ROCKWELL DRIVE RECOVERY PROJECT SITE DF3 *WATER SUSTAINABILITY ACT* CHANGE APPROVAL APPLICATION

February 2023

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FEBRUARY 2023

MOTI10866
VERSION 2.0

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AMENDMENT RECORD

This report has been issued and amended as follows:

Issue	Description	Date	Approved by	
1	First version of Rockwell Drive Recovery Project – Site DF3 – DRAFT	20230203	Garth Taylor Project Director	Tim Poulton Project Manager
2	Second version of Rockwell Drive Recovery Project – Site DF3 – DRAFT	20230210	 Garth Taylor Project Director	 Tim Poulton Project Manager

1.0 PROJECT OVERVIEW

The BC Ministry of Transportation and Infrastructure (MOTI) intends to complete repairs and upgrades to three watercourse crossings along Rockwell Drive in the District of Kent that were damaged during the November 2021 atmospheric river (the Rockwell Drive Recovery Project). The Rockwell Drive Recovery Project is comprised of three sites (DF1, DF2, and DF3) located at the southeast extent of Harrison Lake near Harrison Hot Springs (Figure 1).

Emergency repair works associated with the November 2021 flood event have been conducted at all three sites pursuant to *Water Sustainability Act* (WSA) Section 91 Order 268448, and MOTI intends to develop permanent (long-term) solutions for each site. All three sites include culvert replacements; however, instream channel erosion protection is required upstream of the site DF3 crossing. To make changes in and about a stream requires a license, use approval or change approval; or compliance with an order, or Part 3 of the Water Sustainability Regulation (the Regulation), which includes submitting a Notification to a Habitat Officer. The WSA defines changes in and about a stream (CIAS) as "any modification to the nature of a stream, including any modification to the land, vegetation and natural environment of a stream or the flow of water in a stream; or any activity or construction within a stream channel that has or may have an impact on a stream or a stream channel" (BC Gov. 2022a). A stream channel includes the bed and banks of the stream both above and below the high watermark, whether or not the channel has been modified, and includes side channels. Culvert replacements at all three sites are considered authorized changes under Part 3 of the Regulation and will proceed via a Notification; however, CIAS associated with instream channel erosion protection upstream of site DF3 (the Project) will require a change approval.

On behalf of MOTI, Hatfield Consultants (Hatfield) has prepared this Project supporting information document for instream channel erosion protection works upstream of DF3 in accordance with the application information requirements of a WSA Change Approval (BC Gov. 2022a). Notifications for culvert replacements at all three sites will be submitted separately. Hatfield is also preparing a request for review application pursuant to the *Fisheries Act* on behalf of MOTI for the entire Rockwell Drive Recovery Project (i.e., all three sites) and can provide future updates on the status of that application upon request.

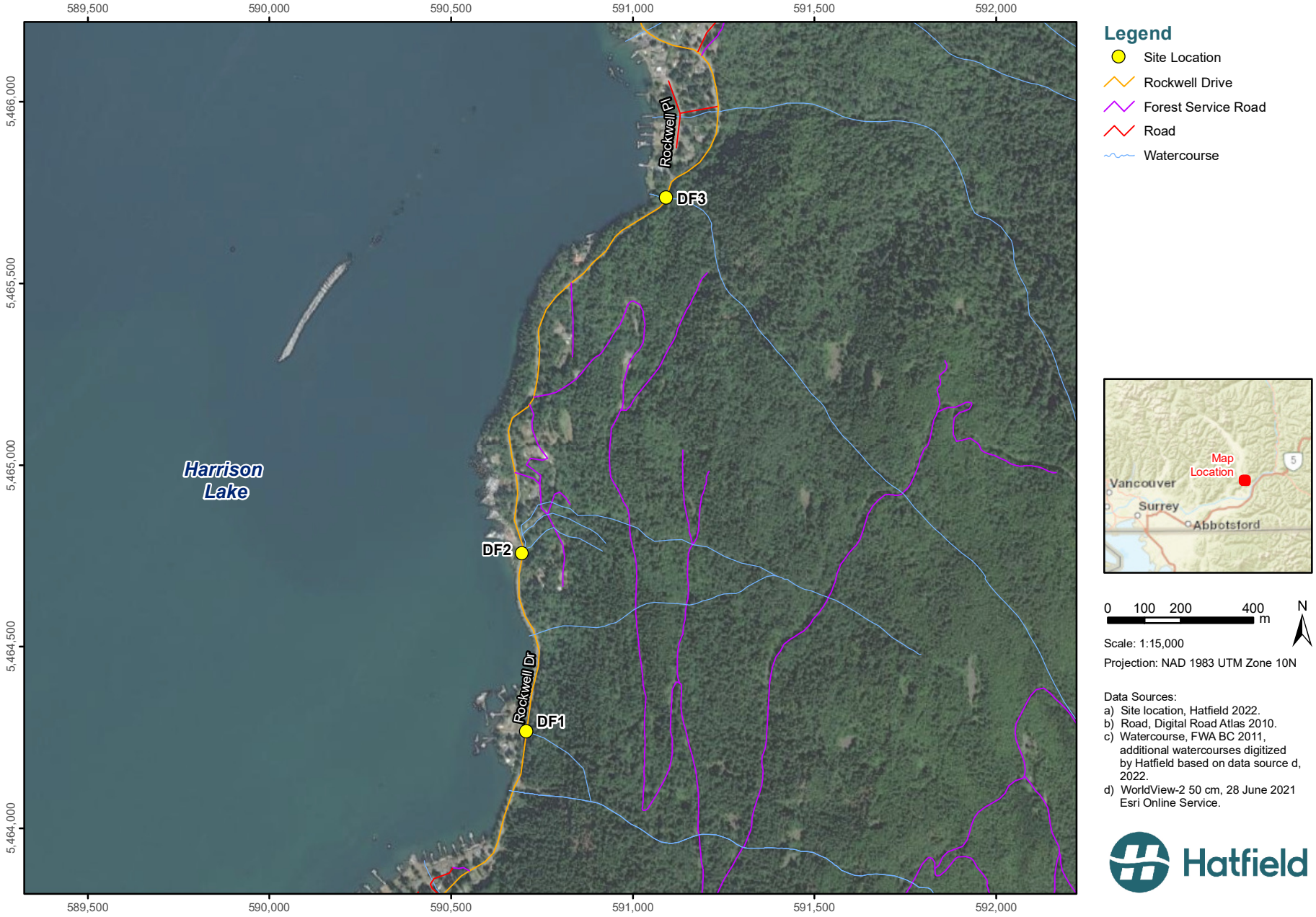
1.1 PROJECT AREA

Site DF3 is the northernmost site of the Rockwell Drive Recovery Project (Figure 1) and is located at 7370 Rockwell Drive. For reference, site DF3 is referred to as "Rockwell Drive | Falls 2 (DF3)" in the WSA Section 91 Order. The Project coordinates and legal description of site DF3 are summarized in Table 1. CIAS will occur within an unnamed non-fish-bearing ephemeral watercourse. Of the approximate 50 m of channel erosion protection required upstream of the site DF3 culvert at Rockwell Drive, approximately 7 m will occur within the MOTI right-of-way and 43 m within private property (PLAN NWP 68927 REM PARCEL B). A permission letter to access the private property portion of the Project is provided in Appendix A1.

Table 1 Project coordinates for Site DF3.

Site Name	MOTI Project No.	Legal Description	Latitude	Longitude
Rockwell Drive | Falls 2 (DF3)	14045	MOTI Right of Way, and PLAN NWP 68927 REM PARCEL B	49° 20'19.78"N	121°44'39.45"W

Figure 1 Rockwell Drive Recovery Project area.



Legend

- Site Location
- Rockwell Drive
- Forest Service Road
- Road
- Watercourse

0 100 200 400 m

N

Scale: 1:15,000

Projection: NAD 1983 UTM Zone 10N

Data Sources:
a) Site location, Hatfield 2022.
b) Road, Digital Road Atlas 2010.
c) Watercourse, FWA BC 2011, additional watercourses digitized by Hatfield based on data source d, 2022.
d) WorldView-2 50 cm, 28 June 2021 Esri Online Service.

Hatfield

Rockwell Drive Recovery Project

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1.2 PROPOSED PROJECT WORKS

The November 2021 atmospheric river resulted in a watercourse avulsion on the steep slope upstream of Rockwell Drive at site DF3. The avulsion resulted in the deposition of debris onto Rockwell Drive and the redirection of flows to the north (Figure 2). No drainage system has previously been constructed to accommodate water flow to the north, and as such flooding of private residences downstream of Rockwell Drive subsequently occurred. Emergency works included re-establishing the road shoulder and installing a catch basin near the eastern edge of the road to direct flows to the western roadside ditch away from the private residences. Short-term recovery works included the construction of an asphalt curb (Binnie 2022). Following an options analysis for the permanent long-term repairs (Binnie 2022), it was determined that the preferred option includes upsizing and replacement of the existing culvert to current design standards and redirecting flows back into the existing channel to avoid crossing Rockwell Drive at an unfavourable location (Binnie 2022).

Figure 2 Watercourse avulsion at Site DF3 (December 14, 2021).

Channel armouring to approximately 50 m upstream of the new culvert is required to prevent a future channel avulsion and/or erosion within the existing channel during a flood event. Channel armouring will include the installation of grouted riprap (50 kg), including the installation of a check dam to reduce water

velocity approximately 32 m upstream of the culvert inlet. Design drawings prepared by R.F. Binnie & Associates are provided in Appendix A2.

Construction means and methods will ultimately be determined by the successful contractor awarded the Project per MOTI Standard Specifications (MOTI 2020); however, it is estimated that construction will proceed in the following sequence:

1. Mobilization and site preparation including installation of sediment and erosion control measures, and flow diversion if required (it is expected that the channel will be naturally dry during construction) (approximately 3 days),
2. Tree clearing and grubbing within the Project footprint (approximately 7 days);
3. Establish a construction access path adjacent to the creek within the clear and grub limits with a small excavator (approximately 3 days);
4. Channel grading with a small excavator working from the top of bank (approximately 5 days);
5. Installation of grouted riprap and check dam within the channel manually and with small machinery (e.g., bobcat) (approximately 10 days);
6. Regrading and decommissioning the avulsed channel and remove flow diversion if required (approximately 3 days);
7. Demobilization (approximately 1 day); and
8. Riparian restoration seeding/planting in fall 2023 (approximately 3 days).

Please refer to Section 5.0 (Assessment of Residual Impacts Description of Works Table 6) for a list of all Project CIAS, duration of works, potential impacts, and mitigation measures.

1.3 PROJECT SCHEDULE

The Project is expected to take four to five weeks to complete and is planned for summer 2023. Although the unnamed watercourse is non-fish-bearing the Project is planned to occur during the regional least-risk work window of August 1 to September 15 (MOE 2006). Works may proceed outside of this period if the creek is naturally dry or the creek is appropriately isolated from flowing water and monitored by an Appropriately Qualified Professional (AQP, also known as a QEP; Refer to Section 4.2).

2.0 EXISTING CONDITIONS

The Project area (defined as the site DF3 crossing of Rockwell Drive and the surrounding environment within a 1-km radius excluding Harrison Lake) is located in the dry maritime subzone within the Coastal Western Hemlock biogeoclimatic zone (CWHdm). The subzone transitions to very wet maritime (CWHvm^2) at an elevation of approximately 650 m – 1000 m.

Rockwell Drive runs north to south along the eastern shoreline of Harrison Lake. Surface cover along the mountain slopes is comprised of dense coniferous forests. and there are several rural residential homes along the shoreline, between Rockwell Drive and Harrison Lake.

2.1 FISH AND FISH HABITAT

Hatfield conducted a desktop review of aquatic resources within the Project area using the following data sources which provided no historical information for site DF3:

- BC Fish Inventories Dara Queries (FIDQ);
- BC Conservation Data Centre (CDC):
    - CDC iMap;
    - BC Species & Ecosystem Explorer;
- Ecological Reports Catalogue (ECOCat);
- Habitat Wizard;
- Species Inventory Web Explorer (SIWE); and
- BC Cross-Linked Information Resources (CLIR).

A field assessment to characterize fish habitat features upstream and downstream of Rockwell Drive at site DF3 was conducted on March 30, 2022. Fish sampling was not conducted given the presence of fish barriers upstream and downstream of Rockwell Drive and the ephemeral nature of the watercourse.

Upstream of Rockwell Drive, the site DF3 watercourse is conveyed down steep slopes (>45%) in a poorly defined channel with an average channel width and wetted width of 4.0 m and 0.75 m, respectively (Figure 3). Substrates are comprised primarily of boulders and cobbles. During the November 2021 flood, the channel avulsed just upstream of Rockwell Drive causing a new channel to form to the north of the existing channel. At Rockwell Drive, flows were directed back to the south within the existing roadside ditch as part of emergency works (Figure 3). Flows are conveyed across Rockwell Drive via a corrugated polyvinylchloride (PVC) culvert that appears to have been recently installed as part of flood emergency works (Figure 3). The culvert outlets to a steep riprap road fill slope (approximately 35% gradient) west of Rockwell Drive ultimately draining to Harrison Lake across a gravel beach and private boat launch associated with 7370 Rockwell Drive (Figure 3). Water temperature, pH, dissolved oxygen, and conductivity at site DF3 were 7.7°C, 6.5, 12.2 mg/L, and 76 us/cm, respectively, during the March 30, 2022 site assessment.

Due to continued steep slopes, the site DF3 watercourse is considered non-fish bearing and provides limited food and nutrient inputs to the larger fish-bearing Harrison Lake during periods of surface flow. Hatfield confirmed that this watercourse is ephemeral during multiple site inspections in August and September 2023 when the channel was observed to be naturally dry.

Figure 3 Photographs of site DF3 (March 30, 2022).

Upstream view of the site DF3 watercourse upstream of Rockwell Drive.

Creek avulsion directed back to the south via a berm along Rockwell Drive.

Rockwell Drive culvert inlet.

Rockwell Drive culvert outlet.

2.2 TERRESTRIAL RESOURCES

A review of existing information within the Project area was also completed for terrestrial resources. Data sources included:

- Wildlife –
    - Species at risk information is available from the CDC Species & Ecosystem Explorer, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and the *Species at Risk Act* (SARA) Registry; and

- General wildlife information for the BC Ministry of Environment Species and Ecosystems Explorer, iMapBC, Species Inventory Web Explorer (SIWE), eBird, BC CLIR, and the Wildlife Tree Stewardship Atlas (WTSA).

- Plants –
  - Rare plants and plant community occurrence records available from the CDC and e-Flora BC; and
  - Invasive plant/weed information from the provincial *Weed Control Act*, the BC Invasive Species Council of BC (ISCBC), and the Invasive Alien Plan Program (IAPP) database and map display.

- Designated wildlife management areas including Wildlife Habitat Areas (WHAs), Ungulate Winter Ranges (UWRs), Special Management Zones (SMZs), and federally designated critical habitat areas for endangered and threatened species from CDC iMap.

- Literature and reports containing information on local wildlife species, plant species, and plant communities are available from the provincial ECOCat and DataBC Data Catalogue.

A general reconnaissance of wildlife and wildlife habitat features upstream and downstream of Rockwell Drive at site DF3 was conducted on March 30, 2022.

Avian Species

Given the time of year and the small area associated with site DF3, detailed surveys for nesting birds were not conducted; however, incidental observations were documented.

Technicians also surveyed the forest surrounding site DF3 and scanned the canopies for any stick nests. This includes the nests of hawks, ospreys, bald eagles, and great blue herons. Trees within the forested areas were assessed for whitewash (excrements) and the bases of the trees were checked for pellets, to look for activity of owl foraging, nesting, or young. No stick nests were observed during the survey.

Cavity nests were not observed in the Project footprint; however, pileated woodpeckers are documented in proximity to site DF3 (eBird 2023).

Wildlife and Wildlife Habitat Features

Technicians walked 5 to 10 m apart in the forested areas on either side of the unnamed watercourse (50 m upstream and downstream of Rockwell Drive) and assessed for different wildlife habitat features Including:

- Cover availability (e.g., micro-terrain features, understory plants, coarse woody debris);
- Game trails and dens; and
- Wildlife trees and snags.

Technicians also turned cobble-sized rocks during the fish habitat surveys looking for evidence of tailed frog tadpoles.

The Project does not occur within a provincially designated management area. The nearest designated management area is the Harrison-Chehalis Wildlife Management Area located approximately 10 km to the southwest near Harrison Mills. Given the Project occurs partially within the MOTI road right-of-way which is subject to routine maintenance, and disturbance from the November 2021 flood event, wildlife habitat features such as dense riparian vegetation, woody debris, or snags (i.e., standing dead trees) were largely absent. Bird nests (including stick nests and cavity nests) were not observed, and incidental wildlife observations included a Pacific sideband snail (*Monadenia fidelis*) in the riparian area upstream of site DF3.

2.2.1 Species at Risk

Species at risk are identified by both provincial and national ranking systems. Federally, the COSEWIC assesses and recommends species ranks. The Government in Council uses COSEWIC information to decide on which species to include on Schedule 1 of SARA. Provincially, species are assessed by the CDC based on the systematic collection and analysis of information on their extent, distribution, and vulnerability to disturbance. Species are red- or blue-listed depending on the urgency of their conservation needs.

A preliminary list of federally and provincially listed species was generated by querying the CDC Species and Ecosystem Explorer database for occurrences within the Fraser Valley Regional District, within the Coastal Western Hemlock (CWH) zone in which the Project area is located. The list was refined by obtaining habitat information from local reports and determining its suitability in supporting critical life-history functions for each species. Such requisites include breeding, foraging, migration for bird species, flowering, and seed dispersal for plants.

Listed wildlife species with the potential to occur within the Project area are provided in Table 2 along with the status of each species, in accordance with the CDC and SARA databases. There is a known occurrence of Oregon forestsnail further to the south near Agassiz and draft habitat mapping suggests that suitable habitat extends into the Project area (Personal communication with BC Parks and MOTI staff, May 2022); however, this species has a fairly specific habitat association with mature bigleaf maple, stinging nettle and sword fern forest types, which was not observed within the Project area during the site assessment. Additionally, there is a masked occurrence (ID 52866) 2.5 km from the Project area (CDCa 2022); however, after further discussion with CDC staff, it was determined that this species will not be impacted by the Project.

Listed plant species with the potential to occur within the Project area are provided in Table 3 along with the status of each species, in accordance with the CDC and SARA databases. Species at risk were not observed during the field survey.

Table 2 Listed animal species with the potential to occur within the Project area.

Common Name	Scientific Name	SARA Schedule 1	Provincial Status	Habitat Requirements	Habitat Requisites to Support Critical Life Functions within Project Area
Birds					
Band-tailed pigeon	*Patagioenas fasciata*	Special Concern	Blue	Found around forests, riparian habitats and springs	Yes
Barn swallow	*Hirundo rustica*	Threatened	Blue	Found around forests, wetlands, riparian habitats as well as agricultural and anthropogenic environments	Yes
Great blue heron	*Ardea herodias fannini*	Special Concern	Blue	Found around riparian and freshwater habitats	Yes
Northern goshawk	*Accipiter gentilis laingi*	Threatened	Red	Found around forests and riparian habitats	Yes
Olive-sided flycatcher	*Contopus cooperi*	Threatened	Blue	Found around forests, lakes and riparian habitats	Yes
Western screech-owl	*Megascops kennicottii kennicottii*	Threatened	Blue	Found around forests and riparian habitats	Yes
Amphibians					
Northern red-legged frog	*Rana aurora*	Special Concern	Blue	Found around riparian habitats, streams, lakes and grassland	Yes
Oregon spotted frog	*Rana pretiosa*	Endangered	Red	Found around riparian habitats, streams, and lakes	Yes
Mammals					
Pacific water shrew	*Sorex bendirii*	Endangered	Red	Found in riparian and wetland habitats	Yes
Trowbridge's shrew	*Sorex trowbridgii*	N/A	Blue	Found in forests and riparian habitats	Yes

Limited to vertebrate species that are either provincially red or blue listed, and/or on SARA schedule 1 as Endangered or Threatened.

Table 3 Listed plant species with the potential to occur within the Project area.

Common Name	Scientific Name	SARA Schedule 1	Provincial Status	Habitat Requirements	Habitat Requisites to Support Critical Life Functions within Project Area
Plants					
American sweet-flag	*Acorus americanus*	Not listed	Blue	Found around lakes, wetlands and riparian habitat	Yes
Tall bugbane	*Actaea elata var. elata*	Endangered	Red	Found around forest habitats	Yes
Cut-leaved water-parsnip	*Berula incisa*	Not listed	Blue	Found around lakes, springs, riparian habitat and lakes	Yes
Angled bittercress	*Cardamine angulata*	Not listed	Blue	Found around forests, riparian habitats and streams/rivers	Yes
Phantom orchid	*Cephalanthera austiniae*	Threatened	Red	Found around forests habitats	Yes
Streambank lupine	*Lupinus rivularis*	Endangered	Red	Found in anthropogenic environments as well as forests, grassland, streams and rivers.	Yes

Limited to plant species that are either provincially red or blue listed, and/or on SARA schedule 1 as Endangered or Threatened.

2.2.2 Invasive Species

Several invasive plant species have been identified close to the Project area; tansy ragwort (*Senecio jacobaea),* common tansy (*Tanacetum vulgare*), butterfly bush (*Buddleja*), and English ivy (*Hedera helix*). Invasive animal species that have been documented in the area include the American bullfrog (*Rana catesbeiana*) and green frog (*Lithobates clamitans*) (CDCb 2022). Invasive species and/or noxious weeds as regulated by the BC *Weed Control Act* and regulation were not identified in the Project area during the site assessment.

3.0 ASSESSMENT OF IMPACTS

The area used for assessing potential impacts to aquatic and terrestrial resources from the Project is based on the 100% design drawings (Appendix A2), and guidelines associated with the Environmental Mitigation Policy (MOE 2014). Given the Project does not occur entirely within municipal boundaries, which typically define riparian setbacks on streams (e.g., Riparian Areas Protection Regulation), the *Forest and Range Practices Act* (FRPA) has been used as a guide. Under FRPA the unnamed watercourse is classified as an S5 stream. S5 streams are non-fish-bearing with an average channel width of > 3 m and are prescribed a 30 m Riparian Management Area (RMA). As such, riparian impacts are assessed within the area 30 m landward the watercourse top of bank and within the Project footprint.

The Project will be undertaken within and adjacent to the road right-of-way in an area already affected by anthropogenic disturbances that limit wildlife usage of the area. Habitat in the area is moderately disturbed because of highway right-of-way maintenance including regular vegetation management and a high level of disturbance from traffic noise.

3.1 DESIGN

The Project will provide a long-term net benefit to the surrounding aquatic and terrestrial environment through the installation of scour protection. This scour protection will prevent future erosion of the watercourse and riparian environment, as well as reduce sediment delivery to downstream fish habitat (i.e., Harrison Lake); however, approximately 386 m^2 of aquatic habitat will be permanently modified as a result of the riprap scour protection and 72 m^2 of riparian habitat will be lost as a result of a 3 m wide access path required for future maintenance (Figure 4).

3.2 CONSTRUCTION

Potential adverse impacts to the aquatic environment during construction are primarily related to water quality should surface flow be present during the CIAS, including but not limited to:

- Erosion of exposed soils and resultant sediment release; and
- Use of heavy machinery and potential accidental release of hydrocarbons.

Potential adverse impacts on the terrestrial environment during construction include direct temporary loss of localized riparian wildlife habitat, habitat degradation associated with construction, and mortality of small vertebrates in microhabitats within the construction footprint. Potential indirect adverse impacts include habitat avoidance and reduced reproductive success as a result of sensory (visual and auditory) disturbance to wildlife species nesting/denning in the Project area.

Figure 4 Assessment of impacts for site DF3, Rockwell Drive Recovery Project.

Rockwell Drive Recovery Project

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4.0 IMPACT MITIGATION STRATEGIES

4.1 DESIGN MITIGATION

The design team has reduced the Project footprint to the extent practicable while maintaining current design standards. Avoiding CIAS entirely is not an option as the unnamed watercourse would further deteriorate, erode, and damage private property and public infrastructure during a future flood event.

Although there will be a permanent modification to the channel upstream of Rockwell Drive, the grouted riprap will be installed below the existing grade and finished with a rough surface (see the typical section on Drawing No. R1-1050-304; Appendix A2). Native substrate will ultimately migrate downstream and cover the grouted riprap during future high-flow events and create a more natural channel shape comprised of native substrates.

The channel avulsion that occurred as a result of the 2021 flood event damaged approximately 77 m^2 of riparian habitat (Figure 4) which will be regraded to pre-flood conditions and revegetated per Section 4.1.1 below.

4.1.1 Riparian Revegetation

Disturbed riparian areas (i.e., areas within 30 m of the watercourse top of bank) beyond 3 m of Rockwell Drive edge of pavement and outside of the maintenance access path will be replanted with native tree, shrub, and forb species suited to site conditions (Table 4). Plants will be of guaranteed nursery stock and installed at one plant per square metre density (BC MoE 2008). Prior to the installation of the plant material, a layer of growing medium (minimum 400 mm thick) will be placed within the planting area. Growing medium shall meet the specifications identified in Section 751 of the 2020 Standard Specifications (SS) for Highway Construction (MOTI 2020a). Large woody debris salvaged during clearing works will be placed within the planting area at a density of 5 to 10 pieces per side of the watercourse. Ideally, large woody debris pieces will have a minimum diameter of 30 cm and a minimum length of 6 m; however, this is contingent upon material sourced onsite.

Table 4 Plant species to be installed within disturbed riparian areas.

Layer	Common Name	Latin Name
Tree	Douglas-fir	*Pseudotsuga menziesii var. menziesii*
	Western redcedar	*Thuja plicata*
	Western hemlock	*Tsuga heterophylla*
	Black Cottonwood	*Populus trichocarpa*
	Red alder	*Alnus rubra*
	Sitka willow	*Salix sitchensis*
Shrub	Vine maple	*Acer circinatum*
	Dull Oregon-grape	*Mahonia nervosa*
	Salal	*Gaultheria shallon*
	Red huckleberry	*Vaccinium parviflorum*
Forb	Sword fern	*Polystichum munitum*
	Bracken fern	*Pteridium aquilinum*

The Contractor's AQP shall develop a Site Restoration Planting Plan in accordance with SS 754 (MOTI 2020a) for review and acceptance by the Ministry Representative. The plan shall highlight areas that should be revegetated, identify planting medium requirements and provide densities and pot sizes of native plants for planting.

4.2 CONSTRUCTION MITIGATION

The successful contractor(s) will be required to submit a detailed Construction Environmental Management Plan (CEMP) with Work Procedures prior to commencing construction. The CEMP shall be prepared in compliance with MOTIs Standard Specifications for Highway Construction (MOTI 2020a) Section 165 Protection of the Environment (SS 165) and must be accepted by MOTI. Special Provisions (SPs) contained in the Project tender package will identify any expectations that differ from MOTI SS 165 and will also include conditions of any environmental approvals. Mitigation measures and best management practices (BMPs) detailed in the CEMP will align with the Requirements and Best Management Practices for Making Changes in and About a Stream in British Columbia (BC Gov. 2022b). The following general mitigation measures and BMPs will be followed to avoid or reduce the potential for adverse impacts:

- Conduct Project works during appropriate least-risk timing windows (August 1 to September 15) or when the watercourse is naturally dry;
- Minimize the extent and duration of instream works;
- Minimize the extent and duration of sediment disturbance;
- Implement erosion and sediment control measures to minimize sediment delivery to the watercourse during CIAS;
- Carry out CIAS during favourable weather conditions;

- Employ BMPs for all CIAS with respect to fish and fish habitat, water quality, invasive species, waste materials management, and emergency spill response, in accordance with the CEMP;
- Review pertinent environmental information and emergency response procedures with crews prior to the start of works;
- Secure all permits, licenses, and authorizations for works prior to commencement; and
- Retain an AQP to monitor works during construction. The AQP shall have the authority to modify or suspend works if deemed necessary to protect fish and wildlife.

4.2.1 Instream Works

Instream works will be monitored by the contractor's AQP and completed during the regional least-risk timing window (August 1 to September 15) or when the watercourse is naturally dry. Based on previous observations the watercourse is naturally dry during August and September. If surface flow is observed prior to the commencement of works a flow diversion system will be installed to isolate the instream work area. The flow diversion (likely comprised of bypass pumps and sandbags) will be on standby should an unexpected significant rain event occur during instream works. Instream works will be completed quickly and scheduled during the typical dry season for this area to avoid potential sediment and erosion control issues. Construction activities will be postponed during forecasted or unforeseen significant rain events as directed by the contractor's AQP.

Water quality will be monitored regularly before, during, and after instream works both upstream (i.e., background) and downstream of Project works for the duration of the Project; however, water quality monitoring is only applicable during periods of surface flow connection to Harrison Lake. In the event that water quality exceeds guidelines for the protection of freshwater aquatic life (MECCS 2021) downstream of the work area, additional sampling will be conducted to determine the extent and magnitude of the exceedance.

In situ water quality parameters to be collected in the field include:

- pH;
- Temperature;
- Specific conductance; and
- Turbidity.

Works may be suspended during an exceedance (i.e., 8 NTU or more above background) until it is confirmed by the contractor's AQP that erosion and sediment control measures are functioning properly. Additional measures will be installed as directed by the AQP if required prior to the recommencement of works.

4.2.2 Erosion and Sediment Control

A key measure for managing erosion and sedimentation potential is to minimize the extent and duration of exposure of bare soils. Mitigation measures shall be installed prior to and concurrently with Project CIAS. Measures shall be maintained on a regular basis, prior to and after runoff events. Any accumulated sediment shall be cleaned out during maintenance.

To minimize the potential for erosion and prevent sedimentation, key mitigation measures that shall be outlined in the Project CEMP include:

- Avoid tracking machinery through exposed soils or sediments during wet periods to the extent practicable;
- Install Erosion and Sediment Control (ESC) measures for managing water flow prior to works;
- Place top of bank barriers (e.g., silt fencing) for any construction activity or stockpile storage that is within 30 m of a watercourse;
- Regularly inspect and maintain ESC measures and structures during CIAS;
- Repair ESC measures if damage occurs to these structures; and
- If soils become exposed as a result of works, and erosion or sedimentation will impact infrastructure or affect water quality, then mitigate potential impacts by covering with erosion control blankets, or other materials to prevent erosion as approved by the contractor's AQP.

4.2.3 Spill Management

Environmental spills have the potential to result in damage to soils and vegetation and/or harm to fish and aquatic habitats. The following BMPs shall be outlined in the Project CEMP:

- All hazardous substances are properly labelled, stored, and contained;
- All work areas and machinery are tidy and free of excess oil, grease, and leaks;
- Required training for Project personnel on environmental awareness and emergency/spill response has been carried out prior to works;
- Emergency contact lists are kept on-site in an area accessible to all personnel;
- Spill kits are properly stocked and located at all active work areas, and at sites where hazardous substances are stored or in use, in a location readily accessible to Project personnel;
- The contractor's CEMP will include a management plan for accidental spills of cementitious material (i.e., uncured grout) including the provision of a co_2 bubbler to regulate pH if required; and
- All equipment maintenance, fueling, and controlled substance storage areas are to be located a minimum of 30 m from any open water source.

In the event of an accidental spill or leak, the AQP may suspend works and provide guidance on how to rectify the situation. An Environmental Incident Report will be generated for any of the following incidents:

- Spills reportable to the Provincial Emergency Program (PEP);
- Spills with the potential to introduce a harmful substance to the aquatic environment;

- Spills on land greater than 5 L or with a surface area greater than 1 m^2 and/or deeper than 300 mm, or any release of a hazardous substance that could cause contamination of the site or any lands or waters in the vicinity of the site;
- Any repetitive occurrence of construction activities that are not in compliance with the CEMP; and
- Any incident that has or could result in the violation of a law, regulation or guideline, including encroachment into sensitive areas, or disturbances to wildlife.

The environmental incident report must describe the time of day, staff involved, nature, cause, and degree of spill, recovery process deployed, and agencies notified. The report will also describe future preventative actions in the case of an unanticipated environmental incident. The contractor's AQP will complete these reports within 48 hours of the incident. Within 48 hours, each incident must be reported to the Regional Water Manager. The incident report shall describe mitigation measures employed and a rationale as to why works have resumed or the next steps required before works may resume.

All personnel shall be made aware of spill management and proper handling of hazardous materials (e.g., fuels, oils, and other hydrocarbons) to prevent harmful substances from entering the environment. In addition, a spill kit containing appropriate absorbent materials for spills to both land and water shall be present on site for the duration of works. The AQP shall verify that all staff are made aware of the location of the kit as well as the proper cleanup techniques in the event of a spill.

4.2.4 Wildlife Management

Prior to any clearing or construction activities, a pre-construction survey for incidental occurrences of wildlife (e.g., forestsnails, terrestrial amphibians, and small mammals) including species at risk will be conducted by an AQP. At a minimum, mitigation during construction should also include:

- Work restrictions during the breeding bird window, which for this area is from March 16 to August 17 (ECCC 2018). Bird nesting surveys, as per MOTI protocol (MOTI 2020b), and measures to protect active nests are required for vegetation removal and disturbance activities during the active nesting period;
- Although no cavity nests were identified during the reconnaissance survey, a follow-up pre-construction survey for cavity nests should be conducted. Cavity nests for pileated woodpeckers are protected year-round and for a minimum of three years once they are confirmed abandoned per the Migratory Bird Regulations;
- Keeping all animal attractants stored in containers/vehicles;
- Removing any food waste/food packaging from site at the end of each day;
- Encouraging crew members to report all wildlife sightings to the AQP; and
- Incorporating bear awareness as part of the morning toolbox talks.

Pacific Water Shrew

Based on the habitat conditions and nature of the CIAS the contractor's AQP will conduct a pre-construction salvage for Pacific water shrew before clearing and grubbing occur within the riparian area. It will be the contractor AQP's responsibility to obtain a wildlife salvage permit and define appropriate salvage methods for Pacific water shrew.

4.2.5 Vegetation Management

Precautions shall be taken to prevent the spread of invasive species, primarily through the application of BMPs outlined in the Best Practices for Managing Invasive Plants on Roadsides (MOTI and ISCBC 2019). Key BMPs to be outlined in the CEMP include:

- Avoid parking, turning around, or staging equipment in areas with invasive species;
- Wash equipment before exiting areas with invasive species and entering areas without invasive species;
- Minimize disturbance of areas and retain desirable vegetation where feasible;
- Use only clean fill materials; and
- Restore disturbed areas with non-invasive and quick-establishing native vegetation suited to site conditions as per the Riparian Revegetation standards (Section 4.1.1).

5.0 ASSESSMENT OF RESIDUAL IMPACTS

Potential adverse residual impacts (i.e., impacts that may reasonably occur after all mitigation is considered; refer to Section 4.0) are not expected to occur, given the short duration of the CIAS, ecosystem values sustained within the Project footprint, and proposed mitigation measures (Table 6). Although the CIAS will result in a temporary loss of riparian vegetation within the clearing limits, there will be no permanent loss of aquatic or riparian habitat (Table 5). Further, the erosion protection works will prevent a future channel avulsion that would have the potential to result in a greater loss of riparian habitat. The unnamed watercourse is non-fish-bearing and ephemeral, and as such provides very limited water, food, and nutrient inputs to the much larger fish-bearing Harrison Lake downstream of the Project area.

Table 5 Habitat balance associated with changes in and about as at site DF3.

Habitat Type	Area m^2					
	Permanent Modification	Temporary Loss	Permanent Loss	Permanent Gain	Revegetation	Net Gain/Loss
Aquatic	386	-	-	-	-	0
Riparian	-	287	72	[1]77	[2]364	+5

[1] Includes the riparian area within the footprint of the channel avulsion that will be revegetated.

[2] Includes the riparian areas temporarily disturbed (287 m^2) and the avulsed channel that will be revegetated (77 m^2).

Table 6 Description of works table for site DF3.

CIAS Description	Area of Impact (m^2)	Duration (Days)	Potential Aquatic Riparian Benefits and/or Impacts			Proposed Mitigation
			Aquatic Ecosystem Values	Water Quantity	Water Quality	
Clearing and grubbing of riparian vegetation.	359	7	▪ Riparian function (shade, food/nutrient, and LWD input). ▪ Potential Pacific water shrew habitat. ▪ Potential bird nesting activity.	N/A	Potential short-term increase in sediment delivery to the aquatic environment.	▪ Install sediment and erosion control measures. ▪ Complete works when the channel is naturally dry and within the least risk fisheries window. ▪ Isolate work area from flows if required. ▪ Environmental monitoring including turbidity. ▪ Conduct salvage for Pacific water shrew and install exclusion fencing. ▪ Conduct breeding bird survey.
Establish construction access.	72	3	Same as clearing and grubbing.	N/A	Same as clearing and grubbing	Same as clearing and grubbing
Channel grading	386	5	Water, food, and nutrient input to downstream fish habitat (i.e., Harrison Lake).	N/A	Potential short-term increase in sediment delivery and erosion to the aquatic environment.	▪ Install sediment and erosion control measures. ▪ Complete works when the channel is naturally dry and within the least risk fisheries window. ▪ Isolate work area from flows if required. ▪ Environmental monitoring including turbidity.
Installation of grouted riprap and check dam within the channel.	386	10	Same as channel grading.	N/A	Potential short-term increase in sediment delivery and erosion to the aquatic environment, and a potential increase in water pH.	▪ Install sediment and erosion control measures. ▪ Complete works when the channel is naturally dry and within the least risk fisheries window. ▪ Isolate work area from flows if required. ▪ Environmental monitoring including turbidity, and pH. ▪ Have co_2 bubbler on site in case of an accidental spill of cementitious material in flowing water.
Riparian restoration seeding/planting in the fall.	352	3	▪ Riparian function (shade, food/nutrient, and LWD input). ▪ Potential Pacific water shrew habitat.	N/A	Potential short-term increase in sediment delivery to the aquatic environment.	▪ Install sediment and erosion control measures.

6.0 CLOSURE

The Rockwell Drive Recovery Project includes instream channel erosion protection works upstream of the site DF3 crossing of Rockwell Drive to prevent a future channel avulsion and damage to the surrounding environment, infrastructure, and private property. These CIAS will require a change approval pursuant to the WSA. So long as the mitigation measures outlined in this application are followed it is our opinion that residual adverse impacts will not occur as a result of this Project. A Request for Project Review pursuant to the *Fisheries Act* is currently under development and will be submitted to Fisheries and Oceans Canada. A Record of Consultation with Indigenous communities is provided in Appendix A3.

7.0 REFERENCES

[Binnie] R.F. Binnie & Associates Ltd. 2022. Draft Option Analysis Report. Prepared for: Ministry of Transportation and Infrastructure, Rockwell Drive Recovery – Sites DF1 to DF3. May 17, 2022.

British Columbia Ministry of Environment and Climate Change Strategy. 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture – Guideline Summary. Water Quality Guideline Series, WQG-20. Prov. B.B., Victoria B.C.

CDCa 2022. BC MOE. CDC Data Request masked species. email: Katrina Stipec June 30, 2022

CDCb 2022. BC Conservation Data Centre. 2020. CDC iMap. (Cited 2022.06.07) Available from: http://maps.gov.bc.ca/ess/hm/cdc/

Government of British Columbia. 2022a. A user's Guide for Changes In and About a Stream in British Columbia. Version 2022.01. Government of British Columbia.

Government of British Columbia. 2022b. Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia. Appendix: Scope-specific Best Management Practices for Changes in and About a Stream under the WSA. A companion document to A user's Guide for Changes In and About a Stream in British Columbia.

MOE 2014. Procedures for Mitigating Impacts on Environmental Values (Environmental Mitigation Procedures) Version 1.0. May 27, 2014.

MOE 2008. Riparian Restoration Guidelines. March 2008. Available from: https://www.env.gov.bc.ca/lower-mainland/electronic_documents/RiparianRestorationGuidelines.doc#:~:text=All%20riparian%20plantings%20should%20be,native%20species%20is%20being%20purchased.

[MOTI] British Columbia Ministry of Transportation and Infrastructure. 2020a. Standard Specifications for Highway Construction. British Columbia Construction and Maintenance Branch. https://www2.gov.bc.ca/gov/content/transportation/transportation-infrastructure/engineering-standards-guidelines/standard-specifications-for-highway-construction

MOTI. 2020b. Protection of the Environment – Breeding Bird Nest Survey Protocol. September 10, 2020.

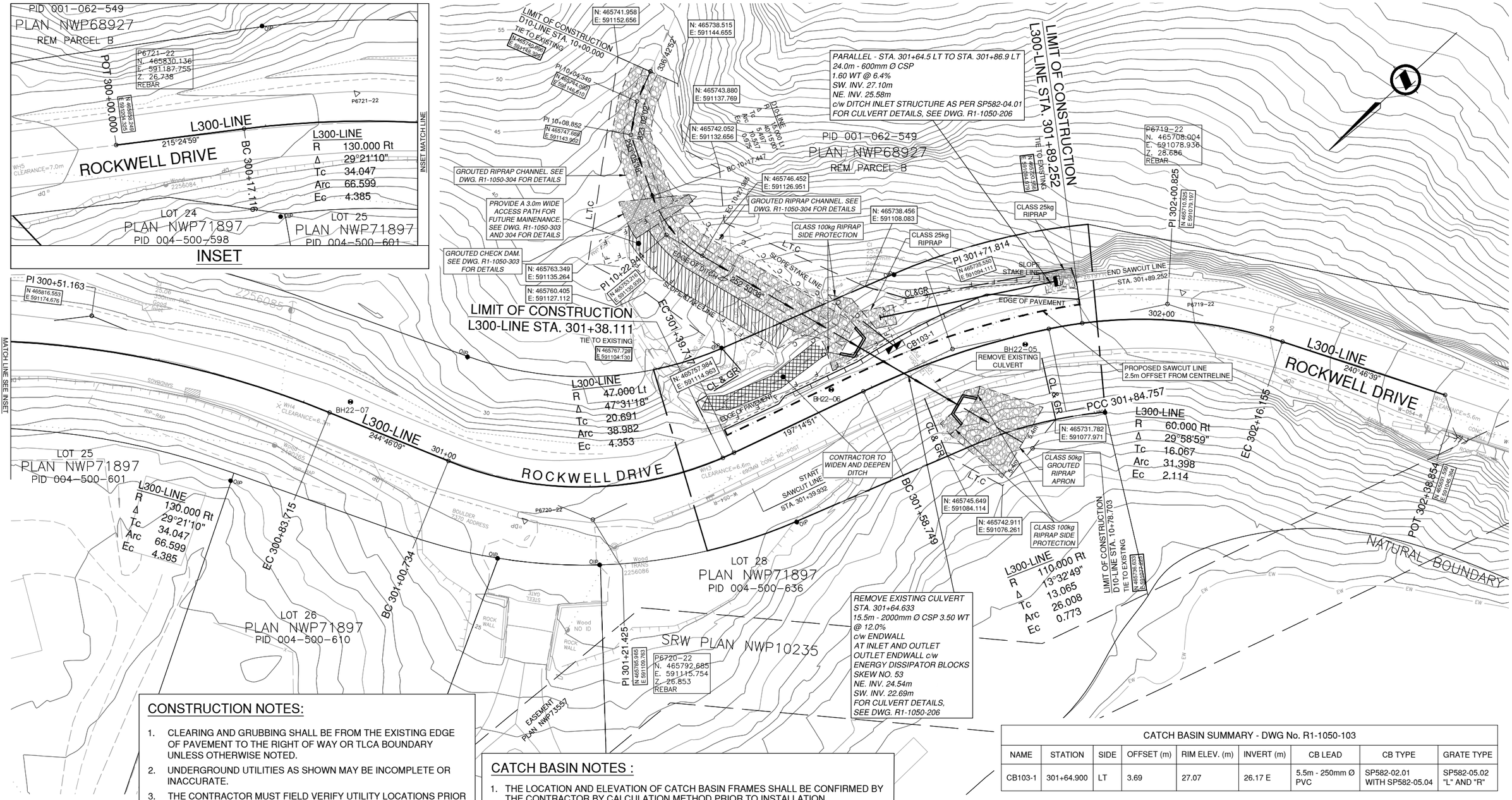
APPENDICES

Appendix A1

Private Property Permission Letter

Appendix A2

Design Drawings



CONSTRUCTION NOTES:

1. CLEARING AND GRUBBING SHALL BE FROM THE EXISTING EDGE OF PAVEMENT TO THE RIGHT OF WAY OR TLCA BOUNDARY UNLESS OTHERWISE NOTED.
2. UNDERGROUND UTILITIES AS SHOWN MAY BE INCOMPLETE OR INACCURATE.
3. THE CONTRACTOR MUST FIELD VERIFY UTILITY LOCATIONS PRIOR TO COMMENCING WORK.
4. ADEQUATE CLEARANCE HAS BEEN PROVIDED TO CONVEY THE DESIGN FLOOD EVENT PER RECOMMENDATION OF SUPPLEMENT TO TAC GEOMETRIC DESIGN GUIDE, SECTION 1040.03. HOWEVER, THE LACK OF ANY DEBRIS CONTROL STRUCTURE UPSTREAM IN THE WATERSHED MAY RESULT IN FUTURE DEBRIS FLOW OVERWHELMING THE INLET BASIN OR FAILURE OF THE STRUCTURE.

CATCH BASIN NOTES :

1. THE LOCATION AND ELEVATION OF CATCH BASIN FRAMES SHALL BE CONFIRMED BY THE CONTRACTOR BY CALCULATION METHOD PRIOR TO INSTALLATION.
2. THE LOCATION OF MoTI CATCH BASINS IN RELATION TO CONCRETE ROADSIDE BARRIER SHALL BE AS SHOWN ON THIS DRAWING. ELEVATIONS AND COORDINATES GIVEN IN THE TABLES ON THIS DRAWING ARE AT CENTRE OF CATCH BASIN FRAME RECESSED 40mm BELOW FINISHED PAVEMENT ELEVATION.
3. DIGITAL DRAWING INFORMATION SHALL NOT BE USED TO OBTAIN COORDINATES FOR THE LAYOUT OF CATCH BASINS. (CATCH BASIN SYMBOL SIZE IS NOT TRUE TO SCALE).
4. CATCH BASIN LEAD PIPE LENGTHS ARE APPROXIMATE ONLY AND ROUNDED OFF TO THE NEAREST METRE. PAYMENT WILL BE MADE ONLY FOR ACTUAL LENGTHS MEASURED DURING CONSTRUCTION.
5. OUTLET PIPES MAY HAVE TO BE FIELD DETERMINED WITH BENDS AND FITTINGS USED ON CATCH BASIN LEAD PIPES.

