TROUT LAKE CREEK BRIDGE NO. 10505, HICK'S LAKE ROAD – *FISHERIES ACT* REQUEST FOR REVIEW SUPPORTING INFORMATION

September 2023

Hatfield

Prepared for:

Fisheries and Oceans Canada

Vancouver, British Columbia

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MOTI10866
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AMENDMENT RECORD

This report has been issued and amended as follows:

Issue	Description	Date	Approved by	
1	Draft version	20230917	Garth Taylor Project Director	Tim Poulton Project Manager
1	First Version of the Trout Lake Creek Bridge No.10505 RFR Application	20230929		 Tim Poulton Project Manager

1.0 PROJECT OVERVIEW

The BC Ministry of Transportation and Infrastructure (MOTI) intends to upgrade the Hick's Lake Road crossing of Trout Lake Creek currently comprised of four temporary culverts with a clear span bridge (the Trout Lake Creek Bridge No. 10505, Hick's Lake Road Project, hereafter referred to as the Project). Damage to the Hick's Lake Road crossing of Trout Lake Creek (referred to as site DF4) occurred as a result of flooding associated with the November 2021 "atmospheric river" flood event. Site DF4 is located at the southern extent of Hick's Lake Road (just north of the intersection with Rockwell Drive) where the MOTI right-of-way bisects Sasquatch Provincial Park at the southeast extent of Harrison Lake near Harrison Hot Springs (Figure 1).

Emergency repair works associated with the November 2021 flood event were conducted at site DF4 pursuant to *Water Sustainability Act* (WSA) Section 91 Order 268448 and consultation with Fisheries and Oceans Canada (DFO), and included the installation of four temporary culverts and associated riprap scour protection to replace a temporary clear-span bridge. The temporary clear-span bridge was installed following the washout of the previous permanent structure (i.e., a perched CSP culvert) following a previous flood in January 2020. MOTI has developed a permanent (long-term) solution following an options analysis (AE 2022) which includes the replacement of the four temporary culverts with a clear-span bridge.

The *Fisheries Act* requires that Project works, undertakings or activities (WUA) avoid causing:

- the death of fish by means other than fishing; and
- the harmful alteration, disruption or destruction of fish habitat (HADD) unless authorized by the Minister of Fisheries and Oceans Canada.

Trout Lake Creek is fish-bearing and drains into Harrison Lake. Hatfield Consultants (Hatfield) has evaluated the proposed Project to confirm if all Measures to Protect Fish and Fish Habitat (DFO 2019a) can be implemented. Accordingly, Hatfield has prepared this supporting information document on behalf of MOTI in accordance with the application information requirements of a Request for Review pursuant to the *Fisheries Act*. Hatfield has also submitted an application for a Change Approval pursuant to the *Water Sustainability Act* on September 13, 2023 (tracking No. 100426429).

An MOTI Indigenous Relations Advisor has been assigned to this Project and MOTI initiated engagement with Indigenous communities on March 4, 2022. MOTI can provide records of consultation upon request.

1.1 PROJECT LOCATION

Site DF4 is located on Hick's Lake Road approximately 200 m north of the intersection with Rockwell Drive where Hick's Lake Road crosses Trout Lake Creek (Figure 1). The Project coordinates and legal description of site DF4 are summarized in Table 1. Project WUA will occur within Trout Lake Creek and the surrounding riparian environment. The majority of works will occur within the MOTI right of way; however, the upstream and downstream extents of the Project footprint fall within Sasquatch Provincial Park. In consultation with BC Parks MOTI has submitted a Park Use Permit application for these works (Permit No. 111791).

Table 1 Project coordinates for Site DF4.

Site Name	MOTI Project No.	Legal Description	Latitude	Longitude
Rockwell Drive DF4	14048-0000	Crown Pin: 35740021 Part Legal Subdivision 5 and 3 SW ¼ Sec.32, TP4, R28, W6M New Westminster District	49°20'33.65"N	121°44'37.18"W

Figure 1 Project Location Map.

Legend

- DF4 Project Site
- Watercourse
- Sasquatch Park

0 50 100 200 m

N

Scale: 1:7,000

Projection: NAD 1983 UTM Zone 10N

Data Sources:

a) DF4 project site, Hatfield 2022.
b) Stream 1 digitized using ortho imagery (data source e), Hatfield 2022.
c) Remaining hydrology, BC Freshwater Atlas, 2011.
d) Sasquatch Park, Tantalis 2015.
e) Ortho imagery 10 cm, provided on Feb 9, 2022 by MOTI.

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Trout Lake Creek Request for Review

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1.2 PROPOSED PROJECT WORKS

Damage to the Trout Lake Creek crossing of Hick's Lake Road occurred as a result of flooding associated with the November 2021 "atmospheric river" flood event. Emergency repair works associated with the 2021 flood were conducted at site DF4 and MOTI subsequently retained Associated Engineering (AE) to conduct an options analysis (AE 2022) to support the design of a new permanent crossing.

