sedge	Red
Thuja plicata / Lonicera involucrata	western redcedar / black twinberry	Red
Thuja plicata - Picea sitchensis / Lysichiton americanus	western redcedar - Sitka spruce / skunk cabbage	Blue
Thuja plicata / Polystichum munitum - Lysichiton americanus	western redcedar / sword fern - skunk cabbage	Blue
Thuja plicata / Polystichum munitum Dry Maritime	western redcedar / sword fern Dry Maritime	Red
Thuja plicata / Polystichum munitum Very Dry Maritime	western redcedar / sword fern Very Dry Maritime	Red
Thuja plicata / Rubus spectabilis	western redcedar / salmonberry	Red
Thuja plicata / Tiarella trifoliata Dry Maritime	western redcedar / three-leaved foamflower Dry Maritime	Blue
Thuja plicata / Tiarella trifoliata Very Dry Maritime	western redcedar / three-leaved foamflower Very Dry Maritime	Blue
Tsuga heterophylla / Buckiella undulata	western hemlock / flat-moss	Blue
Tsuga heterophylla - Pseudotsuga menziesii / Eurhynchium oreganum	western hemlock - Douglas-fir / Oregon beaked-moss	Red
Tsuga heterophylla - Thuja plicata / Struthiopteris spicant	western hemlock - western redcedar / deer fern	Red
Typha latifolia Marsh	common cattail Marsh	Blue

Appendix 1

Site Photos

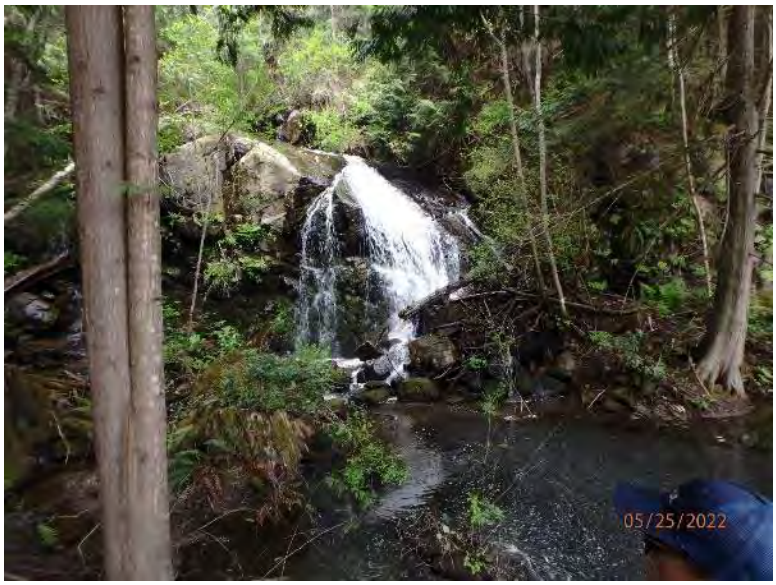
PGL
ENVIRONMENTAL CONSULTANTS

Photograph 1:

View facing northeast (upstream side) from Redrooffs Road. Extreme flooding due to insufficient outflow from temporary culverts (May 25, 2022)

Photograph 2:

Temporary culverts from upstream side, facing downstream (May 25, 2022)



Photograph 3:

Waterfall to the north (May 25, 2022)

Photograph 4:

The base of the waterfall to the north (May 25, 2022)

Photograph 5:

Watercourse impounded by a deep pool on the upstream side of Redrooffs Road. Trees are sitting in approximately 2m of standing water (May 25, 2022)

Photograph 6:

Temporary culvert from downstream side, facing upstream (May 25, 2022)

Photograph 7:

View facing downstream from the base of the riprap and structural road fill that is supporting temporary road access (May 25, 2022)

Photograph 8:

Additional (concrete) culvert from downstream side, facing upstream. Culvert is almost completely submerged with very slow outflow (May 25, 2022)

Photograph 9:

Downstream of temporary culverts, view facing downstream. Native channel, not influenced by emergency works (May 25, 2022)

Appendix 2

Status Definitions for Provincial and Federal SAR

PGL ENVIRONMENTAL CONSULTANTS

Appendix 2
Status Definitions For Provincial and Federal Species at Risk

Status Definitions as per provincial Conservation Data Centre (CDC)

RED: Species that are candidates for Extirpated, Endangered, or Threatened status in BC. Placing taxa on these lists flags them as being at risk and requiring investigation.

BLUE: Species considered of Special Concern in BC. Taxa of Special Concern have characteristics that make them particularly sensitive or vulnerable to human activities or natural events.

Status Definitions as per federal Species at Risk Act (SARA)

ENDANGERED: A wildlife species that is facing imminent extirpation or extinction.

THREATENED: A wildlife species that is likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction.

SPECIAL CONCERN: A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

SCHEDULE 1: Official list of federally protected species.

SCHEDULE 2 and 3: Species under assessment for inclusion to Schedule 1.

Appendix 3

Civil Engineering Drawings

PGL
ENVIRONMENTAL CONSULTANTS

BRITISH COLUMBIA

Ministry of Transportation and Infrastructure

PROJECT NO. 14009

KENYON CREEK
DFAA FLOOD DAMAGE

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Refer to Tender Drawing Package Approval Form	Refer to Tender Drawing Package Approval Form
DIRECTOR, ENGINEERING	REGIONAL DIRECTOR
DATE	DATE

DRAWING NUMBER: R1-1028-000
REV:

PLOT DATE: 2022/11/08 U:\Projects_SUR\1961\0480\15\D-Design\CAD\DrawingProduction\000_CoverKeyPlanLegend\R1-1028-000.dwg