CATCH BASIN SUMMARY - DWG No. R1-1050-103

NAME	STATION	SIDE	OFFSET (m)	RIM ELEV. (m)	INVERT (m)	CB LEAD	CB TYPE	GRATE TYPE
CB103-1	301+64.900	LT	3.69	27.07	26.17 E	5.5m - 250mm Ø PVC	SP582-02.01 WITH SP582-05.04	SP582-05.02 "L" AND "R"

FOR PLANS
SEE DWG. R1-1050-101 to 103

FOR PROFILES AND CULVERT SECTIONS
SEE DWG. R1-1050-201 to 206

FOR TYPICAL SECTIONS
SEE DWG. R1-1050-301 to 304

FOR GEOMETRICS, LANING SIGNING, AND PAVEMENT MARKINGS
SEE DWG. R1-1050-401 to 403

DRAFT

CLEARING AND GRUBBING
TOTAL THIS SHEET: 0.1149 ha

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

SCALE 0 2 1:250 12m

CAD FILENAME 100PL-ROCKWELL-DF3_21-1067.DWG
DATE 2023-01-31
FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

PLAN

ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3
DF3

R.F. BINNIE & ASSOCIATES LTD.
EGBC PERMIT TO PRACTICE
NUMBER 1001128

PROFESSIONAL ENGINEER
M.M. CARREIRA
P 41477
PROVINCE OF BRITISH COLUMBIA

MICHAEL CARREIRA
ENGINEER OF RECORD
DATE

DESIGNED N.B. / A.M. DATE JAN. 2023
QUALITY CONTROL M.C. DATE JAN. 2023
QUALITY ASSURANCE A.M. DATE JAN. 2023
DRAWN N.B. DATE JAN. 2023

PROJECT NUMBER	REG	DRAWING NUMBER	REV
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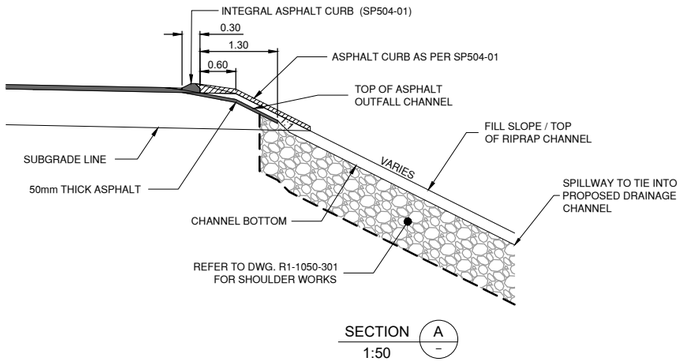

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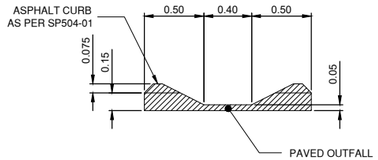

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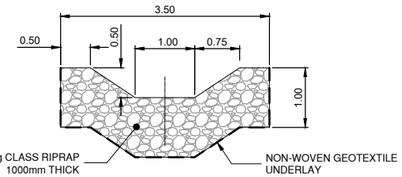

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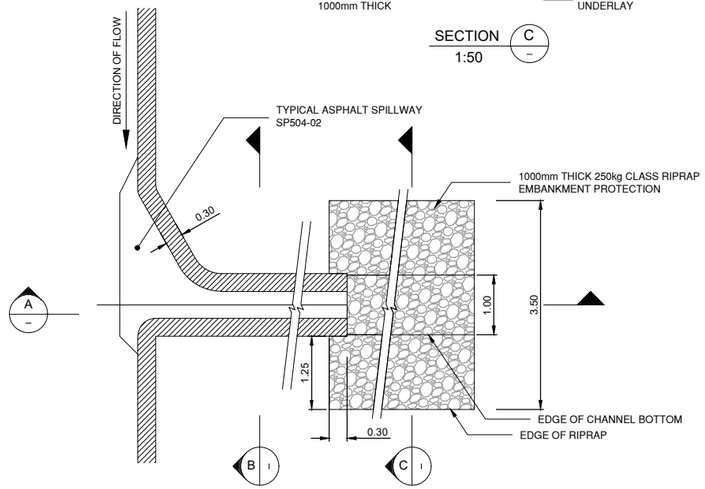
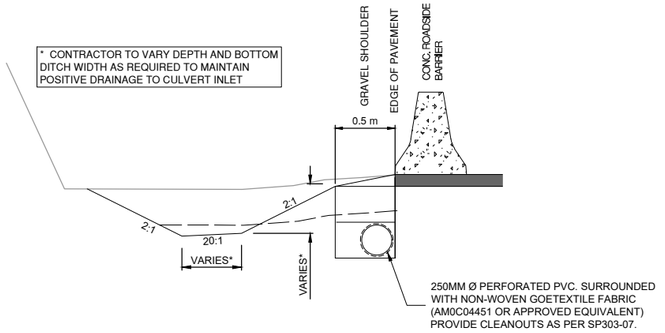


ASPHALT SPILLWAY WITH CURB & RIPRAP OUTFALL
(SEE PLANS FOR LOCATIONS)

0 0.5 1:50 2.5m

* CONTRACTOR TO VARY DEPTH AND BOTTOM DITCH WIDTH AS REQUIRED TO MAINTAIN POSITIVE DRAINAGE TO CULVERT INLET



ROCKWELL DRIVE DF1 (L100-LINE)
FIELD FIT DITCH DETAIL

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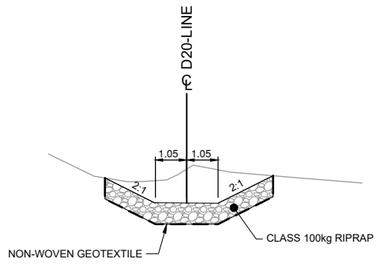
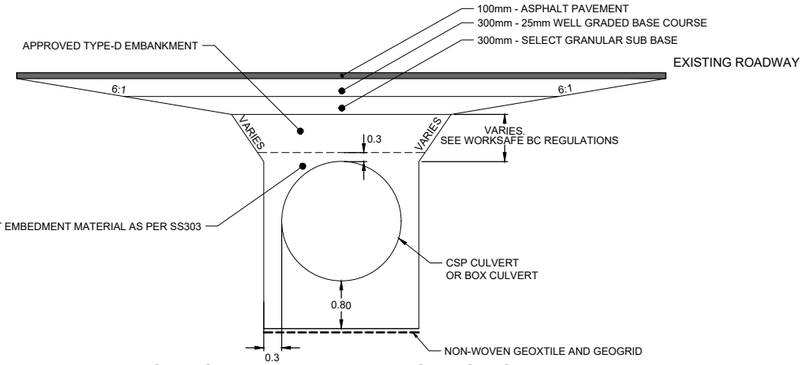


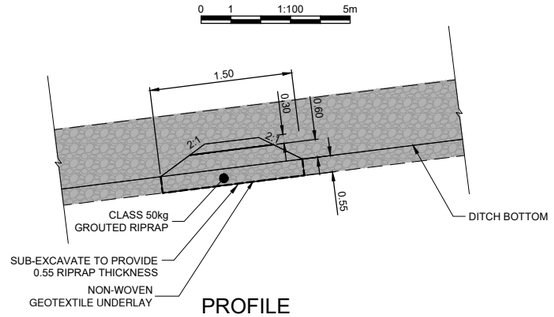
DF2 - D20-LINE
TYPICAL SECTION

0 1 1:100 5m



TRENCHING DETAIL WITHIN EXISTING ROADWAY

0 1 1:100 5m



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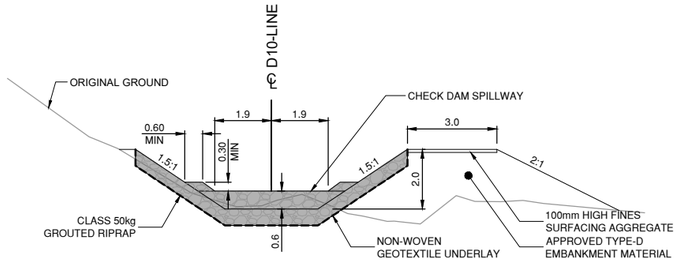

D10-LINE - DITCH CHECK DAM
SECTION A-A
N.T.S.

FOR PLANS
SEE DWG. R1-1050-101 to 103

FOR PROFILES AND
CULVERT SECTIONS
SEE DWG. R1-1050-201 to 206

FOR TYPICAL SECTIONS
SEE DWG. R1-1050-301 to 304

FOR GEOMETRICS , LANING
SIGNING, AND PAVEMENT MARKINGS
SEE DWG. R1-1050-401 to 403

NOTES:

1. HYDROSEED ALL CUT AND FILL SLOPES.

DRAFT

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SCALE AS SHOWN
CAD FILENAME 300TS-ROCKWELL-DF1_21-1067.DWG
DATE 2023-01-31
FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

TYPICAL SECTIONS
ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3

R.F. BINNIE & ASSOCIATES LTD.
EGBC PERMIT TO PRACTICE
NUMBER 1001128

MICHAEL CARREIRA
ENGINEER OF RECORD
DATE

DESIGNED	J.T. / A.M.	DATE JAN. 2023
QUALITY CONTROL	M.C.	DATE JAN. 2023
QUALITY ASSURANCE	A.M.	DATE JAN. 2023
DRAWN	J.T.	DATE JAN. 2023

PROJECT NUMBER	REG	DRAWING NUMBER	REV
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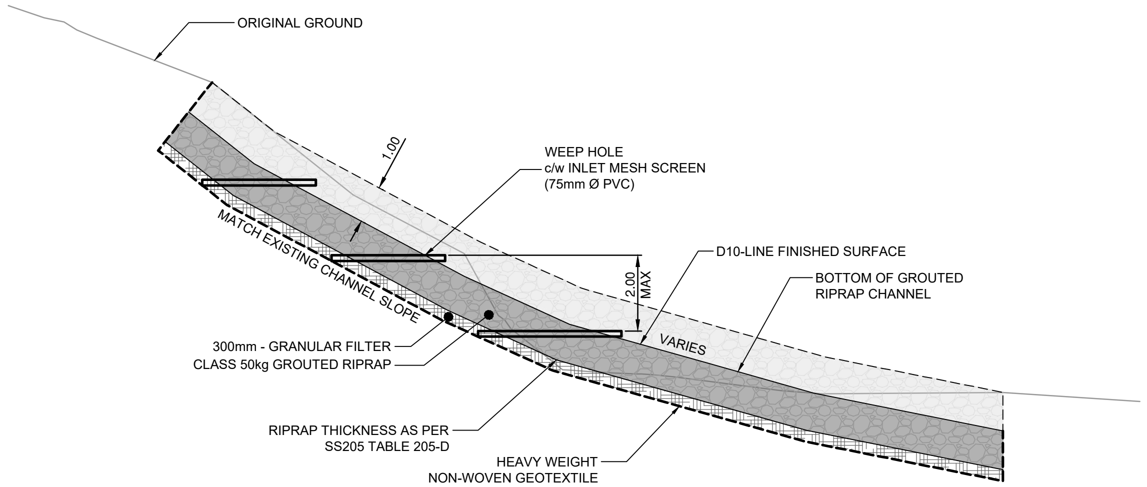

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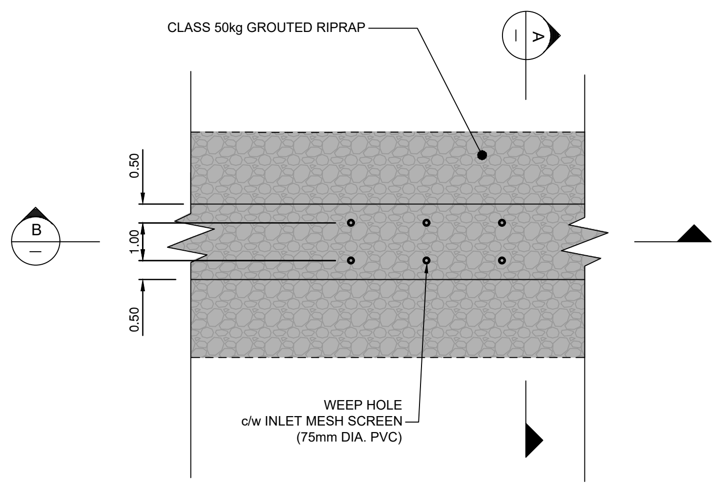
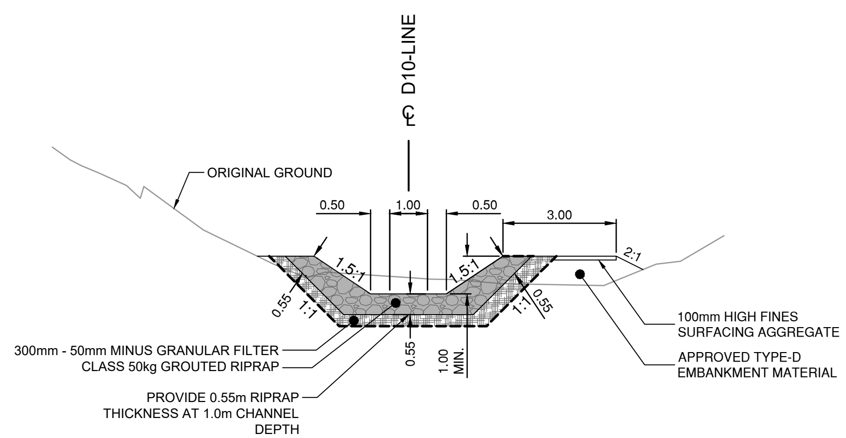
GROUTED RIPRAP CHANNEL

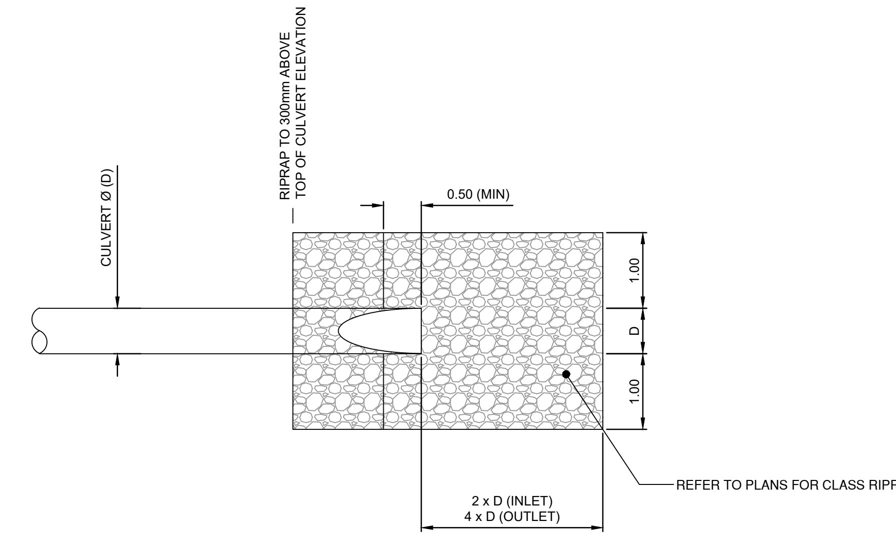


PLAN
GROUTED RIPRAP CHANNEL

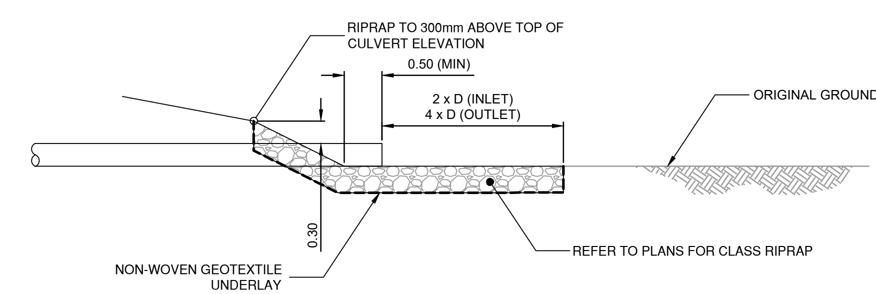


SECTION A-A
GROUTED RIPRAP CHANNEL

DF3 - D10-LINE
GROUTED RIPRAP CHANNEL DETAILS
STA. 10+19.500 TO STA. 10+51.959



CULVERT RIPRAP IN FILL (PLAN)



CULVERT RIPRAP IN FILL (SECTION)

FOR PLANS
SEE DWG. R1-1050-101 to 103

FOR PROFILES AND
CULVERT SECTIONS
SEE DWG. R1-1050-201 to 206

FOR TYPICAL SECTIONS
SEE DWG. R1-1050-301 to 304

FOR GEOMETRICS, LANING
SIGNING, AND PAVEMENT MARKINGS
SEE DWG. R1-1050-401 to 403

NOTES:

1. HYDROSEED ALL CUT AND FILL SLOPES.

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SCALE AS SHOWN
CAD FILENAME 300TS-ROCKWELL-DF1_21-1067.DWG
DATE 2023-01-31
FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

TYPICAL SECTIONS
ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3

R.F. BINNIE & ASSOCIATES LTD.
EGBC PERMIT TO PRACTICE
NUMBER 1001128

MICHAEL CARREIRA
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DRAWN	J.T.	DATE	JAN. 2023

PROJECT NUMBER	REG	DRAWING NUMBER	REV
14045	1	R1-1050-304	

Appendix A3

MOTI Record of Consultation

Ministry of Transportation and Infrastructure
Record of Consultation

PROJECT NUMBER / NAME:	Rockwell Drive Emergency Recovery	MOTI PROJECT MANAGER:	Tyler Lu
LOCATION:	Rockwell Drive East of Harrison Lake	MOTI CONSULTATION LEAD:	Kelsi Fraser

First Nation	Date	Project Phase	Activity	MOTI Contact	First Nation Contact	Comments
Band, Tribal Council, Hereditary Chief	***yyyy-mm-dd***	***50% DD, 90% DD, 100% DD, Pre-tender etc.***	***Letter, E-mail, Phone Call, Meeting***	***Individual in MOTI who initiated / received contact***	***Individual(s) with First Nation who initiated / received contact***	***Reference to the nature of the call, letter etc.***
NNTC	3/4/2022	Initial Notification	Letter	Kelsi Fraser MoTI (Rhiannon Dominy-Pergentile MoTI)		Uploaded NNTC letter and KML/KMZ to the NNTC K Drive
Ashcroft, Coldwater, Cooks Ferry, LNIB, Nicomen, Nooaitch, Peters, Popkum, PRRO, Seabird, Shackan, Shxwowhamel, Siska, Spuzzum, STC, Sts'ailes, Union Bar	3/4/2022	Initial Notification	Letter	Kelsi Fraser MoTI (Rhiannon Dominy-Pergentile MoTI)		Good morning, Please see attached for the Initial Notification Letter for the Rockwell Drive Emergency Recovery Project, located on Rockwell Drive and Hicks Lake Road along Harrison Lake, north of Harrison Hot Springs, BC. Also attached are a KML and KMZ of the site locations, for your review. Should you have any questions, comments, or concerns please contact Kelsi Fraser (A/Project Coordinator, Indigenous Relations) at kelsi.1.fraser@gov.bc.ca or 236-468-2104. Warm regards, Rhiannon Dominy-Pergentile
Scw'exmx Tribal Council CC: Nooaitch Indian Band Shackan Indian Band	3/31/2022	Initial Notification	Email/Letter	Kelsi Fraser MoTI	Jeanette McCauley	March 31, 2022 TR_2022_5711 Ministry of Transportation and Infrastructure South Coast Region 310-1500 Woolridge Street Coquitlam, BC V3K 0B8 Attn: Kelsi Fraser, Project Coordinator, Indigenous Relations Re: Rockwell Drive Debris Flows - Emergency Recovery Dear Ms. Fraser: Attached is a response letter for the notification of the proposed Rockwell Drive Emergency Recovery Project located north of Harrison Hot Springs within the Nlaka'pamux Traditional Territory. The response letter has been signed, scanned and emailed to: Kelsi Fraser. If you have any questions or concerns, you can contact Jeanette McCauley, Referral Officer at (250) 378-4235 Ext. 112 or by email: jmccauley@scwexmxtribal.org Thank you sincerely, Shannon Varley

Ministry of Transportation and Infrastructure
Record of Consultation

PROJECT NUMBER / NAME:	Rockwell Drive Emergency Recovery	MOTI PROJECT MANAGER:	Tyler Lu
LOCATION:	Rockwell Drive East of Harrison Lake	MOTI CONSULTATION LEAD:	Kelsi Fraser

First Nation	Date	Project Phase	Activity	MOTI Contact	First Nation Contact	Comments
Lower Nicola	4/4/2022	Initial Notification	Email	Kelsi Fraser	Rod Malcom	The project area is within the unceded asserted Traditional Territory of the Lower Nicola Indian Band, a member of the Nlaka'pamux Nation. LNIB has no comments on this referral at this time except as follows. If during the work, issues arise that require engagement, outreach, consultation, etc. with First Nations, LNIB requests that it be contacted as soon as the more local First Nations. If you have any questions about these comments, do not hesitate to contact the LNIB Referrals team and please include the LNIB project number, appended to the subject line. Thank you. Rod Roderick Malcom
PRRO	4/8/2022	Initial Notification	Email / Report	Kelsi Fraser	Jacob Kunnathuparambil	Afternoon Kelsi, Please find the attached analysis report regarding the referral 607089, and let us know if you have any questions. Regards, Jacob Stephen K

Ministry of Transportation and Infrastructure
Record of Consultation

PROJECT NUMBER / NAME:	Rockwell Drive Emergency Recovery	MOTI PROJECT MANAGER:	Tyler Lu
LOCATION:	Rockwell Drive East of Harrison Lake	MOTI CONSULTATION LEAD:	Kelsi Fraser

First Nation	Date	Project Phase	Activity	MOTI Contact	First Nation Contact	Comments
PRRO	4/27/2022	Initial Notification	Email	Kelsi Fraser	Jacob Kunnathuparambil	Good Afternoon Jacob, Thank you for providing the Preliminary Response for #14048 – Rockwell Drive Debris Flow – Emergency Recovery Project located near Harrison Lake, BC. Please find below MoTI's response to the topics for engagement. 1.Have an environmental mi. gation plan and apply measures to address concerns around aquatic integrity, water quality, riparian area disturbance, and fish & wildlife habitats. A construction environmental manage plan (CEMP) which outlines how works will be undertaken to protect environmentally sensitive areas, will be in place for the channel works at Trout Lake Creek. The CEMP will include spill contingency plans, invasive plant management plans etc. The contractor will also have to meet the SS 165 Protection of the Environment and any other applicable environmental legislation, such as the Fisheries Act, which prohibits deleterious substances from being released into fish habitat. MoTI will share the CEMP with the PRRO, once available. Additionally, the proposed sediment removal work is intended to restore fish habitat that was impacted by the November 2021 storm event, by removing excess sediment and debris accumulated at the downstream end of the creek. 2.We believe the repair works will not involve fresh ground disturbance. However, if they do, we recommend the proponent consult the Stó:lō Research & Resource Management Center (SRRMC) for advice on construction monitoring requirements. At this time, MoTI anticipates that the scope of works will not involve fresh ground disturbance (disturbance of native soils). Should the scope of works change, such that fresh ground disturbance is required, MoTI agrees to consult with the Stó:lō Research & Resource Management Center (SRRMC) for advice on construction monitoring requirements. 3.Ensure all equipment and vehicles are free of foreign organic residues to prevent the
PRRO	6/6/2022	Initial Notification	Email/Report	Kelsi Fraser	Jacob Kunnathuparambil	Hi Kelsi, Please find the attached final engagement report with this email, and let us know if you have any questions. Regards, Jacob Stephen K
Ashcroft, Coldwater, Cooks Ferry, LNIB, Nicomen, Nooaitch, Peters, Popkum, PRRO, Seabird, Shackan, Shxwowhamel, Siska, Spuzzum, STC, Sts'ailes, Union Bar	6/24/2022	Update Letter	Email	Kelsi Fraser (Michelle Cole)		Good afternoon, Please find attached to this email the Project Update Letter for the Rockwell Drive Debris Flow Emergency Recovery Project located near Harrison Hot Springs, BC. If you have any questions, comments or concerns please contact Kelsi Fraser (Advisor Indigenous Relations) by phone at 236-468-2104 or by email Kelsi.1.fraser@gov.bc.ca Warm regards, Michelle Cole

Ministry of Transportation and Infrastructure
Record of Consultation

PROJECT NUMBER / NAME:	Rockwell Drive Emergency Recovery	MOTI PROJECT MANAGER:	Tyler Lu
LOCATION:	Rockwell Drive East of Harrison Lake	MOTI CONSULTATION LEAD:	Kelsi Fraser

First Nation	Date	Project Phase	Activity	MOTI Contact	First Nation Contact	Comments
PRRO	6/24/2022	Update Letter	Email	Kelsi Fraser (Michelle Cole)		Good afternoon, Please find attached to this email the Project Update Letter for the Rockwell Drive Debris Flow Emergency Recovery Project located near Harrison Hot Springs, BC. If you have any questions, comments or concerns please contact Kelsi Fraser (Advisor Indigenous Relations) by phone at 236-468-2104 or by email Kelsi.1.fraser@gov.bc.ca Warm regards, Michelle Cole
NNTC	6/24/2022	Update Letter	Letter	Kelsi Fraser (Michelle Cole)		Uploaded NNTC Update letter to the K Drive
PRRO	6/29/2022	CEMP	Email	Kelsi Fraser	Jacob Kunnathuparambil	Good Morning Jacob, Thank you for providing the final report. Previously, MoTI had committed to providing the People of the River Referrals Office with the Construction Environmental Management Plan (CEMP) for the works at Rockwell Drive, and more specifically at site 4. Please find attached to this email the CEMP. A friendly reminder that this is a fluid document, and can be updated at any time should advice/requirements change. If you have any questions or comments, please do not hesitate to contact me. Warm regards, Kelsi Fraser
Lower Nicola	7/8/2022	Update Letter	Email	Kelsi Fraser	Rod Malcom	Good afternoon. The project area is within the unceded asserted Traditional Territory of the Lower Nicola Indian Band, a member of the Nlaka'pamux Nation. LNIB has no comments on this referral at this time, except as follows. The proposed project is in an area with cultural overlap with LNIB and where other First Nations engage in shared use with LNIB. Therefore, please ensure, if issues arise requiring outreach, engagement, consultation, etc. with First Nations, that LNIB is advised as soon as the other, more local, First Nations. Please use the LNIB project number, appended to the subject line in any correspondence with LNIB regarding this referral and include the FileClerk@LNIB.net in your response. If you have any questions about these comments, please do not hesitate to contact the LNIB Referrals team. Thank you for the opportunity to comment. Rod

Ministry of Transportation and Infrastructure
Record of Consultation

PROJECT NUMBER / NAME:	Rockwell Drive Emergency Recovery	MOTI PROJECT MANAGER:	Tyler Lu
LOCATION:	Rockwell Drive East of Harrison Lake	MOTI CONSULTATION LEAD:	Kelsi Fraser

First Nation	Date	Project Phase	Activity	MOTI Contact	First Nation Contact	Comments
Lower Nicola	7/8/2022	Update Letter	Email	Kelsi Fraser	Rod Malcom	Good Afternoon Rod, Thank you for your email regarding the Rockwell Drive Emergency Recovery Project #14048. MoTI will ensure that if issues arise requiring outreach, engagement, consultation etc. that Lower Nicola Indian Band will be advised at the same time as the other, more local, First Nations. If you have any further questions, comments or concerns regarding this project, please do not hesitate to contact me. Warm regards, Kelsi Fraser
Ashcroft, Coldwater, Cooks Ferry, LNIB, Nicomen, Nooaitch, Peters, Popkum, PRRO, Shackan, Siska, Spuzzum, STC, Sts'ailes, Union Bar	8/5/2022	Geotechnical Investigations - Site 1, 2, & 3	Email/Letter	Kelsi Fraser		Good Morning, Please find attached to this email the Geotechnical Investigations Notification letter for sites DF1, DF2, and DF3 components of the Rockwell Drive Emergency Recovery Project located near Harrison Hot Springs, BC. Also attached are KMZ files showing the proposed areas of the boreholes. If you have any questions, comments or concerns regarding the proposed geotechnical investigations please contact me prior to September 5, 2022 by telephone at 236-468-2104 or by email at Kelsi.1.Fraser@gov.bc.ca. Warm regards, Kelsi Fraser
NNTC	8/5/2022	Geotechnical Investigations - Site 1, 2, & 3	Email/Letter	Kelsi Fraser		Uploaded NNTC Update letter to the K Drive
PRRO	8/5/2022	Geotechnical Investigations - Site 1, 2, & 3	Email/Letter	Kelsi Fraser	Jacob Kunnathuparambil	Hi Jacob, I sent this letter to the main email address, and forgot to copy you. If the PRRO or SRRMC is interested in monitoring the drilling, please let me know. Thanks, Kelsi Fraser

Ministry of Transportation and Infrastructure
Record of Consultation

PROJECT NUMBER / NAME:	Rockwell Drive Emergency Recovery	MOTI PROJECT MANAGER:	Tyler Lu
LOCATION:	Rockwell Drive East of Harrison Lake	MOTI CONSULTATION LEAD:	Kelsi Fraser

First Nation	Date	Project Phase	Activity	MOTI Contact	First Nation Contact	Comments
Sts'ailes	8/8/2022	Geotechnical Investigations - Site 1, 2, & 3	Email	Kelsi Fraser	Morgan Ritchie	Hi Kelsi, Thanks for the notification. Sts'ailes is happy to have the planned drilling proceed under a Chance Find Procedure, as recommended by Stantec. We were involved with their recent site visit, and will continue to be involved if there is any follow up. -Morgan c: 778 773-3442
Sts'ailes	8/8/2022	Geotechnical Investigations - Site 1, 2, & 3	Email	Kelsi Fraser	Morgan Ritchie	Good Afternoon Morgan, Thank you for your quick response, and for confirming that Sts'ailes concurs with Stantec on the use of a Chance Find Procedure for the geotechnical drilling. I am happy to hear that Sts'ailes was able to participate in Stantec's site visit. If at anytime Sts'ailes is interested in providing a cultural monitor for any of the project works, please let me know and I would be happy to facilitate. If you have any questions, comments or concerns please do not hesitate to contact me. Warm regards, Kelsi Fraser
Sts'ailes	8/8/2022	Geotechnical Investigations - Site 1, 2, & 3	Email	Kelsi Fraser	Morgan Ritchie	Hi Kelsi, Thank you. Please do keep us posted on the project works that may require a monitor. As present, I don't have a schedule of planned activities. I assumed that we would be notified by Stantec at relevant times, but perhaps not? Thanks, -Morgan

Ministry of Transportation and Infrastructure
Record of Consultation

PROJECT NUMBER / NAME:	Rockwell Drive Emergency Recovery	MOTI PROJECT MANAGER:	Tyler Lu
LOCATION:	Rockwell Drive East of Harrison Lake	MOTI CONSULTATION LEAD:	Kelsi Fraser

First Nation	Date	Project Phase	Activity	MOTI Contact	First Nation Contact	Comments
Sts'ailes	8/8/2022	Geotechnical Investigations - Site 1, 2, & 3	Email	Kelsi Fraser	Morgan Ritchie	Hi Morgan, Stantec would only notify you if they intend to have an archaeologist on-site. Otherwise, all notifications regarding project related works and/or investigations will come from myself. As indicated in the notification letter sent on June 24, 2022, we are anticipating the sediment removal at Trout Lake Creek to take place this month, so as to comply with the least risk window for fish and fish habitat. I'm not certain of the start date, but I can keep you informed if you are interested in monitoring. The remaining works (long-term solutions) for all four sites, likely won't take place until 2023. In the mean time, I will continue to keep you up to date on any works and/or investigations, as well as the detailed designs for the sites as they progress. Please let me know if you have any further questions, Kelsi Fraser
PRRO	8/8/2022	Geotechnical Investigations - Site 1, 2, & 3	Email	Kelsi Fraser	Jacob Kunnathuparambil	Hi Kelsi, Could you please provide me with PRRO referral ID? Thank you, Jacob Stephen K
PRRO	8/8/2022	Geotechnical Investigations - Site 1, 2, & 3	Email	Kelsi Fraser	Jacob Kunnathuparambil	Good Afternoon Jacob, Thank you for your email. I believe the referral ID is 607089. Please let me know if you require anything further. Warm regards, Kelsi Fraser
Popkum	8/26/2022	Geotechnical Investigations - Site 1, 2, & 3	Email	Kelsi Fraser	Nisha Sikka	Hi Kelsi, Further to the below, Popkum First Nation does not have any comments at this time, based on the information provided to date. Popkum First Nation would, however, appreciate it if you could keep us up to date with respect to the proposed investigations, including any feedback received from First Nations and Indigenous groups. Thanks a lot. Best regards, Nisha Sikka (she/her)

Ministry of Transportation and Infrastructure
Record of Consultation

PROJECT NUMBER / NAME:	Rockwell Drive Emergency Recovery	MOTI PROJECT MANAGER:	Tyler Lu
LOCATION:	Rockwell Drive East of Harrison Lake	MOTI CONSULTATION LEAD:	Kelsi Fraser

First Nation	Date	Project Phase	Activity	MOTI Contact	First Nation Contact	Comments
Popkum	8/29/2022	Geotechnical Investigations - Site 1, 2, & 3	Email	Kelsi Fraser	Nisha Sikka	Good Morning Nisha, Thank you for your email regarding the Geotechnical Investigations at Sites 1, 2 and 3 on Rockwell Drive. MoTI will continue to keep you informed of updates for all four sites along Rockwell Drive, as the projects progress. At this time we expect the geotechnical drilling to take place on September 20th and 21st. If I may be of any further assistance in the meantime, please do not hesitate to contact me. Warm regards, Kelsi Fraser
Cook's Ferry	9/9/2022	Geotechnical Investigations - Site 1, 2, & 3	Email	Kelsi Fraser	Katie Turriff	Hello, Please find the Cook's Ferry Indian Band's response to the referral for MOTI – ROCKWELL DRIVE GEOTECH INVESTIGATIONS – FILE #14048 attached to this email. If you have any questions, please contact the Lands Director, Scott Mackay, at lands@cooksferry.ca. Kʷukʷstemc - Thank you Katie Turriff
Cook's Ferry	9/12/2022	Geotechnical Investigations - Site 1, 2, & 3	Email	Kelsi Fraser	Katie Turriff	Good Morning Katie, Thank you for providing Cook's Ferry Indian Band's response to the Rockwell Drive Geotechnical Investigations letter, a component of file #14048. MoTI understands that Cook's Ferry Indian Band doesn't have any concerns at this time pertaining to the geotechnical investigations. However, MoTI agrees that should any changes occur, or new information becomes available which could impact Aboriginal rights and title, MotTI will provide you with the information so that you may be further consulted. Additionally, MoTI will ensure that the 24 hour notification period outlined in your letter with regards to unanticipated environmental events and/or chance cultural or archaeological finds is adhered to. If you have any further questions or comments, please do not hesitate to contact me. Otherwise, I will continue to be in touch as the project progresses. Warm regards, Kelsi Fraser

Ministry of Transportation and Infrastructure
Record of Consultation

PROJECT NUMBER / NAME:	Rockwell Drive Emergency Recovery	MOTI PROJECT MANAGER:	Tyler Lu
LOCATION:	Rockwell Drive East of Harrison Lake	MOTI CONSULTATION LEAD:	Kelsi Fraser

First Nation	Date	Project Phase	Activity	MOTI Contact	First Nation Contact	Comments
Lower Nicola	9/13/2022	Geotechnical Investigations - Site 1, 2, & 3	Email	Kelsi Fraser	Rod Malcom	The project area is within the unceded asserted Traditional Territory of the Lower Nicola Indian Band, a member of the Nlaka'pamux Nation. LNIB has no additional comments on this referral at this time. Please use the LNIB project number, appended to the subject line in any correspondence with LNIB regarding this referral and include the FileClerk@LNIB.net in your response. If you have any questions about these comments, please do not hesitate to contact the LNIB Referrals team. Thank you for the opportunity to comment. Rod
Lower Nicola	9/14/2022	Geotechnical Investigations - Site 1, 2, & 3	Email	Kelsi Fraser	Rod Malcom	Good Morning Rod, Thank you for your email regarding the Rockwell Drive Emergency Recovery Project, and the Geotechnical Investigations at site 1, 2, and 3. MoTI will continue to keep LNIB informed as the project progresses. If at anytime any questions or concerns arise, please do not hesitate to contact me. Warm regards, Kelsi Fraser
Ashcroft, Coldwater, Cooks Ferry, LNIB, Nicomen, Nooaitch, Peters, Popkum, PRRO, Shackan, Siska, Spuzzum, STC, Sts'ailes, Union Bar	1/18/2023	100% Detailed Design - Sites 1, 2, and 3 ONLY	Email/Letter	Kelsi Fraser (Michelle Cole)		Good afternoon, Further to our previous correspondence, please find attached to this email the 100% Detailed Design Letter for the Rockwell Drive Debris Flows Emergency Recovery Project– Sites 1, 2 and 3 ONLY, near Harrison Lake, BC. Also attached are the 100% Detailed Design Drawings, the Draft Archaeological Impact Assessment and the Environmental Overview Assessment. If you have any information that may inform the review of the proposed project and how the proposed project might impact your Aboriginal interests, please contact Kelsi Fraser (Advisor, Indigenous Relations) at 236-468-2104 or by email at Kelsi.1.Fraser@gov.bc.ca. Kind regards, Michelle Cole Analyst, Indigenous Relations

Ministry of Transportation and Infrastructure
Record of Consultation

PROJECT NUMBER / NAME:	Rockwell Drive Emergency Recovery	MOTI PROJECT MANAGER:	Tyler Lu
LOCATION:	Rockwell Drive East of Harrison Lake	MOTI CONSULTATION LEAD:	Kelsi Fraser

First Nation	Date	Project Phase	Activity	MOTI Contact	First Nation Contact	Comments
NNTC	1/18/2023	100% Detailed Design - Sites 1, 2, and 3 ONLY	Letter/Upload	Kelsi Fraser (Michelle Cole)	Nick Cessford	Hi Nick, I uploaded a 100% Detailed Design Letter and 3 attachments into the following NNTC folder for uploading: \\Sfp.idir.bcgov\s130\S3001\NNTC Consultation\14048- Rockwell Drive Debris Flows Emergency Recovery- Sites 1, 2 and 3- 100% Detailed Design Thanks! Michelle Cole Analyst, Indigenous Relations
Popkum	2/1/2023	100% Detailed Design - Sites 1, 2, and 3 ONLY	Email	Kelsi Fraser	Nisha Sikka	Hi Kelsi, Further to the below, Popkum First Nation does not have any comments at this time, based on the information/materials provided to date. Popkum First Nation would, however, appreciate it if you could continue to keep us up to date with respect to the proposed project, including any feedback received from First Nations and Indigenous groups. Thanks a lot. Best regards, Nisha Sikka (she/her)
Popkum	2/2/2023	100% Detailed Design - Sites 1, 2, and 3 ONLY	Email	Kelsi Fraser	Nisha Sikka	Good Afternoon Nisha, Thank you for your email regarding the 100% Detailed Designs for sites 1, 2 and 3 of the Rockwell Drive Debris Flow Emergency Recovery Project. The Ministry acknowledges that Popkum First Nation does not have any comments at this time, based on the information/materials provided to date. However, the Ministry will continue to update Popkum First Nation as the project progresses. If in the interim any questions, comments or concerns arise, please do not hesitate to contact me. Warm regards, Kelsi Fraser
Popkum	2/3/2023	100% Detailed Design - Sites 1, 2, and 3 ONLY	Email	Kelsi Fraser	Nisha Sikka	Thanks, Kelsi. Best regards, Nisha Sikka

March 4, 2022 Project #14048

Ashcroft Indian Band
414 Cornwall Road, PO Box 440
Ashcroft BC V0K 1A0

Dear Chief and Band Manager,

Re: Rockwell Drive Debris Flows – Emergency Recovery

The Ministry of Transportation and Infrastructure (MoTI) would like to notify the Ashcroft Indian Band of the proposed Rockwell Drive Emergency Recovery Project (the Project) located on Rockwell Drive and Hicks Lake Road, along Harrison Lake, north of Harrison Hot Springs, BC. The proposed short-term works look to repair and restore infrastructure at four locations along the road to ensure the safety of road users and prevent further flooding of highway infrastructure during spring freshet.

PROPOSAL:	Rockwell Drive Debris Flows – Emergency Recovery
LOCATION:	Rockwell Drive & Hicks Lake Road, along Harrison Lake, North of Harrison Hot Springs, BC. Site 1: (Lat, Long: 49.324162, -121.7529749 °) Site 2: (Lat, Long: 49.3288703, -121.7517123) Site 3: (Lat, Long: 49.3402281, -121.7441785) Site 4: (Lat, Long: 49.3417622, -121.7468264)
PROPOSED CONSTRUCTION START/END DATES:	**March - May 2022**
PROPOSED TENDER DATE:	**Works to be completed through the maintenance contractor.**
PRIMARY CONTACT:	Kelsi Fraser A/ Project Coordinator 236-468-2104 Kelsi.1.Fraser@gov.bc.ca

Context of the Proposal:
On November 14/15, 2021, an Atmospheric River event occurred which brought heavy rains to British Columbia. The heavy rains resulted in a bridge washout, embankment erosion and debris flows. The following emergency response measures were taken to immediately restore access and use of Highway 1:

- Debris removal and roadway cleaning

- Shoulder repairs
- Redirection of flow of water at site 3
- Removal of temporary rail car bridge, and damaged culverts at site 4

MoTI engineers have visited the site on several occasions and have advised that additional works are required to ensure the safety of road users, and infrastructure during spring freshet. The Proposed additional works include:

- Installation of rip rap and armouring, and repair to damaged culverts at site 1 & 2
- Sediment removal at Trout Lake Creek Channel west of Green Point Bridge
- Asphalt repairs at site 3 and site 4

Additional longer term recovery works are also anticipated. MoTI is actively working to determine the long-term scope and will continue to seek input from Ashcroft Indian Band throughout these phases.

Archaeology & Environment:
Instream works will be conducted under the MoTI Water Sustainability Act Order. Environmental mitigation measures will be put in place with a Qualified Professional onsite to conduct environmental monitoring on all instream works. An Archaeological Chance Find Procedure will be implemented.

Preliminary Schedule:

- Response Phase Works begins: March 2022
- Response Phase Works complete: May 2022
- Recovery Phase Works begin/end: TBD

This schedule is tentative and subject to change. MoTI will continue to seek input from you throughout the design phases. If the Ashcroft Indian Band has any further information that may inform the review of the proposed Rockwell Drive – Emergency Recovery project, and how the project might impact your Aboriginal Interests, please contact me at 236-468-2104 or Kelsi.1.Fraser@gov.bc.ca.

Sincerely,

Kelsi Fraser
A/ Project Coordinator, Indigenous Relations

Cc: Tyler Lu – Project Manager (McElhanney)
Sivagar Sivabalan – Project Tech

Attachments: Project location map (KMZ/KML)

Scw'exmx Tribal Council
Tmix^{w} Research
202 – 2090 Coutlee Avenue
Box 188, Merritt, BC V1K 1B8
Phone: (250) 378-4235 administration@scwexmxtribal.org Fax: (250) 378-9119

March 31, 2022 **TR_2022_5711**

Ministry of Transportation and Infrastructure
South Coast Region
310-1500 Woolridge Street
Coquitlam, BC V3K 0B8

Attn: Kelsi Fraser, Project Coordinator, Indigenous Relations

Re: *Rockwell Drive Debris Flows – Emergency Recovery*

Dear Ms. Fraser:

The Scw'exmx Tribal Council (STC) / Tmix^{w} Research (TR) has received the notification for the proposed Rockwell Drive Emergency Recovery Project located north of Harrison Hot Springs within the Nlaka'pamux Traditional Territory. Although this referral is within the TR members asserted traditional territory, TR would like to *defer* this project to the Sto:Lo Nation for their review and comment. This does not commit TR Member Bands to remit or give away their Traditional Territorial Rights to this area.

The permit referral process should not be understood to fulfill the Province's duty to consult and accommodate, nor should our response to this referral be used to abrogate, limit, or define our Aboriginal Title or Rights. We reserve the right to address the issue of infringement and compensation with the governments of British Columbia and Canada. We reserve the right to raise objections if any unforeseen cultural or heritage sites are identified during this work or any future development.

Contact Jeanette McCauley, Referral Officer, for any questions or further information call (250) 378-4235 Ext. 112 or email: jmccauley@scwexmxtribal.org

Thank you for your participation and cooperation in this matter.

Sincerely,

Jeanette McCauley
Jeanette McCauley
Tmix^{w} Research Referral Officer

March 31 2022
Date

/SVarley

Cc: Nooaitch Indian Band

Shackan Indian Band

Disclaimer Clause

This response is not a legal document therefore any and all of the previous mentioned information shall only be used in an informative manner. This document is also a guideline for the client(s) and the Scw'exmx Tribal Council on behalf of the Nooaitch Band, and Shackan Band to take further action or make recommendations if necessary.

Without Prejudice Clause

This response has been prepared and submitted without prejudice to Aboriginal Title or Rights issues. It does not attempt to define or limit the Aboriginal Title or Rights of any First Nation. This report is not considered consultation for the purpose of defining or limiting the Aboriginal Title and Rights of any First Nation (Band). This report does not relinquish any part of its current or future claims to Aboriginal Title or Rights and is submitted on behalf of Nooaitch Band and Shackan Band.

People of the River Referrals Office

Dear Kelsi Fraser,

Thank you for your referral review application dated March 8, 2022 regarding Rockwell Drive Debris Flows – Emergency Recovery, Harrison within S'ólh Téméxw ('Our Land: Our World').

The **analysis stage** of your application is now complete. The following are the results of the review. Please let us know if you have any questions or concerns regarding this appraisal.

Sincerely,

Jacob Stephen Kunnathuparambil
Lead Referral Officer
People of the River Referrals Office

Administrative Summary of Application

Project Name	Rockwell Drive Debris Flows – Emergency Recovery, Harrison
PRRO ID	607089
Issuing Agency file number(s)	14048
Issuing Organization	BC Ministry of Transportation and Infrastructure
Government statutes	BC Transportation Act
Authorization subtypes	General: Admin. Applications - Low to Med. Impact
Applicant	Kelsi Fraser (BC Ministry of Transportation and Infrastructure)
Proponent	Kelsi Fraser (BC Ministry of Transportation and Infrastructure)
Publication Due	March 11, 2022
Referral Published	March 11, 2022
Preliminary Response Due	April 08, 2022
Preliminary Response Completed	April 08, 2022
Final Response Due	
Final Response Completed	
Project Location	Rockwell Drive & Hicks Lake Road, along Harrison Lake, North of Harrison Hot Springs, BC. Site 1: (Lat, Long: 49.324162, -121.7529749 °) Site 2: (Lat, Long: 49.3288703, -121.7517123) Site 3: (Lat, Long: 49.3402281, -121.7441785) Site 4: (Lat, Long: 49.3417622, -121.7468264)
Calculated Area (ha)	0.13
Lifespan	
Lead officer	Jacob Stephen Kunnathuparambil (Cheam,

Kwaw'Kwaw'Apilt, Skwah) (People of the River Referrals Office)

PRRO Liaisons

Preliminary Response

This section summarizes topics identified in the PRRO Technical Review to be addressed by the Referral Issuant and/or proponent. Upon receiving this report, please contact the PRRO Lead Officer in charge of this file to initiate engagement regarding these topics. Outcomes of this engagement will be summarized in the forthcoming PRRO Final Response. Please be aware that any delays in a response from the Referral Issuant can result in delays to the PRRO Final Response. For more information please see the SSEA Reference Guide, sec. 5, available on the StoloConnect Knowledge Base.

POTENTIAL IMPACTS

Cultural Heritage

Please see the Stó:lō Heritage Policy, available on StoloConnect.com in the Knowledge Base for more information.

Navigation – Project area is in the vicinity of a Navigation site. These are sites uses by Stó:lō both contemporary and ancestrally to orient themselves on the landscape.

Resource Harvesting – Project Area overlaps a Resource Harvesting site. These are sites where Stó:lō have harvested resources critical to their cultural, spiritual, and/or physical wellbeing.

Archaeological

Please see the Stó:lō Heritage Policy, available on StoloConnect.com in the Knowledge Base for more information.

Modelling: Archaeological Potential – The archaeological potential model utilized by the PRRO indicates the project area occurs in or overlaps with an area of modelled archaeological potential.

Environmental

Water – Project area location raises concerns over the integrity of aquatic environmental values.

Topics For Engagement

PRRO recognizes the urgency of the proposed emergency recovery project and believes that both terrestrial and in-stream work will be completed in accordance with applicable environmental, water, and environmental best management practices and guidelines

to avoid and mitigate potential impacts, as shown in the overview results above.

PRRO expects the proponent to ensure the following:

-Have an environmental mitigation plan and apply measures to address concerns around aquatic integrity, water quality, riparian area disturbance, and fish & wildlife habitats.
- We believe the repair works will not involve fresh ground disturbance. But if they do, we recommend the proponent consult the Stó:lō Research & Resource Management Center (SRRMC) for advice on construction monitoring requirements.
Ensure all equipment and vehicles are free of foreign organic residues to prevent the introduction and spread of invasive species.
- Follow the applicable regional fisheries windows for all in-stream works.
- Restore all disturbed work sites, particularly the riparian corridors, with measures
and techniques that enhance the area's natural regenerative capacity.
- Share with PRRO updates, work completion and status reports, and other
relevant information as and when available.
- And, the project area overlaps with an area of modelled archaeological. Contact SRRMC archaeological department (admin@srrmcentre.com) to determine whether further assessment is required.

Please note that to due the nature and limited scope of the proposed works, PRRO
is not anticipating further engagement on this referral unless otherwise advised by
the member communities in which case PRRO will follow up with questions or comments.

Please Note: As outlined in the S'ólh Téméxw Stewardship Alliance Strategic Engagement Agreement (SSEA) Spring 2019, section 3.1(c) "the Provincial Agency will respond to the topics for

engagement identified in the Preliminary Response before the referral may progress to the Engagement Stage". This means a referral will be paused in its timelines until such a time that PRRO receives a response from BC (or delegated authorities) on the Topics for Engagement identified above.

Furthermore, where applicable PRRO expects to be continuously updated on any status and scope change of this application, as well as on any direct consultation with the engagement entities or info-sharing with the proponent.

People of the River Referrals Office

Dear Kelsi Fraser,

Thank you for your referral review application dated March 8, 2022 regarding Rockwell Drive Debris Flows – Emergency Recovery, Harrison within S'ólh Téméxw ('Our Land: Our World').

The **engagement stage** of your application is now complete. The following are the results of the review. Please let us know if you have any questions or concerns regarding this appraisal.

Sincerely,

DocuSigned by:
Jacob Stephen Kunnathuparambil
7000E732E356460...

Jacob Stephen Kunnathuparambil
Lead Referral Officer
People of the River Referrals Office

Administrative Summary of Application

Project Name	Rockwell Drive Debris Flows – Emergency Recovery, Harrison
PRRO ID	607089
Issuing Agency file number(s)	14048
Issuing Organization	BC Ministry of Transportation and Infrastructure
Government statutes	BC Transportation Act
Authorization subtypes	General: Admin. Applications - Low to Med. Impact
Applicant	Kelsi Fraser (BC Ministry of Transportation and Infrastructure)
Proponent	Kelsi Fraser (BC Ministry of Transportation and Infrastructure)
Publication Due	March 11, 2022
Referral Published	March 11, 2022
Preliminary Response Due	April 08, 2022
Preliminary Response Completed	April 08, 2022
Final Response Due	June 01, 2022
Final Response Completed	June 01, 2022
Project Location	Rockwell Drive & Hicks Lake Road, along Harrison Lake, North of Harrison Hot Springs, BC. Site 1: (Lat, Long: 49.324162, -121.7529749 °) Site 2: (Lat, Long: 49.3288703, -121.7517123) Site 3: (Lat, Long: 49.3402281, -121.7441785) Site 4: (Lat, Long: 49.3417622, -121.7468264)
Calculated Area (ha)	0.13
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Lead officer	Jacob Stephen Kunnathuparambil (Cheam,

Kwaw'Kwaw'Apilt, Skwah) (People of the River Referrals Office)

PRRO Liaisons

Preliminary Response

This section summarizes topics identified in the PRRO Technical Review to be addressed by the Referral Issuant and/or proponent. Upon receiving this report, please contact the PRRO Lead Officer in charge of this file to initiate engagement regarding these topics. Outcomes of this engagement will be summarized in the forthcoming PRRO Final Response. Please be aware that any delays in a response from the Referral Issuant can result in delays to the PRRO Final Response. For more information please see the SSEA Reference Guide, sec. 5, available on the StoloConnect Knowledge Base.