The November 2021 flood event was the most recent of multiple washouts at site DF4 (AE 2022). The 2021 flood resulted in channel embankment erosion and caused Trout Lake Creek to top its banks and wash out a temporary railcar bridge (installed following a previous flood event in 2020). Emergency works included the removal of flood debris and the washed-out bridge, the installation of four 1500 mm diameter High-Density Polyethylene (HDPE) culverts, and the installation of associated riprap erosion protection (AE 2022 and Figure 2). The options analysis (AE 2022) included four (4) potential permanent design solutions:

- Option 1: Maintain existing 4 HDPE culverts;
- Option 2: Install a new Corrugated Steel Pipe (CSP) arch culvert with upstream debris mitigation;
- Option 3: Install a new bridge with upstream debris mitigation; and
- Option 4: Install a new bridge sized to convey debris floods.

Significant works on BC Parks land would be required to install upstream debris mitigation, and maintaining the existing culverts would likely result in another flood and washout due to their limited hydraulic capacity and inability to pass debris. Given the hydraulic capacity and the ability to convey the design debris flood, Design Option 4 (i.e., a new clear-span bridge) was selected as the preferred option.

Figure 2 Photographs of site DF4 after emergency works (March 30, 2022).

Photo 1 Trout Lake Creek looking upstream to Hick's Lake Road.

Photo 2 Trout Lake Creek looking downstream to Hick's Lake Road.

The new bridge will have a 19 m span and will be 9.6 m wide. Key components of the bridge design include:

- 100 mm asphalt overlay with protection board and waterproofing;
- 8 x 800 mm deep precast prestressed concrete box stringers;
- Standard bridge parapets with steel bicycle railings;
- Semi-integral reinforced concrete abutments with parallel wing walls; and
- Four reinforced concrete piles with permanent steel casing at each abutment with a diameter of 610 mm (AE 2022).

The hydraulic opening of the bridge will be adequate to convey the design flow of 40.4 m^3/s. This is equivalent to a 100-year, peak instantaneous, climate change-adjusted flow with a 10% bulking factor (AE 2023). The 200-year maximum daily flow is 40.1 m^3/s. Once the temporary culverts are removed a new section of Trout Lake Creek will be constructed within the footprint of the new bridge. The newly constructed channel will be lined with riprap scour protection, and a portion of the channel banks will include buried riprap in the event of a berm failure that is currently located upstream of site DF4 along the left bank of Trout Lake Creek on BC Parks land. Several fish habitat enhancement features (refer to Section 4.1) will be installed upstream and downstream of the new bridge including riparian plantings within the riparian areas disturbed during construction. Detailed design drawings are included in Appendix A1.

A temporary clear-span detour bridge to facilitate traffic during construction will be installed sometime between November 2023 and April 2024 prior to the construction of the new bridge in the summer of 2024. The temporary detour bridge is being installed early to expedite works during the 2024 least-risk window for fish, and to maintain traffic should another flood event and subsequent washout occur during the fall 2023/winter 2024 rainy season. The temporary detour bridge will also be able to convey the 200-year maximum daily flow and will be installed per the conditions and measures to protect fish and fish habitat described in the clear span bridge code of practice (DFO 2022). MOTI will submit a Notification to the regional DFO office a minimum of 10 working days before starting work. Accordingly, the temporary detour bridge is not part of the WUA discussed in this request for review.

Construction means and methods will ultimately be determined by the successful contractor awarded the Project per MOTI Standard Specifications (MOTI 2020a); 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, fish salvages, and stream diversion/isolation if the stream is not naturally dry (approximately 7 days);
2. Tree clearing and grubbing within the Project footprint (approximately 5 days);
3. Substructure (pilling, abutments, wingwalls, etc.) construction (approximately 20 days);
4. Removal of existing culverts and construction of the new channel within the footprint of the bridge (approximately 7 days);

5. Installation of riprap scour protection and bridge superstructure (girder installation, parapet, bicycle railing, etc.) construction (approximately 25 days);
6. Installation of fish habitat enhancement features (3 days);
7. Demobilization (approximately 5 days); and
8. Riparian restoration seeding/planting in fall 2024 (approximately 7 days).

Please refer to Sections 3.0 and 4.0 for a list of all Project WUA, duration of works, potential impacts, and mitigation measures.

1.3 PROJECT SCHEDULE

The Project is expected to take six months to complete (May through October 2024). Instream works will occur during the regional least-risk work window for fish (August 1 to September 15; MOE 2006); however, instream work may proceed outside of this period if the creek is naturally dry.