LOCATION MAP
N.T.S

BRITISH COLUMBIA | Ministry of Transportation and Infrastructure

PROJECT NO. 14009

KENYON CREEK

DFAA FLOOD DAMAGE

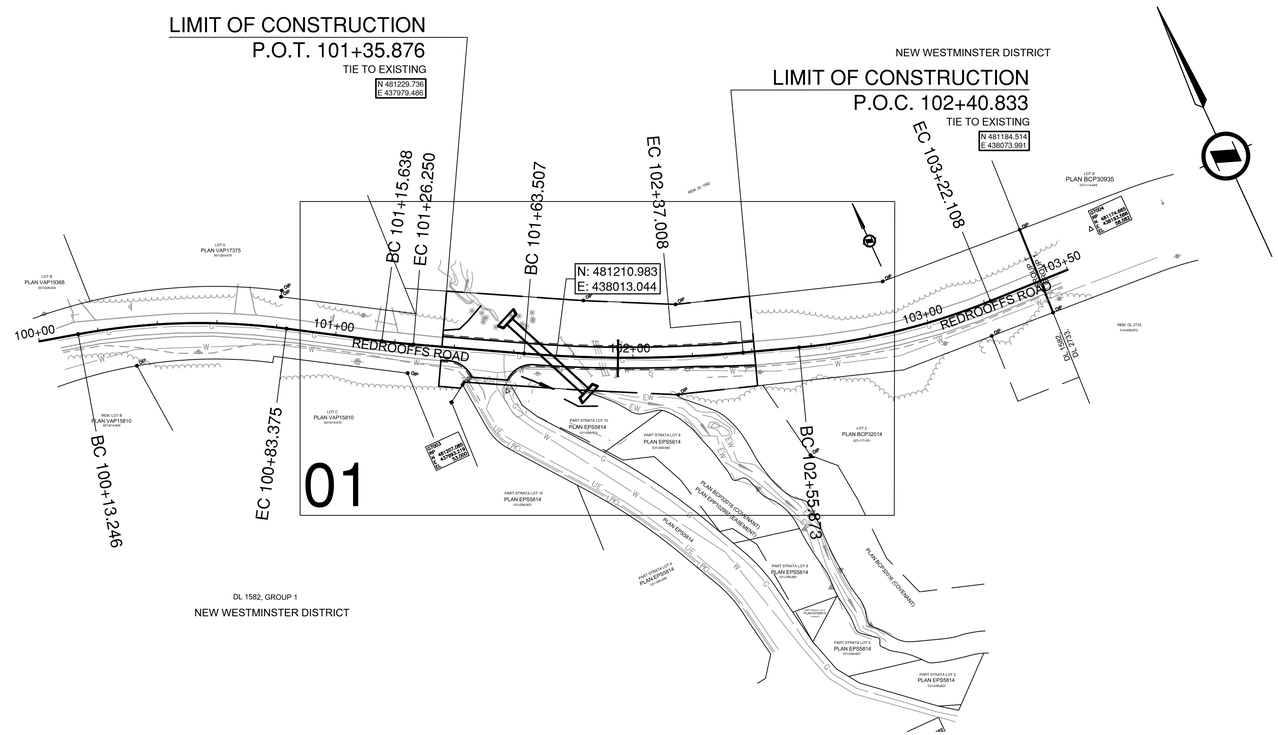
STA. 101+35.876 - STA. 102+40.833

0.105 km

N: 481210.983, E: 438013.044

GRADING AND DRAINAGE CONTRACT

DRAWING INDEX



KEY PLAN

0 10 1:1000 50m

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URBAN SYSTEMS

DRAWING NUMBER R1-1028-001 REV

PLOT DATE: 2022/11/08 U:\Projects_SUR\1961\0480\15\D-Design\CAD\DrawingProduction\000_CoverKeyPlanLegend\R1-1028-000.dwg

LEGEND

SYMBOLS (EXISTING)

AERIAL UTILITIES

- POWER POLE
- POWER POLE WITH TRANSFORMER
- POWER / TELEPHONE POLE WITH TRANSFORMER
- POWER GUY POLE
- POWER / TELEPHONE POLE
- POWER / TELEPHONE GUY POLE
- ANCHOR OR GUY WIRE
- DEADMAN
- TELEPHONE POLE
- TELEPHONE GUY POLE
- HIGH TENSION POLE
- HIGH TENSION TOWER (HT)
- UTILITY POLE (UP)

SURVEY

- CONTROL POINT
- CONTROL MONUMENT
- LEGAL MONUMENT (MON)
- STANDARD IRON PIN FOUND (OIP)
- CAPPED IRON PIN (CIP, OIP)
- LEAD PLUG
- BENCHMARK
- SPOT ELEVATION

GEOTECHNICAL

- TESTPIT
- TESTHOLE (TH)
- OBSERVATION WELL (OW)

DETAIL

- GATE POST (GP)
- MAILBOX (MB)
- OLD POST (Post)
- DELINEATOR POST (DP)
- FLAGPOLE (FP)
- DECORATIVE TREE
- TREE
- PILING (Piling)
- CONCRETE PILLAR
- WELL
- SWAMP
- DIRECTIONAL ARROW

DRAINAGE & UTILITIES

- STORM MANHOLE (MH Storm)
- STANDARD CATCH BASIN
- ROUND CATCH BASIN
- DRYWELL (MH/CB Drywell)
- CB MANHOLE
- CULVERT INLET (CI)

DRAINAGE & UTILITIES

- CULVERT OUTLET (CO)
- SANITARY MANHOLE (MH San)
- UTILITY MANHOLE (MH Vault)
- WATER MANHOLE (MH Water)
- MANHOLE UNKNOWN (MH Unk)

ELECTRICAL

- JUNCTION BOX (JB)
- UTILITY VAULT (JB)
- LAMP STANDARD (LS)
- UTILITY KIOSK
- UTILITY PEDESTAL (PED)
- TRAFFIC COUNTER
- TRAFFIC SIGNAL
- TRAFFIC SIGNAL CONTROLLER

METERS

- VALVE (V)
- WATER VALVE (WV)
- WATER METER (WM)
- FIRE HYDRANT (FH)
- WELL
- STANDPIPE / WATER BLOW OFF (SD)
- AIR VALVE (AIR)
- GAS VALVE (GV)
- SERVICE METER (SV)

UNDERGROUND

- VENT/BREATHER PIPE (BP)
- FILLER CAP (FC)
- FUEL / GAS PUMP (FP)
- FUEL TANK (FT)
- SEPTIC TANK (ST)
- UNDERGROUND MARKER (MISC) (UM)
- IRRIGATION JUNCTION BOX (IJ)
- IRRIGATION SPRINKLER HEAD (IS)

ROAD SIGNS

- STANDARD SIGN
- COMMERCIAL SIGN
- SIGN BRIDGE STRUCTURE
- CANTILEVER STRUCTURE
- TWO POST SIGN
- TWO POST SIGN (BREAKAWAY)
- STANDARD DAVIT POLE - TYPE 3
- STANDARD COMBINATION POLE - TYPE 1
- HEAVY DUTY DAVIT POLE - TYPE 6
- HEAVY DUTY COMBINATION POLE - TYPE 7
- HEAVY POLE - TYPE H
- HEAVY COMBINATION POLE - TYPE H

LINE TYPES (EXISTING)

LOT BOUNDARIES

- SECTION LINE / DISTRICT LOT
- 1/4 SECTION BOUNDARY
- LOT BOUNDARY
- EASEMENTS

LINE TYPES (EXISTING)