POTENTIAL IMPACTS

Cultural Heritage

Please see the Stó:lō Heritage Policy, available on StoloConnect.com in the Knowledge Base for more information.

Navigation – Project area is in the vicinity of a Navigation site. These are sites uses by Stó:lō both contemporary and ancestrally to orient themselves on the landscape.

Resource Harvesting – Project Area overlaps a Resource Harvesting site. These are sites where Stó:lō have harvested resources critical to their cultural, spiritual, and/or physical wellbeing.

Archaeological

Please see the Stó:lō Heritage Policy, available on StoloConnect.com in the Knowledge Base for more information.

Modelling: Archaeological Potential – The archaeological potential model utilized by the PRRO indicates the project area occurs in or overlaps with an area of modelled archaeological potential.

Environmental

Water – Project area location raises concerns over the integrity of aquatic environmental values.

Topics For Engagement

PRRO recognizes the urgency of the proposed emergency recovery project and believes that both terrestrial and in-stream work will be completed in accordance with applicable environmental, water, and environmental best management practices and guidelines

to avoid and mitigate potential impacts, as shown in the overview results above.

PRRO expects the proponent to ensure the following:

-Have an environmental mitigation plan and apply measures to address concerns around aquatic integrity, water quality, riparian area disturbance, and fish & wildlife habitats.
- We believe the repair works will not involve fresh ground disturbance. But if they do, we recommend the proponent consult the Stó:lō Research & Resource Management Center (SRRMC) for advice on construction monitoring requirements.
Ensure all equipment and vehicles are free of foreign organic residues to prevent the introduction and spread of invasive species.
- Follow the applicable regional fisheries windows for all in-stream works.
- Restore all disturbed work sites, particularly the riparian corridors, with measures
and techniques that enhance the area's natural regenerative capacity.
- Share with PRRO updates, work completion and status reports, and other
relevant information as and when available.
- And, the project area overlaps with an area of modelled archaeological. Contact SRRMC archaeological department (admin@srrmcentre.com) to determine whether further assessment is required.

Please note that to due the nature and limited scope of the proposed works, PRRO
is not anticipating further engagement on this referral unless otherwise advised by
the member communities in which case PRRO will follow up with questions or comments.

Please Note: As outlined in the S'ólh Téméxw Stewardship Alliance Strategic Engagement Agreement (SSEA) Spring 2019, section 3.1(c) "the Provincial Agency will respond to the topics for

engagement identified in the Preliminary Response before the referral may progress to the Engagement Stage". This means a referral will be paused in its timelines until such a time that PRRO receives a response from BC (or delegated authorities) on the Topics for Engagement identified above.

Furthermore, where applicable PRRO expects to be continuously updated on any status and scope change of this application, as well as on any direct consultation with the engagement entities or info-sharing with the proponent.

Final Response

This section summarizes the engagement processes undertaken to address topics, if any, raised by the S'ólh Téméxw Stewardship Alliance (STSA) communities in the Preliminary Response. It highlights any Outstanding Issues that still need to be addressed and provides the STSA's decision regarding the proposed works, along with any mitigation measures, conditions, and/or relevant rationale, if applicable. For more information please see the SSEA Reference Guide, sec. 5, available on the StoloConnect Knowledge Base.

Review Status Review Completed, STSA Decision Made

DECISION

STSA Decision Approve Application with Condition(s)

Rationale/Condition PRRO recognizes the urgency of the proposed emergency recovery project and believes that both terrestrial and in-stream work will be completed in accordance with applicable environmental, water, and environmental best management practices and guidelines to avoid and mitigate potential impacts, as shown in the overview results above.

PRRO expects the proponent to ensure the following:

-Have an environmental mitigation plan and apply measures to address concerns around aquatic integrity, water quality, riparian area disturbance, and fish & wildlife habitats.
- We believe the repair works will not involve fresh ground disturbance. But if they do, we recommend the proponent consult the Stó:lō Research & Resource Management Center (SRRMC) for advice on construction monitoring requirements.
Ensure all equipment and vehicles are free of foreign organic residues to prevent the introduction and spread of invasive species.
- Follow the applicable regional fisheries windows for all in-stream works.
- Restore all disturbed work sites, particularly the riparian

corridors, with measures
and techniques that enhance the area's natural regenerative capacity.
- Share with PRRO updates, work completion and status reports, and other
relevant information as and when available.
- And, the project area overlaps with an area of modelled archaeological. Contact SRRMC archaeological department (admin@srrmcentre.com) to determine whether further assessment is required.

Please Note: Where applicable, PRRO expects to be continuously updated on any status and scope change of this application, as well as on any direct consultation with the engagement entities or info-sharing with the proponent.

STSA Approval of Final Report

PRRO AUTHORIZED SIGNATORIES

Recommended By

DocuSigned by:
Jacob Stephen Kunnathuparambil
7900E732E356460...

Jacob Stephen Kunnathuparambil
(Referral Officer, PRRO)

Date Signed

Approved By

DocuSigned by:
Dave Schaepe
9BB3433CB218468...

Dave Schaepe, Ph.D. (General Manager, PRRO)

Date Signed

Please Note: The PRRO Receives and responds to referrals in accordance with the SSEA on behalf of the Stó:lō Nations that are signatory on the SSEA. As per Section 15.1 of the SSEA, the PRRO is authorized to act on behalf of a Stó:lō First Nation in respect of a Proposed Activity. The intent of this report is to capture information sharing and communication between the Provice, proponents, and the communities involved. This report may contain sensitive and confidential information, and thus may not be duplicated, distributed or shared without prior consent of the Signatory Stó:lō First Nations involved.

Project #14048

June 24, 2022

Ashcroft Indian Band
414 Cornwall Road, PO Box 440
Ashcroft BC V0K 1A0

Dear Chief and Council,

Re: Rockwell Drive Debris Flows – Emergency Recovery

Further to the Initial Notification letter sent on March 4, 2022, the Ministry of Transportation and Infrastructure (MoTI) would like to provide Ashcroft Indian Band with an update for the Rockwell Drive Emergency Recovery Project (the Project) located on Rockwell Drive and Hicks Lake Road, along Harrison Lake, North of Harrison Hot Springs, BC.

PROPOSAL:	Rockwell Drive Debris Flows – Emergency Recovery
LOCATION:	Rockwell Drive & Hicks Lake Road, along Harrison Lake, North of Harrison Hot Springs, BC. Site 1: (Lat, Long: 49.324162, -121.7529749 °) Site 2: (Lat, Long: 49.3288703, -121.7517123) Site 3: (Lat, Long: 49.3402281, -121.7441785) Site 4: (Lat, Long: 49.3417622, -121.7468264)
PROPOSED CONSTRUCTION START/END DATES:	**March - August 2022**
PROPOSED TENDER DATE:	**Works to be completed through the maintenance contractor & Day Labor contractor.**
PRIMARY CONTACT:	Kelsi Fraser Advisor 236-468-2104 Kelsi.1.Fraser@gov.bc.ca

Context of the Proposal:
As a result of the Atmospheric River event in November of 2021 a bridge washout, embankment erosion and debris flows occurred along Rockwell Drive on the East side of Harrison Lake. Emergency Response efforts were undertaken immediately to restore access to residents in the area. However, in the previous letter MoTI advised that further work was required including:

- Installation of rip rap and armouring, and repair to damaged culverts at site 1 2, & 3

- Sediment removal at Trout Lake Creek Channel West of Green Point Bridge
- Asphalt repairs at site 3 and site 4

MoTI is happy to report that the response works at sites 1, 2, and 3 have now been completed, and long-term planning is underway.

Unfortunately, the sediment removal at Trout Lake Creek (Site 4) has yet to be completed, for safety reasons. As a result, MoTI is proposing to complete the sediment removal in August, in accordance with the least risk window for Fish and Fish Habitat. Additionally, MoTI is proposing the placement of a new culvert(s) North of the creek. The culvert(s) would be utilized to isolate the creek during sediment removal and provide relief in future flood events. MoTI recommends that either a single 1.8 meter diameter culvert, or two 1.35 meter diameter culverts be implemented. In order to place the culverts, ground disturbance not exceeding 2.5 meters in depth would be required.

If you have any feedback regarding these works, please contact me prior to July 25, 2022.

Archaeology & Environment:
MoTI has retained Stantec to conduct an Archaeological Impact Assessment (AIA) to support the installation of the culvert(s), as well as long-term recovery plans for site 4. A Notice of Intent (NOI) has recently been sent out and invitations to participate will be forthcoming from Stantec.

The short-term works outlined above will be dependant on the issuance of a Water Sustainability Act Order from the Ministry of Forests (MOF), for which a separate consultation was commenced in May of 2022. The order is expected to be forthcoming shortly. If you have any comments regarding the order for this site, please let me know. Environmental mitigation measures will continue to be in place with a Qualified Professional onsite to conduct environmental monitoring for all in-stream works.

Preliminary Schedule:
- Response Phase Works Complete: December 2021
- Response Phase Works Begin: March 2022
- Recovery Phase Works Complete: Spring 2024

This schedule is tentative and subject to change. MoTI will continue to seek input from you throughout the design phases for both the response and recovery works. If the Ashcroft Indian Band has any further information that may inform the review of the Rockwell Drive – Emergency Recovery project, and how the project might impact your Aboriginal Interests, please contact me at 236-468-2104 or Kelsi.1.Fraser@gov.bc.ca.

Sincerely,

Kelsi Fraser
Advisor, Indigenous Relations

Cc: Tyler Lu – Project Manager (McElhanney)
Sivagar Sivabalan – Project Tech

Attachments: Project Map – Site 4: Trout Lake Creek

Project #14048

June 24, 2022

People of the River Referrals Office
Building 10-7201 Vedder Road
Chilliwack BC, V2R 4G5

Dear Referrals Administrator,

Re: Rockwell Drive Debris Flows – Emergency Recovery

Further to the Initial Notification letter sent on March 4, 2022, the Ministry of Transportation and Infrastructure (MoTI) would like to provide People of the River Referrals Office with an update for the Rockwell Drive Emergency Recovery Project (the Project) located on Rockwell Drive and Hicks Lake Road, along Harrison Lake, North of Harrison Hot Springs, BC.

PROPOSAL:	Rockwell Drive Debris Flows – Emergency Recovery
LOCATION:	Rockwell Drive & Hicks Lake Road, along Harrison Lake, North of Harrison Hot Springs, BC. Site 1: (Lat, Long: 49.324162, -121.7529749 °) Site 2: (Lat, Long: 49.3288703, -121.7517123) Site 3: (Lat, Long: 49.3402281, -121.7441785) Site 4: (Lat, Long: 49.3417622, -121.7468264)
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Sincerely,

Kelsi Fraser
Advisor, Indigenous Relations

Cc: Tyler Lu – Project Manager (McElhanney)
Sivagar Sivabalan – Project Tech

Attachments: Project Map – Site 4: Trout Lake Creek

GREEN POINT BRIDGE FLOOD MITIGATION PROJECT

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

June 2022

Prepared for:

Ministry of Transportation and Infrastructure

Coquitlam, British Columbia

Hatfield Consultants LLP

#200 - 850 Harbourside Drive
North Vancouver, British Columbia, Canada V7P 0A3
Tel: 1.604.926.3261 • Fax: 1.604.926.5389
www.hatfieldgroup.com

GREEN POINT BRIDGE FLOOD MITIGATION PROJECT CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

Prepared for:

MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE
310-1500 WOOLRIDGE STREET
COQUITLAM, BC
CANADA V3K 0B8

Prepared by:

HATFIELD CONSULTANTS LLP
#200 - 850 HARBOURSIDE DRIVE
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CANADA V7P 0A3
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JUNE 2022

MOTI10866
VERSION 2.0

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Name	Firm	Hardcopies	Email	FTP
Joanne Letkeman	MOTI	-	✓	-
Tyler Lu	McElhanney	-	✓	-

AMENDMENT RECORD

This report has been issued and amended as follows:

Issue	Description	Date	Approved by	
1	First version of Green Point Bridge Flood Mitigation Project CEMP	20220509	Garth Taylor Project Director	Tim Poulton Project Manager
2	Second version of Green Point Bridge Flood Mitigation Project CEMP	20220617	 Garth Taylor Project Director	 Tim Poulton Project Manager

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

The BC Ministry of Transportation and Infrastructure (MOTI) intends to clear debris from Trout Lake Creek (the Creek) at Green Point Bridge (the Bridge) which provides access to the Green Point Day Use Area in Sasquatch Provincial Park from Rockwell Drive in the District of Kent (the Project). A substantial amount of bedload was deposited upstream, under (including large woody debris), and downstream of the Bridge during the November 2021 "atmospheric river" flood event (the flood) causing the Creek to top its banks and damage Rockwell Drive around the Bridge. This flood also caused substantial damage to the Hicks Lake Road bridge further upstream. Emergency works at Hicks Lake Road included the replacement of the collapsed bridge with four temporary culverts.

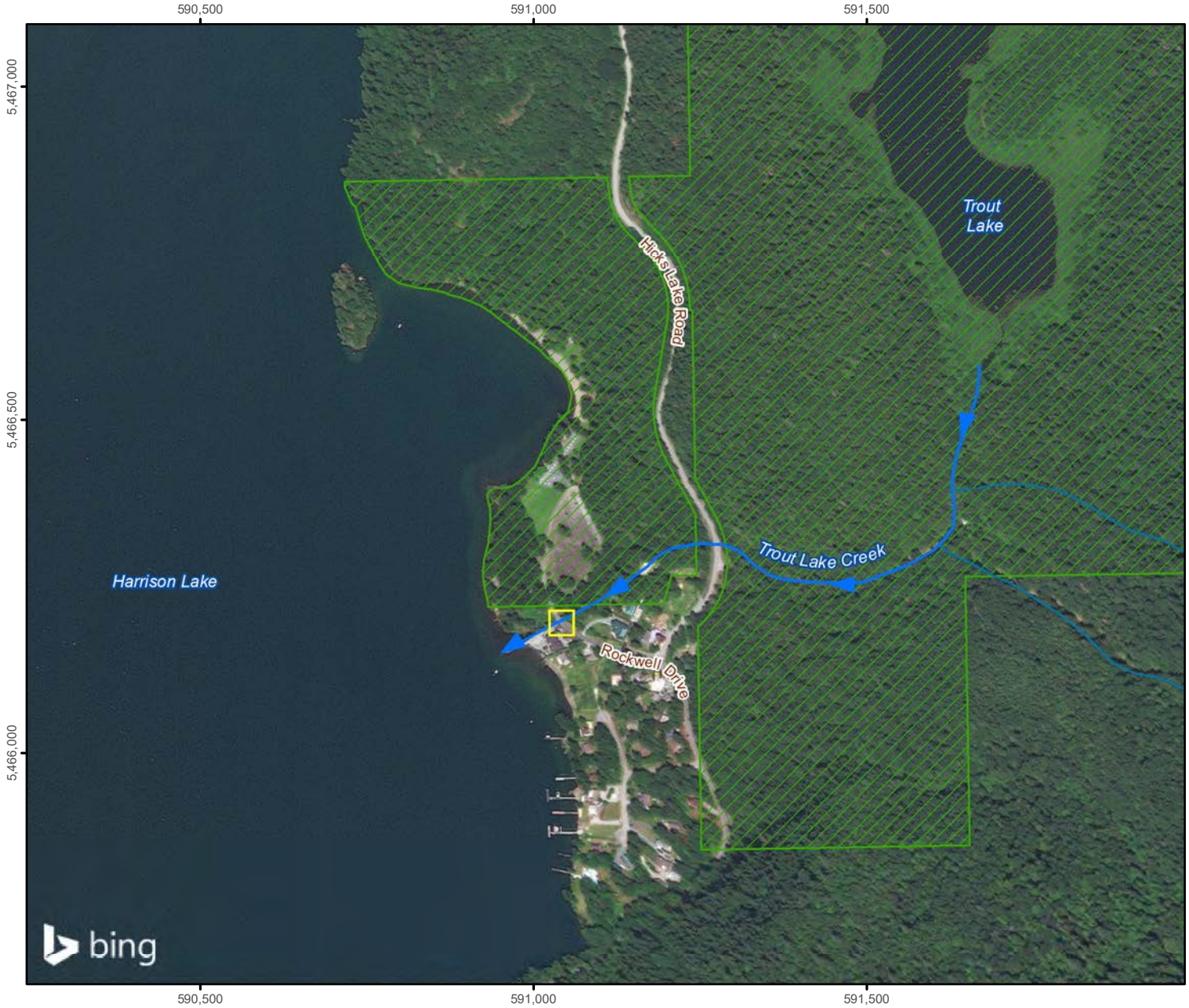
Prior to the flood, there was approximately 2 m of clearance between the Creek bed and bottom of the Bridge, which has since been reduced to less than 1 m of clearance. Large woody debris (LWD) is also trapped under the Bridge further reducing flow capacity, as well as increasing the potential to trap additional LWD during high flows. The Bridge is susceptible to further flooding as a result of the reduced clearance and trapped LWD. To prevent further damage to MOTI and BC Parks infrastructure, and private property, MOTI intends to restore the streambed to its pre-flood profile through the removal of accumulated debris and bedload.

The proposed construction schedule is estimated to take 5 to 10 days to complete and will occur during the 2022 regional reduced risk instream work window (August 1 to September 15). Construction staging is proposed as follows:

- Mobilization:
    - Installation of erosion and sediment control measures to prevent deleterious substances from entering the Creek;
- Stream diversion:
    - Isolation of the Creek upstream and downstream of the Bridge via a flow bypass system; fish stop nets will be used to prevent fish passage into the isolated work area followed by a fish salvage;
- Debris removal and riprap placement;
- Implementation of Creek restoration measures (i.e., fish passage features and installation of native substrates); and
- Decommissioning of the flow bypass system.

The following Construction Environmental Management Plan (CEMP) has been developed to address each stage of construction.

Figure 1 Project location map.



Legend

- Green Point Bridge
- Sasquatch Park
- Watercourse

0 50 100 200 m

N

Scale: 1:9,000

Projection: NAD 1983 UTM Zone 10N

Data Source:
a) Green Point Bridge, Hatfield 2022.
b) Watercourse, BC Freshwater Atlas.
c) Sasquatch Park, Tantalis 2015.
d) Background, Bing Maps Aerial, Esri Online Service.

Hatfield

Trout Lake Creek Request for Review

K:\Data\Project\MOTI10866-NV\A_MXD\MOTI10866_RockwellDrive_20220412_v0_1_AH.mxd

1.2 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN OBJECTIVES AND SCOPE

This CEMP provides the environmental best management practices (BMPs) to be implemented during construction of the Project. The objectives of the CEMP are to:

- Identify sensitive environmental features in and around the work zone;
- Identify key environmental personnel and contacts during day-to-day construction activities and provide a clear chain of communication during an environmental emergency;
- Ensure construction proceeds in accordance with all regulatory environmental requirements and best practices;
- Mitigate environmental impacts during construction; and
- Describe monitoring and reporting requirements.

2.0 KEY ENVIRONMENTAL SENSITIVITIES

Key environmental sensitivities identified for the Project include:

- Fish and fish habitat;
- Water quality;
- Riparian vegetation; and
- Wildlife and wildlife habitat.

3.0 REGULATORY CONTEXT

All Project construction works will be completed in compliance with applicable legislation, guidelines, and commitments as outlined in:

- Relevant environmental legislation and regulations (Table 1);
- Policies, guidelines, and BMPs established by regulatory agencies including least risk timing windows; and
- All Project-related permits, licenses, approvals, and authorizations.

Table 1 Environmental legislation and regulations.

Legislation	Agency	Area of Regulation	Possible Permits/ Actions
Federal			
Fisheries Act	Fisheries and Oceans Canada (DFO)	No person shall carry on any work, undertaking or activity that results in the death of fish, or the harmful alteration, disruption or destruction (HADD) of fish habitat.	Request for project review, fish salvage permit.
Migratory Birds Convention Act and Regulations	Environment and Climate Change Canada (ECCC)	Prohibits injury, molestations, and destruction of migratory birds and their nests.	A bird nesting survey and measures to protect active nests are recommended for nesting habitat (vegetation, rock feature, human infrastructure) removal if required during the active nesting period.
Species at Risk Act	DFO, ECCC, Parks Canada	Protects threatened or endangered species and their critical habitats.	Species at risk are not identified within the Project footprint; however, the environmental monitor shall have the authority to suspend works during incidental occurrences of species at risk should they occur.
Provincial			
Water Sustainability Act	Ministry of Land, Water and Resource Stewardship (MLWRS)	Regulates activities being carried out in and about a stream as well as surface and groundwater use and withdrawals.	Follow the terms and conditions of the Section 91 Order.
Wildlife Act	MLWRS	Angling and Scientific Collection Regulations.	A Scientific Fish Collection Permit will be required for fish salvages.
Weed Control Act	MLWRS	Duty to control noxious weeds identified in the Weed Control Regulation.	Prevent the introduction and/or spread of noxious weeds. Removal of any existing noxious weeds within MOTI right of way.
Spill Reporting Regulations of the *Environmental Management Act*	Provincial Emergency Program (PEP)	Establishes procedures for reporting the unauthorized release of substances into the environment as well as outlining detailed of reportable amounts for certain substances for sites having Provincial jurisdiction.	An Environmental Emergency Plan and a Spill Response Plan have been developed for the construction phase of the Project and are provided in Section 7.0 of this CEMP.

3.1 POLICIES, GUIDELINES, AND BEST MANAGEMENT PRACTICES

All works shall be carried out following guidance included in the following BMPs:

- Standard Specifications for Highway Construction Volume I (Section 165 Protection of the Environment), Ministry of Transportation and Infrastructure, 2020;
- Standards and Best Practices for Instream Works, Ministry of Water, Land and Air Protection, March 2004 (referenced in the WSA Section 91 Order);
- Requirements and Best Management Practices for Making Changes in and About a Stream in British Columbia, Ministry of Forests, Lands, Natural Resource Operations and Rural Development. January 10, 2022;
- Measures to Protect Fish and Fish Habitat, Fisheries and Oceans Canada, 2019;
- Control of Erosion and Shallow Slope Movement, Coulter and Halladay, August 22, 1997;
- A Field Guide to Fuel Handling, Transportation and Storage. BC Ministry of Water, Land and Air Protection, 2002;
- A Guidebook for British Columbia: Stormwater Planning. BC Ministry of Water, Land and Air Protection, 2002;
- British Columbia Inland Oil Spill Response Plan, BC Ministry of the Environment, 2013;
- BC Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. Guideline Summary, Ministry of Environment & Climate Change Strategy, 2021;
- Develop with Care: Environmental Guidelines for Urban and Rural Land Development in BC, MOE, 2014;
- Land Development Guidelines for the Protection of Aquatic Habitat, Department of Fisheries and Oceans Canada and Ministry of Environment, Lands and Parks, 1992; and
- Best Practices for Managing Invasive Plants on Roadsides, Ministry of Transportation and Infrastructure and the Invasive Species Plant Council of BC, 2019 Edition.

3.1.1 Regional Timing Windows

3.1.1.1 Fish

The Ministry of Environment sets timing windows for instream works based on the time of year when the least amount of risk to spawning fish, eggs, and alevins occurs within a stream. Prior to undertaking work activities during this period, a fish salvage shall be carried out by an Appropriately Qualified Professional (AQP) as defined by the MOTI Standard Specifications (MOTI 2020a). Section 5.4 discusses procedures for the fish salvage and mitigation measures to be undertaken during instream works. All works below the high watermark will take place during the reduced risk instream work window of August 1 to September 15.

3.1.1.2 Breeding Birds

Environment and Climate Change Canada (ECCC) is the federal authority for migratory birds in Canada. Protection for breeding birds including their nesting sites must meet ECCC's protocols, which require protection of nesting sites even if the nest is not located, based on behavioral observations (e.g., alarm calls, an adult carrying nesting material, food, or fecal matter, a territorial male accompanied by a discreet female consistently flying into one vegetation patch). Should the removal of vegetation need to occur during the nesting period for this region (i.e., March 12 to August 17) an AQP will be required to conduct a bird nest survey for breeding birds in accordance with the Breeding Bird Nest Survey Protocol (MOTI 2020b).

If required, setback distances (i.e., no work buffers) from active nest sites shall be determined by an AQP. Buffers will remain in place until the nest is determined by the AQP to be no longer active. Nests that are protected year-round (i.e., raptors and herons) have not been identified in the area during past surveys.

3.2 PERMITS, LICENCES, AND APPROVALS

Activities affecting fish and fish habitat are primarily guided by the federal *Fisheries Act* and the BC *Water Sustainability Act* (WSA). The *Fisheries Act* regulates activities that cause or may cause "harmful alteration, disruption or destruction of fish habitat (HADD)", which is defined as "any temporary or permanent change to fish habitat that directly or indirectly impairs the habitat's capacity to support one or more life processes of fish" (DFO 2019). So long as the measures outlined in this CEMP are followed, the Project will not result in HADD. Due to the nature of the works required to remove debris from the stream, a request for review application will be submitted to DFO to confirm the death of fish or HADD will not occur as a result of the Project.

The WSA regulates activities being carried out in and about a stream as well as surface and groundwater use and withdrawals. The works associated with the Project are in response to the November 2021 flood event, and as such will be conducted pursuant to the terms and conditions outlined in the WSA Section 91 Order issued to MOTI by the Comptroller of Water Rights to clear, repair, and reopen transportation corridors impacted by the November 2021 flood event. Additionally, a Scientific Fish Collection Permit under the BC *Wildlife Act* and the *Fisheries Act* will be required to complete a fish salvage prior to instream works.

4.0 ENVIRONMENTAL MANAGEMENT

4.1 ROLES AND RESPONSIBILITIES

A pre-construction meeting with the Environmental Representative, environmental monitor (EM), and the Construction Supervisor assigned to the Project will be held prior to the commencement of construction. Roles and responsibilities of each party will be clearly identified during this meeting. Protocols and contact information will be clearly identified and provided to each party in the event of an environmental emergency. The Construction Supervisor is responsible for the overall implementation of the CEMP.

4.1.1 Environmental Representative

The Environmental Representative (Hatfield) will be available throughout the duration of the Project to represent the Owner in all matters related to the protection of the environment. The Environmental Representative will ensure that the Contractor is aware of environmentally sensitive features and best management practices for mitigating environmental impacts, as outlined in the CEMP. The Environmental

Representative will be contacted in the event of an environmental emergency during the duration of works. The Environmental Representative shall also be responsible for communicating any additional environmental conditions, procedures, and/or policies required by MOTI to the Construction Supervisor and EM prior the beginning of the Project.

4.1.2 Construction Supervisor

The Construction Supervisor, representing the Contractor (Emil Anderson Construction), is responsible for ensuring that all environmental protection provisions in this document are implemented on-site. The Construction Supervisor will ensure that all Project personnel are aware of environmentally sensitive and best management practices for mitigating environmental impacts, as outlined in this document.

4.1.3 Environmental Monitor

Environmental monitoring shall be conducted by or under the direct supervision of an AQP with relevant training and experience in environmental construction monitoring. The EM (Hatfield) shall be responsible for monitoring and reporting of Project activities as they relate to the environment. Specifically, the EM will be responsible for determining the adequacy of environmental mitigation measures and shall provide input and recommendations for additional measures as required. The EM shall report to the Environmental Representative and Construction Supervisor and have the authority to suspend works should the likelihood of an adverse effect to environmentally sensitive areas be imminent. The temporary suspension of works shall remain in effect until remedial measures have been taken to remove the environmental threat to the satisfaction of the qualified professional. Key items the EM is responsible for include:

1. Ensuring all best management practices and mitigation measures are in place to avoid and minimize environmental impacts on the land and to fish and fish habitat;
2. Ensuring erosion and sediment control measures are constructed, installed, and maintained appropriately for the full duration of instream works;
3. Supervising all instream works;
4. Monitoring all diversion works daily to ensure flow bypasses are in proper working condition (refer to Section 5.5);
5. Isolating the work area to prevent fish access following a fish salvage (refer to Section 5.4);
6. Suspending works as required to prevent impacts to the environment; and
7. Reporting of spills and environmental incidents.

4.2 MONITORING

Environmental monitoring is essential to ensuring effective implementation of the environmental plans and permitting and legislative requirements. Construction environmental monitoring will be conducted during all phases of the Project. Prior to works, a pre-construction kickoff meeting with key Project personnel will be conducted to ensure roles and responsibilities, key environmental sensitivities and mitigation plans for the Project are well understood by the project team.

Monitoring activities for which the EM will be responsible include but are not limited to:

- Review and understand the CEMP, Project permits, licenses and approvals (PLAs), agency guidelines and other documents;
- Review the Contractor and sub-Contractor (if applicable) work procedures to verify functionality and compliance with the CEMP and applicable regulations, standards and BMPs;
- Attend Project meetings/calls as required;
- Monitor all waste management initiatives and report whether properly addressed as identified in Section 9;
- Inventory contents of emergency spill response kits, and confirm if they are appropriately stocked and maintained;
- Observe, document and report spill cleanup, as required;
- Contact the Environmental Representative in the event of an environmental incident or development of unforeseen site conditions with potential for serious environmental degradation;
- Verify that all machinery working in and about a watercourse is clean, leak-free and free of excess oil and grease. Should instream works be required, verify that the Contractor is using biodegradable hydraulic oils in their machines when working instream;
- Inspect upstream and downstream stop nets to ensure that they are functioning as intended and that debris buildup is not causing unnecessary backwatering;
- Maintain Project records related to the implementation of the CEMP. This should include any measurements taken (e.g., pH, turbidity, TSS), environmental incident reports, diaries, and photographs;
- Verify that all repairs and refueling take place on level ground and a minimum of 30 m from the top of bank of any watercourse;
- Inspect erosion and sediment control measures to ensure they are functioning as intended;
- Ensure all regulatory approvals and authorizations are in place prior to works, and that all conditions of the approvals are being adhered to; and
- Regularly monitor water quality upstream and downstream of each Project component for the duration of the Project to ensure compliance with the BC water quality guidelines for turbidity. Water quality monitoring will be conducted in accordance with the procedures outlined below (Section 4.2.1).

For works that have the potential to pose an immediate threat to fish and fish habitat, the EM will have the authority to suspend works until such time as impacts can be mitigated. Triggers that may result in works being suspended include the failure to meet any of the key mitigation measures or other activities that pose an increased risk beyond those contemplated in the CEMP. Corrective action for any deposit of deleterious materials into fish habitat shall be guided by BMPs. Appropriate mitigative measures will be carried out under the guidance of the EM.

4.2.1 Water Quality Monitoring

Water quality will be monitored regularly before, during and after instream works both upstream (i.e., background) and downstream of Project works for the duration of the Project. In the event that water quality exceeds guidelines downstream of the Site, additional sampling downstream of the Site will be conducted to determine the extent and magnitude of the exceedance.

In situ water quality parameters to be collected in the field include:

- pH;
- Temperature;
- Specific conductance; and
- Turbidity.

In the event that turbidity levels downstream of the work site become elevated by 8 NTU or more above background, surface grab samples will be collected and sent to an accredited laboratory, to be analyzed for total suspended solids (TSS). Works may be suspended during an exceedance until it is confirmed by the EM that erosion and sediment control measures are functioning properly. Additional measures will be installed as directed by the EM if required prior to the recommencement of works.

4.2.2 Clearing and Grubbing

Clear and grub limits must be clearly marked in the field prior to the commencement of works. The EM will inspect clear and grub boundaries to ensure there are no sensitive wildlife habitats (e.g., raptor nests), erosion and sediment control measures are in place, and all equipment is clean and free of invasive plant propagules.

4.2.3 Emissions Reduction Strategy

In accordance with the Ministry of Transportation's special provisions for air and noise pollution, the Ministry has identified vehicle and equipment idle reduction as a means of reducing greenhouse gas emissions during project operations. Adherence to the following procedures will be monitored by the EM to ensure the successful implementation of the emissions reduction strategy. The following procedures have been developed in accordance with the Ministry of Transportation and Infrastructure's Standard Specifications for Highway Construction.

Location of staging areas to minimize the impact of emissions:

- Locate combustion engines away from sensitive receptors such as fresh air intakes, air conditioners, and windows; and
- Establish a staging zone for trucks that are waiting to load or unload material in the Contract area, away from sensitive receptors.

Idling time restrictions:

During periods of inactivity and while stopped within a queue formed under the direction of a traffic control person or device, idling of Contractor and Sub-Contractor off-road equipment shall be minimized and are not to exceed the following:

- Motor vehicles and light diesel trucks – 1 minute;
- Heavy-duty diesel vehicles – 5 minutes;
- Diesel Vehicles involved in construction Site passenger transportation – 10 minutes; and
- Construction Equipment – exempt when employed at the site for the intended work.

Idling for more than the above times is permitted only under the following circumstances:

- When the vehicle or equipment is forced to remain motionless because of other traffic conditions or mechanical difficulties over which the operator has no control;
- To bring the vehicle or equipment to the manufacturer's recommended operating temperature;
- When the outdoor temperature is below 0°C or above +30°C and the operator or passengers are inside the vehicle, and there are no auxiliary power sources available to provide temperature control;
- When it is necessary to operate auxiliary equipment that is located in or on the vehicle or equipment to accomplish the intended use of the vehicle or equipment (for example, cranes and cement mixers);
- When the vehicle is detaching or exchanging a trailer;
- When the vehicle or equipment is being repaired or engaged in repairing another vehicle, if idling is necessary for such repair;
- When the vehicle or equipment is queued for inspection, if idling is necessary for such inspection;
- For designated emergency vehicles or any vehicle or equipment assisting in police, fire or ambulance services; and/or
- When defrosting or defogging windows. Idling shall end when fog, frost, or ice conditions have been eliminated.

Outreach and Communications:

- The Contractor shall implement a system of education and training as part of Site orientation for all on-site staff and Sub-contractors; and
- The Contractor shall reinforce the idle reduction initiative via signage and during toolbox, health and safety, and Ministry meetings.

Idle Reduction Technologies:

- The Contractor is encouraged to utilize idle reduction technologies where appropriate and applicable.

4.3 CEMP ORIENTATION AND TRAINING

Prior to the commencement of each component of construction, the Environmental Representative, EM, and the Construction Supervisor shall meet to review the CEMP and plan out its implementation on-site during the Project. The Environmental Representative and EM will also develop a method to ensure all personnel are aware of the CEMP requirements and environmentally sensitive areas. A physical copy of the CEMP and all relevant approvals and authorizations shall be present on-site for the duration of the works, and a copy of these documents shall be distributed to all key personnel prior to works.

4.4 REPORTING

Given the Project is only expected to take 5 to 10 days to complete one environmental monitoring report will be prepared and submitted to the Environmental Representative and MOTI upon Project completion. The report will summarize:

- Activities undertaken during the reporting period;
- Key communications or meetings;
- Mitigation in place during the reporting period;
- Any deficiencies noted, and corrective actions undertaken by the contractor and/or employees;
- Water quality sampling results;
- fish salvage results; and
- Any outstanding environmental issues that remain to be addressed.

The report will be submitted to MOTI and may be forwarded to regulatory agencies as required by conditions of the approvals or authorizations obtained for the works.

4.4.1 Environmental Incident Reports

Environmental incident reporting must be completed for incidents that pose or may pose a threat to the environment.

An Environmental Incident Report will be generated for any of the following incidents:

- Spills reportable to the Provincial Emergency Program (PEP);
- Spills with the potential to introduce a harmful substance to the aquatic environment;
- Spills on land greater than 5 L or with a surface area greater than 1 m^2 and/or deeper than 300 mm, or any release of a hazardous substance that could cause contamination of the site or any lands or waters in the vicinity of the site;

- Any repetitive occurrence of construction activities that are not in compliance with the CEMP; and
- Any incident that has or could result in the violation of a law, regulation or guideline, including encroachment into sensitive areas, or disturbances to wildlife.

The environmental incident report describes the time of day, staff involved, nature, cause, and degree of spill, recovery process deployed, and agencies notified. The report will also describe future preventative actions in the case of an unanticipated environmental incident. The EM and/or the Environmental Representative will complete these reports within 48 hours of the incident. Within 48 hours, each incident must be reported to the Regional Water Manager. The incident report shall describe mitigation measures employed and a rationale as to why works have resumed or the next steps required before works may resume.

4.5 EMERGENCY CONTACT LIST

Project contacts that may be reached in the event of an environmental emergency are listed in Table 2. In the case of any on-site emergencies, the Environmental Representative and representatives from the Contractor and MOTI should be notified immediately. Depending on the type of emergency, contacts in the *Additional Contacts* section should also be contacted.

Table 2 Emergency contact list.

Contact Name	Organization and Title	Phone Number
Primary Contacts		
Tim Poulton	Hatfield Consultants - Environmental Representative	604-250-9945
TBD	Hatfield Consultants - Environmental Monitor	Number
TBD	Emil Anderson Construction - Construction Supervisor	Number
Provincial spill reporting (reportable spills)	Emergency Management BC	1-800-663-3456
DFO spill reporting (spills to water)	Fisheries and Oceans Canada	1-800-889-8852
Joanne Letkeman	MOTI – Owner	236-468-1984
Tyler Lu	McElhanney – Ministry Representative	604-424-4905
Additional Contacts		
RCMP	Emergency	911
Ambulance	Emergency	911
Fire	Emergency	911

5.0 FISH AND FISH HABITAT PROTECTION PLAN

5.1 POTENTIAL ENVIRONMENTAL IMPACTS

Works have the potential to impact fish habitat in Trout Lake Creek due to:

- Excavation, stockpiling and/or alterations to channel function and fish passage;
- Introduction of hazardous and/or foreign materials (e.g., accidental spills of petroleum-based products); and
- Loss of riparian habitat providing shade, food and nutrients to the Creek.

5.2 MITIGATION MEASURES

Mitigation measures are provided below in a checklist format to be reviewed by the EM during each day that relevant monitoring activities occur. All instream works shall align with the Standards and Best Practices for Instream Works (MWLAP 2004) and Requirements and Best Management Practices for Making Changes in and About a Stream in British Columbia (Government of BC 2022).

Table 3 Fish and fish habitat mitigation checklist.

Key Environmental Indicators – Fish and Fish Habitat
Carry out instream works once fish have been relocated downstream and the site isolated so that no fish are present within the work area.
Conduct works during the least risk timing windows in isolation of flows, or during a period when the creek is naturally dry.
Check and maintain fish isolation nets to ensure they are preventing fish from entering the work area.
Thresholds for turbidity/total suspended solids (TSS) are within the BC Water Quality Guidelines for the Protection of Aquatic Life.
Limit disturbance to fish and fish habitat by following appropriately laid out plans and delineating exclusion zones on the ground prior to construction. Disturbance from construction will not encroach beyond designated disturbance boundaries. Work zones are to be delineated by fencing or flagging prior to construction and maintained.
Conduct instream works in isolation of flows and ensure turbid groundwater from the construction footprint is pumped and discharged to an appropriate vegetated location at least 30 m away from any watercourse or waterbody in proximity to the Project location.
No deleterious materials are introduced to any watercourse.
Erosion and sediment control measures are maintained and functioning as intended.
All refueling is carried out on level ground a minimum of 30 m from watercourses, with the aid of a drip tray.
Jerry cans and other hazardous materials are stored a minimum of 30 m from watercourses on level ground and have secondary containment.
All machines are maintained in a leak-free state and free of excess oil and grease.
Spill kits are readily available on site and properly equipped with materials appropriate for containing and cleaning up spills to water and crews are trained on how to use them.

5.3 INSTREAM WORKS

Works will begin with salvages (Section 5.4), to be followed by any flow diversion (Section 5.5) and construction (in that order). The construction supervisor will have physical copies of all relevant permits required for works to proceed. Instream works will be scheduled during dry weather as much as practicable. Mitigation measures to be applied during all instream works include:

- Works will be conducted during the regional least risk timing window for rainbow trout and pacific salmon (August 1 to September 15) in isolation of flows, or when the creek is naturally dry;
- Once started, pursue in-water works to completion as quickly as possible;
- The EM will be present full time for all instream works;
- No fording of watercourses outside of designated Project work boundaries;
- Maintain stumps and root systems of cleared trees and low-growing vegetation within 30 m of Trout Lake Creek to the greatest extent feasible and minimize exposed soils;
- Install erosion and sediment control measures for managing water within the work area prior to construction;
- Water quality will be monitored regularly before, during and after instream works on Trout Lake Creek both upstream and downstream of the work site;
- Operate machinery in a manner that minimizes disturbance to stream banks and riparian vegetation;
- Machinery operating instream must exclusively utilize food-grade lubricants;
- All soil and waste rock stockpiles will be located and managed to avoid adverse erosion and sedimentation impacts;
- Inspect and maintain equipment working in and around a stream;
- Immediately remove any leaking machinery from a watercourse if a leak develops;
- In situ water quality parameters to be collected in the field include pH, temperature, specific conductance and turbidity. Surface grab samples for TSS will be collected if there is an exceedance in turbidity of 8 NTU above background levels; and
- If water quality exceeds guidelines downstream of the work site, additional sampling will take place farther downstream to determine the extent and magnitude of the exceedance.

5.4 TROUT LAKE CREEK FISH SALVAGE

A fish salvage will be conducted prior to any instream works in Trout Lake Creek to isolate the work area from fish. Fish salvages will be completed during the regional instream work window for rainbow/cutthroat trout and pacific salmon (August 1 to September 15). Fish salvage permits have been obtained from both the Ministry of Lands, Water and Resource Stewardship (MLWRS) and DFO. The fish salvage will adhere to the CEMP and conditions of the fish salvage permits and any other relevant permits, legislation or regulations. The fish salvage will include the following measures:

- Fish stop nets will be installed at the upstream and downstream work limits within Trout Lake Creek to prevent fish from accessing the construction area;
- Fish will be salvaged via backpack electrofishing. Seining and minnow traps will be employed if conditions are not conducive to electrofishing or if additional capture techniques are deemed necessary. Captured fish will be temporarily held in aerated coolers and released at a suitable point upstream of the work area;
- Nets will be installed in a manner that maintains site exclusion in the event of a storm event or other change in water level. The nets will be checked periodically throughout the day and regularly throughout the construction period for signs of breaching and buildup of debris. Debris will be removed as required on a regular basis to prevent the nets from blowing out; and
- All captured fish will be identified to species, weighed with a digital tabletop scale (400 g $\pm$ 0.01g), and measured (1 $\pm$ mm fork length) prior to being released upstream of the work area to satisfy reporting requirements of the fish collection permits.

5.5 FLOW DIVERSION

A temporary diversion channel will be constructed to convey flows passively along the north side of the Creek in an area already disturbed by the flood and devoid of riparian vegetation, and include a temporary culvert at Rockwell Drive to maintain access to the Green Point Day Use Area during Project works. Specifications of the diversion channel and temporary culvert are provided in Drawing No. R1-SK-XXX-701 prepared by Associated Engineering (April 20, 2022). The temporary diversion will align with the DFO Interim Code of Practice: Temporary Cofferdams and Diversion Channels (DFO 2020); however, not all measures specified in this code of practice are achievable (e.g., maintaining fish passage). The diversion channel will be constructed in the dry prior to diverting flows via bulk bags (aka pea gravel bags) including the installation of energy dissipation materials (e.g., sandbag apron) at the downstream end of the diversion channel where flows are returned to the Creek.

5.6 RIPARIAN VEGETATION MANAGEMENT

Clearing and grubbing of riparian vegetation will be kept to a minimum. Heavy machinery will access the work site using existing trails and roads wherever possible to avoid disturbance to riparian vegetation and prevent soil compaction.

Table 4 Key environmental performance indicators checklist for riparian vegetation protection.

Key Environmental Indicators – Riparian Vegetation Protection
Any clearing and grubbing boundaries are clearly marked on plans and in the field, and machinery and equipment do not encroach beyond the clearing and grubbing boundaries.
Have an AQP conduct breeding bird surveys prior to any clearing or grubbing activities taking place outside the regional timing window.
Vegetation removal is to be limited to the permanent footprint of the Project plus areas necessary to temporarily facilitate construction.
Natural drainage patterns outside the clearing boundaries are maintained or restored.
Avoid placement of stripped materials adjacent to watercourses.
Native topsoil that is required to be removed within the Project footprint will be stored separately from subsoils for later reclamation use.
Machinery brought to site does not result in the introduction or spread of invasive plants or their propagules. Invasive species are managed according to Vegetation Protection Plan criteria.

5.6.1 Mitigation Measures

- Laydown, staging, waste and storage areas are to be located at least 30 m from the top bank of any watercourse;
- Mark clearing and grubbing boundaries on construction plans and in the field prior to works;
- When practicable, vegetation will be pruned or topped as opposed to grubbing/uprooting;
- Preserve root structure and stability of topped trees located on the bank of a watercourse to help bind soil and encourage rapid colonization of low-growing plant species;
- Minimize removal and disturbance of low-growing shrub, herb or grass species;
- Limit soil disturbance during clearing and grubbing activities to minimize the potential for erosion as required by the Sediment and Erosion Control Plan;
- Topsoil shall be set aside during excavations and, to the maximum extent practicable, replaced when construction is complete. Topsoil shall be stored in a manner that prevents erosion or mixing; and
- Banks disturbed by any activity associated with the Project will be stabilized to prevent erosion and/or sedimentation. Appropriately sized, clean rock will be used to reinforce/armour exposed banks to prevent erosion or slope failure. All construction materials will be removed from the site upon Project completion.

5.6.2 Invasive Species Management

- Prior to construction, assess the Project area for invasive species and remove using manual or mechanized control methods;
- Report invasive species not previously identified on site to the EM and Environmental Representative;
- Clean and inspect all machinery prior to mobilization to site, to prevent the introduction of invasive plants and their propagules. Identify any existing infestations and minimize disturbance in these areas to the extent feasible. Clean all equipment and machinery prior to leaving an infested area;
- If noxious weeds are identified where equipment is working, then clean equipment prior to it moving to different areas of the site. Clean equipment only in designated areas and ensure any invasive plants and their propagules are properly captured and disposed of; and
- Do not use hay/straw for erosion and sediment control (unless certified weed free), to prevent the potential for introduction of non-native seeds and vegetation to the site.

6.0 SEDIMENT AND EROSION CONTROL

Erosion and sedimentation has the potential to result from disturbance of soils by machinery and/or improper erosion and sediment control planning and execution. Erosion and sedimentation has the potential to result in the following:

- Degraded fish habitat/water quality downstream of the work area;
- Introduction of invasive species; and
- Damage to infrastructure such as existing roads, ditches, and private property.

Key environmental performance indicators are provided below in a checklist format, suitable for monitoring.

Table 5 Key environmental performance indicators checklist for erosion and sediment control.

Key Environmental Indicators – Erosion and Sediment Control
Drainage and stormwater flows are appropriately managed in and around work sites to prevent erosion and sedimentation of watercourses and damage to infrastructure.
Erosion and sediment control features are installed correctly and regularly inspected and maintained to ensure continued functionality.
Soil disturbance is limited to that required to complete the works.
All soil and waste rock stockpiles and debris will be located and managed to avoid adverse erosion and sedimentation impacts. All stockpiles will be situated a minimum of 30 m from the top of bank of Trout Lake Creek.
Revegetate areas disturbed during construction prior to winter of the same year of completion and allow natural vegetation to regenerate.
Carry out instream works during the instream work window August 1 to September 15.
Ensure disturbance boundaries are clearly marked on plans and in the field (prior to commencement of construction), and disturbance does not encroach beyond the designated boundaries.

6.1 MITIGATION MEASURES

The purpose of erosion and sediment control is to contain excavated soils onsite and prevent construction-related sediment from entering watercourses or erosion and sedimentation from damaging constructed or existing infrastructure. A key measure for minimizing erosion and sedimentation potential is to minimize the extent and duration of exposure of bare soils.

Erosion and sediment control measures are achieved through the application of the following:

- **Erosion Prevention** – e.g., staged clearing, diversion ditch and dispersion aprons, riprap, gravel sheeting, mulch, erosion control blankets;
- **Runoff Controls and Maintenance of Original Drainage Patterns** – e.g., diversion berms, cross trenches, chutes, check dams, interceptor swales; and/or
- **Sediment Control** – e.g., sediment fence, filter berms, sediment traps, settling ponds.

Mitigation measures will be installed prior to and concurrently with site works. Measures will be maintained on a regular basis, prior to and after runoff events. Any accumulated sediment will be cleaned out during maintenance. Instream works will adhere to Regional Timing Windows to prevent disruption of fish and wildlife habitat.

Disturbed areas in and around watercourses will be revegetated prior to winter of the same year construction is completed, in order to prevent erosion during freshet. Land-based mitigation measures will not be removed until vegetation has been re-established to a sufficient degree (or surface soils stabilized using other measures) to provide adequate erosion protection to disturbed work areas.