2.0 EXISTING CONDITIONS

Hatfield conducted a detailed desktop and field study for site DF4 in 2022 which is presented in the Environmental Overview Assessment (EOA) developed to support the options analysis (Hatfield 2023). The following sections provide a synopsis of those studies.

2.1 FISH AND FISH HABITAT

A summary of fish species documented to occur in Trout Lake Creek during previous desktop and field surveys (Hatfield 2023) is presented in Table 2. Trout Lake Creek is used by both spring and fall spawning salmonids. Spawning chum salmon (*Oncorhynchus keta*) were previously observed by Hatfield during a survey in November 2017 (Hatfield 2018), between the mouth of the Creek and Hick's Lake Road. Coastal cutthroat trout (*Oncorhynchus clarkii clarkii*) and rainbow trout (*Oncorhynchus mykiss*) were captured during the 2017 survey upstream and downstream of Hick's Lake Road, respectively. Hick's Lake Road presents a barrier to upstream migration, therefore it is assumed that cutthroat trout captured upstream of the road are either moving downstream from Trout Lake or represent a small isolated population.

The Species at Risk Public Registry and DFO aquatic species at risk maps were also reviewed to identify potential aquatic species at risk and/or critical habitat within the Project area. There are no federally listed aquatic species at risk or critical habitat documented to occur in Trout Lake Creek.

Table 2 Documented fish species in Trout Lake Creek (Hatfield 2018).

Common Name	Scientific Name	[1]Capture Location	Common Name	Scientific Name	Capture Location
Chum salmon	*Oncorhynchus keta*	Downstream	Pink salmon	*Oncorhynchus gorbuscha*	Unknown
Coho salmon	*Oncorhynchus kisutch*	Downstream	Rainbow trout	*Oncorhynchus mykiss*	Downstream
Coastal cutthroat trout	*Oncorhynchus clarkii clarkii*	Upstream	Sculpin	*Cottus sp.*	Downstream
Kokanee	*Oncorhynchus nerka*	Unknown	Sockeye salmon	*Oncorhynchus nerka*	Unknown
Longnose dace	*Rhinichtys cataractae*	Upstream	Stickleback	*Gasterosteus sp.*	Unknown

[1]Capture location in relation to Hick's Lake Road. Unknown location indicates species identified during the desktop review but not observed during field surveys.

Hatfield previously conducted fish habitat baseline studies at site DF4 in 2017 and 2018 (Hatfield 2017 and Hatfield 2018); however, these studies have been updated due to extensive erosion and bedload movement which occurred during the 2020 and 2021 floods.

Trout Lake Creek originates in Trout Lake, about 670 m upstream of site DF4 (Westrek, 2020), and the creek receives streamflow from Hick's Lake and other unnamed watercourses upstream of Trout Lake and within the watershed. Site DF4 is located approximately 300 m upstream of Harrison Lake and is surrounded by Sasquatch Provincial Park, and several private lots located on the fan west of Hick's Lake Road (Westrek 2020). The reaches of Trout Lake Creek conveyed over the fan are ephemeral, drying out

and/or flowing subsurface during the late summer/early fall (i.e., August/September) as observed during the recent debris removal works at Green Point Bridge; the crossing of Trout Lake Creek at Rockwell Drive downstream of Hick's Lake Road. Trout Lake Creek upstream of Hick's Lake Road appears to flow year-round. Water temperature, pH, dissolved oxygen, and conductivity within a pool upstream of Hick's Lake Road were 8.7°C, 6.36, 11.86 mg/L, and 39.2 us/cm, respectively, during the March 30, 2022, field assessment.

A substantial amount of bedload and road fill material was deposited downstream of site DF4 during the 2020 and 2021 flood events (Hatfield 2023), resulting in morphological changes to Trout Lake Creek (e.g., raising the streambed profile, infilling of pools, accumulation of wood debris, and changes in substrate composition). Emergency works to remove accumulated debris upstream and downstream of the Green Point Bridge located further downstream at Rockwell Drive were conducted during the 2022 least-risk fisheries window to reinstate the freeboard under the bridge (Hatfield 2022 and Figure 3). The previous floods and associated emergency works have also resulted in changes to Trout Lake Creek upstream of site DF4. The approximate 100 m reach upstream of Hick's Lake Road previously characterized by riffle-run-pool morphology has shifted to primarily cascade-pool morphology and a considerable amount of riparian vegetation has been replaced with riprap erosion protection (Figure 3).

Fish habitat within Trout Lake Creek upstream of Hick's Lake Road has been heavily disturbed by the floods and provides limited opportunity for salmonid rearing or spawning given the change in channel morphology and substrate composition, infilling of pools, and displacement of riparian vegetation with riprap scour protection; however, this habitat is likely suitable for longnose dace (*Rhinichtys cataractae*) and sculpin (*Cottus* sp.) previously captured further upstream in 2017 (Hatfield 2017). Chum salmon (*Oncorhynchus keta*) were observed spawning within Trout Lake Creek during previous surveys in November 2017 downstream of Hick's Lake Road; however, much of the suitable gravel spawning substrate has been displaced downstream to the lower reaches of Trout Lake Creek at Harrison Lake. Similar to the previously perched culvert at site DF4 (Figure 3), the current crossing structure is a barrier to fish passage. A summary of fish habitat measurements from the 2022 habitat transects (Figure 4) is provided in Table 3.