MAN-MADE FEATURES

- RAILWAY TRACKS
- RAILWAY BALLAST
- ROAD MARKING - YELLOW
- ROAD MARKING - WHITE
- ROAD MARKING - BROKEN
- CROSSWALK
- STOP LINE
- EDGE OF ROAD - PAVED
- EDGE OF ROAD GRAVEL
- GRAVEL SHOULDER
- DIRT ROAD
- GRAVEL ROAD
- EDGE OF GRAVEL
- SIDEWALK
- CONCRETE PAD
- FENCE
- TOP OF CURB
- CL OF GUTTER
- CONCRETE ROAD BARRIER
- TOP OF FILL
- RIP RAP
- BUILDING
- TREE LINE
- LAWN LINE

HYDRAULIC

- CULVERT
- DITCH CENTER
- DITCH EDGE
- CENTER OF CREEK
- HIGH WATER (HWM)
- EDGE OF WATER (EW)
- HIGH WATER MARK (EXTREME)
- SEEPAGE LINE

TOPOGRAPHY

- BASE OF SLOPE
- MARSH
- TOP OF ROCK
- SLIDE
- TALUS
- TRAIL
- TOP OF SLOPE

UTILITIES

- OVERHEAD UTILITY
- PIPELINE (GAS) (G)
- UG ELECTRIC (UE)
- UG COMMUNICATION (UT)
- STORM SEWER (S)
- SANITARY SEWER (SAN)
- WATER MAIN (W)
- MISCELLANEOUS UNDERGROUND (UG)

SYMBOLS (PROPOSED)

AERIAL UTILITIES

- POWER POLE
- POWER POLE WITH TRANSFORMER
- POWER / TELEPHONE POLE WITH TRANSFORMER
- POWER GUY POLE
- POWER / TELEPHONE POLE
- POWER / TELEPHONE GUY POLE
- ANCHOR OR GUY WIRE
- DEADMAN
- TELEPHONE POLE
- TELEPHONE GUY POLE
- HIGH TENSION POLE
- HIGH TENSION TOWER (HT)

DETAIL

- GATE POST (GP)
- MAILBOX (MB)
- POST (Post)
- POST MOUNTED DELINEATOR (DP)
- FLAGPOLE (FP)
- DIRECTIONAL ARROW

DRAINAGE & UTILITIES

- MANHOLE
- STORM MANHOLE (MH Storm)
- STANDARD CATCH BASIN
- VARIABLE DEPTH CATCH BASIN
- SPILLWAY
- HEADWALL
- DRYWELL (MH/CB Drywell)
- TELEPHONE MANHOLE (MH Tel)
- POWER MANHOLE (MH Power)
- SANITARY MANHOLE (MH San)
- UTILITY MANHOLE (MH Vault)
- WATER MANHOLE (MH Water)
- MANHOLE UNKNOWN (MH Unk)

ELECTRICAL

- JUNCTION BOX (JB)
- UTILITY VAULT (JB)
- LAMP STANDARD
- UTILITY KIOSK
- UTILITY PEDESTAL (PED)
- TRAFFIC SIGNAL
- TRAFFIC SIGNAL CONTROLLER
- UNDERGROUND ELECTRICAL TRANSFORMER (XF)

METERS

- VALVE (V)
- WATER VALVE (WV)
- WATER METER (WM)
- FIRE HYDRANT (FH)
- STANDPIPE / WATER BLOW OFF (SD)
- AIR VALVE (AIR)
- GAS VALVE (GV)
- SERVICE METER (SV)

UNDERGROUND

- VENT/BREATHER PIPE (BP)
- FILLER CAP (FC)
- FUEL / GAS PUMP (FP)
- FUEL TANK (FT)
- SEPTIC TANK (ST)
- UNDERGROUND MARKER (MISC) (UM)

ROAD SIGNS

- STANDARD SIGN
- BARRIER MOUNTED DELINEATOR
- RELOCATED OVERHEAD SIGN
- TWO POST SIGN
- TWO POST SIGN (BREAKAWAY)
- STANDARD DAVIT POLE - TYPE 3
- STANDARD COMBINATION POLE - TYPE 1
- HEAVY DUTY DAVIT POLE - TYPE 6
- HEAVY DUTY COMBINATION POLE - TYPE 7
- HEAVY POLE - TYPE H
- HEAVY COMBINATION POLE - TYPE H
- CANTILEVER STRUCTURE
- SIGN BRIDGE STRUCTURE

PATTERNS

- LEVELLING COURSE
- PAVEMENT MILLING
- PAVEMENT REMOVAL
- RIPRAP
- TURF REINFORCEMENT MATTING

REMOVALS / RELOCATES

- POWER POLE
- TELEPHONE POLE
- HIGHWAY SIGNS

LINE TYPES (PROPOSED)

FEATURES

- HIGHWAY CONTROL LINE (100+00)
- MINOR CONTROL LINE (100+00)
- CLEARING AND GRUBBING (CL. & GR.)
- PAVEMENT EDGE
- SHOULDER EDGE
- CURB AND GUTTER
- RAISED ISLAND
- SAWCUT
- RUMBLE STRIP
- RETAINING WALL
- FENCE
- TOP OF CUT / BOTTOM OF FILL (TOES) (CUT, C/F, FILL)
- 100mm - YELLOW PAINT LINE (SOLID)
- 100mm - WHITE PAINT LINE (SOLID)
- 100mm - CONTINUITY PAINT LINE (BROKEN) (3, 3, 3)
- 100mm - LANE PAINT LINE (BROKEN) (8, 5, 8)
- CONCRETE BARRIER
- DITCH CENTER / ADDITIONAL DITCHING
- DITCH EDGE

BOUNDARIES

- RIGHT OF WAY
- TEMPORARY LICENCE TO CONSTRUCT (T.L.T.C.)