To minimize the potential for erosion and prevent sedimentation, the following mitigation measures will be implemented:

- Provide temporary drainage measures such as grading, ditches, pipes, pumps, or other measures that may be necessary to keep the work site free of any water in accordance with the Land Development Guidelines for the Protection of Aquatic Habitat (1992);
- Schedule instream work during dry weather as much as is practicable and avoid work during significant precipitation events (i.e., >25 mm in 24 hours),
- Once started, pursue in-water works to completion as quickly as possible;
- Install erosion and sediment control measures for managing water flow on the Project site prior to construction;
- Roughen the surfaces of compacted, disturbed and exposed soils where practical to increase infiltration to ground and break up or slow down sheet flows (e.g., implement “cat tracking”);
- Avoid soft soils during wet periods to the extent practicable;
- Place top of bank barriers (e.g., silt fencing) for any construction activity that is in proximity to Trout Lake Creek;
- Use in-line erosion control measures (e.g., erosion blankets, riprap, rock flow checks and vegetated buffers) where necessary to mitigate high flow velocities and excessive erosion/sedimentation;

- Ensure material, such as rock, riprap, or other materials that are to be placed on the banks or within the active channel or floodplain of Trout Creek are inert and free of silt, overburden, debris or other substances deleterious to aquatic life;
- Regularly inspect and maintain erosion and sediment control measures and structures during the course of construction;
- Repair erosion and sediment control measures if damage occurs to these structures;
- Ensure that sufficient materials used for erosion prevention or control (e.g., filter cloth, rock, seed, drain rock, culverts, staking, matting, polyethylene) are readily available on site;
- Remove non-biodegradable erosion and sediment control materials once site is stabilized;
- Re-contour the topography around Trout Lake Creek to restore natural drainage patterns once construction is complete; and
- If soils become exposed as a result of the works and erosion or sedimentation will impact infrastructure or water quality upstream of Trout Lake Creek then mitigate potential impacts by covering with mulch, erosion control blankets, or other materials to prevent erosion.

6.2 RUNOFF INTERCEPTION AND CONTROL

- Preferentially use sediment traps where drainage ditches are required. Sediment traps are any structure constructed for the purpose of effectively removing suspended soil particles from the runoff. The construction of sediment traps typically involves the construction of a containment area or pools within a ditch to retain run-off for a long enough period of time so that suspended materials can settle out. Sediment traps and silt fences will be cleaned regularly to maintain maximum efficiency;
- During major storm events (i.e., >25 mm in 24 hours), direct surface stormwater runoff into forested areas at least 30 m away from Trout Lake Creek, where the forest duff will effectively remove sediment from the runoff. Regular monitoring will be conducted during these events to monitor the effectiveness of runoff measures; and
- Divert surface run-off away from stockpiles.

6.3 SEDIMENT FENCING

Silt fences and related support structures provide an effective barrier for sediment-laden runoff from erodible slopes and surfaces, trapping the sediment close to the erosion source and preventing mobilization into runoff. While they are very effective on short relatively steep slopes, these devices must be properly installed and maintained to be effective (e.g., properly keyed in).

Silt fences will be properly installed on the lower perimeter of slopes where the potential for erosion is high and/or it is desirable to contain waterborne movement of soils. Other areas where silt fences will be used include the bottom of cut or fill slopes, the base of material stockpiles and disturbed natural areas. Each silt fence will be installed according to manufacturer instructions. All fences will be regularly inspected during the Project and maintained.

6.4 CHECK DAMS

Check dams can be used to both control water run-off velocities and allow for suspended sediment to settle out. Check dams can also filter coarse suspended solids from the water column. If required, locations of check dams will be determined in the field by the EM and the construction supervisor.

6.5 CONTINGENCY PLANNING

Rainfall events can result in significant erosion due to the effects of water on exposed soils and the runoff generated. It will be the responsibility of the EM to monitor current weather predictions during construction. The EM will monitor during and immediately following heavy rainfall events to assess the function and condition of erosion and sediment control measures.

Should a nonconformance or accident result in a release of sediment-laden water, the magnitude of the impact will depend on the type of material released, the receptors impacted by the release, and the effectiveness of the cleanup response.

In the event of heavy runoff, diversion berms and check dams may be used where necessary to slow flows and prevent erosion. Materials required to handle excess runoff following a storm event will be stored onsite at all times. In the event of a severe storm event that results in runoff that exceeds the capacity of the sediment control provisions, either additional measures will be undertaken to contain the runoff and/or work will be halted.

If necessary, surface stormwater runoff may be directed into forested areas, where the forest duff will effectively remove sediment from the runoff. Regular monitoring will be conducted during these events to monitor the conditions of the forest floor and modify, if necessary, apply further mitigation measures. If monitoring shows that construction activities are not in compliance or show an impending non-conformance, work will be immediately stopped, additional sediment control measures will be implemented under the direction of the EM, and measurements repeated to check compliance. The contractor will take steps to correct a non-conformance and modify works to achieve conformance.

7.0 SPILL PREVENTION AND EMERGENCY RESPONSE PLAN

7.1 POTENTIAL ENVIRONMENTAL IMPACTS

Environmental spills have the potential to result in:

- Contamination to terrestrial ecosystems,
- Damage to soils and vegetation; and/or
- Harm to fish and aquatic habitats.

Other environmental emergencies such as wildfire and encroachment into sensitive areas have the potential to result in:

- Damage to terrestrial ecosystems,
- Damage to areas with archaeological value;

- Harm to fish and aquatic habitats;
- Disturbance to breeding birds and their nests, and/or
- Result in habitat loss for wildlife.

7.2 KEY ENVIRONMENTAL PERFORMANCE INDICATORS

Key environmental performance indicators are provided below in a checklist format to be reviewed by the EM during each day that monitoring activities occur in accordance with the CEMP.

Table 6 Key environmental performance indicators checklist for waste management.

Key Environmental Indicators – Waste Management
All hazardous substances are properly labelled, stored and contained.
All work areas and machinery are tidy and free of excess oil, grease and leaks.
Required training for Project personnel on environmental awareness and emergency/spill response has been carried out prior to works.
Emergency contact lists are kept on site in an area accessible to all personnel.
Spill kits are properly stocked and located at all active work areas, and at sites where hazardous substances are stored or in use, in a location readily accessible to Project personnel.
All equipment maintenance, fueling and controlled substance storage areas are located a minimum of 30 m from any open water source.
Erosion and sediment control measures are functioning as intended.

7.3 MITIGATION MEASURES

7.3.1 Equipment Inspection and Maintenance

- Equipment will be inspected for rock damage and damaged hoses or seals, and excess oils, grease or oils as part of the daily inspection;
- All equipment will utilize food-grade, biodegradable hydraulic fluid while working in the Creek;
- Fuel or oil leaks on equipment will be repaired as soon as they are discovered, or the equipment must be locked out, removed from site, and not operated until the repairs have been made; and
- All equipment refueling will take place a minimum of 30 m from watercourses, on level ground, and the use of drip trays will be employed if refueling equipment with jerry cans.

7.3.2 Spills

Spills may be reportable to Emergency Management BC (EMBC) depending on the substance and quantity (volume/weight) of the spill. Spills reportable to EMBC include spills of flammable liquids, hydrocarbons and oils >100 L and spills of any volume to water. Report any spills including detailed information such as time of day, staff involved, nature, cause, and degree of spill, recovery process deployed, and agencies notified.

All personnel shall be made aware of spill management and proper handling of hazardous materials (i.e., fuels, oils and other hydrocarbons) to ensure that no harmful substances enter the environment. In addition, a spill kit containing appropriate absorbent materials appropriate for spills to both land and water shall be present on site for the duration of works. The EM shall ensure that all staff are made aware of the location of the kit as well as proper cleanup techniques in the event of a spill. The EM shall be notified immediately of a spill of any volume.

If any petroleum, hydrocarbon or other product (no matter how small) is spilled, containment, cleanup and reporting will be undertaken in the following manner:

- Ensure personal, public, electrical and environmental safety;
- Wear appropriate personal protective equipment (PPE);
- Never rush in; always determine the product spilled before taking action;
- Warn people in the immediate vicinity;
- Be aware of wind direction;
- Ensure no ignition sources if spill is a flammable material;
- Act quickly to reduce the risk of environmental impacts;
- Close valves, shut off pumps, or plug holes and leaks;
- Utilize all available resources to initially contain the spill (i.e., native soil, spill kits, excavators or any material, equipment or tool that can safely contribute to containment efforts);
- Stop the flow or the spill at its source;
- Limit access to the spill area;
- Prevent unauthorized entry onto the site by securing and marking the area to limit exposure to pedestrians, including workers, and vehicle traffic;
- Prevent spilled material from entering drainage structures;
- Use spill-absorbent material to contain the spill; or if that is not possible and the spill volume exceeds the capacity of the spill kit, use native soil, sandbags, straw bales, etc.;
- If necessary, use a dyke or any other method to prevent any discharge on-site;
- A temporary sump may be employed to contain or direct spilled liquids if groundwater is not present;
- Make every effort to minimize contamination;
- Take soil or water samples for laboratory testing;
- Notify the EM, Construction Supervisor, and Environmental Representative immediately (provide spill details);
- If a reportable spill has occurred the Environmental Representative or a designate will call the Provincial Emergency Program (PEP) at 1-800-663-3456 (24 Hours);

- Provide necessary spill details to other external agencies as required;
- Complete an Environmental Incident Report;
- For spills >100 L or reaching a watercourse, contact commercial spill cleanup companies and local fire response teams;
- Additional assistance on cleanup procedures and residue sampling will be available from the Environmental Representative, as required;
- Clean up the affected area, including confirmatory testing on the cleaned area;
- Remove the impact/debris; decontaminate any equipment or tools used in the cleanup;
- Dispose of waste materials at an approved disposal site in compliance with the BC *Environmental Management Act* Hazardous Waste Regulation and BC *Waste Management Act*;
- Dispose of all material used in cleanup (e.g., used sorbents, oil containment materials, etc.) in accordance with the above regulatory requirements; and
- Treat and dispose of contaminated soil in compliance with the BC *Environmental Management Act*, Contaminated Sites Regulation and Hazardous Waste Regulation.

7.3.3 Wildfire

- All refueling stations, fuel storage areas and vehicles will be equipped with appropriate fire extinguishers;
- Do not use heavy machinery, drive, or park vehicles off road during high or extreme fire ratings;
- Do not use cell phones or smoke during refueling, and do not leave the fuel nozzle unattended;
- Maintain construction equipment in good working order and free of excess oily material;
- Discard cigarette butts in designated receptacles; do not discard on site; and
- Carry out all activities in accordance with the BC *Wildfire Act* and Regulations and local fire department bylaws, including checking the fire weather index and fire danger rating on a daily basis between March 1 and November 1; ensure adequate fire suppression systems are in place and firefighting hand tools are available. Some activities may be restricted during periods of high and/or extreme fire risk.

7.4 MONITORING

In the event of a spill, leak, or encroachment into sensitive habitats, the EM may issue a Stop Work Order and provide guidance on how to rectify the situation. MOTI will be notified immediately of the incident, and EMBC will be notified of any spill of a reportable volume within 24 hours of the spill. An environmental incident report (Section 10.0) will be generated that outlines the cause of the incident, measures taken to rectify the incident, any outstanding issues that need to be addressed, and measures taken to prevent further incidents of a similar nature.

8.0 WILDLIFE PROTECTION PLAN

8.1 POTENTIAL ENVIRONMENTAL IMPACTS

Wildlife has the potential to be impacted by project activities due to:

- Removal or disturbance of vegetation serving as key wildlife habitat (i.e., nesting sites, roosting/denning sites);
- Alterations to behavioural patterns of wildlife due to increased noise or human presence;
- Alterations to habitats in a manner that attracts or repels certain wildlife species;
- Collisions with traffic and machinery;
- Reduction of foraging potential for small mammals as a result of water quality degradation (i.e., increases in suspended sediments, deposition of deleterious substances including hydrocarbons, oil and grease), and loss of riparian vegetation and CWD;
- Habituation of wildlife due to feeding of wildlife, whether passively through improper care of wildlife attractants or actively; and/or
- Direct mortality of wildlife.

8.2 MITIGATION MEASURES

Mitigation measures are provided below in a checklist format to be reviewed by the EM during each day that relevant monitoring activities occur:

Table 7 Key environmental performance indicators checklist for Wildlife Protection.

Key Environmental Indicators – Wildlife Protection
Have an AQP conduct breeding bird surveys prior to any clearing activities taking place outside of the applicable regional timing window.
Delineation of clearing and grubbing limits on plans prior to construction, including buffers around sensitive habitat (such as with the use of snow fencing); the clear delineation of clearing and grubbing limits and buffers in the field prior to construction to avoid accidental encroachment.
Wildlife attractants are stored in a sealed container and removed from the work site daily, do not mix food waste with construction waste, and no wildlife are observed trying to access materials on site.
Workers will not touch, feed, collect, harm or harass wildlife encountered at the Project site.
Food and food wastes shall be stored in a manner that is not readily accessible to wildlife. All food and other wildlife attractants, which may contain any substance with a strong smell, shall be stored appropriately in a wildlife-proof container or building and removed from the Site at the end of each day. The feeding of wildlife shall be prohibited on Site.
Corrective action in response to wildlife incidents requiring direct wildlife management (identification of active songbird nests, raptor nests, and/or wildlife encounters, scavengers of Project-related waste products) within the Project footprint.

9.0 WASTE MANAGEMENT AND HAZARDOUS MATERIALS PLAN

The Contractor will apply the following measures for waste management:

General

- Construction wastes shall be reused or recycled where practical and as appropriate;
- Contractors are expected to adhere to all applicable legislation with respect to the handling, transportation, and/or disposal of all materials related to this Project (waste or otherwise). These regulations may include (but not be limited to) the BC Hazardous Waste Regulations, Spill Reporting Regulations, Workers Compensation Board Regulations, TDG Regulations, etc.;
- Specific locations for waste collection and sorting shall be identified before the start of Construction and communicated to employees in the pre-work environmental orientation training session;
- Outdoor refuse containers shall remain sealed at all times except when filling or emptying. Any refuse containers that are damaged or leaking shall be repaired or replaced;
- All tools, equipment and waste shall be stored in the appropriate locations at the end of each day;
- Waste material shall be stored in a manner that is secure and protected from the elements;
- No burning of wastes (including creosote-treated wood) shall be conducted on Site;
- All temporary sanitary facilities shall be self-contained with no septic fields. Portable sanitary facilities shall be located a minimum of 30 m from the top bank of Trout Lake Creek, on flat ground, in an area that is protected from damage resulting from construction activities, vandalism, or environmental factors. Sanitary facilities shall be regularly maintained by an approved operator for disposal (i.e., vac truck) off-site. The use of supplied washroom facilities is mandatory for all construction personnel; and
- Any old structures shall be removed to a suitable upland disposal site away from the aquatic environment to avoid waste material from entering Trout Lake Creek.

Non-Hazardous Waste

Project works shall generate non-hazardous waste. The following mitigation measures are recommended to reduce the potential for releases of non-hazardous waste materials to the environment:

- Littering shall be prohibited on Site. Measures shall be implemented to prevent and control littering;
- Cigarette butts shall be discarded in an appropriate receptacle in designated smoking areas and not be left or buried on the site;
- Regular disposal or recycling shall be carried out at a frequency sufficient to prevent accumulating large quantities of waste. All solid waste shall be handled in accordance with applicable municipal, provincial and federal regulations and disposed of at an authorized receiving facility;

- Records of the volumes and dates of delivery of all site material sent to a disposal location must be maintained on site; and
- Waste materials generated that do not pose a risk to contamination of the site shall be recycled on site where possible. Waste materials generated on site that are non-hazardous and cannot be reused on site shall be recycled at an approved facility, where practicable.

Hazardous Waste

Project works shall generate hazardous waste, including cementitious materials, waste oils, chemical wastes, and used absorbent materials and filters. The following mitigation measures are recommended to reduce the potential for the release of hazardous waste materials to the environment:

- Workers handling hazardous wastes shall be appropriately trained in their handling, storage, and disposal. Training records for those involved with the handling and transportation of hazardous waste shall be kept at the site office (if applicable);
- Hazardous wastes must be managed, transported, labelled, stored, and disposed of according to the EMA HW Regulation via licensed transportation and disposal facilities;
- Hazardous wastes shall be kept segregated from non-hazardous wastes and stored and transported in a manner that prevents incompatible materials from being mixed. Wastes contaminated with flammable liquid shall not be mixed with wastes contaminated with oil;
- Each container or area used to store hazardous waste shall be clearly labelled as containing hazardous waste and shall be equipped with adequate secondary containment. Hazardous waste containers shall be kept closed at all times except when being filled or emptied;
- Hazardous waste storage areas shall be checked weekly and a corresponding inspection log shall be kept in the site office (if applicable);
- All hydrocarbon products and other hazardous wastes potentially present during site activities shall be identified and the associated WHMIS and SDS made available to all construction team members;
- All hazardous waste containers shall be labeled and stored in accordance with all requirements of the TDG Act and *Workers Compensation Act* (WHMIS SDS labeling requirements);
- Waste rags and sorbents shall be stored in containers with self-closing lids, with the bottom of the container raised and vented;
- Used oil and antifreeze shall be picked up by a collector registered by the BC Used Oil Management Association;
- If necessary, hazardous waste shall be temporarily stored in designated, secure areas with secondary containment and protected from the weather. The storage areas shall be located at least 30 m away from the top bank of Trout Lake Creek. Hazardous wastes shall be managed in compliance with applicable fire codes;

- Any stockpiled contaminated and hazardous materials shall be separated from non-contaminated materials and segregated according to materials quality classes. Hazardous waste, waste quality, and industrial land materials shall not be mixed together, nor shall they be diluted with clean water or materials; and
- Spills of hazardous materials shall be cleaned-up and immediately reported to the EM and to appropriate regulatory agencies in accordance with the EMA and the Spill Response Plan (Section 7.3.2).

10.0 EXAMPLE ENVIRONMENTAL INCIDENT REPORT

Incident Information	
Report completed by: [Name]	**Telephone number:** [xxx-xxx-xxxx]
Exact location where incident occurred: [Location]	**Incident Report Number:** [00#]
Distance to nearest potential receptor (e.g., lake, river, stream, wetlands, ditch, etc.): [Insert Text]	
Date of incident: [Date]	**Time**: [Time]
Person in charge at time of incident or person who discovered incident: [Name]	
Company name: [Company(ies)]	**Phone number:** [xxx-xxx-xxxx]
Type of incident: [Insert Text]	
Name of spilled material (was it hazardous, include classification): [Insert Text]	
Type of material spilled: [Insert Text]	**Quantity spilled:** [Insert Text]
Potential impact on environment: [Insert Text]	

Temperature (ºC)	**Rain**	**Snow**	☐ Clear
[Temp]	☐ Light ☐ Moderate ☐ Heavy	☐ Light ☐ Moderate ☐ Heavy	☐ Other (specify): [Insert Text]

Reporting Actions			
Contact Name	**Telephone Number**	**Date**	**Time**
[Name]	[xxx-xxx-xxxx]	[Date]	[Time]
[Name]	[xxx-xxx-xxxx]	[Date]	[Time]
[Name]	[xxx-xxx-xxxx]	[Date]	[Time]
[Name]	[xxx-xxx-xxxx]	[Date]	[Time]
[Name]	[xxx-xxx-xxxx]	[Date]	[Time]

Incident Response		
Describe nature and extent of injuries, damage, or environmental impact/threat: [Insert Text] **Water Quality Results:** [Insert Text]		
Sample Location	**Turbidity** [Date&Time]	**Turbidity** [Date&Time]

[Location]	[Insert Text]	[Insert Text]
[Location]	[Insert Text]	[Insert Text]

Action taken to control spill/incident (Was MSDS reviewed):

[Insert Text]

Suspected cause of incident:

[Insert Text]

Describe how release clean-up material will be contained, stored, and deposited:

[Insert Text]

Describe measures to prevent re-occurrence:

[Insert Text]

Additional information:

[Insert Text]

Completed by: [Name] **Date:** [Date]

11.0 REFERENCES

British Columbia Ministry of Water Land and Air Protection (MWLAP), Air Protection, Ecosystem Standards, and Biodiversity Branch. 2004. “Standards and Best Practices for Instream Works.” *WLAP BMP Series* (March):1–11.

British Columbia Ministry of Transportation and Infrastructure [MOTI]. 2020a. Standard Specifications for Highway Construction. British Columbia Construction and Maintenance Branch. Volume 1. November 1, 2020.

MOTI. 2020b. Protection of the Environment – Breeding Bird Nest Survey Protocol. September 10, 2020.

Fisheries and Oceans Canada [DFO]. 2019. Fish and Fish Habitat Protection Policy Statement. Accessed March 16, 2022. http://www.dfo-mpo.gc.ca/pnw-ppe/policy-politique-eng.pdf

DFO. 2020. Interim code of practice: Temporary cofferdams and diversion channels. https://www.dfo-mpo.gc.ca/pnw-ppe/codes/cofferdams-batardeaux-eng.html

Government of BC. 2022. Requirements and Best Management Practices for Making Changes in and About a Stream in British Columbia. Version 2022.01. Government of British Columbia. January 10, 2022.

Project #14048

August 5, 2022

Ashcroft Indian Band
414 Cornwall Road, PO Box 440
Ashcroft, BC V0K 1A0

Dear Chief and Council,

Re: Rockwell Drive Debris Flows Emergency Recovery – Geotechnical Investigations – Sites 1, 2 and 3 ONLY

Further to the notification letters sent on March 4th and June 24th, 2022, the Ministry of Transportation and Infrastructure (MoTI) would like to provide Ashcroft Indian Band with an update regarding geotechnical investigations for sites 1, 2 and 3 of the Rockwell Drive Emergency Recovery Project (the Project) located on Rockwell Drive along Harrison Lake, north of Harrison Hot Springs, BC.

PROPOSAL:	Geotechnical Investigations
LOCATION:	Rockwell Drive along Harrison Lake, North of Harrison Hot Springs, BC. Site 1: (Lat, Long: 49.324162, -121.7529749 °) Site 2: (Lat, Long: 49.3288703, -121.7517123 °) Site 3: (Lat, Long: 49.3402281, -121.7441785 °)
PROPOSED CONSTRUCTION START/END DATES:	**September – October 2022**
PRIMARY CONTACT:	Kelsi Fraser Advisor, Indigenous Relations 236-468-2104 Kelsi.1.Fraser@gov.bc.ca

Context of the Proposal:
As a result of the November 2021 Atmospheric River Event culvert damage and road washouts occurred at sites 1, 2 and 3. Emergency Response efforts were undertaken immediately to restore access to residents in the area including the installation of riprap, armouring, and temporary culverts, as well as asphalt repairs. MoTI is now working on identifying long-term permanent solutions for sites 1, 2 and 3.

MoTI has retained R.F. Binnie & Associates (Binnie) to develop long-term solutions for the sites, and to better inform the long-term design solutions Binnie is proposing to conduct geotechnical investigations at the sites.

The proposed geotechnical investigations would consist of Sonic Drilling of two (2) boreholes at each site advanced to a depth not to exceed 5 meters. A third borehole will be drilled at site 3 only. During the drilling, traffic control measures would be in place to protect work crews and road users. Following completion of the drilling, crews will backfill the boreholes with grouting material in accordance with the BC Groundwater guidelines.

While the exact locations of the boreholes have not been identified yet, the attached KMZ files show the site boundaries, within which the drilling would be contained. MoTI is proposing to commence with the geotechnical works on or after September 5, 2022, and the works are anticipated to last seven days.

Archaeology:
As indicated previously, MoTI has obtained Stantec to provide Archaeological support to the project. Stantec has proposed that due to the type of drilling, and the relatively low potential of the borehole locations, that the geotechnical works proceed under a Chance Find Procedure.

Preliminary Schedule:

- Response Phase Works Complete: December 2021
- Recovery Phase Works starts: December 2021
- Detailed Designs Complete: December 2022
- Tender: January 2023
- Construction begin/end: Spring 2023 – Fall 2023

This schedule is tentative and subject to change. MoTI will continue to seek input from you throughout the design phases for the recovery works. If the Ashcroft Indian Band has any further information that may inform the review of the Rockwell Drive – Emergency Recovery project, and how the project might impact your Aboriginal Interests, please contact me at 236-468-2104 or Kelsi.1.Fraser@gov.bc.ca.

Sincerely,

Kelsi Fraser
Advisor, Indigenous Relations

Cc: Tyler Lu – Project Manager (McElhanney)
Sivagar Sivabalan – Project Tech

Attachments: Borehole Location Maps (KMZs)

Project #14048

August 5, 2022

Nlaka'pamux Nation Tribal Council (NNTC)
P.O. Box 430
Lytton, BC V0K 1Z0

Dear Chief and Council,

Re: Rockwell Drive Debris Flows Emergency Recovery – Geotechnical Investigations – Sites 1, 2 and 3 ONLY

Further to the notification letters sent on March 4th and June 24th, 2022, the Ministry of Transportation and Infrastructure (MoTI) would like to provide Nlaka'pamux Nation Tribal Council (NNTC) with an update regarding geotechnical investigations for sites 1, 2 and 3 of the Rockwell Drive Emergency Recovery Project (the Project) located on Rockwell Drive along Harrison Lake, north of Harrison Hot Springs, BC.

PROPOSAL:	Geotechnical Investigations
LOCATION:	Rockwell Drive along Harrison Lake, North of Harrison Hot Springs, BC. Site 1: (Lat, Long: 49.324162, -121.7529749 °) Site 2: (Lat, Long: 49.3288703, -121.7517123 °) Site 3: (Lat, Long: 49.3402281, -121.7441785 °)
PROPOSED CONSTRUCTION START/END DATES:	**September – October 2022**
PRIMARY CONTACT:	Kelsi Fraser Advisor, Indigenous Relations 236-468-2104 Kelsi.1.Fraser@gov.bc.ca

Context of the Proposal:
As a result of the November 2021 Atmospheric River Event culvert damage and road washouts occurred at sites 1, 2 and 3. Emergency Response efforts were undertaken immediately to restore access to residents in the area including the installation of riprap, armouring, and temporary culverts, as well as asphalt repairs. MoTI is now working on identifying long-term permanent solutions for sites 1, 2 and 3.

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This schedule is tentative and subject to change. MoTI will continue to seek input from you throughout the design phases for the recovery works. If the Nlaka'pamux Nation Tribal Council (NNTC) has any further information that may inform the review of the Rockwell Drive – Emergency Recovery project, and how the project might impact your Aboriginal Interests, please contact me at 236-468-2104 or Kelsi.1.Fraser@gov.bc.ca.

Sincerely,

Kelsi Fraser
Advisor, Indigenous Relations

Cc: Tyler Lu – Project Manager (McElhanney)
Sivagar Sivabalan – Project Tech

Attachments: Borehole Location Maps (KMZs)

Project #14048

August 5, 2022

People of the River Referrals Office
Building 10-7201 Vedder Road
Chilliwack, BC V2R 4G4

Dear Referrals Administrator,

Re: Rockwell Drive Debris Flows Emergency Recovery – Geotechnical Investigations – Sites 1, 2 and 3 ONLY

Further to the notification letters sent on March 4th and June 24th, 2022, the Ministry of Transportation and Infrastructure (MoTI) would like to provide People of the River Referrals Office with an update regarding geotechnical investigations for sites 1, 2 and 3 of the Rockwell Drive Emergency Recovery Project (the Project) located on Rockwell Drive along Harrison Lake, north of Harrison Hot Springs, BC.

PROPOSAL:	Geotechnical Investigations
LOCATION:	Rockwell Drive along Harrison Lake, North of Harrison Hot Springs, BC. Site 1: (Lat, Long: 49.324162, -121.7529749 °) Site 2: (Lat, Long: 49.3288703, -121.7517123 °) Site 3: (Lat, Long: 49.3402281, -121.7441785 °)
PROPOSED CONSTRUCTION START/END DATES:	**September – October 2022**
PRIMARY CONTACT:	Kelsi Fraser Advisor, Indigenous Relations 236-468-2104 Kelsi.1.Fraser@gov.bc.ca

Context of the Proposal:
As a result of the November 2021 Atmospheric River Event culvert damage and road washouts occurred at sites 1, 2 and 3. Emergency Response efforts were undertaken immediately to restore access to residents in the area including the installation of riprap, armouring, and temporary culverts, as well as asphalt repairs. MoTI is now working on identifying long-term permanent solutions for sites 1, 2 and 3.

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- Detailed Designs Complete: December 2022
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This schedule is tentative and subject to change. MoTI will continue to seek input from you throughout the design phases for the recovery works. If the People of the River Referrals Office has any further information that may inform the review of the Rockwell Drive – Emergency Recovery project, and how the project might impact your Aboriginal Interests, please contact me at 236-468-2104 or Kelsi.1.Fraser@gov.bc.ca.

Sincerely,

Kelsi Fraser
Advisor, Indigenous Relations

Cc: Tyler Lu – Project Manager (McElhanney)
Sivagar Sivabalan – Project Tech

Attachments: Borehole Location Maps (KMZs)

Cook's Ferry Indian Band
Nlaka'pamux Nation

LANDS AND RESOURCES OFFICE
P.O. Box 130, 3691 Deer Lane Spences Bridge, BC V0K 2L0
Email: lands@cooksferry.ca
www.cooksferryband.ca

September 2, 2022

Kelsi Fraser
Advisor, Indigenous Relations
Ministry of Transportation and Infrastructure
310-1500 Woolridge Street
Coquitlam, BC V3K0B8

Electronically to: Kelsi.1.Fraser@gov.bc.ca
SENT ELECTRONICALLY ONLY

SUBJECT: MOTI – ROCKWELL DRIVE GEOTECH INVESTIGATIONS – FILE #14048

The Cook's Ferry Indian Band writes in response to the referral received via e-mail on August 5, 2022.

We understand that, in an effort to find long-term design solutions for culvert damage and road washouts that occurred on sites 1, 2, and 3, at Rockwell Drive along Harrison Lake in the November 2021 Atmospheric River event, R. F. Binnie & Associates are proposing to conduct geotechnical investigations at these sites. We understand that these investigations will involve Sonic Drilling of two boreholes at each site no deeper than 5 meters, with a third borehole drilled at Site 3, and that these sites will be backfilled with grouting material.

The Cook's Ferry Indian Band is a Nlaka'pamux Nation government with asserted traditional territory and waters within the southern interior of British Columbia and northern Washington State.

The Cook's Ferry Indian Band has 26 reserves situated within the Thompson and Nicola River watersheds, and our members continue to use and occupy our lands beyond our reserves to encompass Nlaka'pamux Traditional Territory as a whole. These lands, and the resources

occupying them, are integral to the social, economic, and cultural values and identities we hold as Nlaka'pamux people. Currently and historically, the Cook's Ferry Indian Band members rely upon these lands to fish, hunt, trap, gather, and practice our unique cultural traditions across our territory.

Our rights, and Nlaka'pamux Traditional Territory, are affected by the proposed decision.

Aboriginal Rights and Title

The Cook's Ferry Indian Band is a party to the Nlaka'pamux Nation's *Writ of Summons* filed in the British Columbia Supreme Court in 2003, this document asserts our Aboriginal title to Nlaka'pamux Traditional Territory including the Lower Thompson River area, the Fraser Canyon, the Nicola Valley, the Coldwater River Valley, and the Coquihalla area.

Among other things, the *Writ of Summons* acknowledges that our Nlaka'pamux ancestors occupied our territory prior to the Crown claiming sovereignty and we continue to occupy and maintain a substantial connection to the territory today. Our Band, as a member of the Nlaka'pamux Nation, asserts Aboriginal title to the Traditional Nlaka'pamux Territory that is constitutionally protected pursuant to s. 35 of the *Constitution Act, 1982.* As such, our rights to continue the practices of hunting, trapping, fishing, gathering of plant foods and medicines and other Nlaka'pamux activities we take part in within our Nlaka'pamux Traditional Territory are protected and any erosion of our ability to hunt, trap, fish, gather plant foods and medicines, and take part in any other Nlaka'pamux activities would be a serious infringement of our rights.

Aboriginal rights, which include title, are constitutionally protected legal rights, pursuant to s. 35(1) of the *Constitution Act, 1982*. Aboriginal rights include priority use rights to resources (e.g. fish, wildlife, trees, traditional medicines and foods). Aboriginal title confers on the rights-holding group the exclusive right to decide how the land is used and the right to benefit from those uses, subject to the restriction that the uses must be consistent with the group nature of the interest and the enjoyment of the land by future generations.[1]

The Cook's Ferry Indian Band asserts strong Aboriginal rights within Nlaka'pamux Traditional Territory, and take seriously any infringement of our rights.

Crown's Duty to Consult

Where the Crown has "knowledge, real or constructive, of the potential existence of the Aboriginal right or title and contemplates conduct that might adversely affect it", the Crown has a duty to consult with the First Nation (*Haida Nation v. British Columbia (Minister of Forests),* [2004] 3 S.C.R. 511 at para. 35).

[1] *R.* v. *Sparrow*, [1990] 1 S.C.R. 1075 and *Delgamuukw* v. *B.C.*, [1997] 3 S.C.R. 1010; *Tsilhqot'in Nation v. British Columbia*, 2014 SCC 44.

The Cook's Ferry Indian Band currently uses, and has traditionally used, our Territory for fishing, hunting, trapping, the gathering of food plants and medicines as well as taking part in other Nlaka'pamux activities. Development and resource exploitation have already significantly impacted and infringed on our Aboriginal rights and title in the past, and any new developments will cumulatively infringe on our rights and title. An infringement cannot be justified, without meaningful consultation and accommodation, which may include compensation.

Our Band expects and intends to enter into full meaningful consultation and engagement with government or proponent prior to any work or decision(s) being made that have the potential to infringe on our Aboriginal rights and title. The importance of protecting our Aboriginal rights and title, and the preservation of our lands, waters, natural resources, and culture cannot be overstated.

Referral Response

We have no concerns at this time regarding your proposal based on the information you have provided. However, please note the following:

1. If any further information becomes available regarding any potential impacts of the activities, policies, plans, legislation, or decisions proposed under this referral on our Aboriginal rights and title or reserve lands, this information must be immediately sent to our Lands Office prior to proceeding, and we must be further consulted on the scope and nature of any impacts and required mitigation or accommodation.

2. If the activities, policies, plans, legislation, or decisions proposed under this referral receive government approval, and at any time during its completion, new information or evidence becomes available related to impacts of the activity on our Aboriginal rights and title or reserve lands, this information must be provided to our Lands Office immediately, and we must be further consulted on the scope and nature of any impacts and required mitigation or accommodation. This request applies also to archaeological or cultural heritage values which may be identified by other Nlaka'pamux bands and/or through technical organizations which conduct work on our behalf such as Esh-kn-am Cultural Resources Management Services.

3. If any proposed activity under this referral receives government approval, and at any time during its completion any unanticipated environmental event (accident, malfunction, or spill) occurs that requires reporting to any government regulatory agency, we require that our Lands Office be notified and engaged within 24 hours of the report being issued to the regulatory agency. If we determine such environmental event impacts our Aboriginal rights and title or reserve lands, we will notify you and you must consult and at our

request, involve us in any related follow-up investigation, remediation, monitoring, and/or reporting.

4. If any proposed activity under this referral receives government approval, and at any time during its completion any chance cultural or archaeological find occurs our Lands Office be notified and engaged within 24 hours of the report being issued to the regulatory agency. If we determine such chance find event impacts our Aboriginal rights and title or reserve lands, we will notify you and you must consult and at our request, involve us in any related follow-up investigation or follow-up action.

5. If any future amendments, expansions or modifications are made to the scope of the proposed activities, policies, legislation, or decisions that are the subject of this response, we require that you notify and engage us so that we may determine any additional potential impacts to our Aboriginal rights and title or reserve lands and any required mitigation or accommodation measures.

If you have any questions concerning our response, please email our Lands Director, Scott Mackay at lands@cooksferry.ca.

Kʷukʷstemc - Thank you

Cook's Ferry Indian Band

Scott Mackay
Lands Director (Contract – Shared Value Solutions Ltd.)

Cc. Chief Christine Minnabarriet
Brenda Walkem, Lands Coordinator

Project #14048

Jaqnuary 18, 2023

Ashcroft Indian Band
414 Cornwall Road
PO Box 440
Ashcroft BC V0K 1A0

Dear Chief and Band Manager,

Re: Rockwell Drive Debris Flows Emergency Recovery – 100% Detailed Design Notification – Sites 1, 2 and 3 ONLY

Further to the notification letters sent on March 4th and June 24th, 2022 and August 5, 2022, the Ministry of Transportation and Infrastructure (MoTI) would like to notify Ashcroft Indian Band of the recently completed 100% Detailed Designs for sites 1, 2 and 3 of the Rockwell Drive Emergency Recovery Project (the Project) located on Rockwell Drive along Harrison Lake, north of Harrison Hot Springs, BC.

PROPOSAL:	Geotechnical Investigations
LOCATION:	Rockwell Drive along Harrison Lake, North of Harrison Hot Springs, BC. Site 1: (Lat, Long: 49.324162, -121.7529749 °) Site 2: (Lat, Long: 49.3288703, -121.7517123) Site 3: (Lat, Long: 49.3402281, -121.7441785)
PROPOSED CONSTRUCTION START/END DATES:	**Spring 2023 – Fall 2023**
PROPOSED TENDER:	**March 2023**
PRIMARY CONTACT:	Kelsi Fraser Advisor, Indigenous Relations 236-468-2104 Kelsi.1.Fraser@gov.bc.ca

Context of the Proposal:
As a result of the November 2021 Atmospheric River Event culvert damage and road washouts occurred at sites 1, 2 and F3. Emergency Response efforts were undertaken immediately to restore access to residents in the area including the installation of riprap, armouring, and temporary

culverts, as well as asphalt repairs. MoTI recently completed the 100% Detailed Design for these sites, and the permanent repair solutions are detailed below:

Site 1:

- Grading and paving works
- Culvert removal and replacement including rip rap installation
- New concrete barrier installation
- Full depth asphalt widening
- Channel works, Catch basin, manhole and asphalt spillway installation
- Site Restoration including seeding

Site 2:

- Grading and paving works
- Culvert removal and replacement including rip rap installation
- New concrete barrier installation
- Channel works
- Site Restoration, including revegetation

Site 3:

- Grading and paving works
- Culvert removal and replacement including rip rap installation
- CIP headwall installation
- New concrete barrier installation
- Channel works including check dam and catch basin installation
- Site Restoration, including revegetation

At Site 3 only MoTI anticipates that approximately 8 trees within MoTI right of way and 14 within private property will need to be removed to allow for the permanent repairs.

A copy of the 100% Detailed Design Drawings are attached for your review. Please note that while the cover page indicates they are a draft copy, no changes are being made to these drawings.

Archaeology:

MoTI previously retained Stantec Consulting Ltd. (Stantec) to provide archaeological support to the project. An Archaeological Impact Assessment (AIA) was conducted on October 17, 2022, with participation from First Nations. During the AIA no archaeological resources or areas of potential were identified within sites 1, 2 or 3, nor was any further field work recommended. As such, Stantec has recommended that the permanent works proceed under the provisions of a Chance Find Protocol.

Attached to this letter is a copy of the draft AIA report for your review.

Environment:
The Ministry has sought to reduce or mitigate impacts to the environment through design components and construction/post-construction activities, as follows:

Design Component Mitigation

- Replace the culverts to current design standards that consider climate change and debris flow events to reduce erosion and flooding of downstream environments, infrastructure, and property.
- The footprint of the new culverts and associated riprap scour protection at each site is minimized to the extent feasible while maintaining current design standards to reduce the permanent loss of aquatic and terrestrial resources.
- Top-dressing og the riprap below the watercourses high watermark with native stream substrates salvaged during excavation and maintaining the natural channel shape is a design impact mitigation strategy that will be utilized where possible. This is important at Site 2 downstream of Rockwell Drive, given the proximity to Harrison Lake and the potential for fish presence during periods of surface flow (all other stream crossings are confirmed not-fish-bearing), and upstream of Site 3 where repairs to the channel avulsion will occur.

Construction/Post-Construction Mitigations

- Riparian areas disturbed during construction will be revegetated with native shrub and tree species suited to site conditions.
- Based on the field studies and desktop review aquatic and terrestrial species at risk are not expected to occur within or in proximity to the project footprint with the exception of Pacific water shrew potential at Site 3. The contractor's Appropriately Qualified Professional will be responsible for completing pre-construction salvages for Pacific water shrew at Site 3.
- Temporary construction-related impacts will be mitigated via conventional best management practices and clearly defined in the contractor's Construction Environmental Management Plan (CEMP).
- All works in and about streams will be monitored by the contractor's Appropriately Qualified Professional, whom is responsible for monitoring compliance with environmental regulations and conditions of environmental approvals granted by the federal and provincial governments.

Environmental permit applications currently under development include:

- a request for review pursuant to the federal *Fisheries Act* (all three sites combined),
- a notification according to Section 39 (1) for authorized changes in and about a stream (i.e., culvert replacements for all three sites combined) pursuant to the provincial Water Sustainability Regulation, and
- a Change Approval pursuant to the provincial *Water Sustainability Act* for changes in and about a stream (i.e., channel armouring to repair the channel avulsion) at site DF3 only.

The Ministry of Forests (MOF) will be conducting First Nations consultation for the WSA Change Approval and additional information will be provided as part of that consultation package. However, MoTI invites your feedback and input on any of the environmental components of the project at any time. A copy of the Environmental Overview Assessment, which further details the above information, is attached to this letter.

Preliminary Schedule:

- Response Phase Works Complete: December 2021
- Detailed Designs Complete: December 2022
- Tender: March 2023
- Construction begin/end: Spring 2023 – Fall 2023

This schedule is tentative and subject to change. MoTI will continue to seek input from you throughout the design phases. If the Ashcroft Indian Band has any information that may inform the review of the Rockwell Drive – Emergency Recovery project sites 1, 2, and 3, and how the project might impact your Aboriginal Interests, please contact me at 236-468-2104 or by email at Kelsi.1.Fraser@gov.bc.ca.

Sincerely,

Kelsi Fraser
Advisor, Indigenous Relations

Cc: Sivagar Sivabalan– Project Manager (McElhanney)
Monika Sajdak – Project Tech

Attachments:
100% Detailed Design Drawings
Draft Archaeological Impact Assessment
Environmental Overview Assessment

ARCHAEOLOGICAL IMPACT ASSESSMENT
INTERIM REPORT
Rockwell Drive Sites DF1, DF2, and DF3

Administration					
Title	Archaeological Impact Assessment Interim Report for Rockwell Drive Sites DF1, DF2, and DF3 (14045RC) in the District of Kent, British Columbia				
Report	2021-0453: Stantec-001	**Project/Task**	123221766.410	**Report Date**	December 23, 2022
HCA Permit Number	2021-0453	**Archaeology Branch Contact**	Bonnie Campbell	Telephone: 250 475-7450 Fax: 250 953-3340 Email: Bonnie.Campbell@gov.bc.ca	
Author(s)	Melissa Scott	**Editor(s)**	Sean McKnight; Shane Bond	**Pages**	18

Permit Holder			
Permit Holder	Sarah Fraser Ministry of Forests 4th Floor, 545 Superior Capital Park, Victoria, BC V8V 0C5	**Contact Information**	Telephone: 778 **953-3334** Email: archpermitapp@gov.bc.ca

Delegated Archaeologist			
Delegated Archaeologist	Sean McKnight Stantec 500-4515 Central Blvd Burnaby, BC V5H 0C6	**Contact Information**	Telephone: 778 328-1032 Email: Sean.McKnight@stantec.com

Proponent			
Proponent	Krista Englund Ministry of Transportation and Infrastructure 310-1500 Wooldridge Street Coquitlam, BC V3K 0B8	**Contact Information**	Telephone: 236-468-1959 Email: Krista.Englund@gov.bc.ca

Geographic Reference			
Development	**NTS Map Sheet(s)**	**Center Coordinates (NAD 83 Zone 10N)**	**Location**
Site DF1	92H/032	E 590700 N 5464223	DF1 is on the east side of Harrison Lake between Harrison Hot Springs and Sasquatch Provincial Park. DF1 is within the MoTI right-of-way (RoW) between the eastern and western portions of PID 5924243 and crossing Rockwell Drive at the approximate location of 6535 Rockwell Drive.

Site DF2	92H/032	E 590698 N5464721	DF2 is on the east side of Harrison Lake between Harrison Hot Springs and Sasquatch Provincial Park. DF2 is largely within the MoTI RoW, crossing Rockwell Drive at the approximate location of 6990 Rockwell Drive. However, the proposed footprint slightly overlaps PID 2402068 to the west of Rockwell Drive and PID 17931304 to the east of Rockwell Drive.
Site DF3	92H/032	E 591093 N 5465737	DF3 is located on the east side of Harrison Lake between Harrison Hot Springs and Sasquatch Provincial Park. More specifically, site DF3 crosses Rockwell Drive at 7370 Rockwell Drive extending into PID 4500636 to the west of Rockwell Drive and PID 1062549 to the east of Rockwell Drive.

Development Description	
Development	**Description**
Rockwell Drive Sites DF1, DF2, and DF3	The Project is anticipated to include culvert repair and/or culvert removal and replacement at three sites on Rockwell Drive: DF1 - 6535 Rockwell Drive; DF2 - 6990 Rockwell Drive; and DF3 - 7370 Rockwell Drive to mitigate damages from debris flows and washouts associated with the November 2021 atmospheric river event (Figure and 2). Other impacts related to the Project may include but are not limited to ditching surrounding the culvert locations and the installation of riprap and debris control structures. Developments at DF1 are anticipated to include installation of a new culvert, associated headwalls, and riprap and enlargement and grading of the ditch east of Rockwell Drive (Figure 3.1). Developments at DF2 are anticipated to include installation of a new culvert, associated headwalls, and riprap as well as two check dams to the north of the culvert inlet east of Rockwell Drive (Figure 3.2). Developments at DF3 are anticipated to include installation of a new culvert, associated headwalls, and riprap; construction of an armoured channel on to the east of the culvert inlet; installation of check dams at the east end of the armoured channel and south of the culvert and east of Rockwell Drive; and ditching to the north of the culvert inlet (Figure 3.3). The DF1 to DF3 study areas are defined by the limits of construction associated with each of the proposed developments footprints and were bound to the Rockwell Drive RoW except where proposed infrastructure extends beyond the RoW and into adjacent properties.

Management Summary

At the request of MoTI, Stantec Consulting Ltd. (Stantec) conducted an archaeological impact assessment (AIA) of Rockwell Drive sites DF1 to DF3 (Figure 1 and 2) following flood damage associated with the November 2021 atmospheric river event.

The AIA was conducted under the authority of *Heritage Conservation Act* (HCA) heritage inspection permit 2021-0453, a Multi-Assessment Permit (MAP) held by MoTI for assessments related to flood recovery efforts following the November 2021 atmospheric river event. MAP 2021-0453 authorizes the investigation of archaeological sites and areas suspected to contain archaeological sites that may be impacted by on-going weather-related impacts requiring emergency impact management, or by recovery work. Fieldwork was conducted on October 17th, 2022 by Stantec archaeologists and a representative from Stó:lō Research and Resource Management Centre (SRRMC).

No archaeological resources or areas of potential were identified during the AIA and no further archaeological work is recommended at sites DF1 to DF3. Any proposed changes to the development plans should be reviewed by a qualified archaeologist to determine if further archaeological studies may be recommended. It is recommended that the project proceed under the provisions of a chance find protocol in the unlikely event that archaeological resources are identified during construction.

Archaeological Potential				
Archaeological Sites near the Study Area				
Borden Number	**Distance & Direction from Study Area**	**Site Type**	**Permit No. or Year Assessed:**	**Site in Conflict (Y/N)**
DiRk-1	960 m north of DF3	Cultural material; subsurface lithics	Non-permit 1970	N
The DF1 to DF3 study areas were inspected for indicators of high archaeological potential based on the criteria outlined in HCA permit 2021-0453. Pre-field methods used to assess archaeological potential included a review of known archaeological sites and potential within the area, and a review of satellite/orthographic images. Pedestrian survey transects consisted of 3 crew members spaced at 1-5 m intervals. Transect spacing reflected the small study areas associated with sites DF1 to DF3, as well as the potential for surface artifacts to be present where the washouts associated with the 2021 atmospheric river event resulted in extensive exposures, and where a portion of the DF1 study area overlaps beach deposits on the east side of Harrison Lake.				