Figure 3 2018 to 2022 photographic comparison of site DF4.

Photo 3 **Trout Lake Creek upstream of Hick's Lake Road. (upstream view; March 26, 2018).**

Photo 4 **Trout Lake Creek upstream of Hick's Lake Road. (upstream view; March 30, 2022).**

Figure 3 (Cont'd.)

Photo 5 Trout Lake Creek downstream of Hick's Lake Road. (upstream view; March 26, 2018).

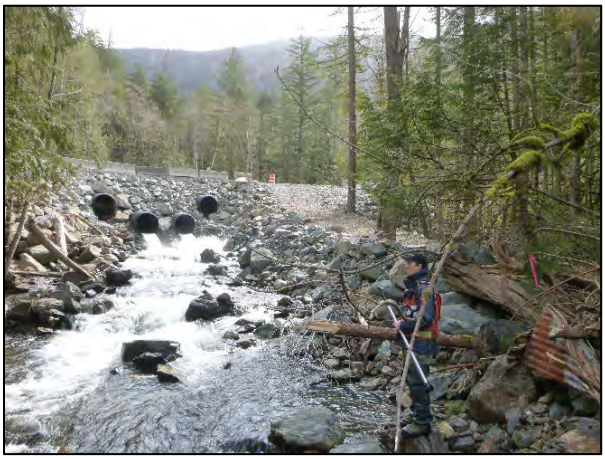

Photo 6 Trout Lake Creek downstream of Hick's Lake Road. (upstream view; March 30, 2022).

Table 3 Trout Lake Creek fish habitat transects from downstream to upstream (March 2022).

Transect ID	Gradient (%)	Channel Width (m)	Wetted Width (m)	Substrate		Depth (cm) Across Channel			Velocity (m/s) Across Channel		
				Dominant	Subdominant	25%	50%	75%	25%	50%	75%
1	2.0	20.7	6.3	Cb	Gr	19	28	28	0.3	0.6	1.0
2	2.5	5.5	3.9	Cb	Gr	36	47	35	0.6	0.7	0.2
3	3.5	13.2	6.7	Cb	Bd	35	36	21	0.9	0.8	0.4
4	2.0	18.8	8.5	Cb	Gr	25	38	20	0.8	0.5	0.6
5	3.0	22.6	8.5	Cb	Bd	39	22	28	1.1	0.1	0.9
6	4.0	25.0	5.2	Cb	Gr	56	56	36	0.2	0.9	0.3
7	3.0	28.5	7.5	Cb	Bd	24	44	13	0.1	0.5	0.1
[1]8	3.5	10.8	8.8	Cb	Bd	16	29	23	0.9	1.2	1.0
[2]9	8.0	28.3	7.3	Cb	Bd	32	22	16	0.3	0.2	1.5
10	4.5	10.4	6.8	Cb	Gr	39	62	26	0.1	0.2	0.3
11	8.0	9.3	7.7	Bd	Gr	25	56	39	0.2	0.7	0.4

GR= Gravel; Cb = Cobble; Bd = Boulder

[1] Within the Project footprint and immediately downstream of Hick's Lake Road.

[2] Within the Project footprint and immediately upstream of Hick's Lake Road.

Figure 4 Location of Habitat Transects along Trout Lake Creek (March 30, 2022).

Legend

- Transect
- Watercourse
- Sasquatch Park

0 50 100 200 m

N

Scale: 1:7,000

Projection: NAD 1983 UTM Zone 10N

Data Source:
a) Transects, Hatfield 2022.
b) Watercourse, BC Freshwater Atlas.
c) Sasquatch Park, Tantalis 2015.
d) Ortho imagery 10 cm, provided on Feb 9, 2022 by MOTI.