UTILITIES

- OVERHEAD UTILITY
- PIPELINE (GAS) (G)
- SERVICE LINE (GAS)
- UG ELECTRIC (UE)
- UG COMMUNICATION (UT)
- STORM SEWER (S)
- SUB DRAIN (SD)
- CULVERT
- SANITARY SEWER (SAN)
- WATER MAIN (W)
- MISCELLANEOUS UNDERGROUND (UG)

NOTE:
NOT ALL SYMBOLS AND LINE TYPES ILLUSTRATED IN THIS LEGEND ARE UTILIZED IN THE FOLLOWING DESIGN

ISSUED FOR 50% DESIGN
2022-11-08
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SCALE

CAD FILENAME R1-1028-000
PLOT DATE 2022-11-08

REV	DATE	REVISIONS	NAME

URBAN SYSTEMS

BRITISH COLUMBIA
MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE
SOUTH COAST REGION
HIGHWAY ENGINEERING AND GEOMATICS

CODY BAGG, P.ENG.
SENIOR DESIGNER
DATE ---

DESIGNED S.CAVASINNI DATE 2022-11-08
QUALITY CONTROL C.BAGG DATE 2022-11-08
QUALITY ASSURANCE J.BORCH DATE 2022-11-08
DRAWN S.CAVASINNI DATE 2022-11-08

LEGEND
KENYON CREEK
DFAA FLOOD DAMAGE

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
872CS1714	14009	1	R1-1028-002	

PLOT DATE: 2022/11/08 U:\Projects_SUR\1961\0480\15\D-Design\CAD\DrawingProduction\000_CoverKeyPlanLegend\R1-1028-000.dwg

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2022-11-08
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SURVEY NOTE:
COORDINATES ARE AT GROUND LEVEL AND BASED ON THE FOLLOWING CONVERSION FACTORS FROM UTM Z10 NAD 83 (CSRS), CGVD28 (HT2.0):
- -TACK POINT: GCM 177964
- -ADJUSTED COORDINATES WERE DIVIDED BY GIVEN SCALE FACTOR OF : 0.9996417
- -ROTATION: NOT APPLIED
- -TRANSLATION: SHIFT NORTH (-5000000.000), SHIFT EAST (0.000)

THE LOCATION OF EXISTING UNDERGROUND UTILITIES SHOWN HEREON IS APPROXIMATE ONLY AND PREDOMINANTLY BASED ON AS-BUILT INFORMATION. THE CONTRACTOR WILL CONFIRM THE FIELD LOCATIONS OF THESE UTILITIES WITH THE UTILITY STAKEHOLDERS.

CL & GR TOTAL
THIS DWG = 0.316 ha.

FOR PROFILES SEE DWG
R1-1028-201

FOR DRAINAGE AND UTILITIES
SEE DWG R1-1028-701 to R1-1028-702

PLOT DATE: 2022/11/09 U:\Projects_SUR\1961\0480\15\D-Design\CAD\DrawingProduction\100_Plans\R1-1028-100.dwg

URBAN SYSTEMS

SCALE 0 2 1:250 12m

CAD FILENAME R1-1028-100
PLOT DATE 2022-11-09

REV	DATE	REVISIONS	NAME

BRITISH COLUMBIA
MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE
SOUTH COAST REGION
HIGHWAY ENGINEERING AND GEOMATICS

CODY BAGG, P.ENG.
SENIOR DESIGNER
DATE ----

DESIGNED	S.CAVASINNI	DATE	2022-11-08
QUALITY CONTROL	C.BAGG	DATE	2022-11-08
QUALITY ASSURANCE	J.BORCH	DATE	2022-11-08
DRAWN	S.CAVASINNI	DATE	2022-11-08

PLAN
KENYON CREEK
DFAA FLOOD DAMAGE
STA. 101+00.000 TO 103+080.000

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
872CS1714	14009	1	R1-1028-101	

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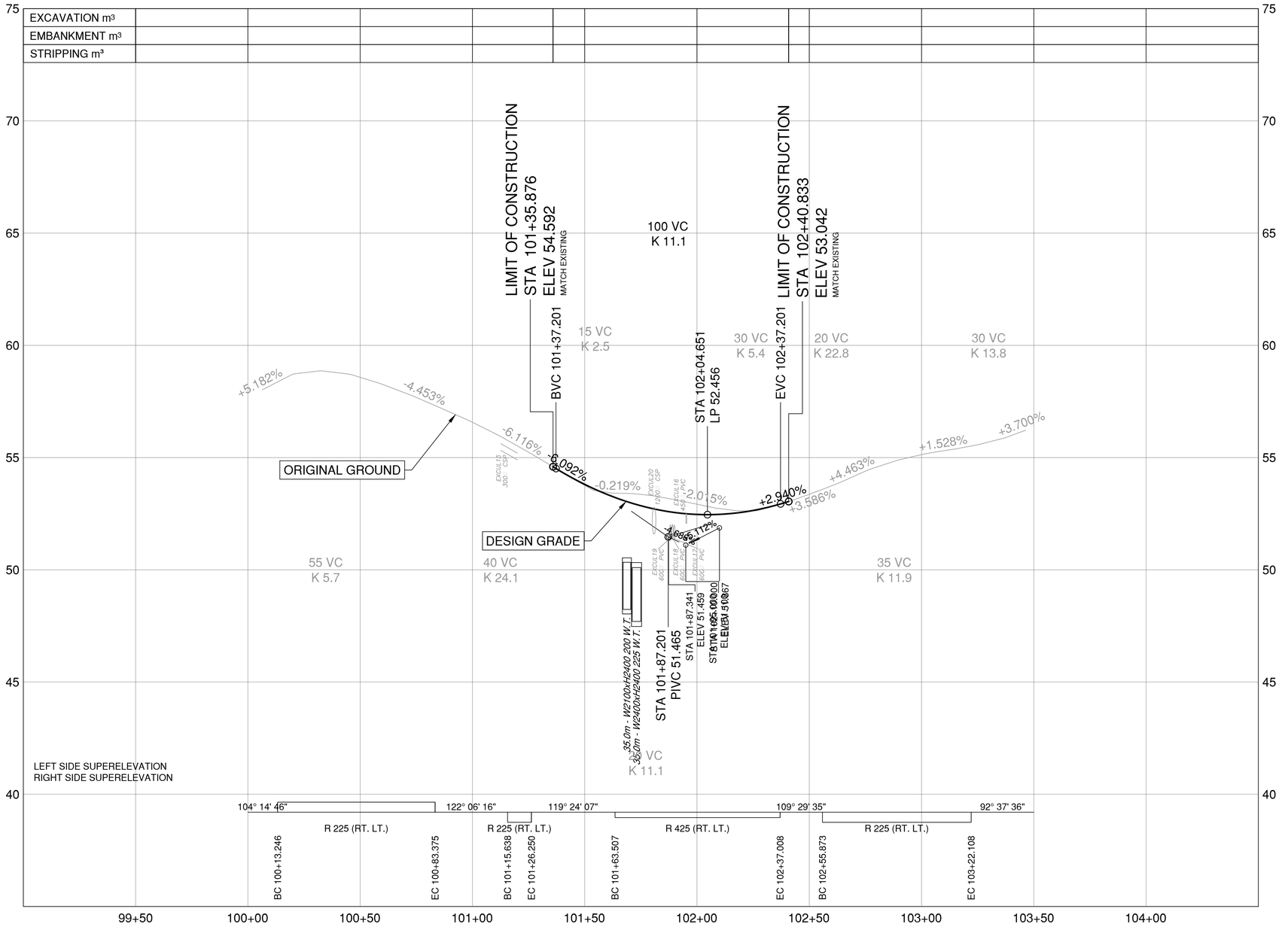
EMBANKMENT m³												
STRIPPING m³												