Previous Field Studies (Date Accessed: 10/20/2020)				
Previously Assessed Development:	**Type of Assessment:**	**Direct Overlap with Study Area (Y/N):**	**Distance & Direction from Proposed Development:**	**Permit No. or Year Assessed:**
Rockwell Drive Sites DF1, DF2, and DF3	Archaeological Overview Assessment	Y	The DF1 to DF3 study areas are within the Chilliwack Forest District Archaeological Overview Assessment study area (Golder Associates Ltd. 1999). Areas of high archaeological potential presented in the AOA are present approximately 30 m northeast of DF3 and 180 m southwest of DF1.	1999

In-Field Methods					
Crew Members	3	**Transect Intervals**	1-5 m	**Visibility**	20 – 50 m
Subsurface Test Measure	n/a	**Testing Intervals**	n/a	**Notification of Work Date**	August 24, 2022
Assessment Area	Rockwell Drive Sites DF1, DF2, and DF3				
Development	**Survey Date(s)**		**Field Director (On Site? Y/N)**	**Other Field Personnel (Affiliation)**	
Rockwell Drive Sites DF1, DF2, and DF3	10/17/2022		Sean McKnight (N)	Melissa Scott (Stantec); Katie Burdeyney (Stantec); Alicia Chappell (SRRMC)	

In-Field Methods	
In-Field Observations	
Rockwell Drive Sites DF1, DF2, and DF3	The DF1 to DF3 study areas correspond to existing culvert locations crossing Rockwell Drive on the east side of Harrison Lake (Figure 1, 2, and 3.1-3.3). Accordingly, the study areas are largely restricted to previously developed terrain encompassing the Rockwell Drive right-of-way and associated ditches, existing culvert paths including culvert inlet and outlets, and to a lesser extent encompass small portions of developed properties bordering Rockwell Drive. Additionally, the topography of the study areas (described in detail below) provides natural run-off corridors prone to gravitational processes such as colluvial events and washouts. This was evidenced by the accumulation of large colluvial boulders and organic debris present within the DF2 and DF3 study areas, and the material deposited within the DF1 to DF3 study areas during the recent washouts associated with the 2021 atmospheric river event. One hundred percent survey coverage was achieved for the DF1 and DF2 study areas (Figure 3.1 and 3.2). Due to property access restrictions, survey coverage at DF3 excluded the area to the east of Rockwell Drive (within PID 001062549) (Figure 3.3). However, visual inspection from the Rockwell Drive RoW was feasible for this portion of the survey area. In-field observations specific to each study area are provided below from south to north (DF1 to DF3). **DF1** The DF1 study area has been extensively disturbed by road construction, culvert installation, and property development (Photos 1-2). The east side of the study area sits at the base of a sheer rockface bisected by Rockwell Drive and is occupied by the existing culvert inlet dug into the ditch at the base of the rock face (Photo 2). Terrain to the west of Rockwell Drive is moderately sloping (approximately 15-20°) and gradually grades toward Harrison Lake (Photo 1). The study area west of the road encompasses an existing culvert outlet located between a gravel driveway to the south and terrain that has been built up approximately 1 m in elevation and subsequently levelled and tiered during property development to the north. Though the study area has undergone significant development related impacts that have largely obliterated the natural topography, visual inspection of properties along the west side of the road indicates that prior to development, terrain consisted of a continuous, moderate slope toward Harrison Lake. The base of the culvert outlet and driveway to the south appear to correspond the natural grade. Vegetation within the study area is limited to grasses, salmonberry, Himalayan blackberry and juvenile broadleaf maple and red alder adjacent to Rockwell Drive. Based on the undifferentiated moderately sloping terrain, extensive land-alterations during development, and negative surface survey results, the DF1 study area is assessed as having low archaeological potential. **DF2** The DF2 study area has been significantly impacted by road construction, property development, and drainage efforts on the east and west sides of Rockwell Drive. On the east side of Rockwell Drive, terrain transitions from a rock wall at the southern portion of the study area, to an ascending slope (30°) to the south and east of an existing culvert inlet, and hummocky sloping terrain intersected by a driveway to the northeast and north of the culvert inlet (Photos 4 and 5). A small drainage trending roughly northeast to southwest traverses the hummocky, sloping terrain toward the existing culvert, and is paralleled by a berm of pushed material, approximately 1 m high, that appears to have been constructed to divert flow away from the property to the north and into the culvert. Terrain on the west side of Rockwell Drive drops approximately 1 m below the road and consists of gently sloping beachfront (10°) on the east side of Harrison Lake (Photo 3). Within the study area, an existing culvert outlet is bound by a 2 m high berm of pushed material oriented roughly northeast to southwest, and rip-rap armoured slope along Rockwell Drive to the south. Where not obstructed by the berm and/or riprap, the beach deposits provide 100% surface exposure consisting of angular pebbles and a sandy matrix. Ongoing erosion from the culvert outlet was observed at this location. Extensive disturbance was observed throughout the DF2 study area from road construction, property development, ditching and culverting, and the washout associated with the 2021 atmospheric river event and subsequent temporary works.

In-Field Methods	
	Vegetation was largely limited to the east side of the study area surrounding the culvert inlet and drainage. The present vegetation consisted of grasses, thimbleberry, Himalayan blackberry, juvenile broadleaf maple and red alder, as well as regenerated western redcedar and Douglas fir on the berm adjacent to the small drainage observed on the eastern side of Rockwell Drive. The DF2 study area is assessed as having low archaeological potential. The assessment of potential is based on steeply sloping terrain, the absence of relatively-level terrain and/or defined landforms in less sloping portions of the study area, and extensive development-related disturbances that have altered the natural topography of the area. In addition, the assessment of potential on the west side of Rockwell Drive considers the negative results of the surface survey at the culvert outlet and adjacent beach area confirming the absence of a surface component within this area. **DF3** The DF3 study area is comprised of sloping terrain that acts as a natural corridor for organic and colluvial debris. Terrain to the east of Rockwell Drive is characterized by a bedrock rockface within the southern portion of the study area and an ascending slope ranging from 20-40° within the northern portion of the study area (Photo 6). The sloping topography acts as a natural debris flow catching both organic material and large cobbles and boulders that have cleaved off the adjacent rock face. To the west of Rockwell Drive, terrain drops steeply toward the lake (30-45°) (Photo 7). Development related disturbance observed at DF3 is limited to the construction of Rockwell Drive, which cuts through the bedrock in this area, and more recent temporary works associated with clean up following the 2021 atmospheric river event. Natural disturbances included ongoing gravitational processes and the washout associated with the 2021 atmospheric river event. Vegetation within the study area is restricted to sloping terrain to the east and west of Rockwell Drive and is dominated by western redcedar, broadleaf maple, sword fern, bracken fern, and moss. The DF3 study area is assessed as having low archaeological potential based on the sloping terrain, absence of relatively level or defined landforms, and the active colluvial environment observed within the study area.

Results Summary
No archaeological sites or areas of archaeological potential were identified during the AIA completed for the study areas associated with Rockwell Drive sites DF1 to DF3.

Recommendations
No further archaeological work is recommended at sites DF1 to DF3. Any proposed changes to the development plans should be reviewed by a qualified archaeologist to determine if further archaeological studies, such as completion of an AIA in unassessed areas, may be recommended. It is recommended that the project proceed under the provisions of a chance find protocol in the unlikely event that archaeological resources are identified during construction.

Disclosure Statement & Signature

The present study was designed to satisfy the objectives of an archaeological impact assessment under Heritage Inspection Permit 2021-0453. These recommendations apply solely to physical archaeological evidence of past human activity.

STANTEC CONSULTING LTD.

Melissa Scott
Archaeologist
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Sean McKnight, MA, RPCA
Senior Associate, Project Manager, Archaeology
Phone: (778) 328-1032
sean.mcknight@stantec.com

References Cited:

Golder Associates Ltd. 1999. Archaeological Review and Management Plan for the Southern Chilliwack Forest District. On file with the Archaeology Branch of the Ministry of Forests, Victoria, BC. Available at: https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-resource-use/archaeology/forms-publications/aoa_-_chilliwack_forest_district_-_northern_and_southern_-_reports.pdf Retrieved: 12/09/2022.

Remote Access to Archaeological Data. Site Forms DkRi-1. Archaeology Branch of the Ministry of Forests, Victoria BC. Last accessed 12/09/2022.

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Cook's Ferry Indian Band	lands@cooksferry.ca
Esh-kn-am Cultural Resource Management	eshknam.arch@gmail.com
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Scw'exmx Tribal Council	referrals@scwexmxtribal.org
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Peters First Nation	administrator@petersfn.ca victoria.peters@petersfn.ca
Popkum First Nation	popkum@live.ca
Seabird Island Band	referrals@seabirdisland.ca
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Spuzzum First Nation	sdmb@spuzzumnation.com
Stó:lō Nation	referrals@peopleoftheriver.com
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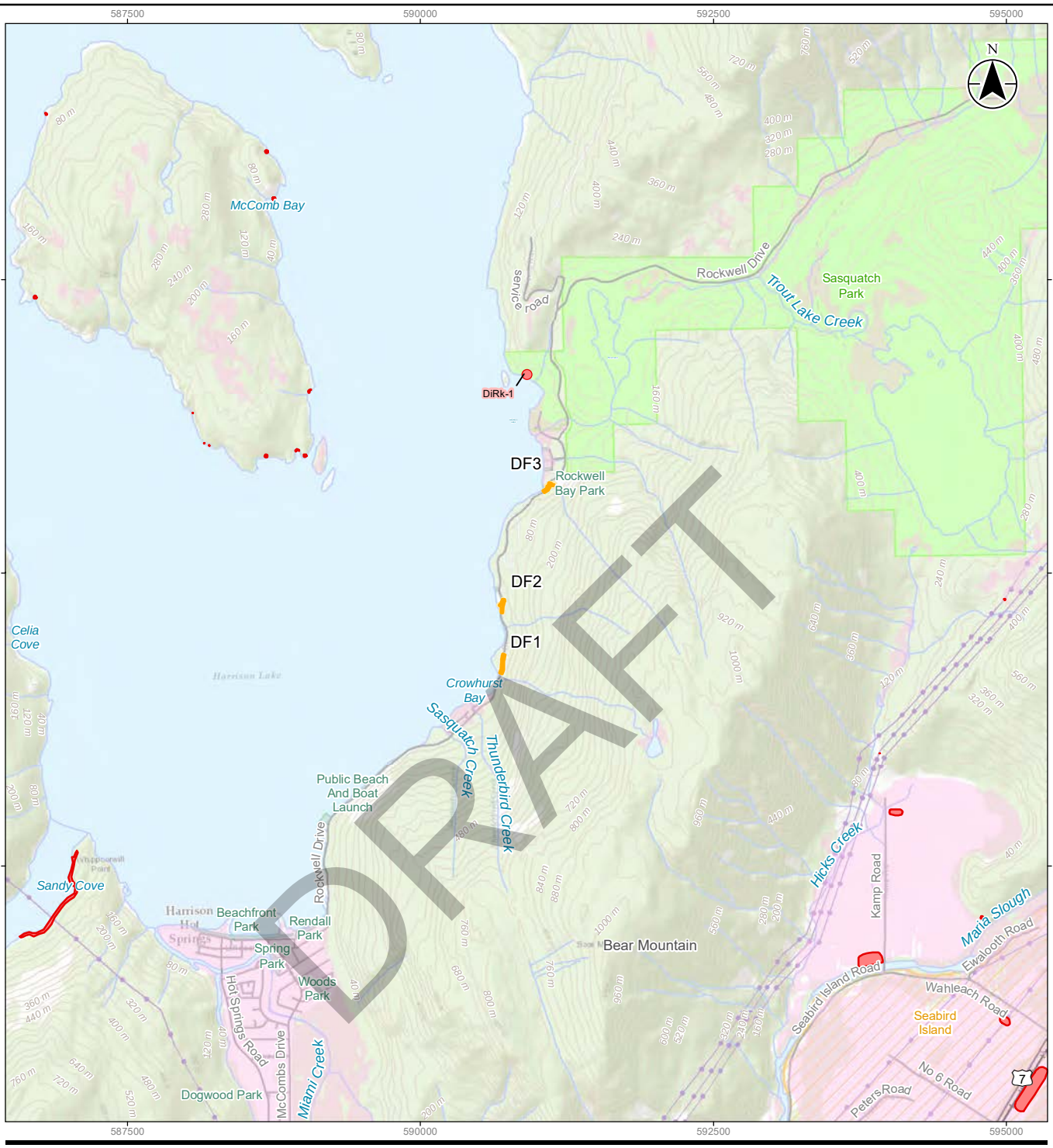
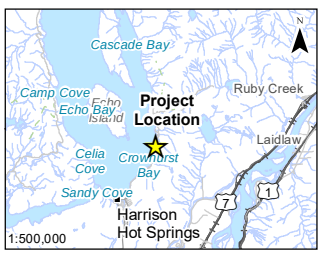
Sts'ailes First Nation	reception@stsailes.com
Union Bar First Nation	Chiefandy7632@gmail.com; stanashcroft@telus.blackberry.net

APPENDIX A

Figures





- Highway
- Road
- Local Street
- Resource Road
- Railway
- Transmission Line
- Topographic Contour
- Watercourse
- Waterbody
- First Nations Reserve
- Local Greenspace
- Provincial Park, Ecological Reserve, or Protected Area
- Study Area
- Archaeological Site - Previously Recorded
- AOA Model - High Archaeological Potential (Chilliwack Forest District, 1999)

0 500 1,000 1,500 2,000 m

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Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; ESRI World Imagery

Stantec

Ministry of Transportation and Infrastructure

Project Location:
Kent, BC
NTS 20K Grid: 92H.032

Project Number: 123221766
Prepared by TDINNEEN on 20220809
Requested by MSCOTT on 20220808
Checked by MSCOTTon 20220810

Client/Project/Report
Ministry of Transportation and Infrastructure
Rockwell Drive Sites DF1 - DF3 AIA
HCA Permit 2021-0453

Figure No.
1

Title
Overview Map

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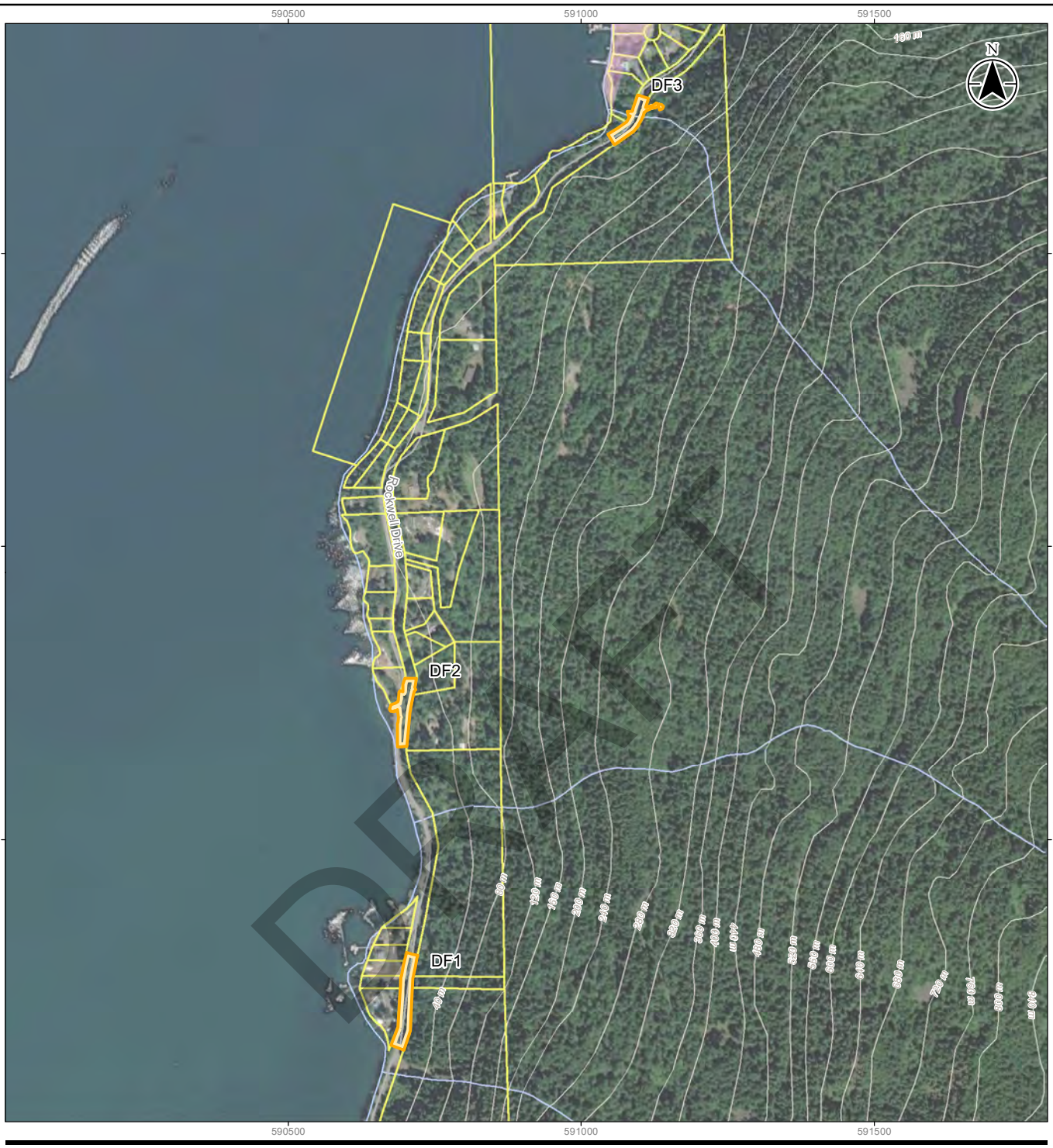

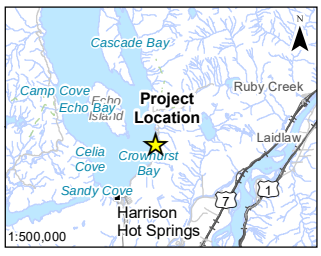

Local Street
Topographic Contour
Watercourse
Waterbody
Land Parcel Boundary
AOA Model - High Archaeological Potential (Chilliwack Forest District, 1999)
Study Area

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Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; ESRI World Imagery

Stantec

Ministry of Transportation and Infrastructure

Project Location:
Kent, BC
NTS 20K Grid: 92H.032

Project Number: 123221766
Prepared by TDINNEEN on 20221213
Requested by MSCOTT on 20221212
Checked by MSCOTTon 20221213

Client/Project/Report
Ministry of Transportation and Infrastructure
Rockwell Drive Sites DF1 - DF3 AIA
Notice of Intent - HCA Permit 2021-0453

Figure No.
2

Title
Study Areas

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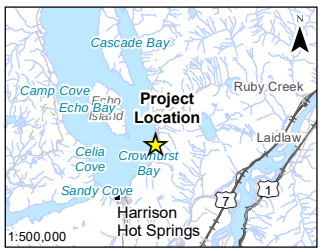

Local Street
Topographic Contour
Waterbody
Land Parcel Boundary
Study Area
Culvert
Headwall
Riprap

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Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; ESRI World Imagery

Stantec

Ministry of Transportation and Infrastructure

Project Location:
Kent, BC
NTS 20K Grid: 92H.032

Project Number: 123221766
Prepared by TDINNEEN on 20221213
Requested by MSCOTT on 20221212
Checked by MSCOTTon 20221213

Client/Project/Report
Ministry of Transportation and Infrastructure
Rockwell Drive Sites DF1 - DF3 AIA
Notice of Intent - HCA Permit 2021-0453

Figure No.
3.1

Title
Detailed Map - DF1

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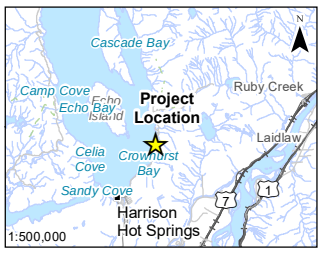

Local Street
Topographic Contour
Waterbody
Land Parcel Boundary
Study Area
Check Dam
Culvert
Headwall
Riprap

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1:1,000 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; ESRI World Imagery

Stantec

Ministry of Transportation and Infrastructure

Project Location:
Kent, BC
NTS 20K Grid: 92H.032

Project Number: 123221766
Prepared by TDINNEEN on 20221213
Requested by MSCOTT on 20221212
Checked by MSCOTTon 20221213

Client/Project/Report
Ministry of Transportation and Infrastructure
Rockwell Drive Sites DF1 - DF3 AIA
Notice of Intent - HCA Permit 2021-0453

Figure No.
3.2

Title
Detailed Map - DF2

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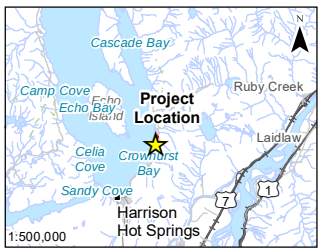

Local Street
Topographic Contour
Watercourse
Waterbody
Land Parcel Boundary
AOA Model - High Archaeological Potential (Chilliwack Forest District, 1999)

Study Area
Armoured Channel
Check Dam
Culvert
Headwall
Riprap
Widen Ditch

0 10 20 30 40 m
1:1,000 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; ESRI World Imagery

Stantec

Ministry of Transportation and Infrastructure

Project Location:
Kent, BC
NTS 20K Grid: 92H.032

Project Number: 123221766
Prepared by TDINNEEN on 20221213
Requested by MSCOTT on 20221212
Checked by MSCOTTon 20221213

Client/Project/Report
Ministry of Transportation and Infrastructure
Rockwell Drive Sites DF1 - DF3 AIA
Notice of Intent - HCA Permit 2021-0453

Figure No.
3.3

Title
Detailed Map - DF3

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APPENDIX B

Photographs

Photo 1 **DF1-View west of culvert outlet showing the sloping terrain toward the lake and property development on the west side of Rockwell Drive**

Photo 2 **DF1-View east of the culvert inlet and rock face on the east side of Rockwell Drive**

Photo 3 **DF2 - View west-southwest of the culvert input on the east side of Rockwell Drive showing sloping terrain to the south and temporary works including installation of riprap.**

Photo 4 **DF2 - View east-northeast of washout debris on an existing berm on the east side of Rockwell Drive.**

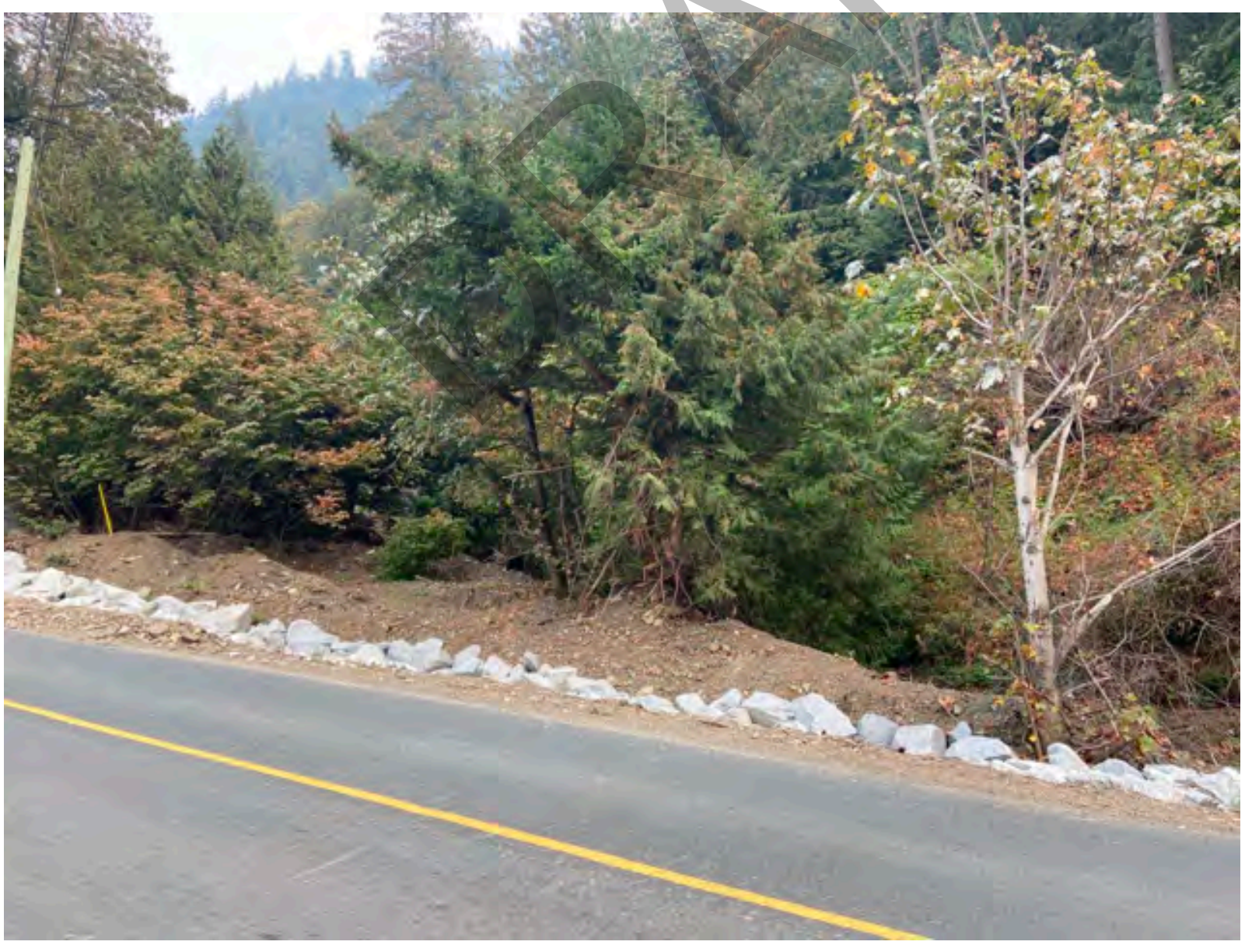


Photo 5 **DF2-View northeast of the culvert output on the west side of Rockwell Drive showing the berm to the left and the built up elevation of Rockwell Drive**

Photo 6 **DF3-View east-northeast of terrain on the east side of Rockwell Drive and temporary works including ditching and riprap installation following the 2021 atmospheric river event**

Photo 7 DF3-View west-southwest of culvert outlet and steep terrain descending to Harrison Lake on the west side of Rockwell Drive

BRITISH COLUMBIA

Ministry of Transportation and Infrastructure

PROJECT NO. 14045

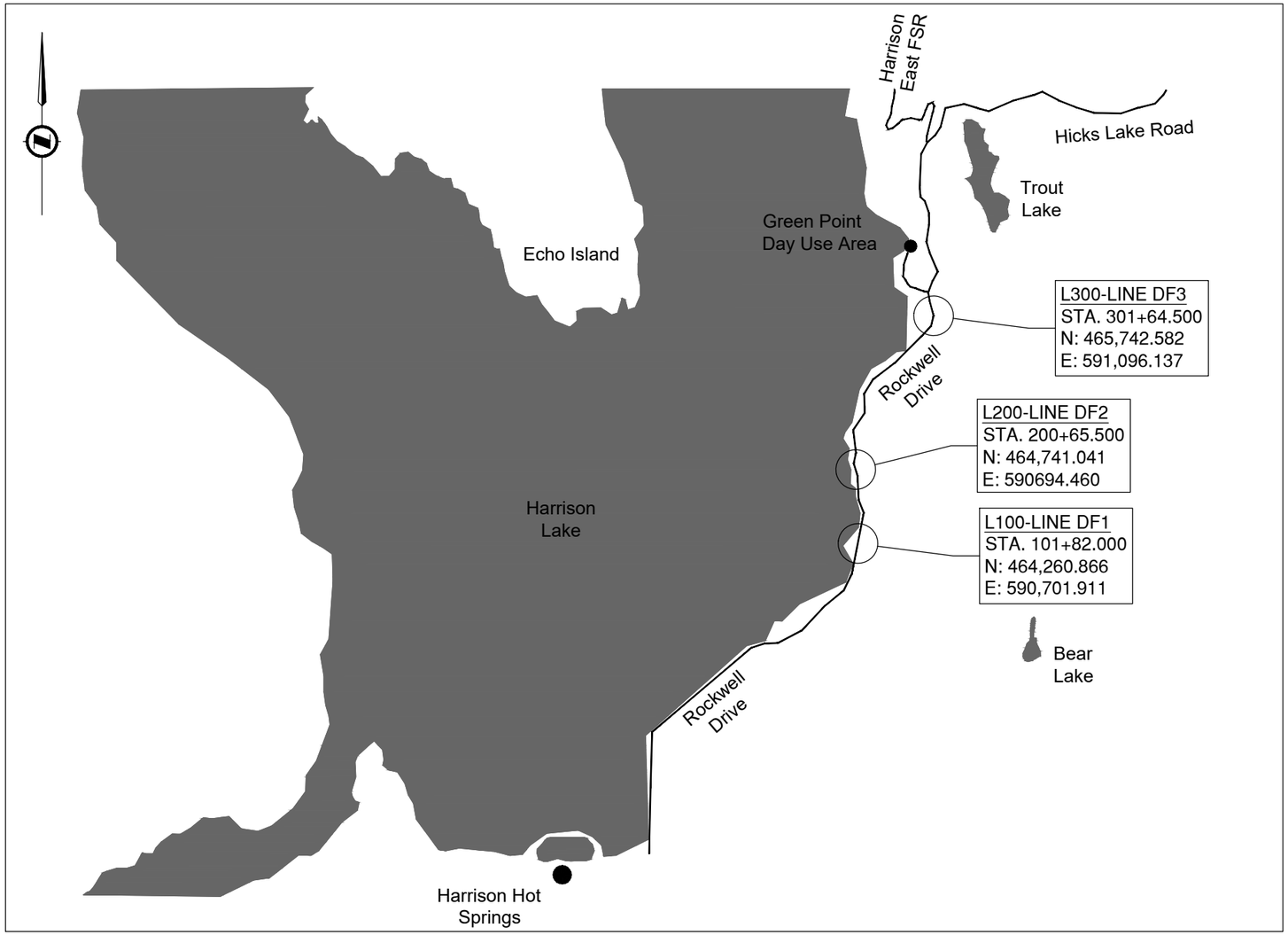
ROCKWELL DRIVE FLOOD RECOVERY

SITES DF1, DF2, AND DF3

100% DETAILED DESIGN - DEC. 9, 2022

DRAFT

DRAWING NUMBER	REV
R1-1050-000	



LOCATION MAP
N.T.S.

PROVINCE OF BRITISH COLUMBIA
MINISTRY OF TRANSPORTATION & INFRASTRUCTURE

SOUTH COAST REGION

PROJECT NO. 14045

ROCKWELL DRIVE FLOOD RECOVERY

SITES DF1, DF2, AND DF3

L100-LINE (DF1 ROCKWELL DRIVE)
STA. 101+41.112 - STA. 103+01.972
0.16 km

L200-LINE (DF2 ROCKWELL DRIVE)
STA. 200+20.000 - STA. 201+48.159
0.13 km

L300-LINE (DF3 ROCKWELL DRIVE)
STA. 301+38.111 - STA. 301+89.252
0.05 km

DRAWING INDEX

DRAFT

100% DETAILED DESIGN - DEC. 9, 2022

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

SCALE N.T.S.
CAD FILENAME 000KP-ROCKWELL-DF1_21-1067.DWG
DATE 2022-12-08
FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

KEY PLAN
ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3

R.F. BINNIE & ASSOCIATES LTD.
EGBC PERMIT TO PRACTICE
NUMBER 1001128

MICHAEL CARREIRA
ENGINEER OF RECORD
DATE

DESIGNED	J.T.	DATE	DEC. 2022
QUALITY CONTROL	M.C.	DATE	DEC. 2022
QUALITY ASSURANCE	A.M.	DATE	DEC. 2022
DRAWN	N.B.	DATE	DEC. 2022

PROJECT NUMBER	REG	DRAWING NUMBER	REV
14045	1	R1-1050-001	

Date: February 04, 2022			Origin: CZ47 derived from TRSI Static Network from CHWK							
Project: Rockwell Drive @ Harrison Lake - Sites DF1 to DF4			Tack Point: P6718-22		ACSF: 0.999713					
Horizontal Datum: UTM NAD83 (CSRS) Z10N			Vertical Datum: CGVD28 HT2_0							
Point ID	**Local**		**Orthometric Height**		**UTM**		**Ellipsoidal Height**	**C.S.F.**	**Class**	**Type**
	Northing	**Easting**	**CGG2013a**	**HT2_0**	**Northing**	**Easting**				
GCZ47-21	-	-	-	14.621	5458088.163	588549.861	-2.918	0.999697	CORRIDOR	9" SPIKE
G897019-22	-	-	-	14.396	5459420.545	588655.547	-3.104	0.999697	PROJECT	GCM753988
P6710-22	464119.556	590686.159	-	16.421	5464120.002	590686.251	-0.869	0.999701	PROJECT	REBAR
P6711-22	464264.563	590707.230	-	23.229	5464264.968	590707.316	5.939	-	PROJECT	REBAR
P6712-22	464285.406	590601.150	-	10.326	5464285.805	590601.267	-6.964	0.999702	PROJECT	REBAR
P6713-22	464433.453	590730.374	-	14.399	5464433.809	590730.454	-2.891	-	PROJECT	REBAR
P6714-22	464610.608	590699.980	-	13.029	5464610.913	590700.069	-4.249	0.999702	PROJECT	REBAR
P6715-22	464742.588	590663.848	-	12.407	5464742.855	590663.947	-4.869	0.999702	PROJECT	REBAR
P6716-22	464787.086	590704.708	-	18.820	5464787.341	590704.795	1.544	-	PROJECT	REBAR
P6717-22	464861.090	590674.279	-	27.376	5464861.324	590674.374	10.100	-	PROJECT	REBAR
P6718-22	465674.192	591007.581	-	36.493	5465674.192	591007.581	19.235	0.999699	PROJECT	REBAR
P6719-22	465708.004	591078.936	-	28.686	5465707.995	591078.915	11.428	-	PROJECT	REBAR
P6720-22	465792.685	591115.754	-	26.853	5465792.651	591115.723	9.601	0.999700	PROJECT	REBAR
P6721-22	465830.136	591187.755	-	26.738	5465830.091	591187.703	9.486	-	PROJECT	REBAR
P6722-22	465927.538	591242.052	-	31.012	5465927.465	591241.984	13.760	-	PROJECT	REBAR
P6723-22	466026.688	591222.256	-	35.302	5466026.587	591222.195	18.050	-	PROJECT	REBAR
P6724-22	466104.042	591216.613	-	33.207	5466103.919	591216.553	15.955	-	PROJECT	REBAR
P6725-22	466147.062	591172.786	-	26.801	5466146.926	591172.739	9.562	0.999701	PROJECT	REBAR
P6726-22	466166.260	591073.539	-	16.756	5466166.118	591073.520	-0.483	-	PROJECT	REBAR
P6727-22	466196.283	591028.916	-	13.637	5466196.133	591028.910	-3.602	-	PROJECT	REBAR
P6728-22	466283.532	591020.439	-	13.014	5466283.357	591020.436	-4.233	-	PROJECT	REBAR
P6729-22	466185.794	590959.371	-	10.670	5466185.648	590959.385	-6.577	0.999703	PROJECT	REBAR
P6730-22	466226.255	591230.721	-	28.381	5466226.096	591230.657	11.134		PROJECT	REBAR
P6731-22	466300.185	591280.516	-	30.209	5466300.005	591280.438	12.979	0.999700	PROJECT	REBAR
P6732-22	466400.322	591228.471	-	38.364	5466400.113	591228.407	21.135	-	PROJECT	REBAR
P6733-22	464909.548	590682.006	-	30.243	5464909.767	590682.099	12.972	0.999699	PROJECT	REBAR
P6734-22	466302.726	591249.510	-	25.776	5466302.545	591249.441	8.505	-	PROJECT	REBAR
P6735-22	466329.775	591206.991	-	21.593	5466329.587	591206.934	4.322	-	PROJECT	REBAR
P6736-22	466280.400	591098.732	-	17.721	5466280.226	591098.706	0.450	-	PROJECT	REBAR

All local coordinates are derived by first scaling from the Tack Point and then removing the millionth digit from the Northing

Notes:

* The CGG2013a Geoid uses the CGVD2013 vertical datum and the HT2_0 Geoid uses the CGVD28 vertical datum
* Corridor control can be derived from robust network adjustments using sources such as Mascot, active, and/or PPP for valid absolute accuracies.
* Project control originates from a corridor point and closes to a network confined within the specific project to provide survey grade relative accuracies.
* "name"static brass cap monuments-year. "G" static tag #-year. "K" multi epoch rtk, "P"closed total station traverse.

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100% DETAILED DESIGN - DEC. 9, 2022

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SOUTH COAST REGION
HIGHWAY ENGINEERING AND GEOMATICS

SCALE N.T.S.

CAD FILENAME 000KP-ROCKWELL-DF1_21-1067.DWG
DATE 2022-12-08
FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

SURVEY CONTROL POINTS

ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3

R.F. BINNIE & ASSOCIATES LTD.
EGBC PERMIT TO PRACTICE
NUMBER 1001128

MICHAEL CARREIRA
ENGINEER OF RECORD
DATE

DESIGNED J.T. DATE DEC. 2022
QUALITY CONTROL M.C. DATE DEC. 2022
QUALITY ASSURANCE A.M. DATE DEC. 2022
DRAWN N.B. DATE DEC. 2022

PROJECT NUMBER	REG	DRAWING NUMBER	REV
14045	1	R1-1050-002	

LEGEND

AERIAL UTILITIES (EXISTING)

- Deadman
- Anchor / Guy Wire
- High Tension Pole
- High Tension Tower (HT)
- Power Guy Pole
- Power / Phone Guy Pole
- Power Poles
- Power Pole with Transformer
- Power / Phone Pole with Transformer
- Power / Phone Pole
- Telephone Pole
- Telephone Guy Pole
- Pedestal (B.C. Tel.) (PED)
- Telephone Booth

SURVEY (EXISTING)

- Bench Mark
- Standard Iron Pin (OIP)
- Lead Plug
- Wooden Post
- Witness Post (WT)
- Reference Point
- Monument
- Aluminum Post
- Angle Iron Post
- Standard Brass Cap Monument (MON)
- Concrete Post Monument (MON)
- Dominion Iron Post
- Unmarked Measured Point
- Rock Post Monument (MON)
- Non- Standard Round Iron Post
- Non-Standard Square Iron Post
- Detail Hub (etc.)
- Spot Elevation

DETAIL (EXISTING)

- Septic Field
- Concrete Pillar
- Guard Post (Post)
- Piling (Piling)
- Gate Post (GP)
- Swamp
- Road Sign
- Well
- Tree
- Decorative Tree
- Delineator Post (DP)
- Flag Pole (FP)
- Mail Box (MB)
- Top of Bank

DRAINAGE (EXISTING)

- Catch Basin / Manhole
- Culvert Outlet (CO)
- Culvert Inlet (CI)
- Culvert Headwall
- Drainage Grate
- Manhole
- Catch Basin
- Culvert Kink
- Asphalt Spillway

METERS (EXISTING)

- Service Meter (SV)
- Water Meter (WM)
- Valve (V)
- Water valve (WV)
- Fire Hydrant (FH)
- Gas Valve (GV)
- Observation Well (OW)

UNDERGROUND (EXISTING)

- Filler Cap (FC)
- Fuel / Gas Pump (FP)
- Fuel Tank (FT)
- Septic Tank (ST)
- Underground Marker (UM)
- Breather / Vent Pipe (BP)

ELECTRICAL (EXISTING)

- Traffic Signal Control Box
- Electrical Outlet
- Junction Box (JB)
- Kiosk
- Lamp Standard (LS)
- Traffic Signal
- Traffic Counter

LEGAL LINETYPES (EXISTING)

- International Bdy.
- Section / District Bdy.
- Parcel Boundary / Old road R/W
- Quarter Section
- Easement
- Agricultural Land Reserve

MAN MADE FEATURES LINETYPES (EXISTING)

- Crown of Existing Road
- Edge of Pavement
- Concrete Barrier
- Dirt Road / Driveway
- Fence
- Gravel Road / Driveway
- Hedge / Bush / Tree Line
- Railway
- Retaining Wall
- Guard Rail
- Paint Lines - Solid
- Paint Lines - Dashed

UNDERGROUND UTILITIES LINETYPES (EXISTING)

- Gas Main (G)
- Oil (OIL)
- Sanitary Sewer Line (SAN)
- Storm / Sewer Drain (S)
- Electrical Cable (UE)
- Miscellaneous (UG)
- Telephone Cable (UT)
- Water Main (W)
- Culvert

OVERHEAD UTILITIES LINETYPES (EXISTING)

- High Tension Wire

HYDRAULIC LINETYPES (EXISTING)

- Creek / Ditch / Stream
- Edge of Water (EW)
- Major Catchment Boundary
- Sub-Catchment Boundary

GEOTECHNICAL (EXISTING)

- Pavement Core With Label — PV07-01
- Test Pit With Label — TP07-01
- Drill Hole With Label — DH07-01

DRAINAGE (PROPOSED)

- Catch Basin
- Deck Drain
- Manhole
- Asphalt Spillway
- Ditch Inlet Structure
- Ditch Block (DB)
- Cleanout (CO)
- Asphalt Swale
- Special Ditching
- Culvert Outfall with Riprap Apron
- Culvert Headwall
- Riprap
- Check Dam

SIGNS (PROPOSED)

- Road Sign (Single Pole)
- Road Sign (Double Pole)
- Post Mounted Delineator (DP)
- Commercial Message Sign

LEGAL LINETYPES (PROPOSED)

- Highway Right of Way
- Easement (L.T.C.)

CONSTRUCTION DETAILS LINETYPES (PROPOSED)

- Berm
- Clearing and Grubbing
- Pavement Sawcut Line
- Surplus Excavation Disposal Area
- Subgrade Pre-Build

SURFACE (PROPOSED)

- Centerline Alignment
- Edge of Pavement
- Concrete Barrier
- Slope Stake Line (C, C/F, F)
- Fence (X)
- Retaining Wall
- Paint Lines - Solid
- Paint Lines - Dashed
- Curb Line
- Trail

UNDERGROUND (PROPOSED)

- Gas Main (G)
- Oil (OIL)
- Sanitary Sewer Line (SAN)
- Storm / Sewer Drain (S)
- Electrical Cable (UE)
- Miscellaneous (UG)
- Telephone Cable (UT)
- Water Main (W)
- Culvert

DRAFT

100% DETAILED DESIGN - DEC. 9, 2022

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BRITISH COLUMBIA

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

SCALE 0 10 1:1000 50m

CAD FILENAME 000KP-ROCKWELL-DF1 21-1067.DWG
DATE 2022-12-08
FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

LEGEND

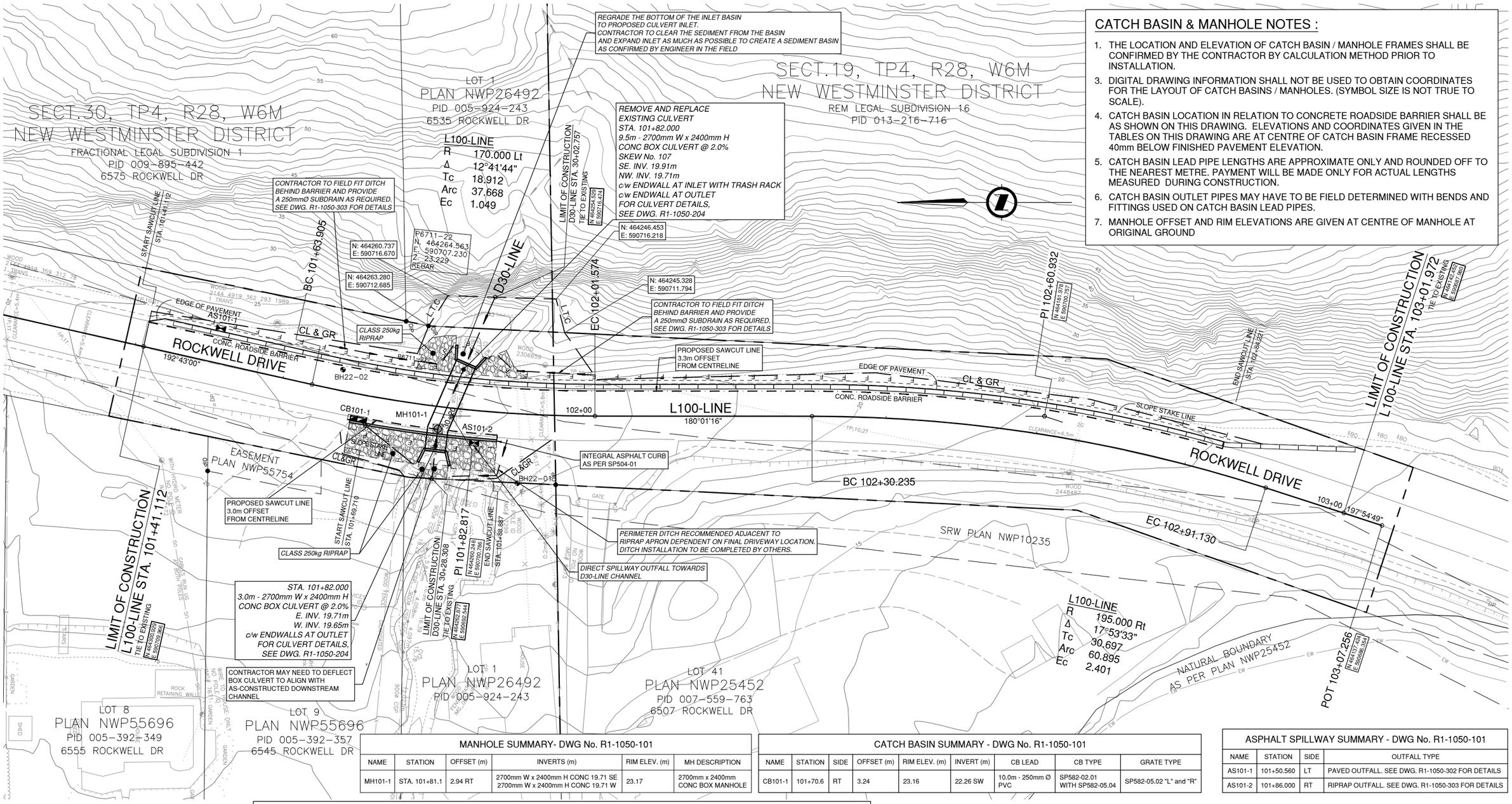
ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3

R.F. BINNIE & ASSOCIATES LTD.
EGBC PERMIT TO PRACTICE
NUMBER 1001128

MICHAEL CARREIRA
ENGINEER OF RECORD
DATE

DESIGNED	J.T.	DEC. 2022
QUALITY CONTROL	M.C.	DEC. 2022
QUALITY ASSURANCE	A.M.	DEC. 2022
DRAWN	N.B.	DEC. 2022

PROJECT NUMBER	REG	DRAWING NUMBER	REV
14045	1	R1-1050-003	



CATCH BASIN & MANHOLE NOTES :

1. THE LOCATION AND ELEVATION OF CATCH BASIN / MANHOLE FRAMES SHALL BE CONFIRMED BY THE CONTRACTOR BY CALCULATION METHOD PRIOR TO INSTALLATION.
3. DIGITAL DRAWING INFORMATION SHALL NOT BE USED TO OBTAIN COORDINATES FOR THE LAYOUT OF CATCH BASINS / MANHOLES. (SYMBOL SIZE IS NOT TRUE TO SCALE).
4. CATCH BASIN LOCATION IN RELATION TO CONCRETE ROADSIDE BARRIER SHALL BE AS SHOWN ON THIS DRAWING. ELEVATIONS AND COORDINATES GIVEN IN THE TABLES ON THIS DRAWING ARE AT CENTRE OF CATCH BASIN FRAME RECESSED 40mm BELOW FINISHED PAVEMENT ELEVATION.
5. CATCH BASIN LEAD PIPE LENGTHS ARE APPROXIMATE ONLY AND ROUNDED OFF TO THE NEAREST METRE. PAYMENT WILL BE MADE ONLY FOR ACTUAL LENGTHS MEASURED DURING CONSTRUCTION.
6. CATCH BASIN OUTLET PIPES MAY HAVE TO BE FIELD DETERMINED WITH BENDS AND FITTINGS USED ON CATCH BASIN LEAD PIPES.
7. MANHOLE OFFSET AND RIM ELEVATIONS ARE GIVEN AT CENTRE OF MANHOLE AT ORIGINAL GROUND

MANHOLE SUMMARY- DWG No. R1-1050-101

NAME	STATION	OFFSET (m)	INVERTS (m)	RIM ELEV. (m)	MH DESCRIPTION
MH101-1	STA. 101+81.1	2.94 RT	2700mm W x 2400mm H CONC 19.71 SE 2700mm W x 2400mm H CONC 19.71 W	23.17	2700mm x 2400mm CONC BOX MANHOLE

CATCH BASIN SUMMARY - DWG No. R1-1050-101

NAME	STATION	SIDE	OFFSET (m)	RIM ELEV. (m)	INVERT (m)	CB LEAD	CB TYPE	GRATE TYPE
CB101-1	101+70.6	RT	3.24	23.16	22.26 SW	10.0m - 250mm Ø PVC	SP582-02.01 WITH SP582-05.04	SP582-05.02 "L" and "R"

ASPHALT SPILLWAY SUMMARY - DWG No. R1-1050-101

NAME	STATION	SIDE	OUTFALL TYPE
AS101-1	101+50.560	LT	PAVED OUTFALL. SEE DWG. R1-1050-302 FOR DETAILS
AS101-2	101+86.000	RT	RIPRAP OUTFALL. SEE DWG. R1-1050-303 FOR DETAILS

CONSTRUCTION NOTES:

1. CLEARING AND GRUBBING SHALL BE FROM THE EXISTING EDGE OF PAVEMENT TO THE RIGHT OF WAY OR TLCA BOUNDARY UNLESS OTHERWISE NOTED.
2. UNDERGROUND UTILITIES AS SHOWN MAY BE INCOMPLETE OR INACCURATE.
3. THE CONTRACTOR MUST FIELD VERIFY UTILITY LOCATIONS PRIOR TO COMMENCING WORK.
4. ADEQUATE CLEARANCE HAS BEEN PROVIDED TO CONVEY THE DESIGN FLOOD EVENT PER RECOMMENDATION OF SUPPLEMENT TO TAC GEOMETRIC DESIGN GUIDE, SECTION 1040.03. HOWEVER, THE LACK OF ANY DEBRIS CONTROL STRUCTURE UPSTREAM IN THE WATERSHED MAY RESULT IN FUTURE DEBRIS FLOW OVERWHELMING THE INLET BASIN OR FAILURE OF THE STRUCTURE.