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3.0 ASSESSMENT OF IMPACTS

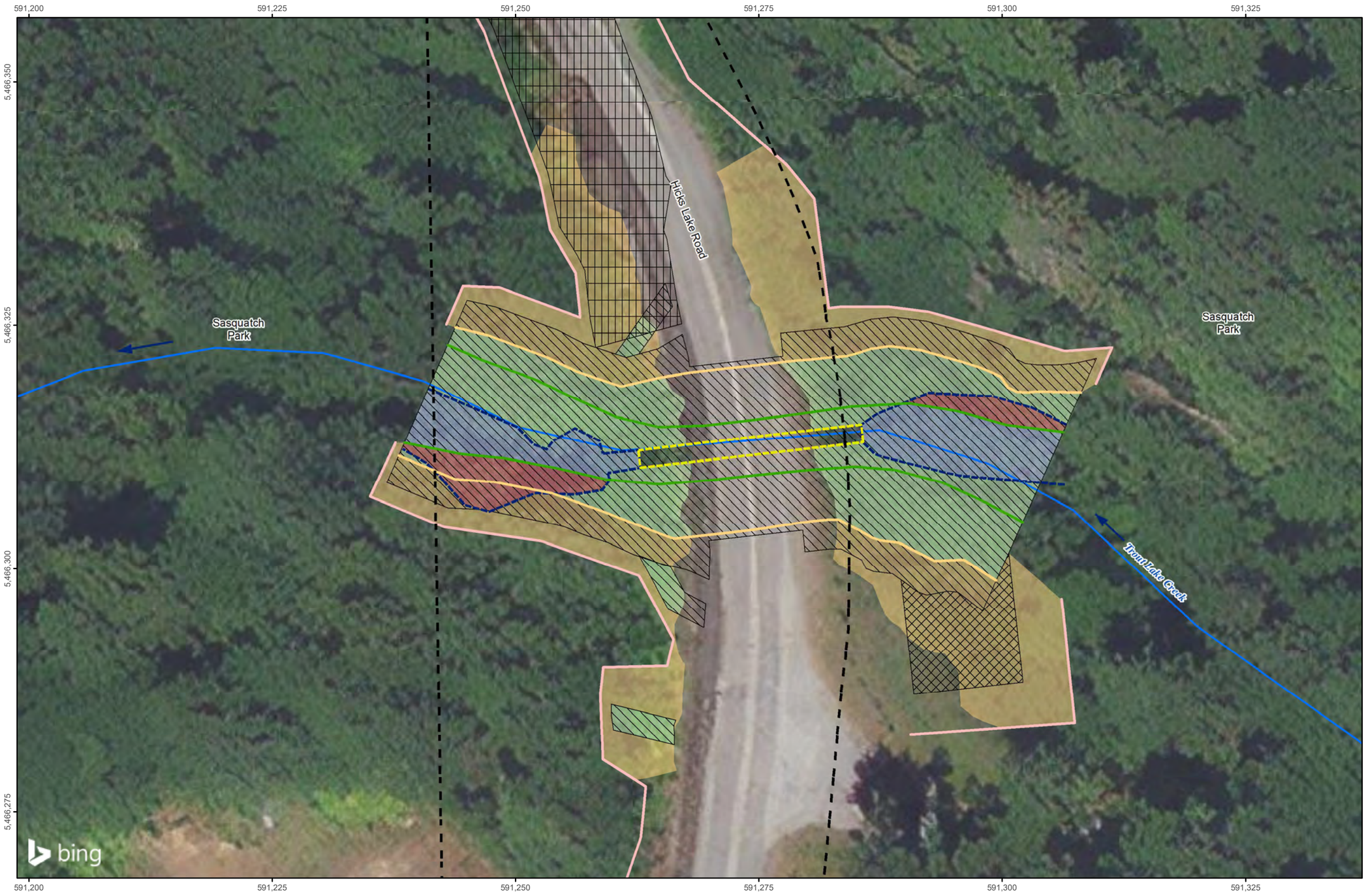
3.1 DESIGN

Based on the options analysis report (AE 2022), Design Option 4 is the preferred long-term design option for site DF4 and is comprised of a new clear-span bridge to convey the design debris flood. Design Option 4 has the largest hydraulic opening of the design options and is the least susceptible to debris blockage. A temporary detour bridge will be required during construction; however, as previously discussed the temporary detour bridge is not part of the WUA associated with this request for review.

The assessment of impacts considers the pre-2020 flood event as the baseline condition for Trout Lake Creek. Using the pre-2020 flood event captures impacts that have occurred as a result of emergency works associated with both the 2020 and 2021 flood events as well as impacts expected to occur from the new clear-span bridge.

It is expected that replacing the culverts with a bridge of current design standards that considers climate change and debris flood events will reduce erosion to Hick's Lake Road and Trout Lake Creek whereby subsequent flooding and damage of downstream environments, infrastructure, and property is reduced. Furthermore, the daylighting of Trout Lake Creek through the removal of the culverts will provide a net gain of aquatic habitat and improve fish passage during moderate flow conditions (refer to Section 4.1). Despite this overall net benefit, there are impacts associated with the previous emergency works, and not all Measures to Protect Fish and Fish Habitat (DFO 2019a) can be implemented for the proposed Project. Expected impacts to the aquatic and riparian environments of Trout Lake Creek associated with the Project are presented in Figure 5.