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50% DESIGN
2022-11-08
urbansystems.ca

PLOT DATE: 2022/11/08 U:\Projects_SUR\1961\0480\15\D-Design\CAD\DrawingProduction\200_Profiles\R1-1028-200.dwg

DESIGN SPEED XX km/h

URBAN SYSTEMS

SCALE 0 10 H 1:1000 50m
0 1 V 1:100 5m

CAD FILENAME R1-1028-200
PLOT DATE 2022-11-08

REV	DATE	REVISIONS	NAME

BRITISH COLUMBIA

MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE
SOUTH COAST REGION
HIGHWAY ENGINEERING AND GEOMATICS

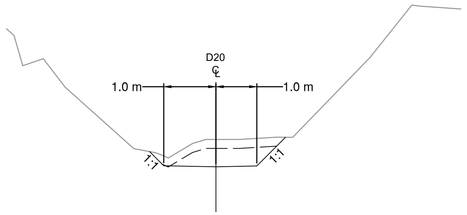
CODY BAGG, P.ENG.
SENIOR DESIGNER
DATE ----

DESIGNED S.CAVASINNI DATE 2022-11-08
QUALITY CONTROL C.BAGG DATE 2022-11-08
QUALITY ASSURANCE J.BORCH DATE 2022-11-08
DRAWN S.CAVASINNI DATE 2022-11-08

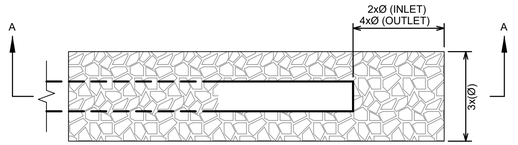
PROFILE

KENYON CREEK
DFAA FLOOD DAMAGE
STA. 101+00.000 TO 103+080.000

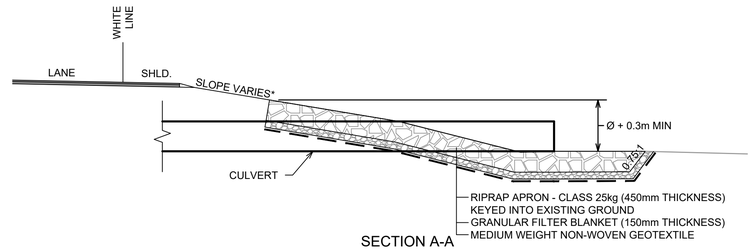
FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
872CS1714	14009	1	R1-1028-201	



D20 - INLET AND OUTLET CHANNEL



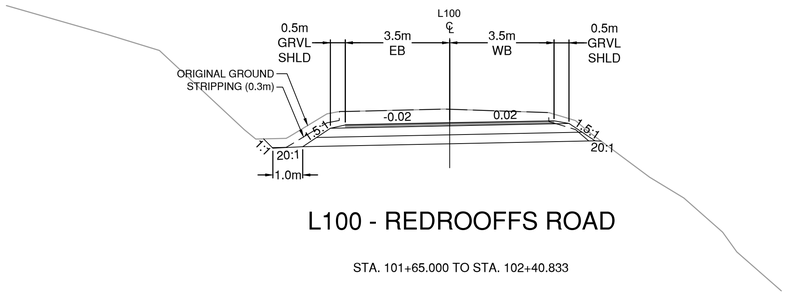
PLAN



SECTION A-A

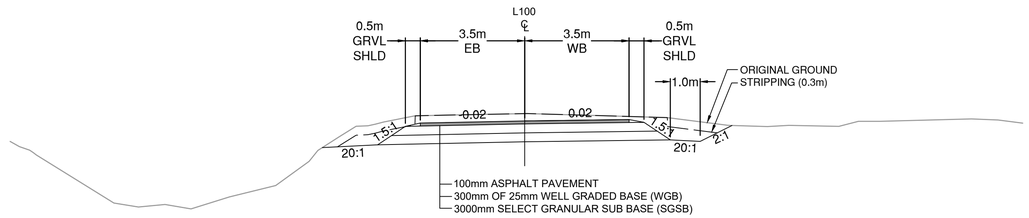
CULVERT INLET & OUTLET

N.T.S.



L100 - REDROOFFS ROAD

STA. 101+65.000 TO STA. 102+40.833



L100 - REDROOFFS ROAD

STA. 101+35.876 TO STA. 101+60.000

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URBAN SYSTEMS

SCALE 0 1 1:100 5m

CAD FILENAME R1-1028-300
PLOT DATE 2022-11-08

REV	DATE	REVISIONS	NAME

BRITISH COLUMBIA
MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE
SOUTH COAST REGION
HIGHWAY ENGINEERING AND GEOMATICS

CODY BAGG, P.ENG.
SENIOR DESIGNER
DATE ----

DESIGNED S.CAVASINNI DATE 2022-11-08
QUALITY CONTROL C.BAGG DATE 2022-11-08
QUALITY ASSURANCE J.BORCH DATE 2022-11-08
DRAWN S.CAVASINNI DATE 2022-11-08