FOR PLANS SEE DWG. R1-1050-101 to 103

FOR PROFILES AND CULVERT SECTIONS SEE DWG. R1-1050-201 to 206

FOR TYPICAL SECTIONS SEE DWG. R1-1050-301 to 304

FOR GEOMETRICS, LANING SIGNING, AND PAVEMENT MARKINGS SEE DWG. R1-1050-401 to 403

DRAFT

CLEARING AND GRUBBING TOTAL THIS SHEET: 0.0606 ha

100% DETAILED DESIGN - DEC. 9, 2022

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BINNIE.com

SCALE 0 2 1:250 12m

CAD FILENAME 100PL-ROCKWELL-DF1_21-1067.DWG
DATE 2022-12-08
FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

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

PLAN

ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3
DF1

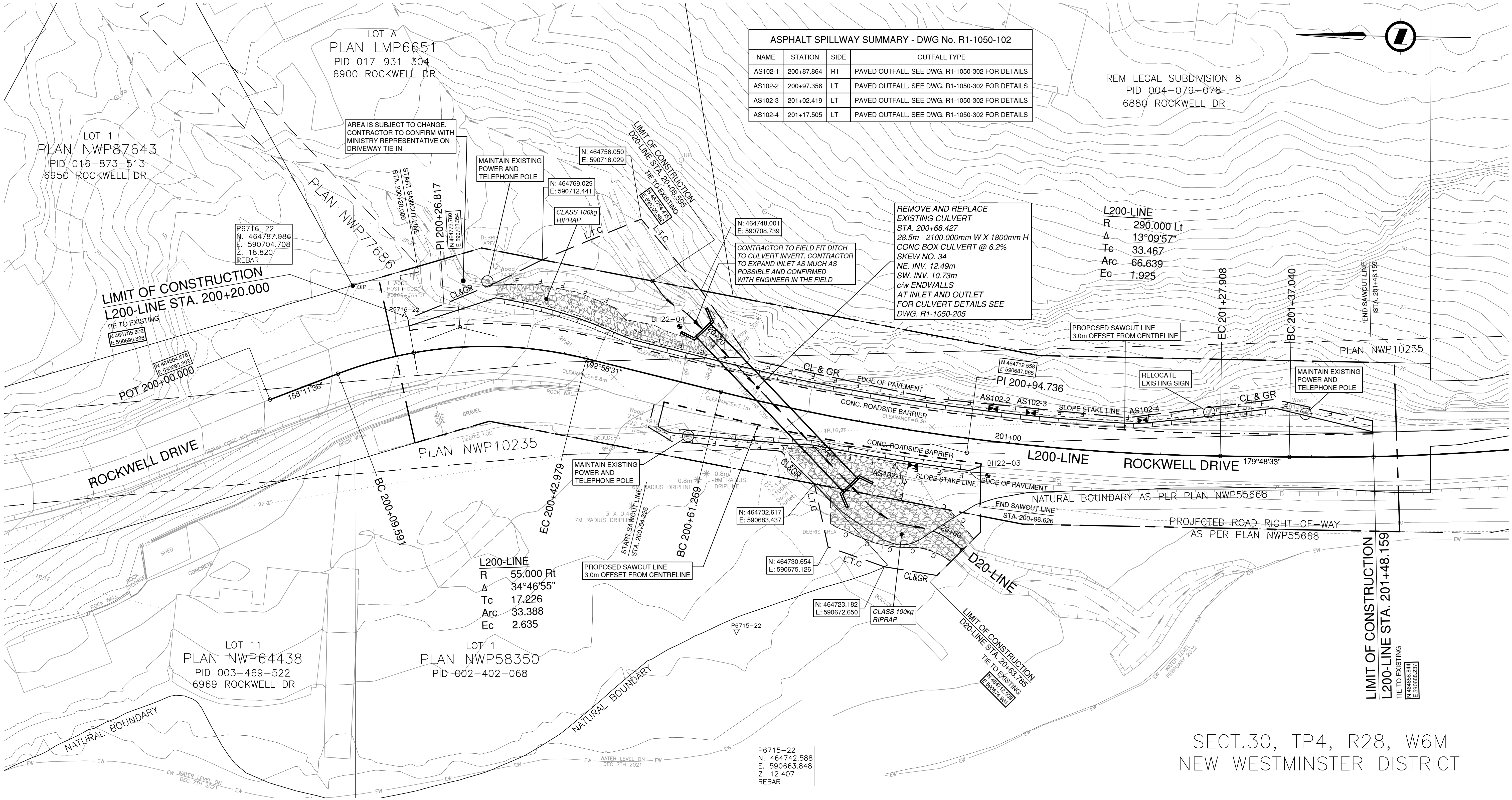
R.F. BINNIE & ASSOCIATES LTD.
EGBC PERMIT TO PRACTICE NUMBER 1001128

MICHAEL CARREIRA
ENGINEER OF RECORD
DATE

DESIGNED	J.T. / A.M.	DATE	DEC. 2022
QUALITY CONTROL	M.C.	DATE	DEC. 2022
QUALITY ASSURANCE	A.M.	DATE	DEC. 2022
DRAWN	J.T.	DATE	DEC. 2022

PROJECT NUMBER	REG	DRAWING NUMBER	REV
14045	1	R1-1050-101	

Dec. 8, 2022 - 05:18 PM P:\2021\21-1067\00 - CAD Files\DF-ROCKWELL_DF1\Drawing\Production\100_Plan\100PL-Rockwell-DF1_21-1067


LOT A
PLAN LMP6651
PID 017-931-304
6900 ROCKWELL DR
LOT 1
PLAN NWP87643
PID 016-873-513
6950 ROCKWELL DR
PLAN NWP77686
REM LEGAL SUBDIVISION 8
PID 004-079-078
6880 ROCKWELL DR
AREA IS SUBJECT TO CHANGE. CONTRACTOR TO CONFIRM WITH MINISTRY REPRESENTATIVE ON DRIVEWAY TIE-IN
MAINTAIN EXISTING POWER AND TELEPHONE POLE
CLASS 100kg RIPRAP
LIMIT OF CONSTRUCTION D20-LINE STA. 20+08.595 TIE TO EXISTING
CONTRACTOR TO FIELD FIT DITCH TO CULVERT INVERT. CONTRACTOR TO EXPAND INLET AS MUCH AS POSSIBLE AND CONFIRMED WITH ENGINEER IN THE FIELD
REMOVE AND REPLACE EXISTING CULVERT STA. 200+68.427 28.5m - 2100.000mm W X 1800mm H CONC BOX CULVERT @ 6.2% SKEW NO. 34 NE. INV. 12.49m SW. INV. 10.73m c/w ENDWALLS AT INLET AND OUTLET FOR CULVERT DETAILS SEE DWG. R1-1050-205
L200-LINE R 290.000 Lt Δ 13°09'57" Tc 33.467 Arc 66.639 Ec 1.925
P6716–22 N. 464787.086 E. 590704.708 Z. 18.820 REBAR
LIMIT OF CONSTRUCTION L200-LINE STA. 200+20.000 TIE TO EXISTING
POT 200+00.000
PI 200+26.817
PI 200+94.736
EC 201+27.908
BC 201+37.040
PROPOSED SAWCUT LINE 3.0m OFFSET FROM CENTRELINE
RELOCATE EXISTING SIGN
ROCKWELL DRIVE
PLAN NWP10235
L200-LINE
D20-LINE
NATURAL BOUNDARY AS PER PLAN NWP55668
PROJECTED ROAD RIGHT–OF–WAY AS PER PLAN NWP55668
END SAWCUT LINE STA. 200+96.626
BC 200+09.591
EC 200+42.979
BC 200+61.269
L200-LINE R 55.000 Rt Δ 34°46'55" Tc 17.226 Arc 33.388 Ec 2.635
LOT 11
PLAN NWP64438
PID 003-469-522
6969 ROCKWELL DR
LOT 1
PLAN NWP58350
PID 002-402-068
LIMIT OF CONSTRUCTION D20-LINE STA. 20+63.785 TIE TO EXISTING
LIMIT OF CONSTRUCTION L200-LINE STA. 201+48.159 TIE TO EXISTING
NATURAL BOUNDARY
P6715–22 N. 464742.588 E. 590663.848 Z. 12.407 REBAR
SECT.30, TP4, R28, W6M
NEW WESTMINSTER DISTRICT

ASPHALT SPILLWAY SUMMARY - DWG No. R1-1050-102

NAME	STATION	SIDE	OUTFALL TYPE
AS102-1	200+87.864	RT	PAVED OUTFALL. SEE DWG. R1-1050-302 FOR DETAILS
AS102-2	200+97.356	LT	PAVED OUTFALL. SEE DWG. R1-1050-302 FOR DETAILS
AS102-3	201+02.419	LT	PAVED OUTFALL. SEE DWG. R1-1050-302 FOR DETAILS
AS102-4	201+17.505	LT	PAVED OUTFALL. SEE DWG. R1-1050-302 FOR DETAILS

CONSTRUCTION NOTES:

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FOR PLANS SEE DWG. R1-1050-101 to 103

FOR PROFILES AND CULVERT SECTIONS SEE DWG. R1-1050-201 to 206

FOR TYPICAL SECTIONS SEE DWG. R1-1050-301 to 304

FOR GEOMETRICS, LANING SIGNING, AND PAVEMENT MARKINGS SEE DWG. R1-1050-401 to 403

DRAFT

CLEARING AND GRUBBING TOTAL THIS SHEET: 0.0928 ha

100% DETAILED DESIGN - DEC. 9, 2022

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R.F. BINNIE & ASSOCIATES LTD. 300 - 4940 Canada Way, Burnaby, BC V5G 4K6 TEL 604 420 1721 BINNIE.com

SCALE 0 2 1:250 12m

CAD FILENAME 100PL-ROCKWELL-DF2_21-1067.DWG
DATE 2022-12-08
FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

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

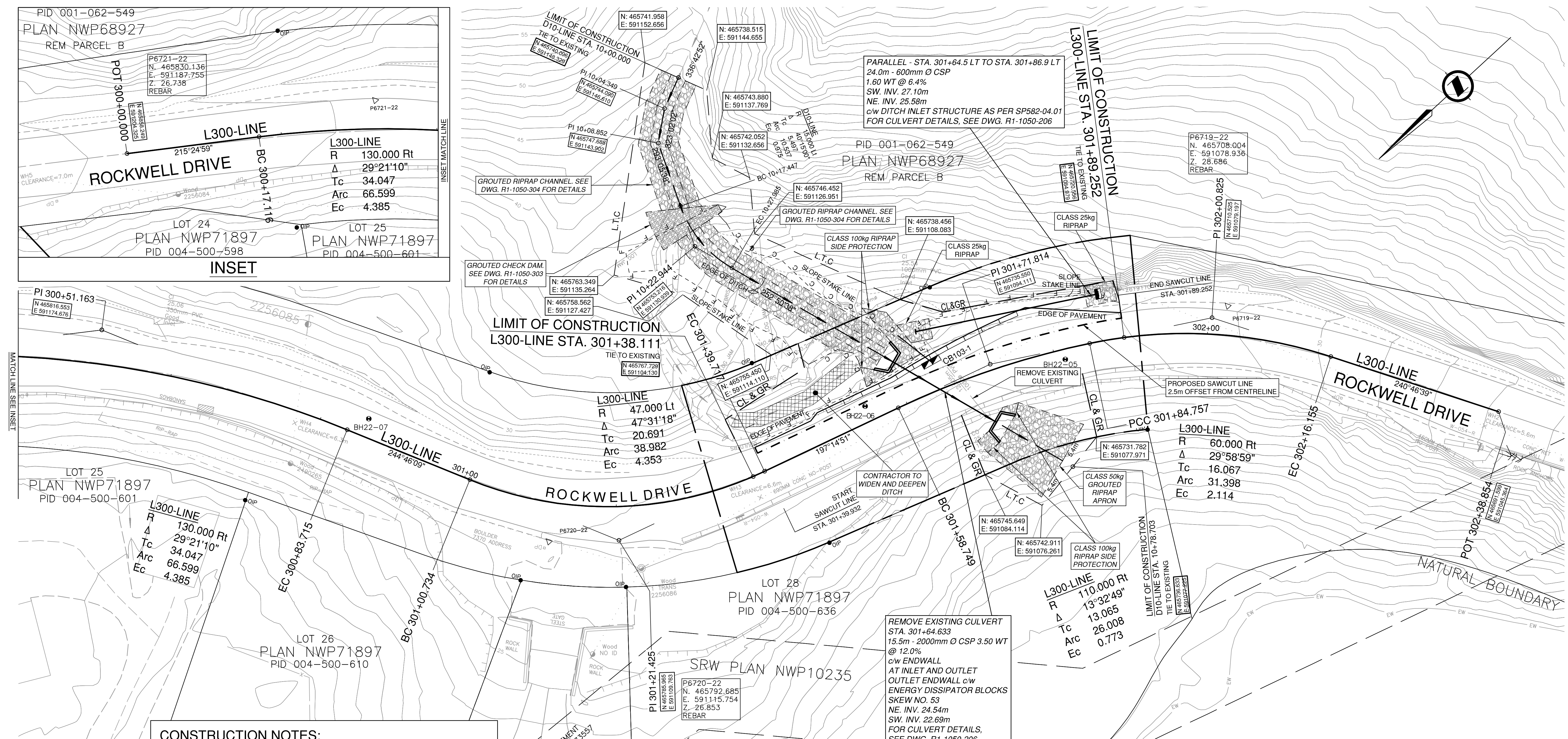
PLAN
ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3
DF2

R.F. BINNIE & ASSOCIATES LTD. EGBC PERMIT TO PRACTICE NUMBER 1001128

DESIGNED	J.T. / A.M.	DATE DEC. 2022
QUALITY CONTROL	M.C.	DATE DEC. 2022
QUALITY ASSURANCE	A.M.	DATE DEC. 2022
DRAWN	J.T.	DATE DEC. 2022

MICHAEL CARREIRA
ENGINEER OF RECORD
DATE

PROJECT NUMBER	REG	DRAWING NUMBER	REV
14045	1	R1-1050-102	



INSET
ROCKWELL DRIVE
L300-LINE
PLAN NWP68927
REM PARCEL B
PID 001-062-549
LOT 24 PLAN NWP71897 PID 004-500-598
LOT 25 PLAN NWP71897 PID 004-500-601
LOT 26 PLAN NWP71897 PID 004-500-610
LOT 28 PLAN NWP71897 PID 004-500-636
SRW PLAN NWP10235
NATURAL BOUNDARY
LIMIT OF CONSTRUCTION L300-LINE STA. 301+38.111
LIMIT OF CONSTRUCTION L300-LINE STA. 301+89.252
LIMIT OF CONSTRUCTION D10-LINE STA. 10+00.000
LIMIT OF CONSTRUCTION D10-LINE STA. 10+78.703
PARALLEL - STA. 301+64.5 LT TO STA. 301+86.9 LT
24.0m - 600mm Ø CSP
1.60 WT @ 6.4%
SW. INV. 27.10m
NE. INV. 25.58m
c/w DITCH INLET STRUCTURE AS PER SP582-04.01
FOR CULVERT DETAILS, SEE DWG. R1-1050-206
REMOVE EXISTING CULVERT
STA. 301+64.633
15.5m - 2000mm Ø CSP 3.50 WT @ 12.0%
c/w ENDWALL AT INLET AND OUTLET
OUTLET ENDWALL c/w ENERGY DISSIPATOR BLOCKS
SKEW NO. 53
NE. INV. 24.54m
SW. INV. 22.69m
FOR CULVERT DETAILS, SEE DWG. R1-1050-206
GROUTED RIPRAP CHANNEL. SEE DWG. R1-1050-304 FOR DETAILS
GROUTED CHECK DAM. SEE DWG. R1-1050-303 FOR DETAILS
CLASS 100kg RIPRAP SIDE PROTECTION
CLASS 25kg RIPRAP
CLASS 50kg GROUTED RIPRAP APRON
CONTRACTOR TO WIDEN AND DEEPEN DITCH
REMOVE EXISTING CULVERT
PROPOSED SAWCUT LINE 2.5m OFFSET FROM CENTRELINE
START SAWCUT LINE STA. 301+39.932
END SAWCUT LINE STA. 301+89.252
EDGE OF PAVEMENT
CB103-1
BH22-05
BH22-06
BH22-07
L300-LINE R 47.000 Lt Δ 47°31'18" Tc 20.691 Arc 38.982 Ec 4.353
L300-LINE R 60.000 Rt Δ 29°58'59" Tc 16.067 Arc 31.398 Ec 2.114
L300-LINE R 110.000 Rt Δ 13°32'49" Tc 13.065 Arc 26.008 Ec 0.773
L300-LINE R 130.000 Rt Δ 29°21'10" Tc 34.047 Arc 66.599 Ec 4.385
P6721-22 N. 465830.136 E. 591187.755 Z. 26.738 REBAR
P6719-22 N. 465708.004 E. 591078.936 Z. 28.686 REBAR
P6720-22 N. 465792.685 E. 591115.754 Z. 26.853 REBAR
MATCH LINE SEE INSET
INSET MATCH LINE

CONSTRUCTION NOTES:

1. CLEARING AND GRUBBING SHALL BE FROM THE EXISTING EDGE OF PAVEMENT TO THE RIGHT OF WAY OR TLCA BOUNDARY UNLESS OTHERWISE NOTED.
2. UNDERGROUND UTILITIES AS SHOWN MAY BE INCOMPLETE OR INACCURATE.
3. THE CONTRACTOR MUST FIELD VERIFY UTILITY LOCATIONS PRIOR TO COMMENCING WORK.
4. ADEQUATE CLEARANCE HAS BEEN PROVIDED TO CONVEY THE DESIGN FLOOD EVENT PER RECOMMENDATION OF SUPPLEMENT TO TAC GEOMETRIC DESIGN GUIDE, SECTION 1040.03. HOWEVER, THE LACK OF ANY DEBRIS CONTROL STRUCTURE UPSTREAM IN THE WATERSHED MAY RESULT IN FUTURE DEBRIS FLOW OVERWHELMING THE INLET BASIN OR FAILURE OF THE STRUCTURE.

CATCH BASIN NOTES :

1. THE LOCATION AND ELEVATION OF CATCH BASIN FRAMES SHALL BE CONFIRMED BY THE CONTRACTOR BY CALCULATION METHOD PRIOR TO INSTALLATION.
2. THE LOCATION OF MoTI CATCH BASINS IN RELATION TO CONCRETE ROADSIDE BARRIER SHALL BE AS SHOWN ON THIS DRAWING. ELEVATIONS AND COORDINATES GIVEN IN THE TABLES ON THIS DRAWING ARE AT CENTRE OF CATCH BASIN FRAME RECESSED 40mm BELOW FINISHED PAVEMENT ELEVATION.
3. DIGITAL DRAWING INFORMATION SHALL NOT BE USED TO OBTAIN COORDINATES FOR THE LAYOUT OF CATCH BASINS. (CATCH BASIN SYMBOL SIZE IS NOT TRUE TO SCALE).
4. CATCH BASIN LEAD PIPE LENGTHS ARE APPROXIMATE ONLY AND ROUNDED OFF TO THE NEAREST METRE. PAYMENT WILL BE MADE ONLY FOR ACTUAL LENGTHS MEASURED DURING CONSTRUCTION.
5. OUTLET PIPES MAY HAVE TO BE FIELD DETERMINED WITH BENDS AND FITTINGS USED ON CATCH BASIN LEAD PIPES.

CATCH BASIN SUMMARY - DWG No. R1-1050-103

NAME	STATION	SIDE	OFFSET (m)	RIM ELEV. (m)	INVERT (m)	CB LEAD	CB TYPE	GRATE TYPE
CB103-1	301+64.900	LT	3.69	27.07	26.17 E	5.5m - 250mm Ø PVC	SP582-02.01 WITH SP582-05.04	SP582-05.02 "L" AND "R"

FOR PLANS SEE DWG. R1-1050-101 to 103

FOR PROFILES AND CULVERT SECTIONS SEE DWG. R1-1050-201 to 206

FOR TYPICAL SECTIONS SEE DWG. R1-1050-301 to 304

FOR GEOMETRICS, LANING SIGNING, AND PAVEMENT MARKINGS SEE DWG. R1-1050-401 to 403

DRAFT

CLEARING AND GRUBBING
TOTAL THIS SHEET: 0.1099 ha

100% DETAILED DESIGN - DEC. 9, 2022

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BRITISH COLUMBIA

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

SCALE 0 2 1:250 12m

CAD FILENAME 100PL-ROCKWELL-DF3_21-1067.DWG
DATE 2022-12-08
FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

PLAN

ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3
DF3

R.F. BINNIE & ASSOCIATES LTD.
EGBC PERMIT TO PRACTICE
NUMBER 1001128

DESIGNED N.B. / A.M. DATE DEC. 2022
QUALITY CONTROL M.C. DATE DEC. 2022
QUALITY ASSURANCE A.M. DATE DEC. 2022
DRAWN N.B. DATE DEC. 2022

MICHAEL CARREIRA
ENGINEER OF RECORD
DATE

PROJECT NUMBER	REG	DRAWING NUMBER	REV
14045	1	R1-1050-103	

L100-LINE (ROCKWELL DRIVE) - DESIGN SPEED 40 km/h

FOR PLANS
SEE DWG. R1-1050-101 to 103

FOR PROFILES AND
CULVERT SECTIONS
SEE DWG. R1-1050-201 to 206

FOR TYPICAL SECTIONS
SEE DWG. R1-1050-301 to 304

FOR GEOMETRICS, LANING
SIGNING, AND PAVEMENT MARKINGS
SEE DWG. R1-1050-401 to 403

DRAFT

NOTES:

1. EMBANKMENT FIGURES SHOWN ARE COMPACTED QUANTITIES
2. EXCAVATION FIGURES SHOWN ARE NEAT LINE UNADJUSTED QUANTITIES

VERTICAL PROFILE IS FOR INFORMATION ONLY.
MATCH EXISTING GROUND ELEVATION AT SAWCUT LOCATION.
CONTRACTOR TO CONFIRM ELEVATIONS ALONG SAWCUT LINE
PRIOR TO LAYOUT AND ADJUST GRADES ACCORDINGLY

100% DETAILED DESIGN - DEC. 9, 2022

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

SCALE
0 5 H 1:500 25m
0 0.5 V 1:50 2.5m

CAD FILENAME 200PR-ROCKWELL-DF1_21-1067.DWG
DATE 2022-12-08
FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

L100-LINE PROFILE

ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3
DF1

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DESIGNED J.T. / A.M. DATE DEC. 2022
QUALITY CONTROL M.C. DATE DEC. 2022
QUALITY ASSURANCE A.M. DATE DEC. 2022
DRAWN J.T. DATE DEC. 2022

MICHAEL CARREIRA
ENGINEER OF RECORD
DATE

PROJECT NUMBER	REG	DRAWING NUMBER	REV
14045	1	R1-1050-201	

Dec. 8, 2022 - 11:53 AM P:\2021\21-1067\00 - CAD Files\00-ROCKWELL_DF1\DrawingProduction\200_Profiles\200PR-Rockwell-DF1_21-1067

EXCAVATION m³	114	TOTAL:	114
EMBANKMENT m³	41	TOTAL:	41
STRIPPING m³	114	TOTAL:	114

	LEFT SIDE ASSUMED ELEVATIONS AT SAWCUT LINE	RIGHT SIDE ASSUMED ELEVATIONS AT SAWCUT LINE
200+20.000	18.848	
200+30.000	17.670	
200+40.000	16.486	
200+50.000	15.490	
200+54.326		14.961
200+60.000	14.753	14.599
200+70.000	14.174	14.015
200+80.000	13.665	13.545
200+90.000	13.324	13.200
200+96.626		13.131
201+00.000	13.233	
201+10.000	13.174	
201+20.000	13.153	
201+30.000	13.193	
201+40.000	13.226	
201+48.159	13.206	

L200-LINE (ROCKWELL DRIVE) - DESIGN SPEED 40 km/h

FOR PLANS
SEE DWG. R1-1050-101 to 103

FOR PROFILES AND
CULVERT SECTIONS
SEE DWG. R1-1050-201 to 206

FOR TYPICAL SECTIONS
SEE DWG. R1-1050-301 to 304

FOR GEOMETRICS , LANING
SIGNING, AND PAVEMENT MARKINGS
SEE DWG. R1-1050-401 to 403

DRAFT

NOTES:

1. EMBANKMENT FIGURES SHOWN ARE COMPACTED QUANTITIES
2. EXCAVATION FIGURES SHOWN ARE NEAT LINE UNADJUSTED QUANTITIES

VERTICAL PROFILE IS FOR INFORMATION ONLY.
MATCH EXISTING GROUND ELEVATION AT SAWCUT LOCATION.
CONTRACTOR TO CONFIRM ELEVATIONS ALONG SAWCUT LINE
PRIOR TO LAYOUT AND ADJUST GRADES ACCORDINGLY

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SOUTH COAST REGION
HIGHWAY ENGINEERING AND GEOMATICS

SCALE 0 5 H 1:500 25m
0 0.5 V 1:50 2.5m

CAD FILENAME 200PR-ROCKWELL-DF2_21-1067.DWG
DATE 2022-12-08
FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

L200-LINE PROFILE
ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3
DF2

R.F. BINNIE & ASSOCIATES LTD.
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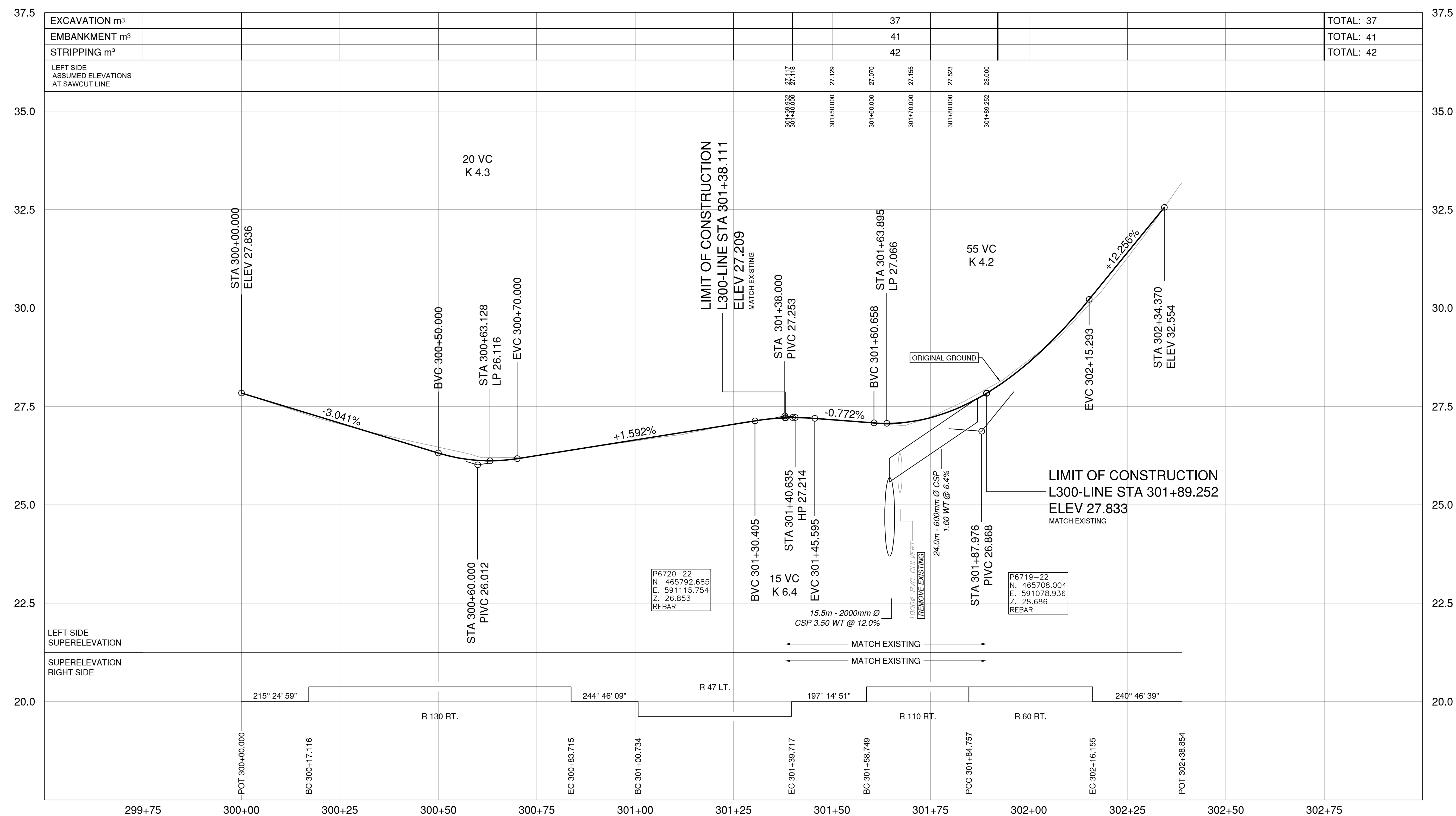
NUMBER 1001128

MICHAEL CARREIRA
ENGINEER OF RECORD
DATE

DESIGNED J.T. / A.M. DATE DEC. 2022
QUALITY CONTROL M.C. DATE DEC. 2022
QUALITY ASSURANCE A.M. DATE DEC. 2022
DRAWN J.T. DATE DEC. 2022

PROJECT NUMBER	REG	DRAWING NUMBER	REV
14045	1	R1-1050-202	

Dec. 8, 2022 - 11:56 AM P:\2021\21-1067\00 - CAD Files\00-ROCKWELL_DF2\DrawingProduction\200_Profiles\200PR-Rockwell-DF2_21-1067



L300-LINE (ROCKWELL DRIVE) - DESIGN SPEED 40 km/h

FOR PLANS
SEE DWG. R1-1050-101 to 103

FOR PROFILES AND
CULVERT SECTIONS
SEE DWG. R1-1050-201 to 206

FOR TYPICAL SECTIONS
SEE DWG. R1-1050-301 to 304

FOR GEOMETRICS, LANING
SIGNING, AND PAVEMENT MARKINGS
SEE DWG. R1-1050-401 to 403

DRAFT

NOTES:

1. EMBANKMENT FIGURES SHOWN ARE COMPACTED QUANTITIES
2. EXCAVATION FIGURES SHOWN ARE NEAT LINE UNADJUSTED QUANTITIES

VERTICAL PROFILE IS FOR INFORMATION ONLY.
MATCH EXISTING GROUND ELEVATION AT SAWCUT LOCATION.
CONTRACTOR TO CONFIRM ELEVATIONS ALONG SAWCUT LINE
PRIOR TO LAYOUT AND ADJUST GRADES ACCORDINGLY

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SCALE 0 5 H 1:500 25m / 0 0.5 V 1:50 2.5m

CAD FILENAME 200PR-ROCKWELL-DF3_21-1067.DWG
DATE 2022-12-08
FILE NUMBER 21-1067

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HIGHWAY ENGINEERING AND GEOMATICS

L300-LINE PROFILE

ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3
DF3

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QUALITY ASSURANCE	A.M.	DATE	DEC. 2022
DRAWN	N.B.	DATE	DEC. 2022

MICHAEL CARREIRA
ENGINEER OF RECORD
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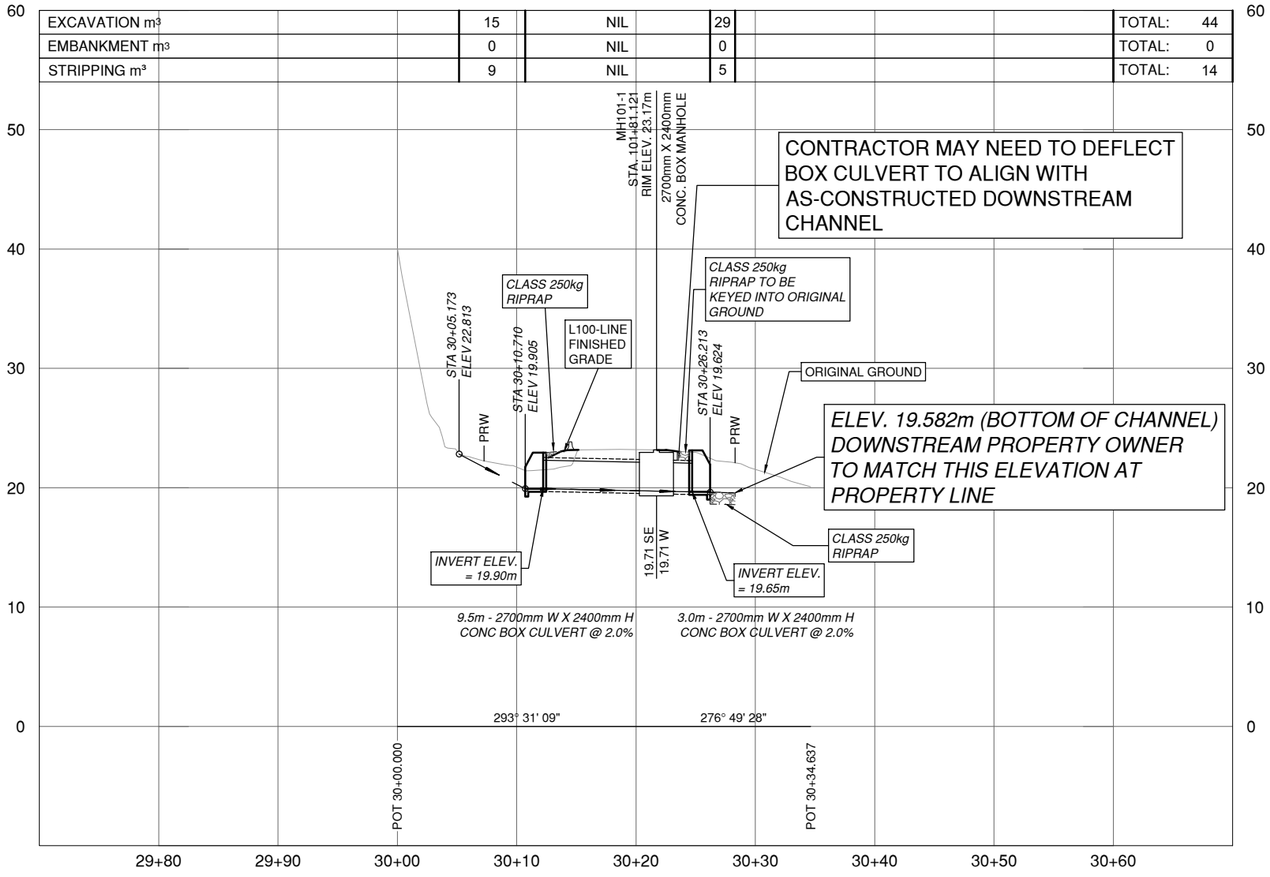
PROJECT NUMBER	REG	DRAWING NUMBER	REV
14045	1	R1-1050-203	

Dec. 8, 2022 - 04:57 PM P:\2021\21-1067\00 - CAD Files\00-ROCKWELL DF3\DrawingProduction\200_Profiles\200PR-Rockwell-DF3_21-1067

EXCAVATION m³	15	NIL	29		TOTAL:	44
EMBANKMENT m³	0	NIL	0		TOTAL:	0
STRIPPING m³	9	NIL	5		TOTAL:	14



FOR PLANS
SEE DWG. R1-1050-101 to 103

FOR PROFILES AND CULVERT SECTIONS
SEE DWG. R1-1050-201 to 206

FOR TYPICAL SECTIONS
SEE DWG. R1-1050-301 to 304

FOR GEOMETRICS , LANING SIGNING, AND PAVEMENT MARKINGS
SEE DWG. R1-1050-401 to 403

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SCALE 0 2 1:250 12m

CAD FILENAME 200PR-ROCKWELL-DF1_21-1067.DWG
DATE 2022-12-08
FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

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SOUTH COAST REGION
HIGHWAY ENGINEERING AND GEOMATICS

D30-LINE PROFILE

ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3
DF1

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ENGINEER OF RECORD
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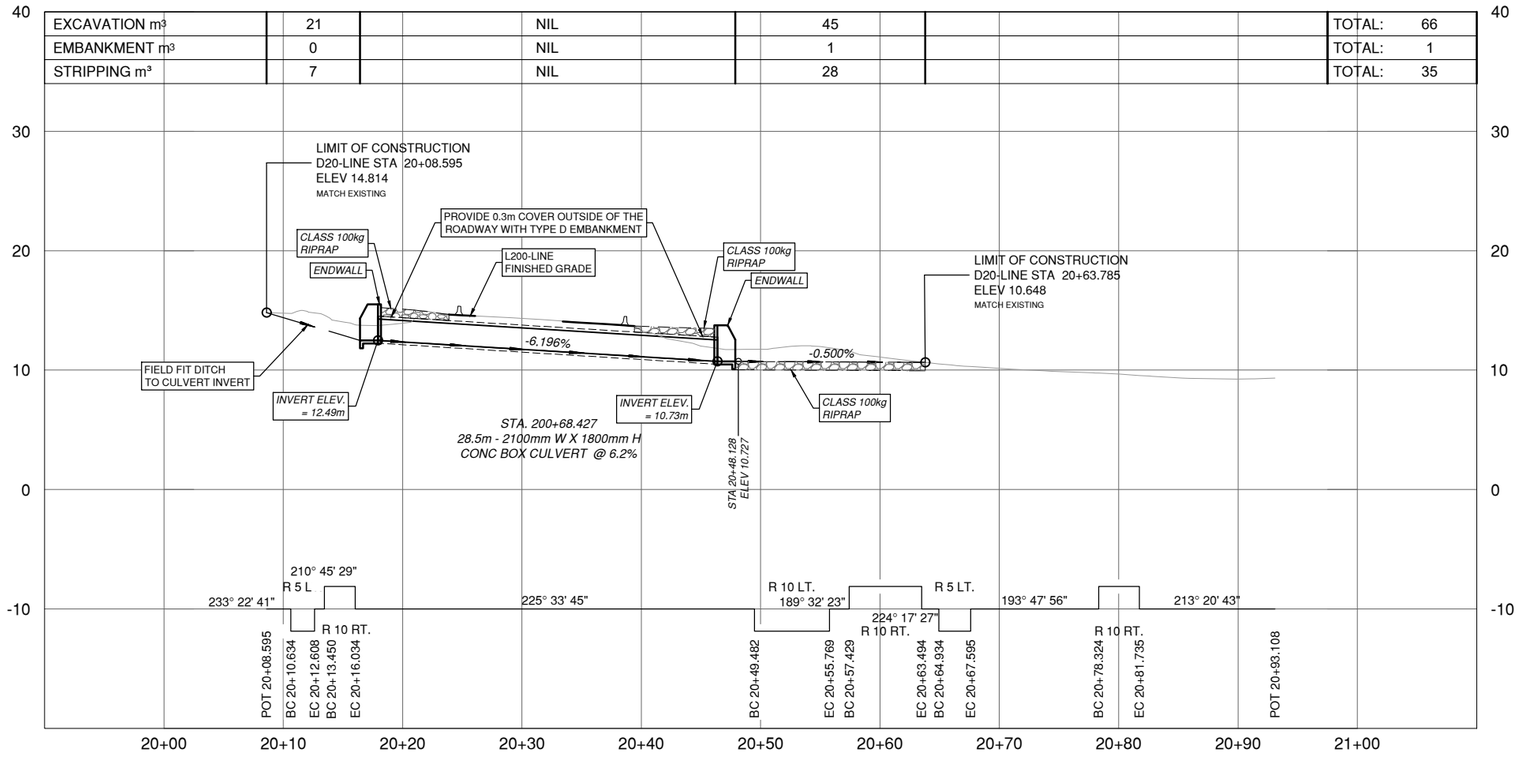
QUALITY CONTROL	M.C.	DEC. 2022
QUALITY ASSURANCE	A.M.	DEC. 2022
DRAWN	J.T.	DEC. 2022

PROJECT NUMBER	REG	DRAWING NUMBER	REV
14045	1	R1-1050-204	

EXCAVATION m³	21		NIL	45		TOTAL: 66
EMBANKMENT m³	0		NIL	1		TOTAL: 1
STRIPPING m³	7		NIL	28		TOTAL: 35



FOR PLANS
SEE DWG. R1-1050-101 to 103

FOR PROFILES AND CULVERT SECTIONS
SEE DWG. R1-1050-201 to 206

FOR TYPICAL SECTIONS
SEE DWG. R1-1050-301 to 304

FOR GEOMETRICS, LANING SIGNING, AND PAVEMENT MARKINGS
SEE DWG. R1-1050-401 to 403

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SCALE 0 2 1:250 12m

CAD FILENAME 200PR-ROCKWELL-DF2_21-1067.DWG
DATE 2022-12-08
FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

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D20-LINE PROFILE

ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3
DF2

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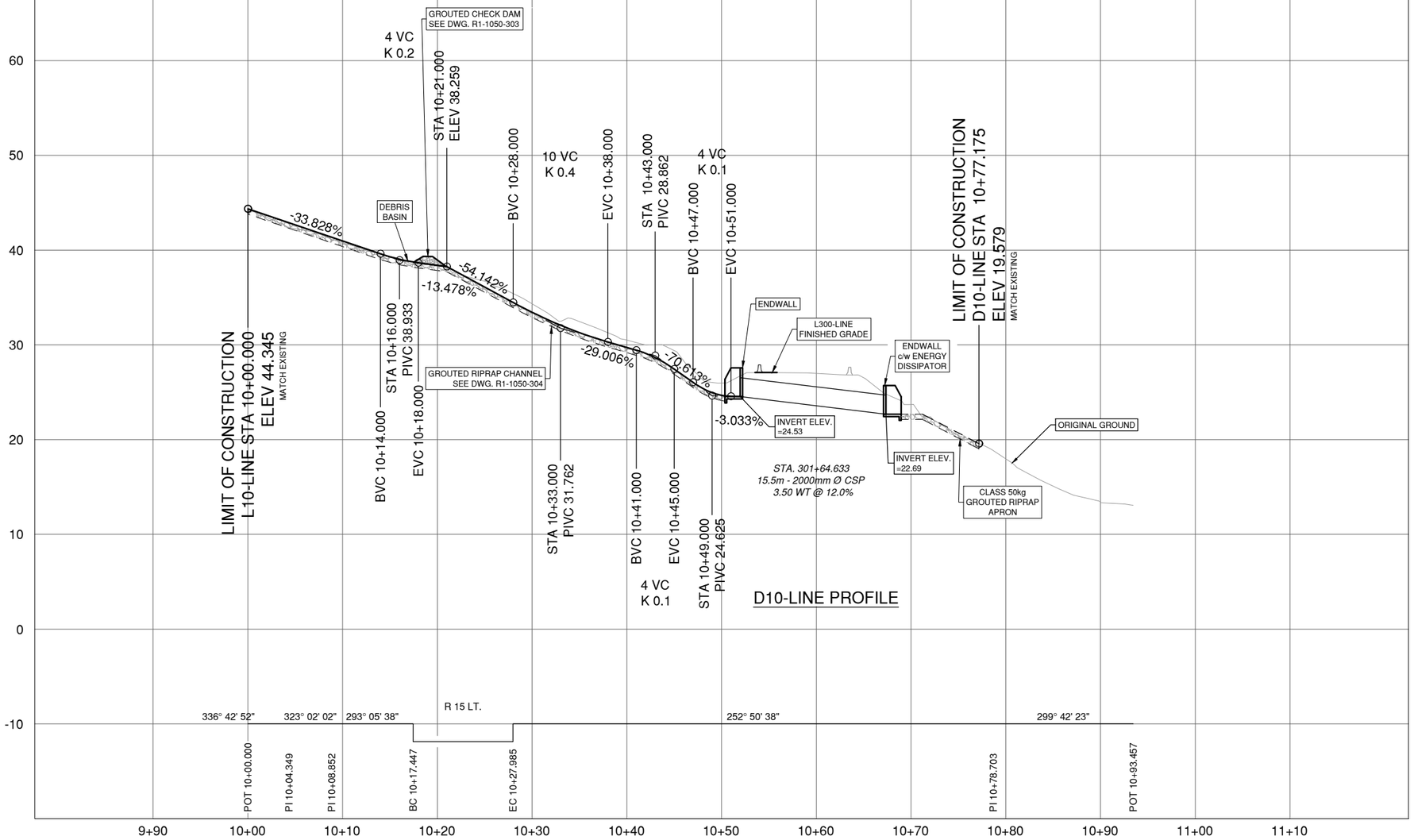
MICHAEL CARREIRA
ENGINEER OF RECORD
DATE

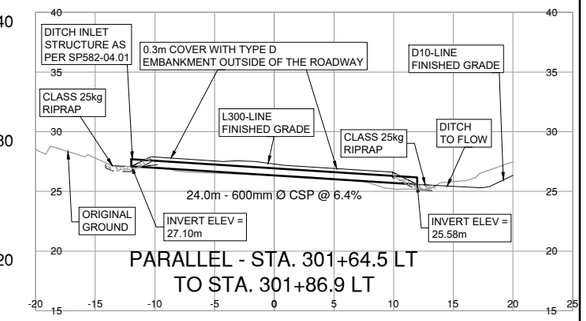
DESIGNED	J.T. / A.M.	DATE DEC. 2022
QUALITY CONTROL	M.C.	DATE DEC. 2022
QUALITY ASSURANCE	A.M.	DATE DEC. 2022
DRAWN	J.T.	DATE DEC. 2022

PROJECT NUMBER	REG	DRAWING NUMBER	REV
14045	1	R1-1050-205	

EXCAVATION m³	81	NIL	TOTAL: 81
EMBANKMENT m³	91	NIL	TOTAL: 91
STRIPPING m³	73	NIL	TOTAL: 73



D10-LINE PROFILE



PARALLEL - STA. 301+64.5 LT
TO STA. 301+86.9 LT

L300-LINE CULVERT SECTION

FOR PLANS
SEE DWG. R1-1050-101 to 103

FOR PROFILES AND
CULVERT SECTIONS
SEE DWG. R1-1050-201 to 206

FOR TYPICAL SECTIONS
SEE DWG. R1-1050-301 to 304

FOR GEOMETRICS, LANING
SIGNING, AND PAVEMENT MARKINGS
SEE DWG. R1-1050-401 to 403

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SCALE 0 2 1:250 12m

CAD FILENAME 200PR-ROCKWELL-DF3_21-1067.DWG
DATE 2022-12-08
FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

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

D10-LINE PROFILE AND CULVERT SECTION

ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3
DF3

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NUMBER 1001128

MICHAEL CARREIRA
ENGINEER OF RECORD
DATE

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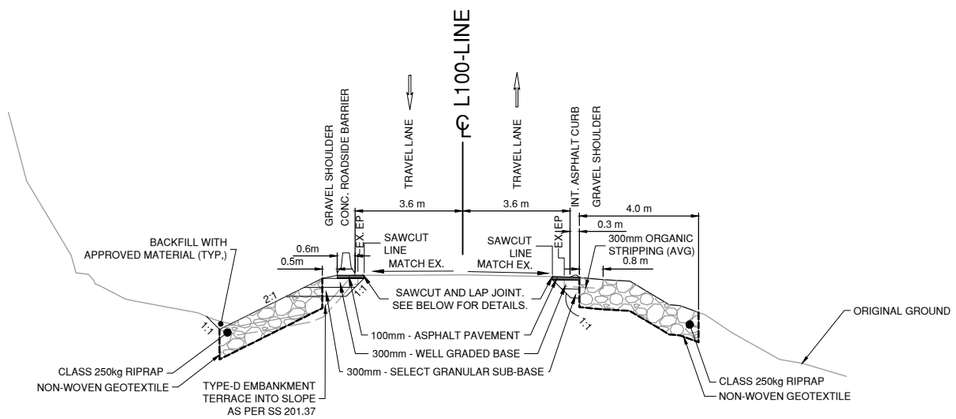
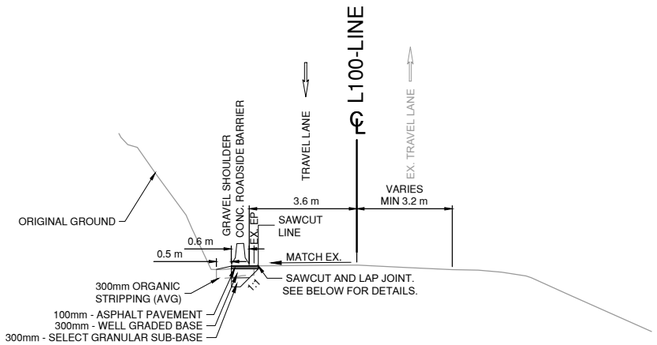
QUALITY CONTROL	M.C.	DEC. 2022
QUALITY ASSURANCE	A.M.	DEC. 2022
DRAWN	N.B.	DEC. 2022

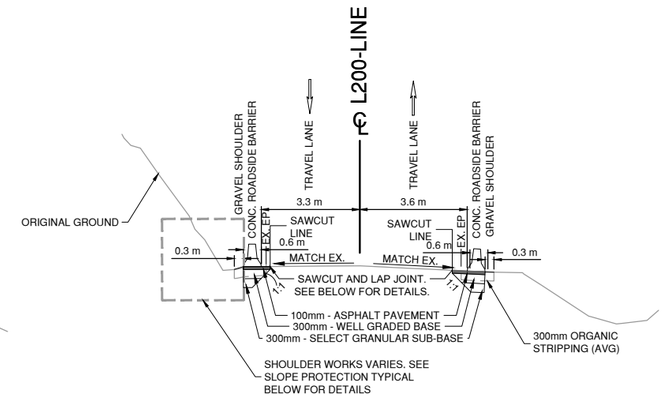
PROJECT NUMBER	REG	DRAWING NUMBER	REV
14045	1	R1-1050-206	



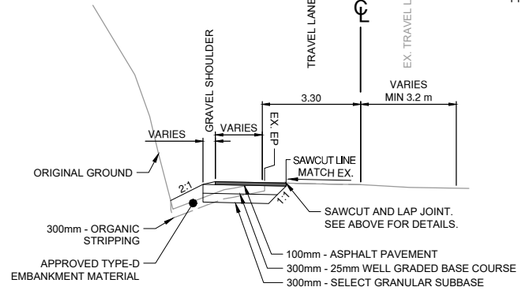
ROCKWELL DRIVE DF1 (L100-LINE)
TYPICAL SECTION - WIDENING BOTH SIDES
STA. 101+80.420 LT TO STA. 101+86.000 LT
STA. 101+69.710 RT TO STA. 101+88.888 RT



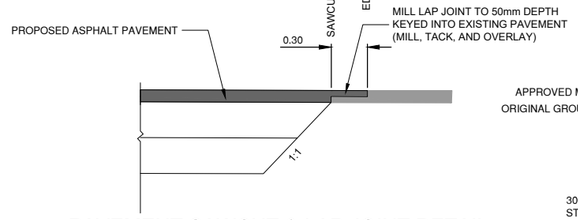
ROCKWELL DRIVE DF1 (L100-LINE)
TYPICAL SECTION - WIDENING WESTBOUND
STA. 101+43.112 LT TO STA. 101+80.420 LT
STA. 101+86.000 LT TO STA. 102+86.473 LT