Figure 5 **Assessment of impacts for the Trout Lake Creek Culvert Replacement Project.**



Legend

- Watercourse
- BC Parks Boundary
- Proposed Clearing and Grubbing Extent
- Proposed Q2 High Water Mark
- Proposed Top of Bank
- 2018 Perched Culvert
- 2018 Q2 High Water Mark
- Geogrid Reinforcements
- Buried Riprap
- Surface Riprap

Habitat Impacts

- Aquatic Habitat Loss (95 m^2)
- Aquatic Habitat Modification (198 m^2)
- Riparian Permanent Loss (584 m^2)
- Riparian Temporary Loss (998 m^2)

0 5 10 m

N

Scale: 1:400

Projection: NAD 1983 UTM Zone 10N

Data Sources:
a) Linework, Associated Engineering, 2023.
b) Habitat impacts, Hatfield, 2023.
c) Watercourse, digitized by Hatfield, 2023, based on linework from Binnie, 2022.
d) Background image, Bing Maps.

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Trout Lake Creek Culvert Replacement Project

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3.2 CONSTRUCTION

The following Project WUA and associated potential effects as identified by the pathways of effects (DFO 2018) are anticipated with Design Option 4 (Table 4).

Table 4 Pathways of effects associated with Project WUA.

Project WUA	Description of Project Activity	Potential Effects (DFO 2018)
Land-based Activities		
Vegetation Clearing	Clearing of vegetation within areas requiring riprap armouring	Changes in water temperature, habitat structure and cover, sediment concentrations, nutrient concentrations, food supply, and contaminant concentrations
Excavation	Installation of buried riprap	Changes in base flow, water temperature, and sediment concentrations
Grading	Realignment and contouring of channel banks for riprap placement	Changes in habitat structure and cover, and sediment concentrations
Use of Industrial Equipment	Use of industrial equipment (e.g., excavator) to install riprap scour protection	Potential mortality of fish/eggs/ova from equipment; changes in sediment concentrations, and contaminant concentrations
Riparian Planting	Planting native plant species within disturbed riparian areas	Changes in water temperature, habitat structure and cover, sediment concentrations, nutrient concentrations, food supply, and contaminant concentrations
In-water Activities		
Placement of Material or Structures in Water	Placement of riprap below the high watermark	Changes in food supply, habitat structure and cover, sediment concentrations, and nutrient concentrations
Excavation	Removal of old culverts and channel daylighting	Changes in habitat structure and cover, and sediment concentrations
Use of Industrial Equipment	Placement of riprap and habitat enhancement features below the high watermark	Potential mortality of fish/eggs/ova from equipment; changes in sediment concentrations, and contaminant concentrations
Structure Removal	Removal of culverts	Changes in sediment concentrations, food supply, habitat structure and cover, and contaminant concentrations

3.2.1 In-Water Activities

Potential temporary adverse impacts to the aquatic environment during in-water activities 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 direct adverse impacts to fish include but are not limited to:

- Mortality from direct contact with industrial equipment/instream structures or dewatering activities; and
- Temporary changes in habitat structure and base flow during channel grading and the installation of riprap scour protection.

3.2.2 Land-Based Activities

Potential temporary adverse impacts to the aquatic environment during land-based activities are primarily related to changes in habitat quality and structure, including but not limited to:

- Increase in water temperature and decrease in cover and food/nutrient supply as a result of riparian vegetation clearing;
- Increase in sediment concentrations as a result of exposed upland soils and channel banks; and
- Underwater noise generated during abutment pile installation.

Riparian Vegetation

Riparian vegetation within the Project footprint is limited due to the previous flood events and subsequent emergency works. Based on the arborist report (McElhanney 2023), a total of 38 trees will be removed as a result of the Project of which 22 will be removed from the MOTI right-of-way, and 16 will be removed from Sasquotch Provincial Park. The majority of trees to be removed are comprised of Douglas-fir (*Pseudotsuga menziesii*) and bigleaf maple (*Acer macrophyllum*). The estimated age of the stand ranges from newly regenerated to 60 years (McElhanney 2023).

Underwater Noise

Concrete piles with steel casings will be installed on land and in the dry as part of the abutment construction; however, it is uncertain whether the contractor will use boring technology or down-hole pile driving. Concrete piles installed on land via boring will not generate sound levels capable of impacting fish (MPDCA 2003); however, it is unclear what levels of underwater noise could be generated from down-hole pile driving.

4.0 IMPACT MITIGATION STRATEGIES

4.1 DESIGN

Generally, the footprint of the new bridge and associated riprap will be minimized to the extent feasible while maintaining current design standards. The new larger bridge span and removal of existing culverts will reduce channel constriction by maintaining the approximate upstream and downstream channel dimensions within the bridge footprint. As previously discussed, the new bridge will result in a net gain of aquatic habitat (Figure 6) and reduce erosion to Hick's Lake Road and Trout Lake Creek whereby subsequent flooding and damage to downstream environments, infrastructure, and property is reduced from current and pre-flood conditions.