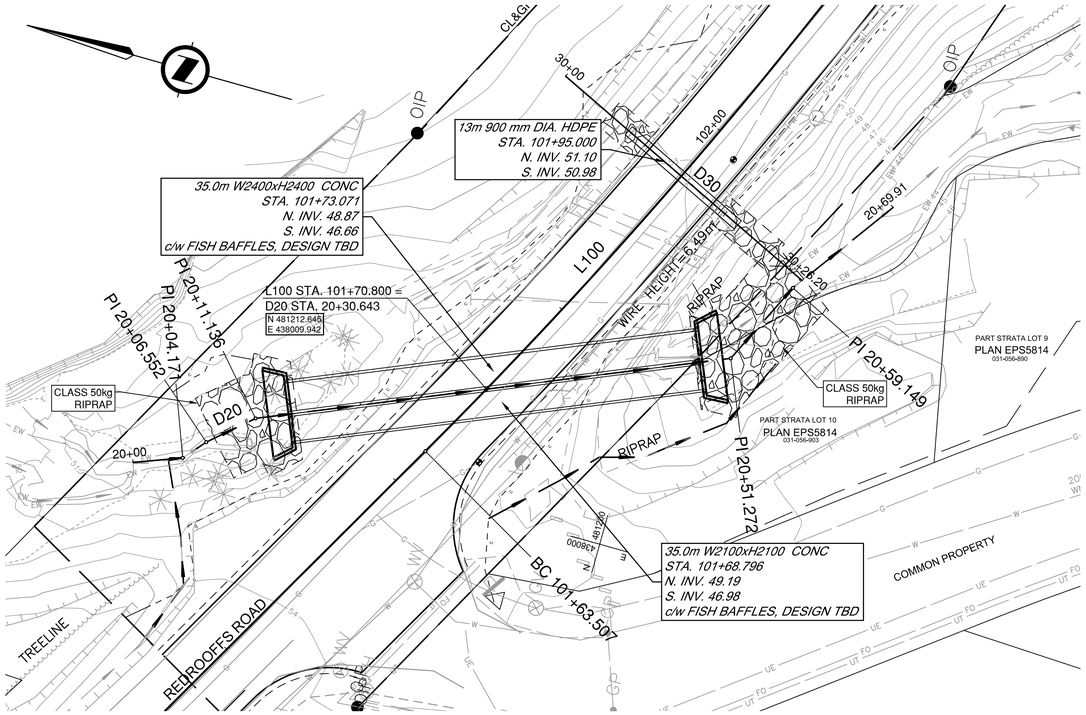
TYPICAL SECTION

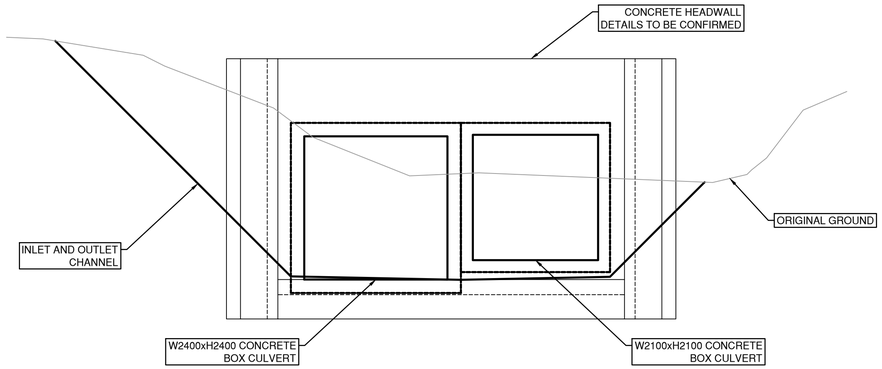
KENYON CREEK
DFAA FLOOD DAMAGE

STA. 101+00.000 TO 103+080.000

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
872CS1714	14009	1	R1-1028-301	

PLOT DATE: 2022/11/08 U:\Projects_SUR\1961\0480\15\D-Design\CAD\DrawingProduction\300_TypicalSections\R1-1028-300.dwg





D20 INLET AND OUTLET SECTION

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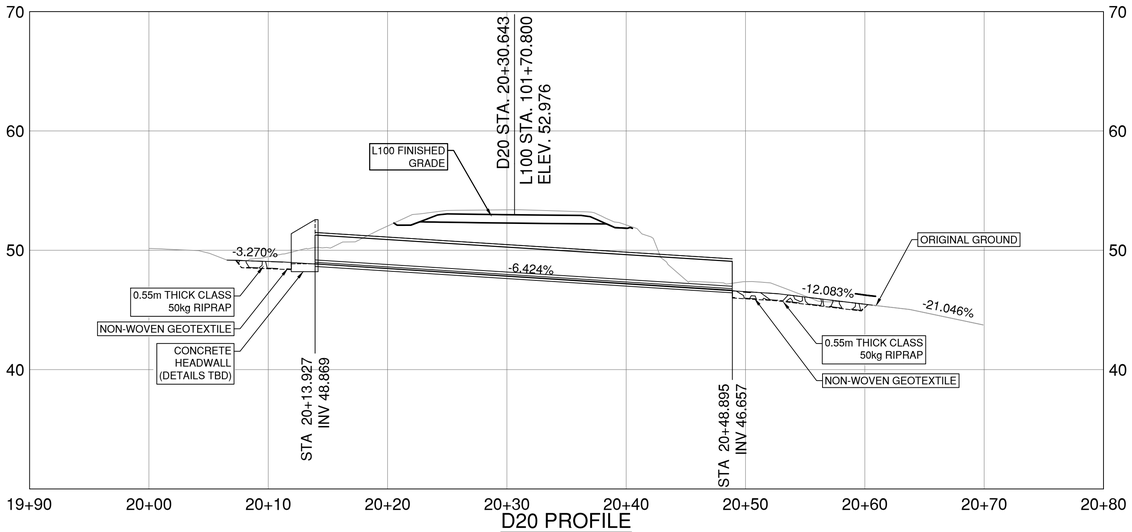
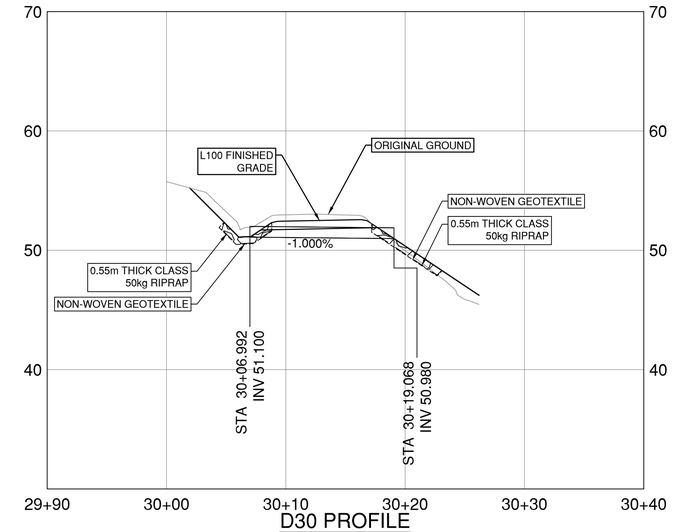


D20 PROFILE



D30 PROFILE

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urbansystems.ca

FOR PLANS SEE DWG
R1-1028-101 to -102

FOR PROFILES SEE DWG
R1-1028-201

URBAN SYSTEMS

SCALE 0 2 1:250 12m

CAD FILENAME R1-1028-700

PLOT DATE 2022-11-09

REV	DATE	REVISIONS	NAME

BRITISH COLUMBIA

MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE
NORTHERN REGION
HIGHWAY ENGINEERING AND GEOMATICS

CODY BAGG, P.ENG.
SENIOR DESIGNER
DATE ----

DESIGNED S.CAVASINNI DATE 2022-11-08
QUALITY CONTROL C.BAGG DATE 2022-11-08
QUALITY ASSURANCE J.BORCH DATE 2022-11-08
DRAWN S.CAVASINNI DATE 2022-11-08