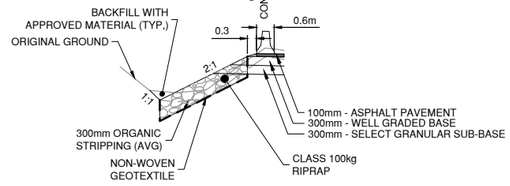
ROCKWELL DRIVE DF2 (L200-LINE)
TYPICAL SECTION - WIDENING



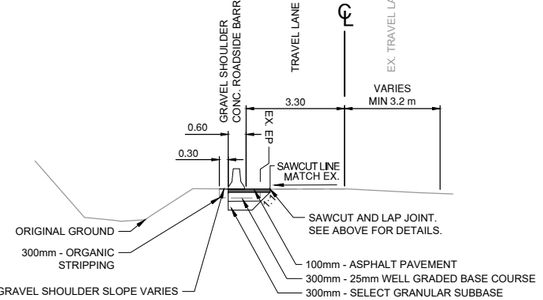
ROCKWELL DRIVE DF3 (L300-LINE) - OPEN SHOULDER
TYPICAL SECTION - WIDENING
STA. 301+39.932 TO STA. 301+49.788
STA. 301+78.000 TO STA. 301+89.253



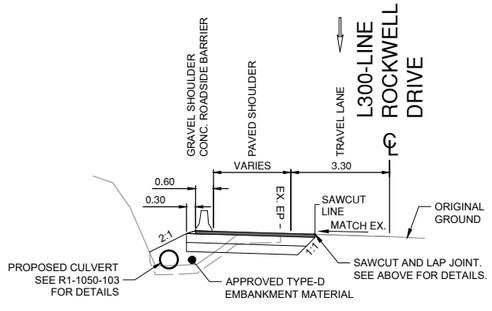
PAVEMENT SAWCUT & LAP JOINT DETAIL



ROCKWELL DRIVE DF2 (L200-LINE)
TYPICAL SECTION - SLOPE PROTECTION
STA. 200+30.750 TO STA. 200+48.115



ROCKWELL DRIVE DF3 (L300-LINE) - WITH BARRIER
TYPICAL SECTION - WIDENING
STA. 301+49.788 TO STA. 301+65.000



ROCKWELL DRIVE DF3 (L300-LINE) - PAVED SHOULDER
TYPICAL SECTION - WIDENING
STA. 301+65.000 TO STA. 301+78.000

FOR PLANS
SEE DWG. R1-1050-101 to 103

FOR PROFILES AND
CULVERT SECTIONS
SEE DWG. R1-1050-201 to 206

FOR TYPICAL SECTIONS
SEE DWG. R1-1050-301 to 304

FOR GEOMETRICS, LANING
SIGNING, AND PAVEMENT MARKINGS
SEE DWG. R1-1050-401 to 403

NOTES:

1. HYDROSEED ALL CUT AND FILL SLOPES.

DRAFT

100% DETAILED DESIGN - DEC. 9, 2022

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Burnaby, BC V5G 4K6
TEL 604 420 1721
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SCALE 0 1 1:100 5m

CAD FILENAME 300TS-ROCKWELL-DF1_21-1067.DWG
DATE 2022-12-08
FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

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

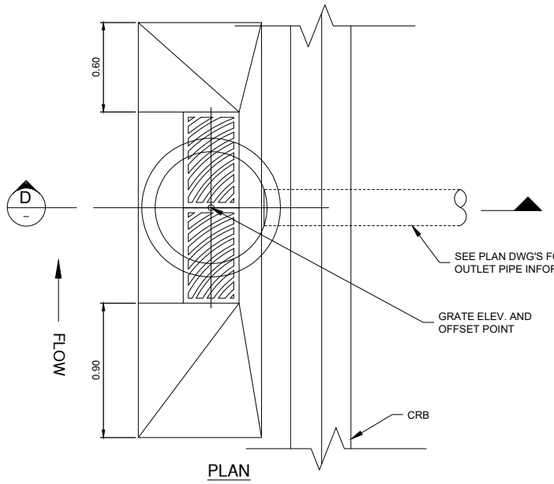
TYPICAL SECTIONS
ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3

R.F. BINNIE & ASSOCIATES LTD.
EGBC PERMIT TO PRACTICE
NUMBER 1001128

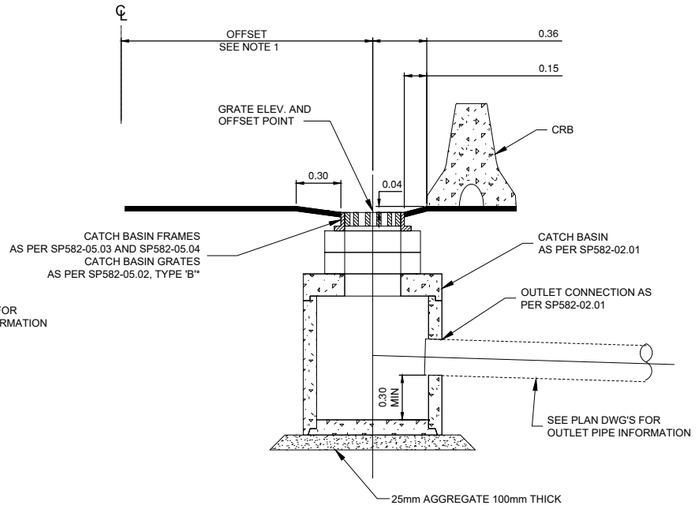
MICHAEL CARREIRA
ENGINEER OF RECORD
DATE

DESIGNED	J.T. / A.M.	DATE	DEC. 2022
QUALITY CONTROL	M.C.	DATE	DEC. 2022
QUALITY ASSURANCE	A.M.	DATE	DEC. 2022
DRAWN	J.T.	DATE	DEC. 2022

PROJECT NUMBER	REG	DRAWING NUMBER	REV
14045	1	R1-1050-301	



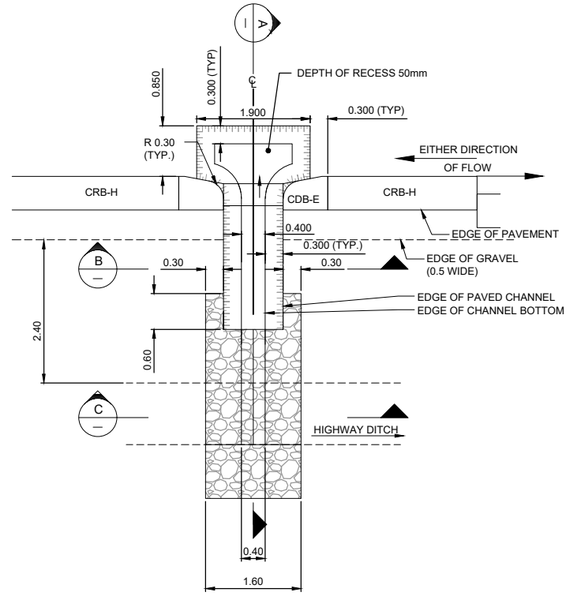
PLAN

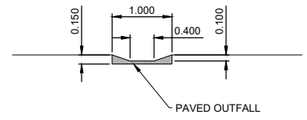


SECTION D

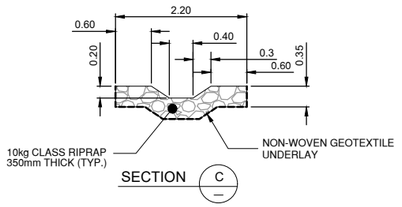
* SEE PLAN DRAWINGS FOR LOCATION AND TYPE

NOTE 1: SEE PLAN DRAWINGS R1-1050-101 AND R1-1050-103 FOR CATCH BASIN OFFSETS AND GRATE ELEVATIONS





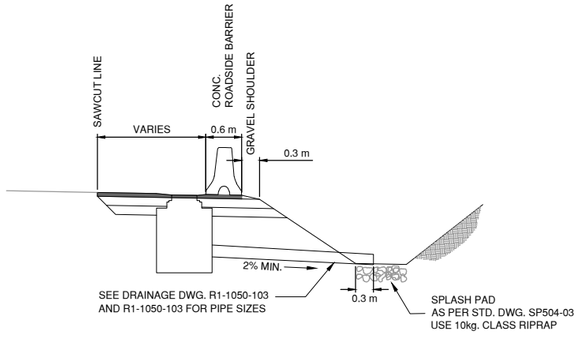
SECTION B



SECTION C

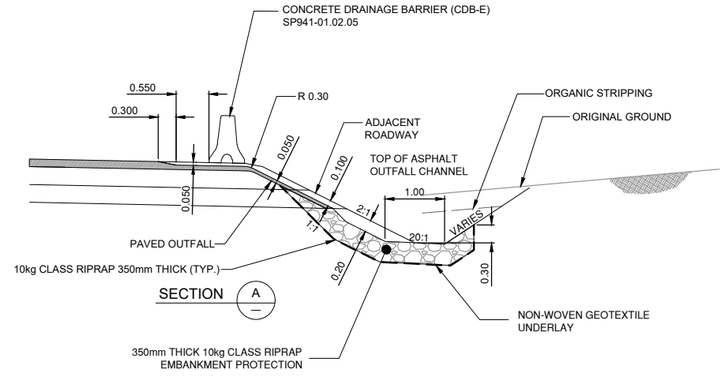
CATCH BASIN ADJACENT TO CONCRETE BARRIER

0 0.2 1:20 1m



CATCH BASIN WITH BARRIER AND PIPED OUTFALL TO DITCH

0 0.5 1:50 2.50m



PAVED OUTFALL IN CUT

LOCATIONS AS SHOWN ON PLAN DRAWINGS

0 0.5 1:50 2.50m

FOR PLANS
SEE DWG. R1-1050-101 to 103

FOR PROFILES AND
CULVERT SECTIONS
SEE DWG. R1-1050-201 to 206

FOR TYPICAL SECTIONS
SEE DWG. R1-1050-301 to 304

FOR GEOMETRICS , LANING
SIGNING, AND PAVEMENT MARKINGS
SEE DWG. R1-1050-401 to 403

NOTES:

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DRAFT

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BRITISH COLUMBIA

MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE
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HIGHWAY ENGINEERING AND GEOMATICS

SCALE AS SHOWN

CAD FILENAME 300TS-ROCKWELL-DF1_21-1067.DWG
DATE 2022-12-08
FILE NUMBER 21-1067

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D30-LINE PROFILE

ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3
DF1

R.F. BINNIE & ASSOCIATES LTD.
EGBC PERMIT TO PRACTICE
NUMBER 1001128

MICHAEL CARREIRA
ENGINEER OF RECORD
DATE

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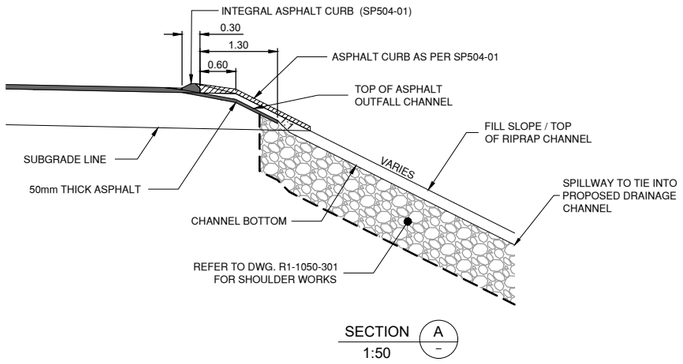
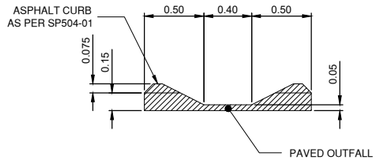
QUALITY ASSURANCE	A.M.	DATE	DEC. 2022
DRAWN	J.T.	DATE	DEC. 2022

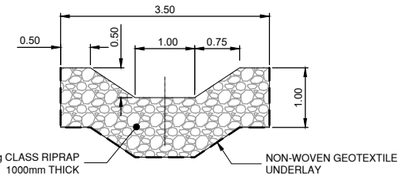
PROJECT NUMBER	REG	DRAWING NUMBER	REV
14045	1	R1-1050-302	



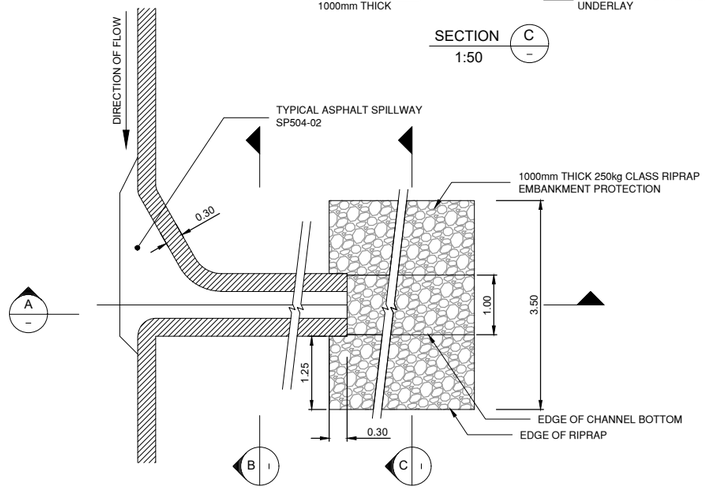
SECTION A
1:50



SECTION B
1:25

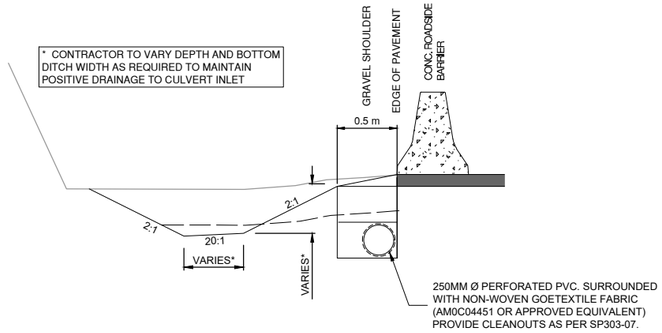


SECTION C
1:50



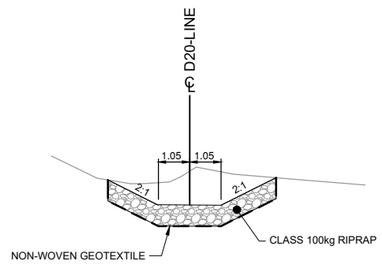
ASPHALT SPILLWAY WITH CURB & RIPRAP OUTFALL
(SEE PLANS FOR LOCATIONS)

0 0.5 1:50 2.5m



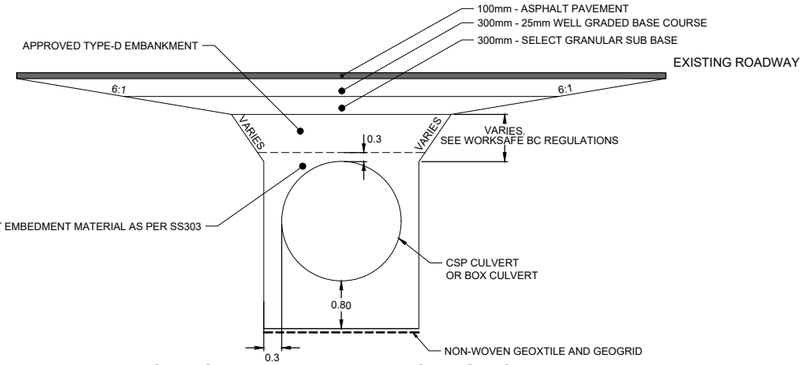
ROCKWELL DRIVE DF1 (L100-LINE)
FIELD FIT DITCH DETAIL

0 0.25 1:25 1.25m



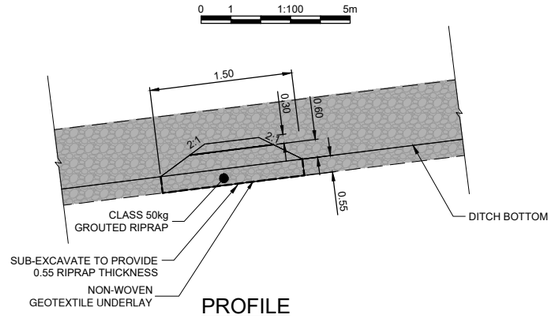
DF2 - D20-LINE
TYPICAL SECTION

0 1 1:100 5m

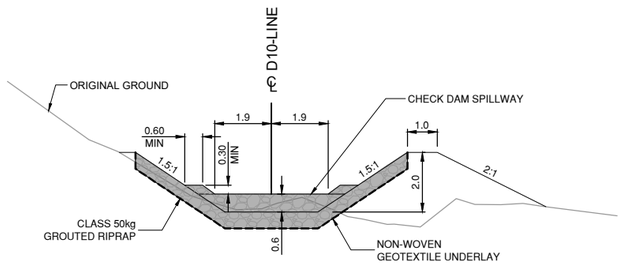


TRENCHING DETAIL WITHIN EXISTING ROADWAY

0 1 1:100 5m



PROFILE
N.T.S.



D10-LINE - DITCH CHECK DAM
SECTION A-A
N.T.S.

FOR PLANS
SEE DWG. R1-1050-101 to 103

FOR PROFILES AND
CULVERT SECTIONS
SEE DWG. R1-1050-201 to 206

FOR TYPICAL SECTIONS
SEE DWG. R1-1050-301 to 304

FOR GEOMETRICS , LANING
SIGNING, AND PAVEMENT MARKINGS
SEE DWG. R1-1050-401 to 403

NOTES:

1. HYDROSEED ALL CUT AND FILL SLOPES.

DRAFT

100% DETAILED DESIGN - DEC. 9, 2022

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

SCALE AS SHOWN
CAD FILENAME 300TS-ROCKWELL-DF1_21-1067.DWG
DATE 2022-12-08
FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

TYPICAL SECTIONS
ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3

R.F. BINNIE & ASSOCIATES LTD.
EGBC PERMIT TO PRACTICE
NUMBER 1001128

MICHAEL CARREIRA
ENGINEER OF RECORD
DATE

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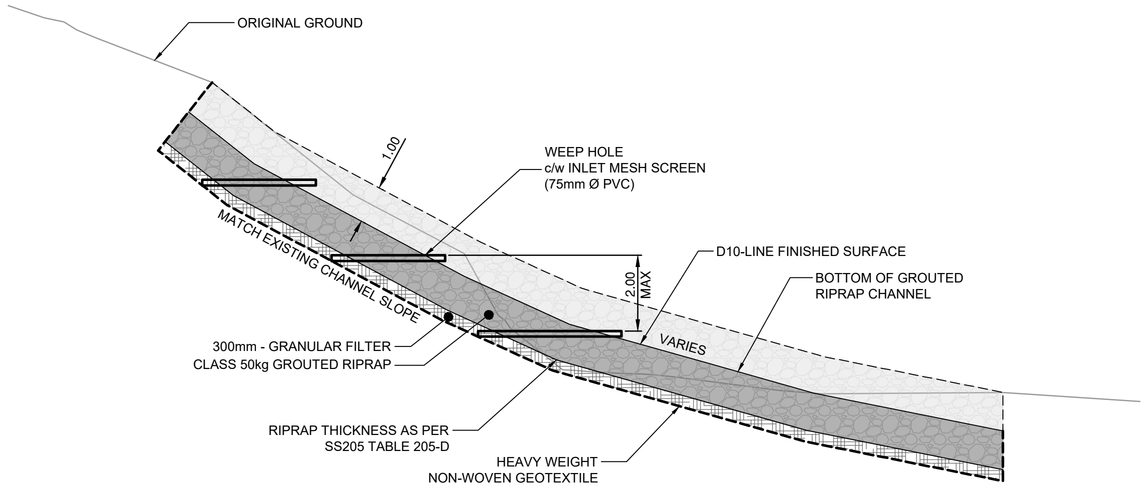
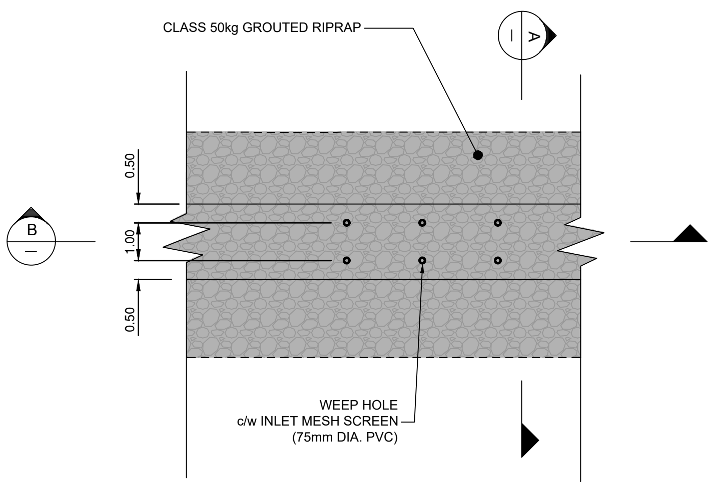
QUALITY ASSURANCE	A.M.	DEC. 2022
DRAWN	J.T.	DEC. 2022

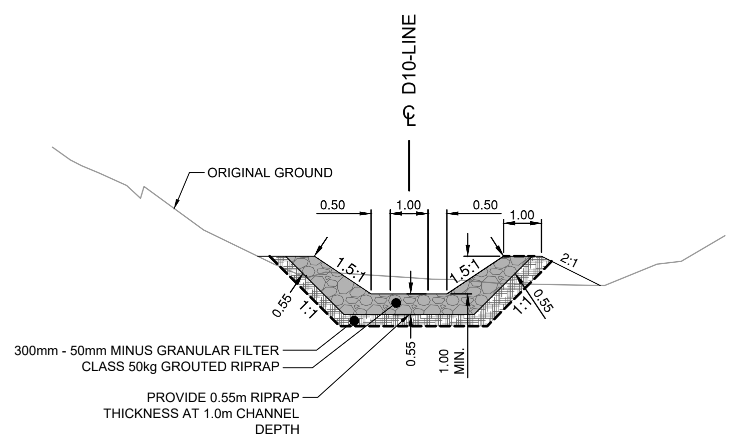
PROJECT NUMBER	REG	DRAWING NUMBER	REV
14045	1	R1-1050-303	



SECTION B-B
GROUTED RIPRAP CHANNEL

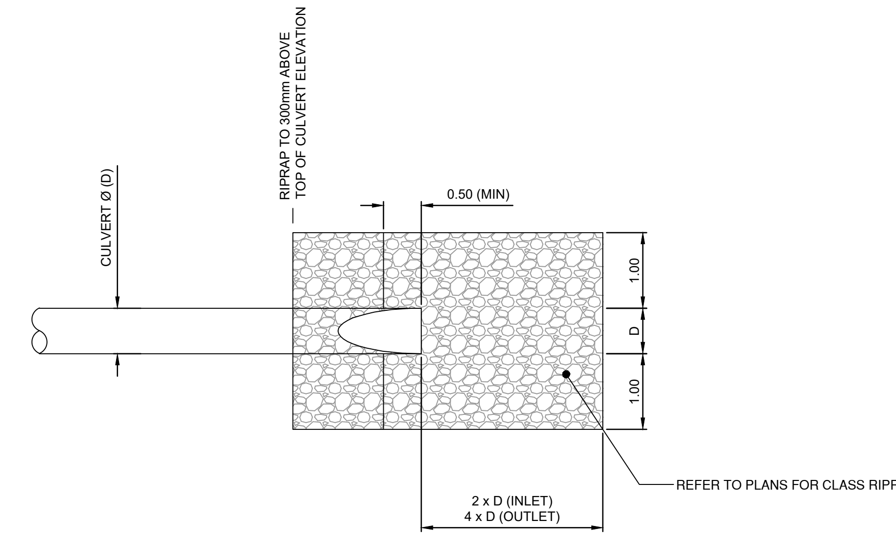


PLAN
GROUTED RIPRAP CHANNEL

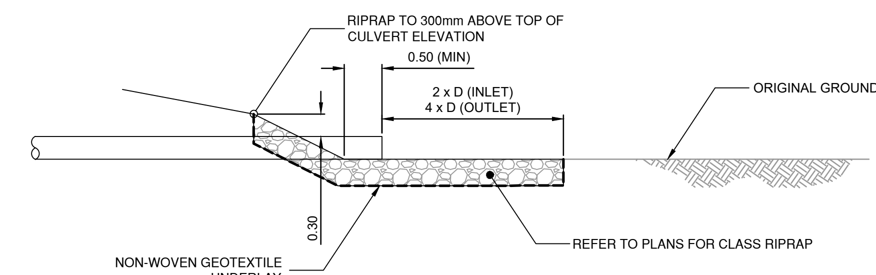


SECTION A-A
GROUTED RIPRAP CHANNEL

DF3 - D10-LINE
GROUTED RIPRAP CHANNEL DETAILS
STA. 10+19.500 TO STA. 10+51.959



CULVERT RIPRAP IN FILL (PLAN)



CULVERT RIPRAP IN FILL (SECTION)

FOR PLANS
SEE DWG. R1-1050-101 to 103

FOR PROFILES AND
CULVERT SECTIONS
SEE DWG. R1-1050-201 to 206

FOR TYPICAL SECTIONS
SEE DWG. R1-1050-301 to 304

FOR GEOMETRICS, LANING
SIGNING, AND PAVEMENT MARKINGS
SEE DWG. R1-1050-401 to 403

NOTES:

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DRAFT

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CAD FILENAME 300TS-ROCKWELL-DF1_21-1067.DWG
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TYPICAL SECTIONS
ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3

R.F. BINNIE & ASSOCIATES LTD.
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NUMBER 1001128

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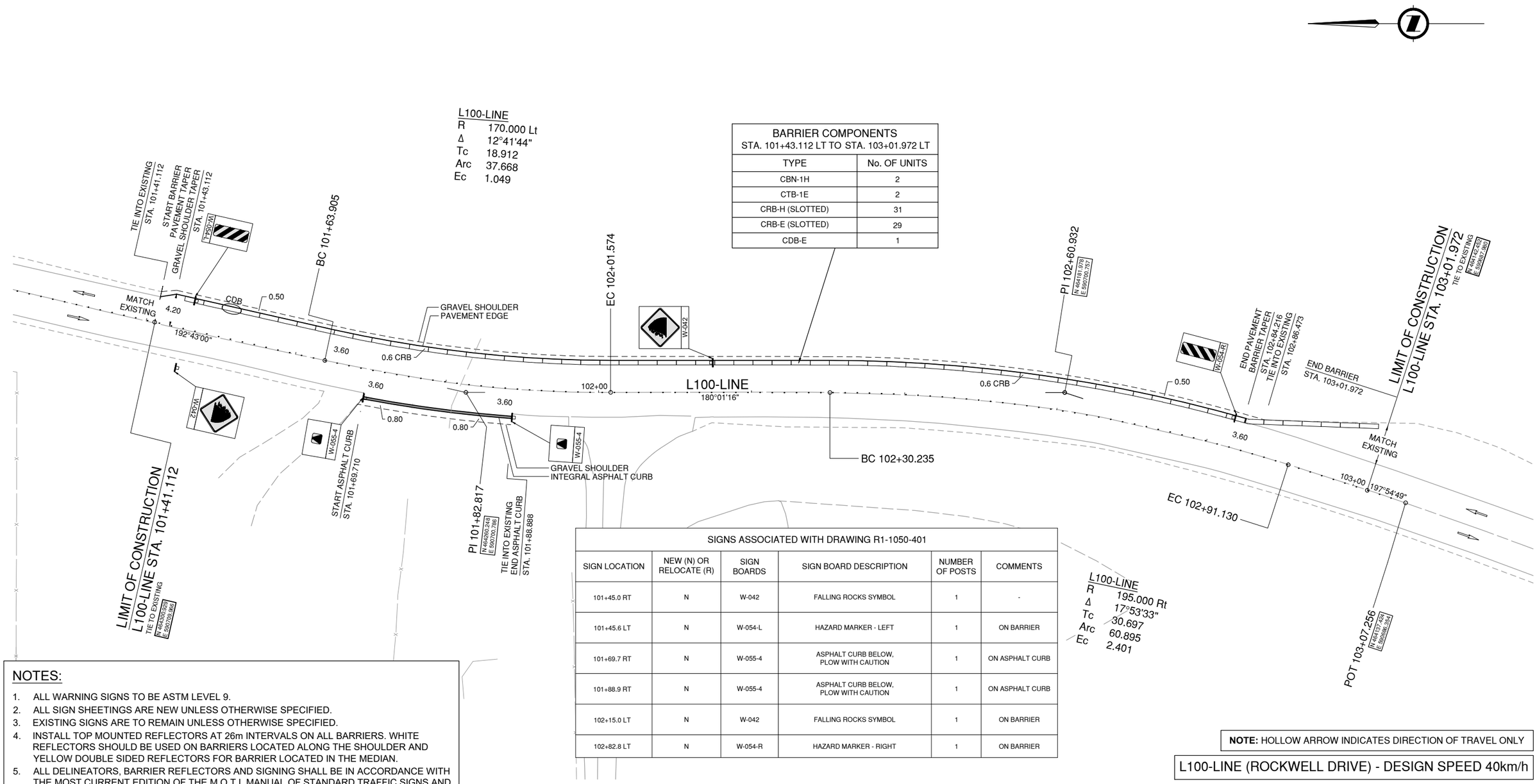
MICHAEL CARREIRA
ENGINEER OF RECORD
DATE

PROJECT NUMBER	REG	DRAWING NUMBER	REV
14045	1	R1-1050-304	



SIGNS ASSOCIATED WITH DRAWING R1-1050-401					
SIGN LOCATION	NEW (N) OR RELOCATE (R)	SIGN BOARDS	SIGN BOARD DESCRIPTION	NUMBER OF POSTS	COMMENTS
101+45.0 RT	N	W-042	FALLING ROCKS SYMBOL	1	-
101+45.6 LT	N	W-054-L	HAZARD MARKER - LEFT	1	ON BARRIER
101+69.7 RT	N	W-055-4	ASPHALT CURB BELOW, PLOW WITH CAUTION	1	ON ASPHALT CURB
101+88.9 RT	N	W-055-4	ASPHALT CURB BELOW, PLOW WITH CAUTION	1	ON ASPHALT CURB
102+15.0 LT	N	W-042	FALLING ROCKS SYMBOL	1	ON BARRIER
102+82.8 LT	N	W-054-R	HAZARD MARKER - RIGHT	1	ON BARRIER

NOTES:

1. ALL WARNING SIGNS TO BE ASTM LEVEL 9.
2. ALL SIGN SHEETINGS ARE NEW UNLESS OTHERWISE SPECIFIED.
3. EXISTING SIGNS ARE TO REMAIN UNLESS OTHERWISE SPECIFIED.
4. INSTALL TOP MOUNTED REFLECTORS AT 26m INTERVALS ON ALL BARRIERS. WHITE REFLECTORS SHOULD BE USED ON BARRIERS LOCATED ALONG THE SHOULDER AND YELLOW DOUBLE SIDED REFLECTORS FOR BARRIER LOCATED IN THE MEDIAN.
5. ALL DELINEATORS, BARRIER REFLECTORS AND SIGNING SHALL BE IN ACCORDANCE WITH THE MOST CURRENT EDITION OF THE M.O.T.I. MANUAL OF STANDARD TRAFFIC SIGNS AND PAVEMENT MARKINGS.
6. REMOVE EXISTING DELINEATOR POSTS WITHIN LIMITS OF CONSTRUCTION.

FOR PLANS
SEE DWG. R1-1050-101 to 103

FOR PROFILES AND CULVERT SECTIONS
SEE DWG. R1-1050-201 to 206

FOR TYPICAL SECTIONS
SEE DWG. R1-1050-301 to 304

FOR GEOMETRICS , LANING SIGNING, AND PAVEMENT MARKINGS
SEE DWG. R1-1050-401 to 403

DRAFT

NOTE: HOLLOW ARROW INDICATES DIRECTION OF TRAVEL ONLY

L100-LINE (ROCKWELL DRIVE) - DESIGN SPEED 40km/h

100% DETAILED DESIGN - DEC. 9, 2022

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SCALE 0 2 1:250 12m

CAD FILENAME 400GL-ROCKWELL-DF1 21-1067.DWG
DATE 2022-11-09
FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

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

GEOMETRICS, LANING, SIGNING, AND PAVEMENT MARKINGS

ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3
DF1

R.F. BINNIE & ASSOCIATES LTD.
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MICHAEL CARREIRA
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PROJECT NUMBER	REG	DRAWING NUMBER	REV
14045	1	R1-1050-401	

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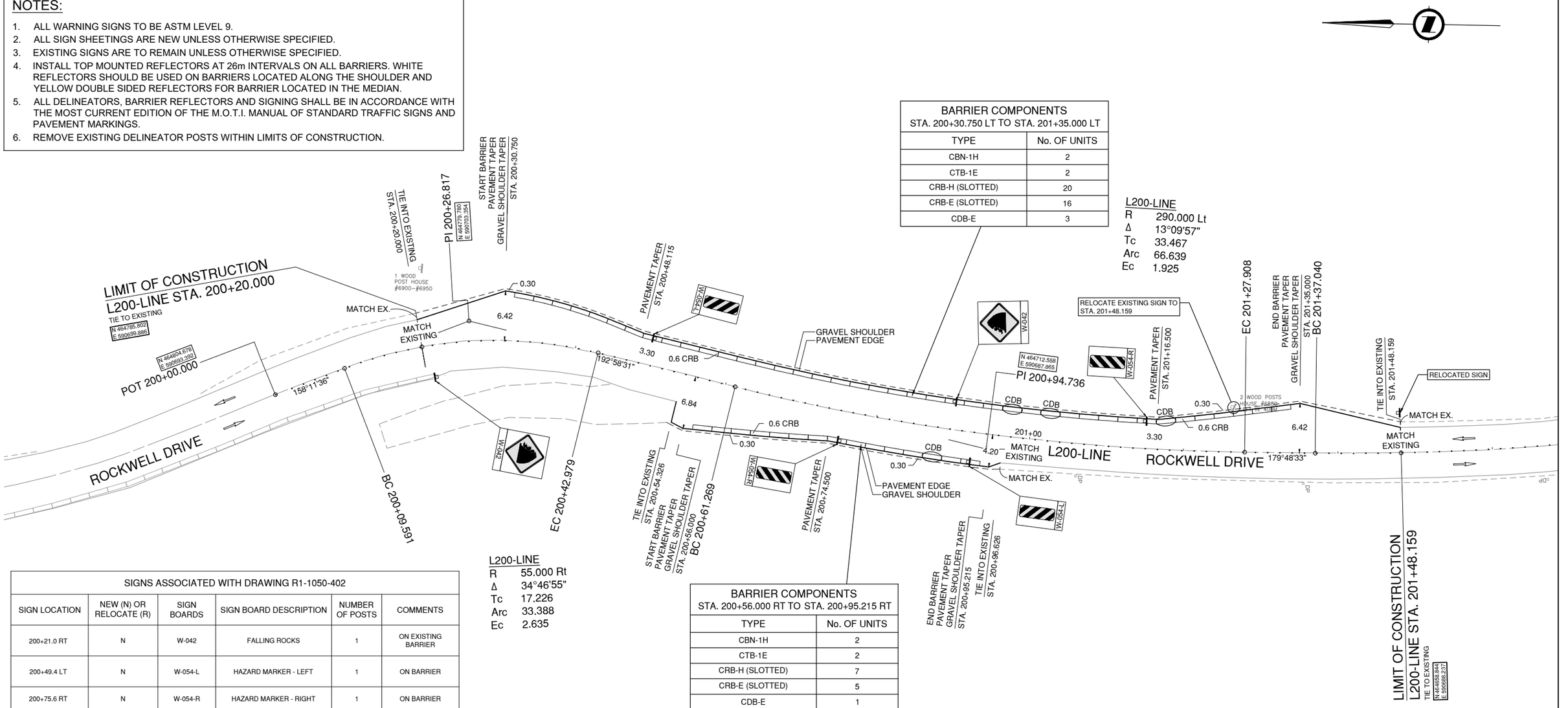
6. REMOVE EXISTING DELINEATOR POSTS WITHIN LIMITS OF CONSTRUCTION.



BARRIER COMPONENTS STA. 200+30.750 LT TO STA. 201+35.000 LT	
TYPE	No. OF UNITS
CBN-1H	2
CTB-1E	2
CRB-H (SLOTTED)	20
CRB-E (SLOTTED)	16
CDB-E	3

L200-LINE
R 55.000 Rt
Δ 34°46'55"
Tc 17.226
Arc 33.388
Ec 2.635

BARRIER COMPONENTS STA. 200+56.000 RT TO STA. 200+95.215 RT	
TYPE	No. OF UNITS
CBN-1H	2
CTB-1E	2
CRB-H (SLOTTED)	7
CRB-E (SLOTTED)	5
CDB-E	1

SIGNS ASSOCIATED WITH DRAWING R1-1050-402					
SIGN LOCATION	NEW (N) OR RELOCATE (R)	SIGN BOARDS	SIGN BOARD DESCRIPTION	NUMBER OF POSTS	COMMENTS
200+21.0 RT	N	W-042	FALLING ROCKS	1	ON EXISTING BARRIER
200+49.4 LT	N	W-054-L	HAZARD MARKER - LEFT	1	ON BARRIER
200+75.6 RT	N	W-054-R	HAZARD MARKER - RIGHT	1	ON BARRIER
200+90.0 LT	N	W-042	FALLING ROCKS	1	ON BARRIER
200+94.6 RT	N	W-054-L	HAZARD MARKER - LEFT	1	ON BARRIER
201+15.1 LT	N	W-054-R	HAZARD MARKER - RIGHT	1	ON BARRIER
201+48.2 LT	R	CUSTOM	HOUSE #6880 LEFT IN 400m	2	-

NOTE: HOLLOW ARROW INDICATES DIRECTION OF TRAVEL ONLY

L200-LINE (ROCKWELL DRIVE) - DESIGN SPEED 40km/h

FOR PLANS
SEE DWG. R1-1050-101 to 103

FOR PROFILES AND CULVERT SECTIONS
SEE DWG. R1-1050-201 to 206

FOR TYPICAL SECTIONS
SEE DWG. R1-1050-301 to 304

FOR GEOMETRICS , LANING SIGNING, AND PAVEMENT MARKINGS
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DRAFT

100% DETAILED DESIGN - DEC. 9, 2022

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SCALE 0 2 1:250 12m

CAD FILENAME 400GL-ROCKWELL-DF2_21-1067.DWG
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REV	DATE	REVISIONS	SIGNATURE

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

GEOMETRICS, LANING, SIGNING, AND PAVEMENT MARKINGS

ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3
DF2

R.F. BINNIE & ASSOCIATES LTD.
EGBC PERMIT TO PRACTICE
NUMBER 1001128

MICHAEL CARREIRA
ENGINEER OF RECORD
DATE

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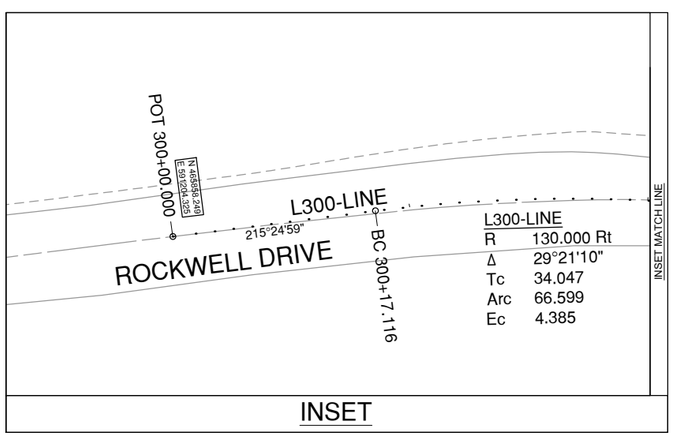
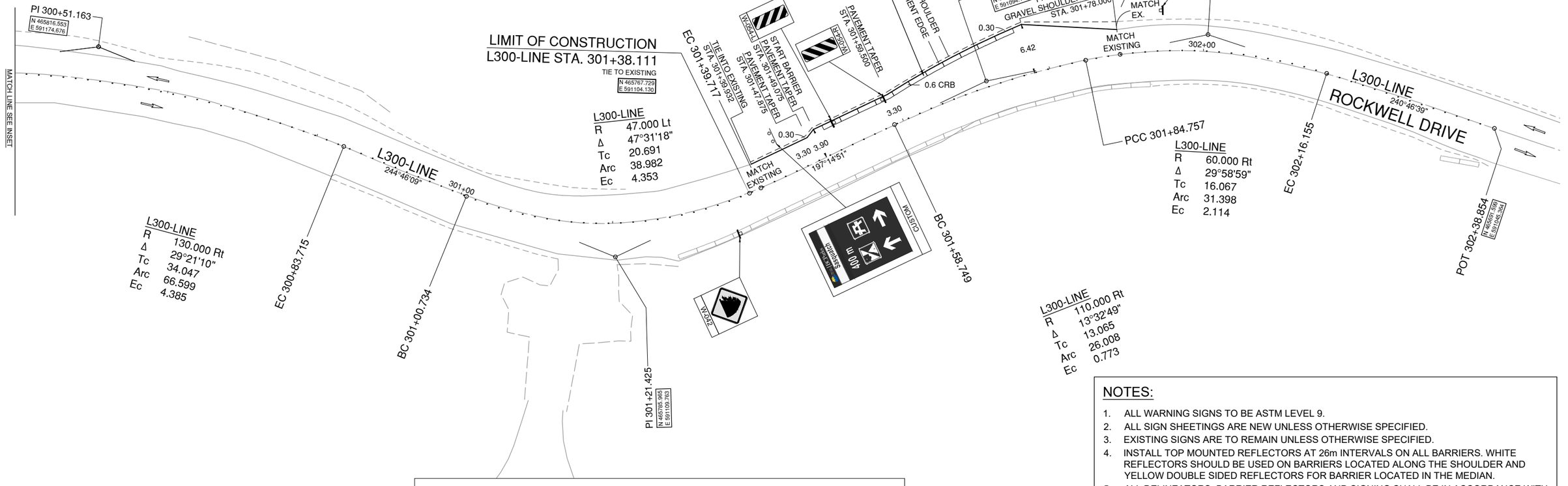
QUALITY ASSURANCE	A.M.	DATE	DEC. 2022
DRAWN	J.T.	DATE	DEC. 2022

PROJECT NUMBER	REG	DRAWING NUMBER	REV
14045	1	R1-1050-402	





BARRIER COMPONENTS STA. 301+49.075 LT TO STA. 301+77.974 LT	
TYPE	No. OF UNITS
CBN-1H	2
CTB-1E	2
CRB-H (SLOTTED)	5
CRB-E (SLOTTED)	4

NOTES:

1. ALL WARNING SIGNS TO BE ASTM LEVEL 9.
2. ALL SIGN SHEETINGS ARE NEW UNLESS OTHERWISE SPECIFIED.
3. EXISTING SIGNS ARE TO REMAIN UNLESS OTHERWISE SPECIFIED.
4. INSTALL TOP MOUNTED REFLECTORS AT 26m INTERVALS ON ALL BARRIERS. WHITE REFLECTORS SHOULD BE USED ON BARRIERS LOCATED ALONG THE SHOULDER AND YELLOW DOUBLE SIDED REFLECTORS FOR BARRIER LOCATED IN THE MEDIAN.
5. ALL DELINEATORS, BARRIER REFLECTORS AND SIGNING SHALL BE IN ACCORDANCE WITH THE MOST CURRENT EDITION OF THE M.O.T.I. MANUAL OF STANDARD TRAFFIC SIGNS AND PAVEMENT MARKINGS.
6. REMOVE EXISTING DELINEATOR POSTS WITHIN LIMITS OF CONSTRUCTION.

SIGNS ASSOCIATED WITH DRAWING R1-1050-403					
SIGN LOCATION	NEW (N) OR RELOCATE (R)	SIGN BOARDS	SIGN BOARD DESCRIPTION	NUMBER OF POSTS	COMMENTS
301+40.0 RT	N	W-042	FALLING ROCKS	1	ON EXISTING BARRIER
301+44.0 LT	N	CUSTOM SA-008 SA-018	SASQUATCH PARK - 400m CAMPING TRAILER/ TENT - THROUGH PICNIC TABLE - RIGHT	2	-
301+51.5 LT	N	W-054-L	HAZARD MARKER - LEFT	1	ON BARRIER
301+59.0 LT	N	W-054-R	HAZARD MARKER - RIGHT	1	ON BARRIER
301+95.0 LT	N	W-042	FALLING ROCKS	1	-

NOTE: HOLLOW ARROW INDICATES DIRECTION OF TRAVEL ONLY

L300-LINE (ROCKWELL DRIVE) - DESIGN SPEED 40km/h

FOR PLANS
SEE DWG. R1-1050-101 to 103

FOR PROFILES AND CULVERT SECTIONS
SEE DWG. R1-1050-201 to 206

FOR TYPICAL SECTIONS
SEE DWG. R1-1050-301 to 304

FOR GEOMETRICS, LANING SIGNING, AND PAVEMENT MARKINGS
SEE DWG. R1-1050-401 to 403

DRAFT

100% DETAILED DESIGN - DEC. 9, 2022

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

SCALE 0 2 1:250 12m

CAD FILENAME 400GL-ROCKWELL-DF3_21-1067.DWG
DATE 2022-12-07
FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

GEOMETRICS, LANING, SIGNING, AND PAVEMENT MARKINGS

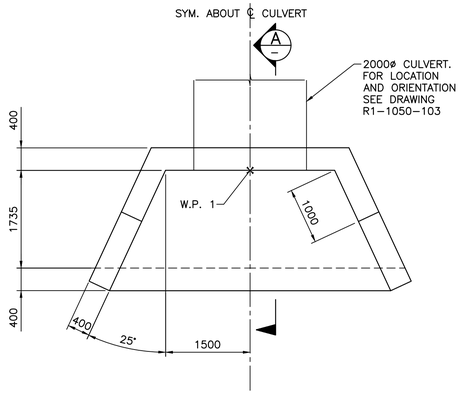
ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3
DF3

R.F. BINNIE & ASSOCIATES LTD.
EGBC PERMIT TO PRACTICE
NUMBER 1001128

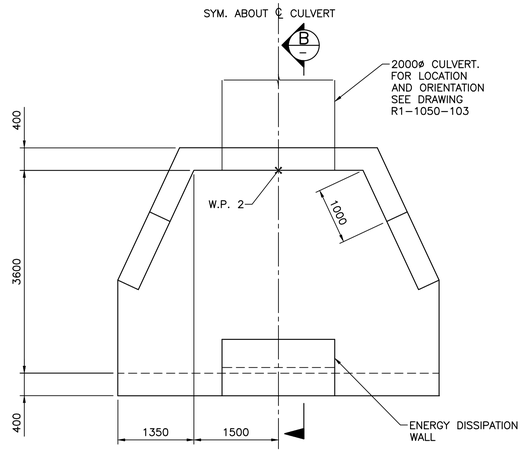
MICHAEL CARREIRA
ENGINEER OF RECORD
DATE

DESIGNED	J.T.	DATE	DEC. 2022
QUALITY CONTROL	M.C.	DATE	DEC. 2022
QUALITY ASSURANCE	A.M.	DATE	DEC. 2022
DRAWN	J.T.	DATE	DEC. 2022

PROJECT NUMBER	REG	DRAWING NUMBER	REV
14045	1	R1-1050-403	



PLAN – HEADWALL – INLET END
SCALE 1:50



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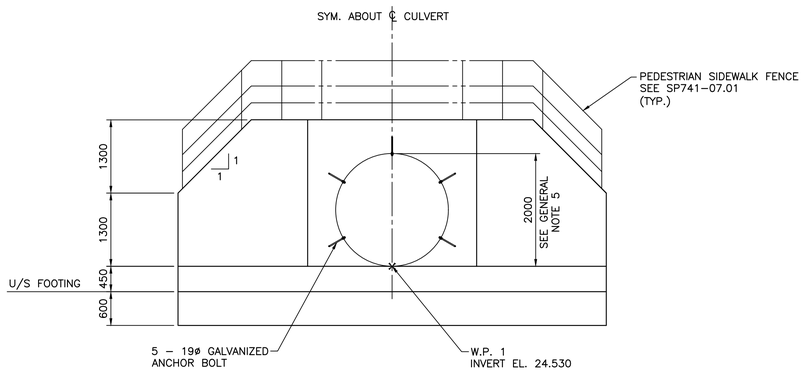

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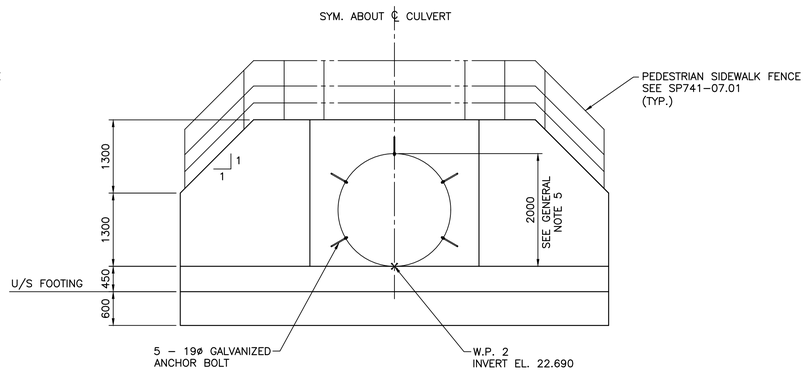
SCALE 1:50



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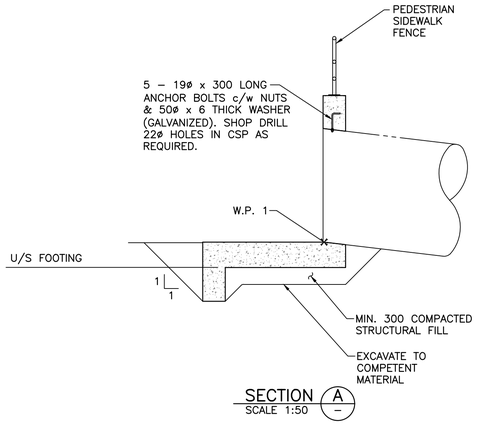
HEADWALL – OUTLET END
SCALE 1:50



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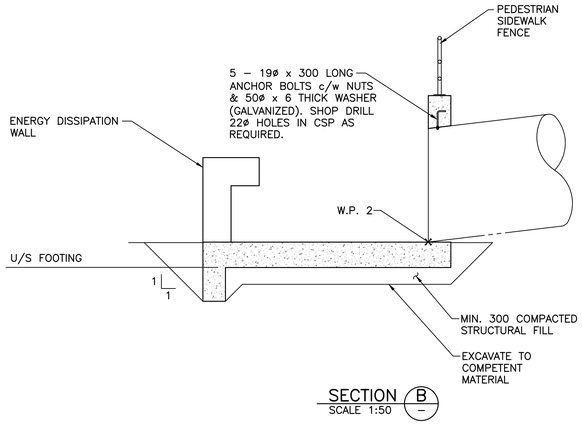

SECTION B
SCALE 1:50

GENERAL NOTES:

1. ALL DIMENSIONS ARE GIVEN IN MILLIMETERS (mm). ELEVATIONS ARE GIVEN IN METRES (m).
2. DESIGN SPECIFICATIONS: CSA–S6–19 AND THE BC MOTI SUPPLEMENT TO CSA–S6–19.
3. ALL WORK SHALL BE IN ACCORDANCE WITH SCHEDULE 3 – SPECIAL PROVISIONS AND THE 2020 STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION.
4. DESIGN LIFE: 75 YEARS.
5. OPENINGS IN ENDWALLS SHALL BE ADJUSTED TO SUIT FINAL CULVERT DIMENSIONS, AS REQUIRED.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND PROTECTING ALL UTILITIES AND EXISTING INFRASTRUCTURE DURING CONSTRUCTION UNLESS SPECIFICALLY NOTED OTHERWISE IN THE PROJECT SPECIFICATIONS.