Fish Passage

Given the previous permanent crossing and current temporary crossing present a barrier to fish passage, the opportunity to improve fish passage through the new crossing has been extensively reviewed and discussed with the Project team during the options analysis. Based on the previous baseline studies conducted in 2017 and 2018 (Hatfield 2017 and Hatfield 2018), which documented suitable fish habitat in the form of potential rearing and spawning areas within an approximate 100 m reach upstream of Hick's Lake Road, it was originally determined that designing for fish passage was warranted; however, due to shifting baseline conditions as a result of the 2020 and 2021 flood events and associated emergency works, the previously identified suitable habitat has been downgraded to marginal habitat (refer to Section 2.1). Given the marginal habitat for fish upstream of Hick's Lake Road and engineering challenges associated with steep channel gradients and the large size of riprap required to construct a fishway (e.g., step-pools), we are no longer recommending this design mitigation strategy.

The Project team developed a fish habitat restoration options analysis to identify the most suitable fish habitat restoration option for the Project. Four restoration options were considered including:

- Option 1: Provide fish passage under the new bridge via the construction of a fishway (e.g., step-pools) to improve fish passage across a range of flows;
- Option 2: Restore a side channel downstream of the bridge to provide fish-rearing opportunities and refuge during future flood events;
- Option 3: The installation of mainstem channel habitat features upstream and downstream of the new bridge to provide instream complexity for cover and high-flow refuge. This option may also provide fish passage during moderate flow conditions; and
- Option 4: Provide no fish habitat restoration, given DF4 was already a fish barrier during baseline conditions and impacts to the creek occurred as a result of natural flood events.

The options analysis summarizing all considerations associated with each restoration option is presented in Table 5. Restoration Option 3 was selected as the most suitable restoration approach given the change in fish habitat values upstream of the bridge, property, maintenance, and constructability constraints associated with Restoration Option 1 and Option 2. Restoration Option 3 would provide appropriate mitigation for the Project and contribute to the restoration of fish habitat disturbed as a result of multiple flood events.

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Figure 6 Aquatic habitat gains associated with the Trout Lake Creek Culvert Replacement Project.

Legend

- Watercourse
- BC Parks Boundary
- Proposed Clearing and Grubbing Extent
- Proposed Q2 High Water Mark
- Proposed Top of Bank
- 2018 Perched Culvert
- 2018 Q2 High Water Mark
- Geogrid Reinforcements
- Buried Riprap
- Surface Riprap

Habitat Impacts

- Aquatic Habitat Gain (276 m^2)

0 5 10 m

N

Scale: 1:400

Projection: NAD 1983 UTM Zone 10N

Data Sources:
a) Linework, Associated Engineering, 2023.
b) Habitat impacts, Hatfield, 2023.
c) Watercourse, digitized by Hatfield, 2023, based on linework from Binnie, 2022.
d) Background image, Bing Maps.

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Trout Lake Creek Culvert Replacement Project

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Table 5 Trout Lake Creek Bridge, fish habitat restoration options analysis.