DRAINAGE DETAILS

KENYON CREEK
DFAA FLOOD DAMAGE

STA. 101+00.000 TO 103+080.000

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
872CS1714	14009	1	R1-1028-701	

PLOT DATE: 2022/11/09 U:\Projects_SUR\1961\0480\15\D-Design\CAD\DrawingProduction\700_DrainageUtilities\R1-1028-700.dwg

NEW WESTMINSTER DISTRICT
REM. DL 1582
004-633-938
LOT 5
PLAN VAP17375
007-283-679
INLET HIGHWATER MARK ELEVATION 51.3m
35.0m W2100xH2100 CONC
STA. 101+68.796
N. INV. 49.41
S. INV. 47.66
35.0m W2400xH2400 CONC
STA. 101+73.071
N. INV. 49.08
S. INV. 47.33
c/w FISH BAFFLES, DESIGN TBD
POTENTIAL TEMPORARY PUMP WATERLINE LOCATION
CLASS 25kg RIPRAP
14.0m 750 DIA HDPE
STA. 101+95.000
N. INV. 51.52
S. INV. 49.74
LIMIT OF CONSTRUCTION
P.O.T. 102+41.000
N: 481240.141
E: 438009.369
N: 481241.731
E: 438001.649
CLASS 50 kg RIPRAP CHANNEL BOTTOM TO BE TOP DRESSED WITH FISHERIES GRAVELS
N: 481226.244
E: 438013.677
N: 481237.784
E: 437988.780
N: 481240.250
E: 437984.405
N: 481218.849
E: 438020.960
N: 481193.942
E: 438077.505
CL&GR
EDGE OF GRAVEL
PAVEMENT EDGE
101+00
REDROOFFS ROAD
102+00
POTENTIAL CRANE PAD LOCATION
N: 481217.550
E: 437980.254
N: 481212.580
E: 437980.677
N: 481221.394
E: 437973.779
CONCRETE HEAD WALL SEE DWG. R1-1028-701 FOR DETAILS
OUTLET HIGHWATER MARK ELEVATION 48.2m
N: 481190.163
E: 438032.634
N: 481173.589
E: 438070.301
N: 481206.050
E: 437992.264
LOT C
PLAN VAP15810
007-614-870
LIMIT OF CONSTRUCTION
P.O.T. 101+35.000
TIE TO EXISTING
S.R.W
CLASS 50 kg RIPRAP CHANNEL BOTTOM TO BE TOP DRESSED WITH FISHERIES GRAVELS
PART STRATA LOT 10
PLAN EPS5814
031-056-903
PART STRATA LOT 9
PLAN EPS5814
031-056-890
N: 481179.723
E: 438025.081
COMMON PROPERTY
KENYON CREEK
PLAN BCP32016 (COVENANT)
LOT 2
PLAN BCP32014
027-177-351
PART STRATA LOT 10
PLAN EPS5814
031-056-903
PLAN BCP32016 (COVENANT)
PLAN EPP102997 (EASEMENT)
PLAN EPS5814
PART STRATA LOT 9
PLAN EPS5814
031-056-890

PLOT DATE: 2023/01/20 U:\Projects_SUR\1961\0480\15\D-Design\CAD\DrawingProduction\EnvironmentalDrawings\R1-1028-100-Enviro.dwg