EXCAVATION AND BACKFILL SPECIFICATIONS:

1. SUBGRADE TO BE INSPECTED BY THE GEOTECHNICAL ENGINEER PRIOR TO HEADWALL CONSTRUCTION.
2. IF BOULDERS OR INCOMPETENT MATERIAL IS PRESENT IN THE SUBGRADE, SUB–EXCAVATION MAY BE REQUESTED BY THE GEOTECHNICAL ENGINEER TO REMOVE UNDESIRED MATERIALS. BACKFILL OF SUB–EXCAVATIONS SHALL BE COMPACTED ENGINEERED FILL.
3. PLACEMENT AND OR COMPACTION OF FROZEN FILL, OR FILL OVER FROZEN GROUND IS NOT PERMITTED.
4. EXCAVATED SLOPES SHOULD BE REVIEWED BY THE GEOTECHNICAL ENGINEER DURING CONSTRUCTION.

CAST–IN–PLACE CONCRETE:

1. CONCRETE SHALL CONFORM TO SS211 AS AMENDED BY THE SPECIAL PROVISIONS.
2. ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 30 MPa AT 28 DAYS.
3. ALL EXPOSED EDGES OF CONCRETE TO BE CHAMFERED 20 mm.

DRAFT

NOT FOR CONSTRUCTION

Klohn Crippen Berger

B.C. PERMIT TO PRACTICE No. 1000171

Rev	Date	Description	Init

REVISIONS

BRITISH COLUMBIA | Ministry of Transportation & Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
ROCKWELL DRIVE

CULVERT @ STA. 301+64.633
HEADWALL DETAILS – SHEET 1

PREPARED UNDER THE DIRECTION OF

ENGINEER OF RECORD

DATE

DESIGNED _____ DATE _____
CHECKED _____ DATE _____
DRAWN _____ DATE _____
SCALE AS NOTED
NEGATIVE No.

FILE No.	PROJECT No.	REG.	DRAWING No.
	14045		R1–

CANCEL PRINTS BEARING PREVIOUS LETTER

H–308–1–1–(07–08)

ROCKWELL DRIVE RECOVERY PROJECT ENVIRONMENTAL OVERVIEW ASSESSMENT DF1 - 3

August 2022

Prepared for:

BC Ministry of Transportation and Infrastructure
Coquitlam, British Columbia

Hatfield Consultants LLP
#200 - 850 Harbourside Drive
North Vancouver, British Columbia, Canada V7P 0A3
Tel: 1.604.926.3261 • Fax: 1.604.926.5389
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ROCKWELL DRIVE RECOVERY PROJECT ENVIRONMENTAL OVERVIEW ASSESSMENT DF1 - 3

Prepared for:

BC MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE
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AUGUST 2022

MOTI 10866
VERSION 2.0

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AMENDMENT RECORD

This report has been issued and amended as follows:

Issue	Description	Date	Approved by	
1	First version of Rockwell Drive Recovery Project Environmental Overview Assessment DF1 - 3	20220804	(Garth Taylor) Project Director	(Tim Poulton) Project Manager
2	Second version of Rockwell Drive Recovery Project Environmental Overview Assessment DF1 - 3	20220823	 Garth Taylor Project Director	 Tim Poulton Project Manager

1.0 INTRODUCTION

Hatfield Consultants LLP (Hatfield) was retained by the Ministry of Transportation and Infrastructure (MOTI) to provide environmental support for the Rockwell Drive Recovery Project (the Project). This environmental overview assessment (EOA) report summarizes key environmental features within the Project area, associated environmental permit implications, and provides design and construction mitigation strategies to assist with the design options analysis.

1.1 PROJECT DESCRIPTION

Damage to a number of stream crossings along Rockwell Drive in the District of Kent occurred as a result of flooding associated with the November 2021 atmospheric river. The Project area is comprised of three sites (DF1, DF2, and DF3) located at the southeast extent of Harrison Lake near Harrison Hot Springs (Figure 4).

Emergency repair works associated with the November 2021 flood event have been conducted at all three sites and MOTI wishes to develop permanent (long-term) solutions for each site. In addition to the permanent solution, MOTI has conducted short-term remedial repairs to prevent further flooding and damage to private property and infrastructure (Binnie 2022a).

1.1.1 Site DF1 – 6535 Rockwell Drive

At site DF1, the existing Rockwell Drive culvert was overwhelmed by an unnamed watercourse due to the heavy mountain runoff, resulting in excess water running over the road, which eroded the roadway embankment and private property lands downstream of Rockwell Drive, including the culverted portion of the watercourse within the property (Figure 1). Short-term emergency/recovery works included the removal of debris, channel grading, and placement of riprap adjacent to the private residence. The options analysis for the permanent long-term design includes repairing the existing culvert, upsizing and replacement of the existing culvert, and updating the roadway geometry (Binnie 2022b). Currently, the preferred option includes upsizing and replacement of the existing culvert; however, the design team is still reviewing the preferred option which may include a “Flat Debris Flow Breaker or similar structure with open grid deck” to address debris control at Site DF1 (Binnie 2022b).

Figure 1 **Upstream view of site DF1 from within the 6535 Rockwell Drive property (December 14, 2021).**

1.1.2 Site DF2 – 6969 Rockwell Drive

At site DF2, a debris flow associated with an unnamed watercourse above a private residential access road located at 6969 Rockwell Drive deposited debris and incised a new stream channel in what was previously a driveway. The debris flow damaged the Rockwell Drive roadside drainage ditch and culvert inlet crossing Rockwell Drive which discharges to Harrison Lake (Figure 2). Emergency and short-term recovery works included removal of debris deposited on Rockwell Drive, regrading and armouring the roadside ditch, and armouring the Rockwell Drive culvert inlet with riprap (Binnie 2022a). The options analysis for the permanent long-term design includes repairing the existing culvert, upsizing and replacement of the existing culvert, and updating the roadway geometry (Binnie 2022b). Currently, the preferred option includes upsizing and replacement of the existing culvert (Binnie 2022b).

Figure 2 **Downstream view of site DF2 showing erosion and debris along Rockwell Drive (December 14, 2021).**

1.1.3 Site DF3 – 7370 Rockwell Drive

The November 2021 atmospheric river resulted in a watercourse avulsion upstream of Rockwell Drive at site DF3 (Binnie 2022a). The avulsion resulted in the deposition of debris onto Rockwell Drive and the redirection of flows to the north (Figure 3). No drainage system has previously been constructed to accommodate water flow to the north, and as such flooding of private residences downstream of Rockwell Drive subsequently occurred. Emergency works included re-establishing the road shoulder and installing a catch basin near the eastern edge of the road to direct flows to the western roadside ditch away from the private residences. Short-term recovery works included the construction of an asphalt curb (Binnie 2022b). The options analysis for the permanent long-term design includes repairing the existing culvert, upsizing and replacement of the existing culvert, and updating the roadway geometry (Binnie 2022b). Currently, the preferred option includes upsizing and replacement of the existing culvert and redirecting the ditch back into the existing channel to avoid crossing Rockwell Drive at an unfavourable location (Binnie 2022b).

Figure 3 Watercourse avulsion at site DF3 (December 14, 2021).

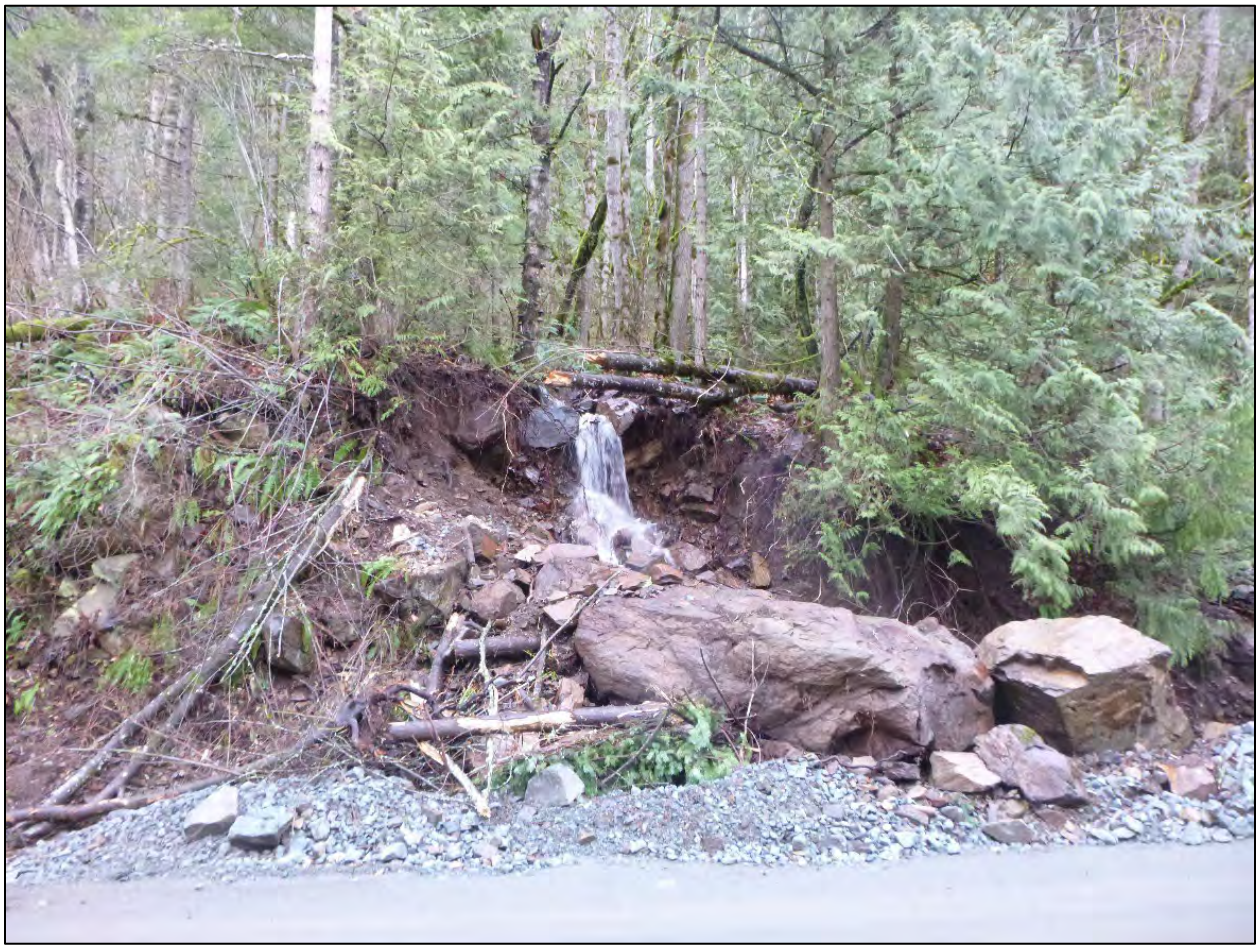
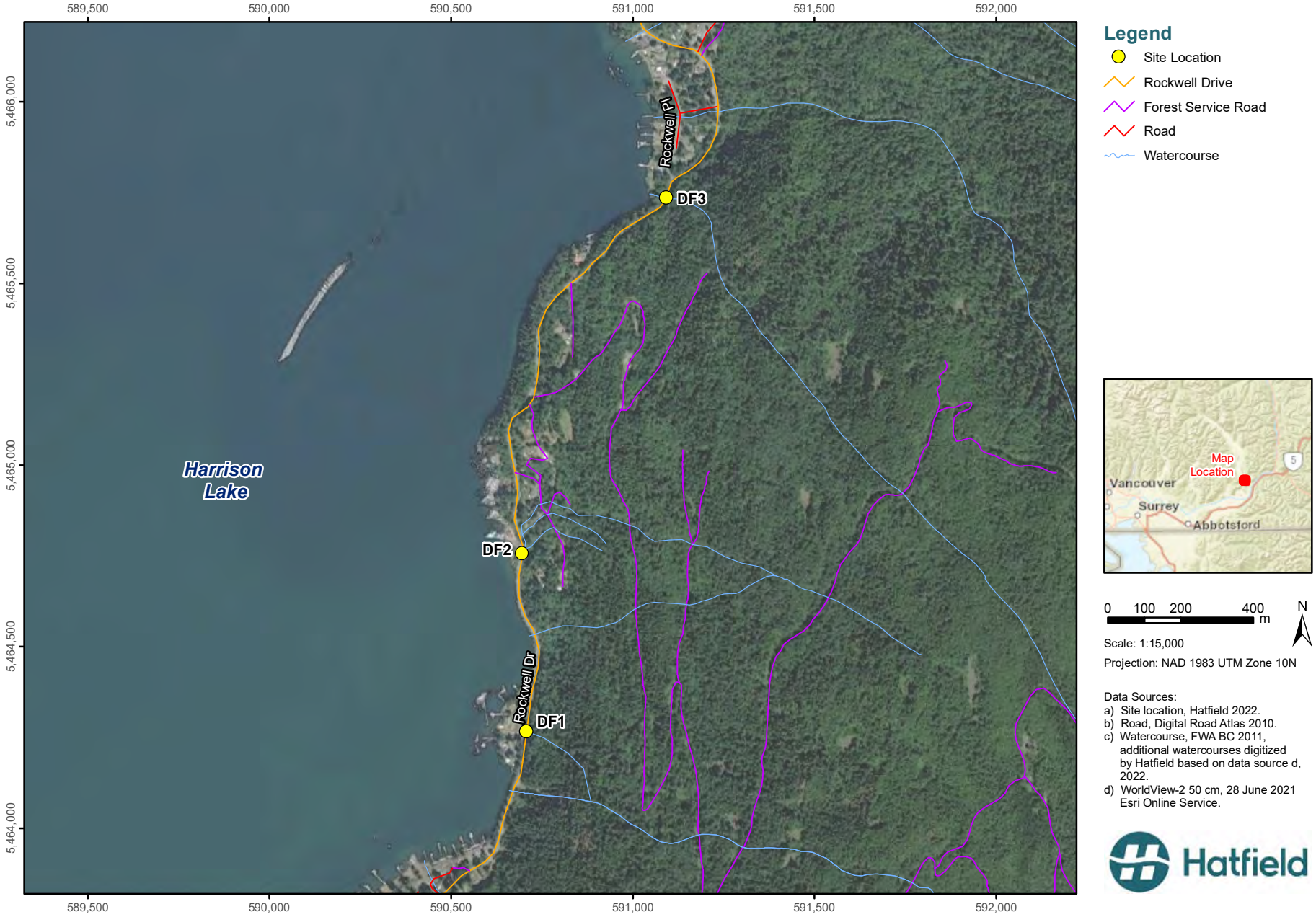


Figure 4 DF1, DF2, and DF3 Project area.



Rockwell Drive Recovery Project

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2.0 METHODS

2.1 LITERATURE REVIEW

2.1.1 Fish & Fish Habitat

Hatfield conducted a desktop review of aquatic resources within the Project area (i.e., Rockwell drive along sites DF1, DF2, and DF3) using the following data sources:

- BC Fish Inventories Dara Queries (FIDQ);
- BC Conservation Data Centre (CDC):
    - CDC iMap
    - BC Species & Ecosystem Explorer
- Ecological Reports Catalogue (ECOCat);
- Habitat Wizard;
- Species Inventory Web Explorer (SIWE); and
- BC Cross-Linked Information Resources (CLIR).

2.1.2 Terrestrial Resources

A review of existing information was also completed for terrestrial resources in the vicinity of sites DF1, DF2, and DF3 and within an approximate 1-km radius surrounding each site. Data sources included:

- Wildlife –
    - Species at risk information is available from the CDC Species & Ecosystem Explorer, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and the *Species at Risk Act* (SARA) Registry; and
    - General wildlife information for the BC Ministry of Environment Species and Ecosystems Explorer, iMapBC, Species Inventory Web Explorer (SIWE), eBird, BC CLIR and the Wildlife Tree Stewardship Atlas (WTSA).
- Plants –
    - Rare plants and plant community occurrence records available from the CDC and e-Flora BC; and
    - Invasive plant/weed information from the provincial *Weed Control Act*, the BC Invasive Species Council of BC (ISCBC), and the Invasive Alien Plan Program (IAPP) database and map display.

- Designated wildlife management areas including Wildlife Habitat Areas (WHAs), Ungulate Winter Ranges (UWRs), Special Management Zones (SMZs), and federally designated critical habitat areas for endangered and threatened species from CDC iMap.
- Literature and reports containing information on local wildlife species, plant species, and plant communities are available from the provincial ECOCat and DataBC Data Catalogue.

2.1.3 Species at Risk

Species at risk are identified by both provincial and national ranking systems. Federally, the COSEWIC assesses and recommends species ranks. The Government in Council uses COSEWIC information to decide on which species to include on Schedule 1 of SARA. Provincially, species are assessed by the CDC based on the systematic collection and analysis of information on their extent, distribution, and vulnerability to disturbance. Species are red- or blue-listed depending on the urgency of their conservation needs.

A preliminary list of federally and provincially listed species was generated by querying the CDC Species and Ecosystem Explorer database for occurrences within the Fraser Valley Regional District, within the Coastal Western Hemlock (CWH) zone in which the Project area is located. The list was refined by obtaining habitat information from local reports and determining its suitability in supporting critical life-history functions for each species. Such requisites include breeding, foraging, migration for bird species, flowering, and seed dispersal for plants.

2.2 FIELD DATA COLLECTION

Field baseline studies were conducted on March 30, 2022, and included the following activities:

- Characterization of fish habitat features upstream and downstream of each crossing; and
- A general reconnaissance of wildlife and wildlife habitat features upstream and downstream of each crossing.

2.2.1 Fish Habitat

Fish habitat features up to a maximum of 50 upstream and downstream of site DF2 were assessed as per Resource Inventory Standards Committee (RISC) methods and included the following measurements:

- Average channel width;
- Average wetted width;
- Max pool depth;
- Bankfull channel depth;
- Depth and velocity transects (3 per survey reach);
- Substrate composition;
- Channel morphology (e.g., percent riffle, pool, run, cascade) and gradient;

- Type and percent overhead and instream cover;
- Characterization of the riparian area;
- In situ water quality; and
- An assessment of fish passage.

Information from the fish habitat assessment was documented on habitat inventory datasheets as per RISC standards.

Fish habitat assessments at sites DF1 and DF 3 were limited to visual assessments of habitat features, and in situ water quality measurements given the highly modified nature of these crossings (i.e., comprised primarily of riprap ditches and/or culverts) and safety concerns (e.g., waterfall upstream of DF1 and steep terrain upstream and downstream of DF3). Fish sampling was not conducted given the presence of fish barriers upstream and downstream of each site, the exception being downstream of site DF2 which is presumed to be fish-bearing given its proximity to Harrison Lake.

2.2.2 Terrestrial Resources

Avian Species

Given the time of year and the small area associated with each site, detailed surveys for nesting birds were not conducted; however, incidental observations were documented.

Technicians also surveyed the forest surrounding each site and scanned the canopies for any stick nests. This includes the nests of hawks, ospreys, bald eagles, and great blue herons. Trees within the forested areas were assessed for whitewash (excrements) and the bases of the trees were checked for pellets, to look for activity of owl foraging, nesting, or young.

Wildlife and Wildlife Habitat Features

Technicians walked 5 to 10 m apart in the forested areas on either side of each fish habitat survey reach and assessed for different wildlife habitat features. Including:

- Cover availability (e.g., micro-terrain features, understory plants, coarse woody debris);
- Game trails, and dens; and
- Wildlife trees and snags.

Technicians also turned cobble-sized rocks during the fish habitat surveys looking for evidence of tailed frog tadpoles.

3.0 RESULTS

3.1 FISH & FISH HABITAT

All three sites are comprised of existing culvert crossings at Rockwell Drive. The unnamed watercourse headwaters associated with each site originate from the mountain east of Harrison Lake, and flows are conveyed west down steep (>40%; Binnie 2022b) forested slopes (occasionally crossing forest service roads) to Rockwell Drive, and ultimately drain into Harrison Lake.

Stream permanence of each watercourse is unknown; however, given the small catchment and steep gradient, they are likely all ephemeral, drying during the summer months. Each stream is non-fish bearing due to fish barriers (i.e., steep channel gradient and/or culverts) upstream of Harrison Lake, and as such existing literature or data does not exist for these streams. The exception is site DF2 downstream of Rockwell Drive which is assumed to be fish-bearing given its proximity to Harrison Lake and lower channel gradient (i.e., 7%).

3.1.1 Site DF1

The site DF1 watercourse originates from Bear Lake and conveys flows west down the steep mountain slopes upstream of Rockwell Drive. At Rockwell Drive, the site DF1 watercourse is characterized by a large waterfall and plunge pool immediately upstream of the Rockwell Drive culvert (Figure 5). The November 2021 atmospheric river and subsequent emergency works to remove debris from the culvert inlet has disturbed riparian vegetation surrounding the watercourse upstream of Rockwell Drive; however, due to the primarily bedrock nature of the watercourse at site DF1, riparian vegetation was likely limited prior to the flood event as well. Water temperature, pH, dissolved oxygen, and conductivity within the pool upstream of Rockwell drive were 6.4°C, 6.2, 12.4 mg/L, and 75 us/cm, respectively, during the March 30, 2022 site assessment.

Downstream of the Rockwell Drive culvert, flows are conveyed within private property (6535 Rockwell Drive) via a short section of flume to a buried culvert that ultimately daylights approximately 20 m upstream of Harrison Lake (Figure 5). Given the extensive culverting within 6535 Rockwell Drive and the large waterfall upstream of Rockwell Drive, the DF1 watercourse is considered non-fish bearing and provides limited food and nutrient inputs to the larger fish-bearing Harrison Lake during periods of surface flow.

Figure 5 Photographs of Site DF1 (March 30, 2022).

Photo 1: DF1 waterfall upstream of Rockwell Drive.

Photo 2: Large pool at the Rockwell Drive culvert inlet.

Photo 3: Downstream of Rockwell Drive the DF1 watercourse is culverted on private property.

Photo 4: DF1 watercourse outlet at Harrison Lake.

3.1.2 Site DF2

Upstream of Rockwell Drive the site DF2 watercourse has been historically altered within the private property located at 6969 Rockwell Drive. Prior to the November 2021 flood event, the watercourse was directed around the private residence to a corrugated steel pipe (CSP) culvert located at Rockwell Drive. Following the flood event, a portion of the watercourse incised a new stream channel in what was previously a driveway conveying flows to the roadside ditch north of the Rockwell Drive culvert. Both the original altered stream channel and newly incised flood channel converge at the Rockwell Drive culvert inlet (Figure 6). Short-term recovery works in April 2022 included armouring the roadside ditch with riprap to prevent further erosion during spring freshet (Figure 7).

Downstream of Rockwell drive the site DF2 watercourse is conveyed for approximately 40 m over a gravel shoreline to Harrison Lake (Figure 6). A summary of fish habitat features at site DF2 is provided in Table 1. Water temperature, pH, dissolved oxygen, and conductivity at site DF2 were 7.6°C, 6.6, 12.1 mg/L, and 89 µs/cm, respectively, during the March 30, 2022 site assessment.

Figure 6 Photographs of Site DF2 (March 30, 2022).

Photo 1: Terminus of the DF2 watercourse at Harrison Lake.

Photo 2: Upstream view of the Rockwell Drive culvert outlet.

Photo 3: Upstream view of the roadside ditch along Rockwell Drive upstream of the culvert.

Photo 4: Downstream view of the Rockwell Drive culvert inlet where the roadside ditch and altered channel converge.

Table 1 Summary of fish habitat features at site DF2 (March 30, 2022).

Survey Reach	Average Channel Width (m)	Average Wetted Width (m)	Average Depth (m)	Average Velocity (m/s)	Channel Gradient (%)
1	2.8	2.1	0.18	0.2	7
2	3.2	1.8	0.17	0.3	7

Survey Reach 1 = Downstream of Rockwell Drive; Survey Reach 2 = Upstream Rockwell Drive within the roadside ditch.

Figure 7 Short-term recovery works at site DF2 (April 26, 2022).

Due to the steep culvert gradient at Rockwell Drive (i.e., approximately 50% at the inlet) and gradients upstream of Rockwell Drive, the site DF2 watercourse is considered non-fish bearing upstream of Rockwell Drive; however, there is the potential for fish access from Harrison Lake upstream to the culvert outlet during periods of sufficient surface flow (Figure 6).

The Lillooet River is the main inlet to Harrison Lake, which ultimately drains to the Fraser River via the Harrison River near Harrison Mills. Harrison Lake is inhabited by a variety of fish species, (Table 1, CDCa 2022; MOEa 2019; and MOEb 2022). Although fish access for a number of fish species from Harrison Lake is possible during periods of sufficient flow, suitable spawning, rearing, or overwintering habitat for salmonids was not observed, and limited for resident forage species such as sculpin (*Cottus* sp.) and stickleback (*Gasterosteus* sp.) due to the ephemeral nature of this watercourse.

Table 2 Documented fish species in Harrison Lake.

Common name	Scientific name	SARA Schedule 1	Provincial Status
Cutthroat trout	*Oncorhynchus clarkii*	-	-
Coastal Cutthroat Trout	*Oncorhynchus clarkii clarkii*	-	Blue
Pygmy Longfin smelt	*Spirinchus thaleichthys*	-	Red
Chinook Salmon	*Oncorhynchus tshawytscha*	-	-
Chum Salmon	*Oncorhynchus keta*	-	-
Coho Salmon	*Oncorhynchus kisutch*	-	-
Coastrange Sculpin	*Cottus aleuticus*	-	-
Lamprey (General)	*Entosphenus* sp.	-	-
Threespine Stickleback	*Gasterosteus aculeatus*	-	-
Dolly Vardan	*Salvenlinus malma*	-	-
Sockeye Salmon/Kokanee	*Oncorhynchus nerka*	-	-
Lake Whitefish	*Coregonus clupeaformis*	-	-
Mountain Whitefish	*Prosopium williamsoni*	-	-
Northern Pikeminnow	*Ptychocheilus oregonensis*	-	-
Pink Salmon	*Oncorhynchus gorbuscha*	-	-
Prickly Sculpin	*Cottus asper*	-	-
Rainbow Trout/Steelhead	*Oncorhynchus mykiss*	-	-
Redside shiner	*Richardsonius balteatus*	-	-

3.1.3 Site DF3

Upstream of Rockwell Drive, the site DF3 watercourse is conveyed down steep slopes (>45%) in a poorly defined channel with an average channel width and wetted width of 4.0 m and 0.75 m, respectively (Figure 8). Substrates are comprised primarily of boulders and cobbles. During the November 2021 flood, the channel avulsed just upstream of Rockwell Drive causing a new channel to form to the north of the existing channel. At Rockwell Drive flows were directed back to the south within the existing roadside ditch as part of emergency works (Figure 8). Flows are conveyed across Rockwell Drive via a corrugated polyvinylchloride (PVC) culvert that appears to have been recently installed as part of flood emergency works (Figure 8). The culvert outlets to a steep riprap road fill slope (approximately 35% gradient) west of Rockwell Drive ultimately draining to Harrison Lake across a gravel beach and private boat launch associated with 7370 Rockwell Drive (Figure 8). Water temperature, pH, dissolved oxygen, and conductivity at site DF3 were 7.7°C, 6.5, 12.2 mg/L, and 76 us/cm, respectively, during the March 30, 2022 site assessment.

Due to continued steep slopes, the site DF3 watercourse is considered non-fish bearing and provides limited food and nutrient inputs to the larger fish-bearing Harrison Lake during periods of surface flow.

Figure 8 Photographs of Site DF3 (March 30, 2022).

Photo 1: Upstream view of the site DF3 watercourse upstream of Rockwell Drive.

Photo 2: Creek avulsion directed back to the south via a berm along Rockwell Drive.

Photo 3: Rockwell Drive culvert inlet.

Photo 4: Rockwell Drive culvert outlet.

3.2 TERRESTRIAL RESOURCES

The Project area is located in the dry maritime subzone within the Coastal Western Hemlock biogeoclimatic zone (CWHdm). The subzone transitions to very wet maritime (CWHvm^2) at an elevation of approximately 650 m – 1000 m.

Rockwell Drive runs north to south along the eastern shoreline of Harrison Lake. Surface cover along the mountain slopes is comprised of dense coniferous forest. There are several rural residential homes along the shoreline, between Rockwell Drive and Harrison Lake (Binnie 2022b).

3.2.1 Wildlife and Wildlife Habitat

The Project area does not occur within a provincially designated management area. The nearest designated management area is the Harrison-Chehalis Wildlife Management Area located approximately 10 km to the southwest near Harrison Mills. Given the Project area occurs primarily within the MOTI road right-of-way which is subject to routine maintenance, and disturbance from the November 2021 flood event, wildlife

habitat features such as coarse riparian vegetation, woody debris, or snags (i.e., standing dead trees) were largely absent. Bird nests (including stick nests and cavity nests) were not observed. Incidental wildlife observations included a pair of hooded mergansers (*Lophodytes cucullatus*) along the shoreline of Harrison Lake near site DF2, and a Pacific sideband snail (*Monadenia fidelis*) in the riparian area upstream of site DF3.

3.2.2 Species at Risk

Listed wildlife species with the potential to occur within the Project area (as determined using methods described in Sections 2.1.2 and 2.1.3) are provided in Table 3 along with the status of each species, in accordance with the CDC and SARA databases. There is a known occurrence of Oregon forestsnail further to the south near Agassiz and draft habitat mapping suggests that suitable habitat extends into the Project area (Personal communication with BC Parks and MOTI staff, May 2022); however, this species has a fairly specific habitat association with mature bigleaf maple, stinging nettle and sword fern forest types, which was not observed within the Project area during the site assessment. Additionally, there is a masked occurrence (ID 52866) 2.5 km from the Project area (CDCb 2022); however, after further discussion with CDC staff, it was determined that this species will not be impacted by the Project.

Listed plant species with the potential to occur within the Project area (as determined using methods described in Sections 2.1.2 and 2.1.3) are provided in Table 4 along with the status of each species, in accordance with the CDC and SARA databases. Invasive plant or animal species were not observed during the field survey.

3.2.3 Invasive Species

There have been several invasive plant species identified close to the Project area; tansy ragwort (*Senecio jacobaea),* common tansy (*Tanacetum vulgare*), butterfly bush (*Buddleja*), and English ivy (*Hedera helix*). Invasive animal species that have been documented in the area include the American bullfrog (*Rana catesbeiana*) and green frog (*Lithobates clamitans*) (CDCa 2022). Invasive species and/or noxious weeds as regulated by the BC *Weed Control Act* and regulation were not identified during the site assessment.

Table 3 Listed animal species with the potential to occur within the Project area.

Common Name	Scientific Name	SARA Schedule 1	Provincial Status	Habitat Requirements	Habitat Requisites to Support Critical Life Functions within Project area
Birds					
Band-tailed pigeon	*Patagioenas fasciata*	Special Concern	Blue	Found around forests, riparian habitats and springs	Yes
Barn swallow	*Hirundo rustica*	Threatened	Blue	Found around forests, wetlands, riparian habitats as well as agricultural and anthropogenic environments	Yes
Great blue heron	*Ardea herodias fannini*	Special Concern	Blue	Found around riparian and freshwater habitats	Yes
Northern goshawk	*Accipiter gentilis laingi*	Threatened	Red	Found around forests and riparian habitats	Yes
Olive-sided flycatcher	*Contopus cooperi*	Threatened	Blue	Found around forests, lakes and riparian habitats	Yes
Western screech-owl	*Megascops kennicottii kennicottii*	Threatened	Blue	Found around forests and riparian habitats	Yes
Amphibians					
Northern red-legged frog	*Rana aurora*	Special Concern	Blue	Found around riparian habitats, streams, lakes and grassland	Yes
Oregon spotted frog	*Rana pretiosa*	Endangered	Red	Found around riparian habitats, streams, and lakes	Yes
Mammals					
Pacific water shrew	*Sorex bendirii*	Endangered	Red	Found in riparian and wetland habitats	Yes
Trowbridge's shrew	*Sorex trowbridgii*	N/A	Blue	Found in forests and riparian habitats	Yes

Limited to vertebrate species that are either provincially red or blue listed, and/or on SARA schedule 1 as Endangered or Threatened.

Table 4 Listed plant species with the potential to occur within the Project area.

Common Name	Scientific Name	SARA Schedule 1	Provincial Status	Habitat Requirements	Habitat Requisites to Support Critical Life Functions within Project area
Plants					
American sweet-flag	*Acorus americanus*	Not listed	Blue	Found around lakes, wetlands and riparian habitat	Yes
Tall bugbane	*Actaea elata var. elata*	Endangered	Red	Found around forest habitats	Yes
Cut-leaved water-parsnip	*Berula incisa*	Not listed	Blue	Found around lakes, springs, riparian habitat and lakes	Yes
Angled bittercress	*Cardamine angulata*	Not listed	Blue	Found around forests, riparian habitats and streams/rivers	Yes
Phantom orchid	*Cephalanthera austiniae*	Threatened	Red	Found around forests habitats	Yes
Streambank lupine	*Lupinus rivularis*	Endangered	Red	Found in anthropogenic environments as well as forests, grassland, streams and rivers.	Yes

Limited to plant species that are either provincially red or blue listed, and/or on SARA schedule 1 as Endangered or Threatened.

4.0 PRELIMINARY ASSESSMENT OF IMPACTS

4.1 DESIGN

Based on the draft Design Options Analysis Report (Binnie 2022b) the preferred option includes culvert upsizing and replacement at each site to meet current design flow requirements. Additionally at site DF3, flows upstream of Rockwell Drive will be returned to the original channel location away from the creek avulsion. It is expected that replacing the culverts to current design standards that consider climate change and debris flow events will reduce erosion and flooding of downstream environments, infrastructure, and property. Despite this overall net benefit, there is potential to adversely impact aquatic and terrestrial resources as a result of the design of each culvert. Potential adverse design impacts include the loss of aquatic (e.g., fish-bearing and non-fish-bearing watercourses) and terrestrial (e.g., riparian environments within 30 m of a watercourse) habitats that support fish and wildlife species should the footprint of the new culverts and associated riprap extend beyond the footprint of the existing crossing structures.

4.2 CONSTRUCTION

Potential adverse impacts to the aquatic environment during construction are primarily related to water quality, including but not limited to:

- Erosion of exposed soils and resultant sediment release; and
- Use of heavy machinery and potential accidental release of hydrocarbons.

Potential adverse impacts to the terrestrial environment during construction include direct temporary and/or permanent loss of localized riparian wildlife habitat, habitat degradation associated with construction, and mortality of small vertebrates breeding in microhabitats within the construction footprint. Potential indirect adverse impacts include habitat avoidance and reduced reproductive success as a result of sensory (visual and auditory) disturbance to wildlife species nesting/denning in the Project area.

5.0 IMPACT MITIGATION STRATEGIES

Potential residual impacts (i.e., predicted to occur after all mitigation is considered) to environmental resources are not expected to occur so long as conventional design and construction BMPs are followed. The Project will be undertaken in a small area already heavily affected by anthropogenic disturbances that limit fish and wildlife usage of the area. Habitat in the area is highly disturbed as a result of routine road maintenance, and a high level of disturbance from traffic noise.

5.1 DESIGN

Generally, the footprint of new culverts and associated riprap scour protection at each site should be minimized to the extent feasible while maintaining current design standards. Minimizing the footprint at each site to within the existing culvert footprint will reduce the permanent loss of aquatic and terrestrial resources. Top-dressing riprap required below a watercourse high watermark with native stream substrates salvaged during excavation and maintaining the natural channel shape is a design impact mitigation strategy that should be utilized where possible. This is especially important at site DF2 downstream of Rockwell Drive, given the proximity to Harrison Lake and the potential for fish presence, and upstream of site DF3 where repairs to the channel avulsion will occur. Riparian areas disturbed during construction should be revegetated with native shrub and tree species suited to site conditions.

In accordance with Part 3 of the Water Sustainability Regulation the installation of a culvert is considered an authorized change if the following design conditions are met:

- The culvert inlet and outlet incorporate measures to protect the structure and the stream channel against erosion;
- Debris can pass through the culvert;
- The culvert and its approach roads do not produce a backwater effect or increase the head of the stream;
- The culvert capacity is equivalent to the hydraulic capacity of the stream channel or is capable of passing the 1 in 200-year maximum daily flow without the water level at the culvert inlet exceeding the top of the culvert;
- The culvert has a minimum equivalent diameter of 600 mm;
- The culvert has an equivalent diameter of 2 m or greater or has a design capacity to pass a flow of more than 6 m^3 per second, the culvert is designed by an engineering professional and constructed in conformance with that design;
- The culvert is installed in a manner that permits the removal of obstacles and debris within the culvert and at the culvert ends;
- Embankment fill materials do not, and are unlikely to, encroach on culvert inlets and outlets;
- The culvert has a depth of fill cover that is at least 300 mm or as required by the culvert manufacturer's specifications;

- The maximum fill heights above the top of the culvert do not exceed 2 m; and
- The culvert is made of materials that meet the applicable standards of the Canadian Standards Association.

5.2 CONSTRUCTION

The successful Contractor(s) will be required to submit a detailed Construction Environmental Management Plan (CEMP) with work procedures prior to commencing construction. The CEMP shall be prepared in compliance with MOTI's Standard Specifications for Highway Construction (MOTI 2020a) Section 165 Protection of the Environment (SS 165), and align with the Requirements and Best Management Practices for Making Changes in and About a Stream in British Columbia (BC Gov. 2022), and the Measures to Protect Fish and Fish Habitat (DFO 2019). The CEMP shall be submitted to MOTI for review and approval prior to the start of works. Special Provisions (SPs) contained in the Project Tender package will identify any expectations that differ from MOTI SS 165 and will also include conditions of any environmental approvals. SPs may also refer to mitigation measures outlined in this or any other environmental assessment reports prepared for the Project that form part of regulatory application submissions. Mitigation measures and best management practices (BMPs) detailed in the CEMP will include but not be limited to the following management plans:

- Fish and fish habitat protection plan (including fish salvages where required);
- Spill prevention and emergency response plan;
- Erosion and sediment control plan;
- Vegetation management plan (including management of invasive and noxious weeds);
- Wildlife protection plan including a salvage for Pacific water shrew at site DF3 pending results of the pre-construction survey; and
- Waste management plan.

In accordance with Part 3 of the Water Sustainability Regulation the installation of a culvert is considered an authorized change if the following construction BMPs are met:

- The equipment used for site preparation, or for installation of the culvert, is situated in a dry stream channel or operated from the top of the bank; and
- The installation of the culvert does not destabilize the stream channel.

5.2.1 Least Risk Windows

Fish

Instream works should be conducted during the regional least risk work window of August 1 to September 15 to protect potential trout and salmon species downstream of site DF2 (MOEc 2006). The least risk window does not apply to sites DF1 and DF3 given these streams are not fish-bearing; however, instream work areas should be isolated from flows to prevent the delivery of sediment-laden water to Harrison Lake

which is fish-bearing. It should be noted that the least risk window for fish does not apply if the watercourse is naturally dry.

Birds

Vegetation should be minimal at these previously disturbed sites but if vegetation clearing is required, particularly for site preparation works, mitigation during construction should include work restrictions during the breeding bird window, March 15 to August 30 (ECCC 2018). Bird nesting surveys, as per MOTI protocol, and measures to protect active nests are required for vegetation removal and disturbance activities during the active nesting period (MOTI 2020b). If clearing cannot be conducted during this time due to the Project schedule, pre-clearing bird nesting surveys by a Qualified Environmental Professional will be required to ensure compliance with the federal *Migratory Birds Convention Act*, which prohibits the removal or destruction of birds or bird habitat during the breeding season. Surveys should be conducted so that no-disturbance buffers can be established around active nest sites. Raptor nests were not observed during the preliminary design studies; however, raptor nest surveys should be completed immediately prior to construction to ensure conditions have not changed.

6.0 REGULATORY CONSIDERATIONS

Based on a review of the draft options analysis (Binnie 2022b) and existing environmental resources identified in this EOA, Hatfield has identified the following environmental legislation and permits that may apply to the Project (Table 5).

Table 5 Summary of legislation applicable to the Project.

Legislation	Agency	Area of Regulation	Possible Permits/Action
Federal			
Species at Risk Act	Environment and Climate Change Canada (ECCC)	Protects threatened or endangered species	No endangered or threatened species listed under Schedule 1 have been identified in the Project area; however, pre-construction surveys for SARA-listed species should be conducted.
Migratory Birds Convention Act and Regulations	ECCC	Prohibits injury, molestations, and destruction of migratory birds and their nests.	Bird nesting surveys and measures to protect active nests are required for vegetation removal during the active nesting period (March 15 to August 30).
Fisheries Act	Fisheries and Oceans Canada (DFO)	No person shall carry on any work, undertaking or activity that results in the death of fish or the harmful alteration, disruption or destruction (HADD) of fish habitat.	A request for project review will be required if all measures to protect fish and fish habitat cannot be followed (see Section 6.3). An Authorization is not expected to be required.
Provincial			
Water Sustainability Act and Regulation	BC Ministry of Forests (MOF)	Regulates activities being carried out in and about a stream.	Each culvert replacement will require submission of a notification pursuant to Part 3 of the Water Sustainability Regulation a minimum of 45 days before commencement of works. Site DF3 will also include a notification for the restoration or maintenance of a stream channel by the government.
Wildlife Act	MOF	Section 34 prohibits the disturbance of birds, their eggs, and their nests while occupied by a bird or its eggs. The nests of eagles, peregrine falcon, gyrfalcon, osprey, heron, and burrowing owls are protected year-round.	Nests protected year-round have not been identified within the Project area. A pre-construction survey should be conducted to confirm that there are no active nests or nests protected year-round in the Project area.
		Regulates works that impact vertebrate species, other than birds	A wildlife permit is required to salvage small vertebrates before works (required for Pacific water shrew at site DF3).
Weed Control Act and Regulation	BC Ministry of Agriculture and Lands	The Weed Control Regulation prohibits the spread of provincial and/or regional noxious weeds throughout the province. This includes vectors such as soils, machinery or vehicles, and seed mixes.	Noxious weeds have not been identified within the Project area; however, a pre-construction survey should be conducted to assess if conditions have changed. Requires all land occupiers to control the spread of provincial and/or regional noxious weeds on their land and premises.

6.1 SPECIES AT RISK ACT

SARA-listed birds and aquatic species are protected where their critical habitat has been identified, in all lands regardless of jurisdictions. Management Plans and Recovery Strategies are federal stewardship initiatives that involve collaboration with provincial governments, and as such it is expected that these protocols are adhered to on provincial lands as a matter of due diligence. It is expected that SARA permits will not be required for this Project.

6.2 MIGRATORY BIRDS CONVENTION ACT

ECCC's Canadian Wildlife Service (CWS) has jurisdiction over birds listed under the federal *Migratory Birds Convention Act* (MBCA 1994), which in the general area of the Project includes insectivorous birds (i.e., warblers, flycatchers, hummingbirds, wrens, thrushes, vireos, nightjars, swallows, tanagers, woodpeckers, chickadees, and their allies), seed eaters (i.e., sparrows, finches, grosbeaks, tanagers), and water birds (i.e., shorebirds, gulls, waterfowl, and their allies). Some of these species are listed under SARA. MBCA prohibits injury, molestations, and destruction of migratory birds and their nests. Generally accepted work windows revolve around the breeding bird nesting periods defined by ECCC which is between March 15 and August 30 for birds in the Fraser Valley (ECCC 2018). If works cannot be conducted outside of these windows, measures to protect active nests are required.

6.3 FISHERIES ACT

The new fish and fish habitat protection provisions of the *Fisheries Act* pursuant to Bill C-68 came into force on August 28, 2019. The *Fisheries Act* requires that project works, undertakings or activities avoid causing:

- The death of fish by means other than fishing; and
- Harmful alteration, disruption or destruction (HADD) unless authorized by the Minister of Fisheries and Oceans Canada.

In accordance with the Fish and Fish Habitat Protection Policy Statement (DFO 2019), DFO interprets HADD as any temporary or permanent change to fish habitat that directly or indirectly impairs the habitat's capacity to support one or more life processes of fish.

Hatfield has evaluated the proposed Project works, undertakings or activities to confirm if all Measures to Protect Fish and Fish Habitat (DFO 2019) can be implemented. A Request for Review application to DFO will be required given the Project is unable to avoid "disturbing or removing materials from the banks, shoreline or waterbody bed" (DFO 2019) at each site. It is expected that DFO will issue a letter of advice for the Project to proceed within 60 days of submitting the Request for Review application.

6.4 WATER SUSTAINABILITY ACT

To make changes in and about a stream requires a license, use approval or change approval; or compliance with an order, or Part 3 of the Water Sustainability Regulation (the Regulation), which includes submitting a Notification to a Habitat Officer. The BC Water Sustainability Act defines changes in and about a stream as "any modification to the nature of a stream, including any modification to the land, vegetation and natural environment of a stream or the flow of water in a stream, or any activity or construction within a stream

channel that has or may have an impact on a stream or a stream channel" (WSA 2016). A stream channel includes the bed and banks of the stream and includes side channels.

In accordance with Part 3 of the Regulation and based on the draft options analysis (Binnie 2022b) it is anticipated that Project works may proceed via Notification of works (i.e., culvert replacement at each site and maintenance of a stream channel by the government at site DF3). Notifications must be submitted within 45 days of Project works.

6.5 BC WILDLIFE ACT

Wildlife in BC are protected from harm under the *Wildlife Act*, except as allowed by regulation for such activities as hunting and trapping. The *Wildlife Act* falls under the jurisdiction of MOF and extends to vertebrate animals including bird species not listed under the *Migratory Birds Convention Act*. A *Wildlife Act* permit is required for the live capture, temporary possession, transport, and release of species of concern from the construction footprint to avoid disturbance and mortality (e.g., Pacific water shrew). The permit application includes a detailed description of the salvage plan and a BC Animal Care Form. The target time frame for making a decision on a *Wildlife Act* permit application is 30 days following submission, although applications to FrontCounter BC can be expedited.

Permits pursuant to the *Wildlife Act* are not expected to be required for sites DF1 and DF2; however, based on the habitat conditions and nature of work at site DF3 it is recommended that a pre-construction salvage for Pacific water shrew occur before realigning the channel back to its original location upstream of Rockwell Drive. It will be the contractor's appropriately qualified professional's (AQP) responsibility to obtain a permit and define appropriate salvage methods for Pacific water shrew.

6.6 WEED CONTROL ACT

Pursuant to the *Weed Control Act* (WCA 1996), the spread of all regional and provincial designated noxious weeds must be controlled. It aims to protect the province's economy, natural resources, and society from the negative impacts that noxious weeds put on native ecosystems and infrastructure. Noxious weeds are to be managed throughout the construction phase of the Project per the contractor's CEMP.

7.0 CLOSURE

MOTI proposes upgrades to 3 watercourse crossings along Rockwell Drive, which were damaged during the November 2021 atmospheric river. Project works include changes in and about a stream and as such will require regulatory review in accordance with the federal *Fisheries Act* and provincial *Water Sustainability Act*. Based on a review of the draft options analysis (Binnie 2022b) and contingent upon recommended design and construction mitigation strategies provided in this EOA it is Hatfield's opinion that residual impacts on environmental resources will not occur as a result of the Project. More detailed quantification of Project-related impacts in support of environmental permit applications will be provided as Project design drawings are advanced.

8.0 REFERENCES

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