WORK WITHIN RIPARIAN ZONE = 950 m²

TOTAL PROJECT AREA = 3189 m²

CL & GR TOTAL THIS DWG = 1984 m²

WORK BELOW HWM = 375 m²

FOR DRAINAGE AND UTILITIES SEE DWG R1-1028-701

LEGEND

RIPRAP	
CHANNEL BOTTOM - RIPRAP TOP DRESSED WITH FISHERIES GRAVELS	

FOR ENVIRONMENTAL PERMITTING

URBAN SYSTEMS

SCALE 0 2 1:250 12m

CAD FILENAME R1-1028-100-ENVIRO
PLOT DATE 2023-01-20

REV	DATE	REVISIONS	NAME

BRITISH COLUMBIA

MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE
SOUTH COAST REGION
HIGHWAY ENGINEERING AND GEOMATICS

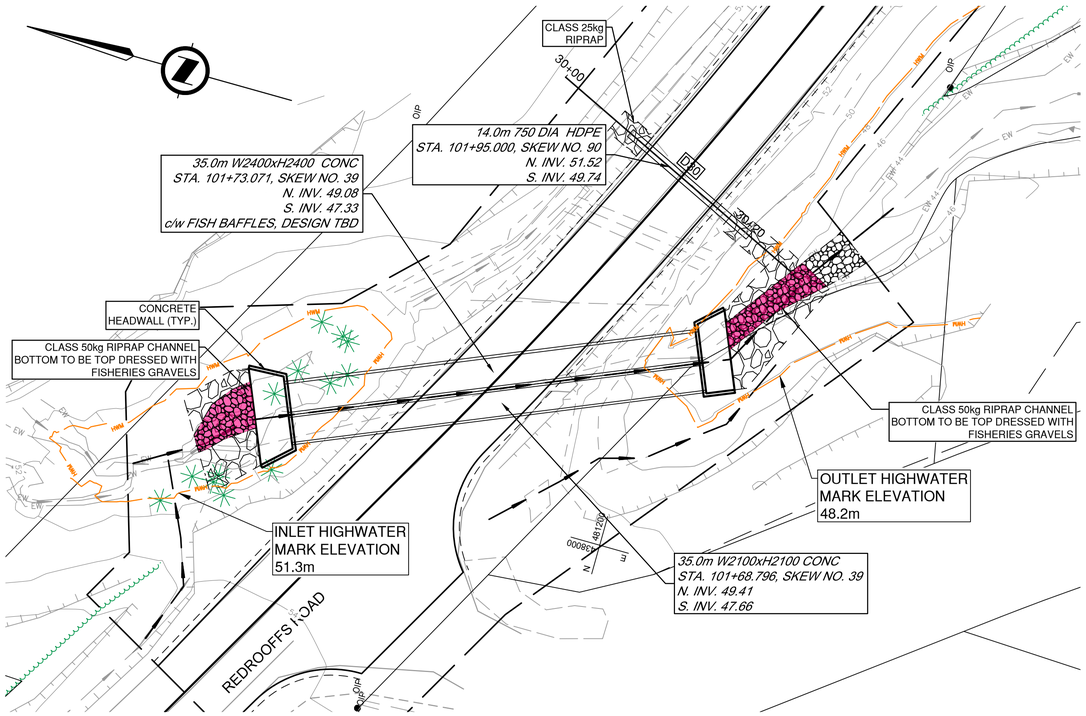
CODY BAGG, P.ENG.
SENIOR DESIGNER
DATE

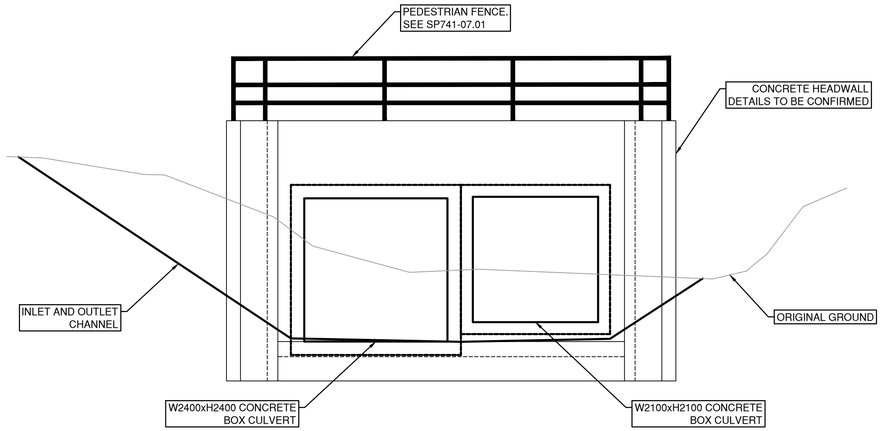
DESIGNED	S.CAVASINNI	DATE	2022-05-26
QUALITY CONTROL	C.BAGG	DATE	2022-05-26
QUALITY ASSURANCE	J.BORCH	DATE	2022-05-26
DRAWN	E.PROULX	DATE	2023-01-16

PLAN

KENYON CREEK
DFAA FLOOD DAMAGE
STA. 101+35.000 TO 102+41.000

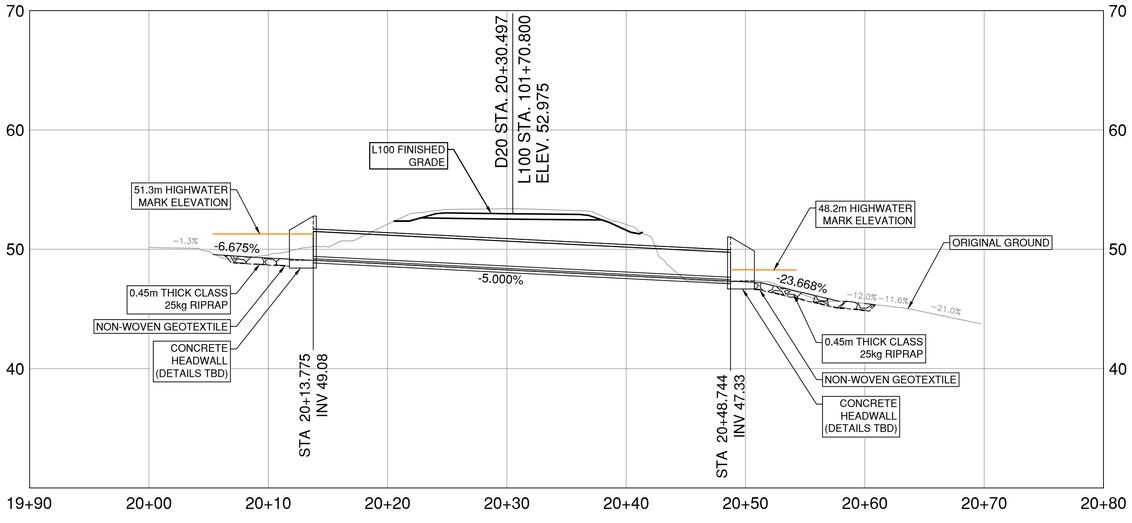
FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
872CS1714	14009	1	R1-1028-101-ENVIRO	



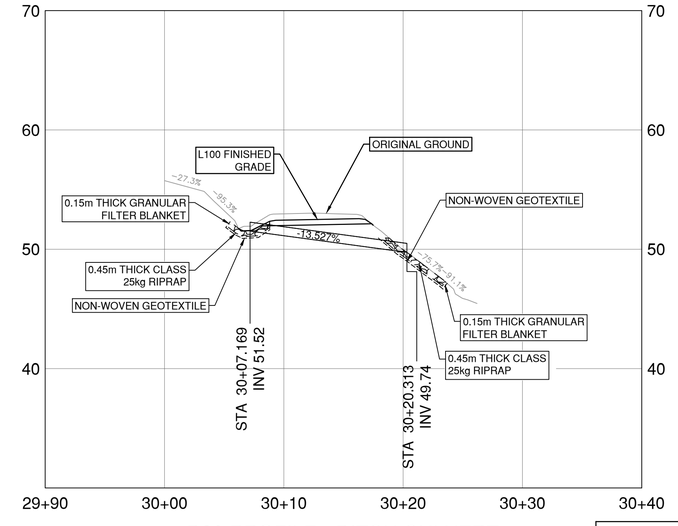


D20 INLET AND OUTLET SECTION

0 0.5 1:50 2.5m



D20 PROFILE - KENYON CREEK CULVERT



D30 PROFILE - DITCH CULVERT

FOR ENVIRONMENTAL PERMITTING

LEGEND

RIPRAP

CHANNEL BOTTOM - RIPRAP TOP DRESSED WITH FISHERIES GRAVELS

URBAN SYSTEMS

SCALE 0 2 1:250 12m

CAD FILENAME R1-1028-700-ENVIRO

PLOT DATE 2023-01-20

REV	DATE	REVISIONS	NAME

BRITISH COLUMBIA

MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE
SOUTH COAST REGION
HIGHWAY ENGINEERING AND GEOMATICS

CODY BAGG, P.ENG.
SENIOR DESIGNER
DATE

DESIGNED S.CAVASINNI DATE 2022-05-26
QUALITY CONTROL C.BAGG DATE 2022-05-26
QUALITY ASSURANCE J.BORCH DATE 2022-05-26
DRAWN E.PROULX DATE 2023-01-16

DRAINAGE AND DETAILS

KENYON CREEK
DFAA FLOOD DAMAGE

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
872CS1714	14009	1	R1-1028-701-ENVIRO	

PLOT DATE: 2023/01/20 U:\Projects_SUR\1961\0480\15\D-Design\CAD\DrawingProduction\EnvironmentalDrawings\R1-1028-700-Enviro.dwg