Option	Objective	Benefits to Fish Productivity	Fish Habitat Limitations	Engineering Considerations	Constructability	Property	Maintenance	Permitting and Risks
Option 1: Fish Passage under the new bridge	▪ Remove fish barrier that has been observed since monitoring commenced in 2017 (perched culvert), and subsequent flood events in 2020 (temporary bridge and steeply sloped riprap) and 2021 (4 HDPE culverts and steeply sloped riprap at outlets).	▪ Provide access to approximately 100 m of fish habitat characterized by spawning, rearing and overwintering habitat prior to the 2020 and 2021 flood events. ▪ Benefits to anadromous fish currently limited to the downstream reach (e.g., coho and chum salmon), and resident fish (e.g., cutthroat trout) upstream of Rockwell Drive that would be able to access the lower reach and Harrison Lake and return upstream.	▪ Previous high-value habitat upstream of bridge has been downgraded to marginal as a result of flood impacts and emergency repair works. Riffles and pools have been replaced by cascades limiting available spawning, rearing and overwintering habitat. ▪ Upstream fish passage is likely not possible during summer low-flow and winter/spring high-flow events which naturally occur in this system; however, fish passage would be further constrained by engineering challenges during low and high-flow conditions (see engineering considerations).	▪ Challenging to maintain surface flow during low-flow conditions due to large riprap voids; grouted riprap will likely not withstand future debris flow. ▪ Steep gradient requiring step-pool fishway. ▪ Step-pools will infill during future debris flow.	▪ Installation of step-pools will require AQP oversight to ensure fish passage. ▪ Stream isolation is required if grouted riprap is used. ▪ Likely requires machinery working below the top of bank.	▪ All works in MOTI ROW.	▪ Clearing of sediment and debris from step-pools likely required.	▪ WSA Change Approval (5 months). ▪ FA Letter of Advice (2 months). ▪ Contingency measures may be required if fish passage fails, and may require additional permitting.
Option 2: Downstream side channel restoration	▪ Reconnect an abandoned side channel to Trout Lake Creek that has become isolated due to previous debris flow. Debris berm will remain in place to provide flood protection, and flows will be reconnected via a buried intake pipe through the debris berm.	▪ High-flow refuge, protection from future debris flow, overwintering, and summer rearing (all limiting habitat features in Trout Lake Creek) ▪ Provide access to approximately 100 m of abandoned fish habitat	▪ Potential fish stranding during low-flow conditions. ▪ Environmental flow needs for both the side channel and mainstem may not be achievable.	▪ Side channel intake structure design will need to consider debris maintenance. ▪ Grade control feature (i.e., weir) may be required across main channel to ensure proper hydraulic function of side channel intake.	▪ Can be constructed in isolation of flows easily with the exception of the intake structure which would be constructed last (i.e., works in the side channel would be conducted before commissioning flows) ▪ Access is available, but may require the removal of a few trees (can be used as LWD in the side channel)	▪ Majority of works on BC Parks Land (Sasquatch Provincial Park).	▪ Maintenance of the intake structure will be required. TBD if this be the responsibility of BC Parks or MOTI staff.	▪ WSA Change Approval (5 months) and Water Licence (1 year, can be staged to allow works to proceed). ▪ May require FA Authorization (5 months). ▪ Will require a letter of Authorization from BC Parks. ▪ Benefit of having intake works under Licence is that future maintenance or repairs on structure will not require individual / future WSA approval. ▪ May not meet DFAA funding criteria.
Option 3: Mainstem channel habitat features upstream and downstream of the bridge	▪ Install rock spurs, boulder clusters, and LWD.	▪ Provide instream complexity for cover and high-flow refuge.	▪ Instream habitat features within the mainstem channel have a high potential of being displaced/damaged during a future debris flow.	▪ Conventional designs available ▪ Sizing and anchoring habitat features to withstand future debris flow ▪ Change in flood stage, and potential to trap/accumulate debris on habitat features	▪ Anchoring of LWD, boulder clusters, spurs etc. may require bank and channel excavation and stream isolation	▪ All works in MOTI ROW	▪ Debris and sediment removal following flood events	▪ WSA Change Approval (5 months). ▪ FA Letter of Advice (2 months). ▪ Contingency measures may be required if habitat features fail during future debris flow, and may require additional permitting.
Option 4: No fish habitat restoration	▪ Restoration not required, the majority of impacts to fish habitat and fish passage naturally occurred and are likely to occur again based on stream channel dynamics	▪ N/A	▪ Natural recovery of flood-impacted fish habitat may take a long time or never occur.	▪ Crossing designed to meet hydrotechnical requirements	▪ N/A	▪ N/A	▪ N/A	▪ WSA Change Approval (5 months). ▪ FA Letter of Advice (2 months). ▪ Permits may not be issued without restoration measures.

Restoration Option 3 (Installation of Mainstem Habitat Features)

A number of design features have been incorporated into the Project to enhance fish habitat functions including:

1. Siting the new bridge within the footprint of the existing crossing to minimize negative impacts to fish and wildlife habitat;
2. Daylighting approximately 276 m^2 of aquatic habitat (Figure 6) through the removal of the existing culverts which currently present a barrier to fish passage and grading the channel to an approximate slope of 8.6%;
3. Top-dressing riprap scour protection up to the high watermark (i.e., 2-year return flow) with native substrates (i.e., cobble/gravel/fines) salvaged during construction to fill riprap voids (and promote surface flow) and provide a natural channel appearance more suitable for benthic invertebrate production and fish habitat;
4. Installation of boulder clusters and large woody debris to provide habitat complexity, cover, and velocity hides for fish during high-flow events and provide fish passage during moderate-flow events; and
5. Minimizing clear and grub limits to the greatest extent possible, especially in areas adjacent to and within BC Parks land. A tree survey has been conducted to optimize clear and grub limits whereby significant trees are avoided if possible. Planting of native trees, shrubs, and forb species suited to site conditions will occur within riparian areas disturbed during construction and previous flood events.

Instream fish habitat enhancement features are presented in AE Drawing Nos 10505-114 and 10505-118 (Appendix A1).

Riparian Planting Plan

Approximately 1,676 m^2 of plantings will be installed within disturbed riparian areas (Appendix A2). Plants will be of guaranteed nursery stock and installed at one plant per square metre density (BC MoE 2008) or as specified per the landscape plan (Appendix A2). Large woody debris salvaged during construction will be placed throughout the planting areas.

4.2 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 (Gov. BC 2022b), and the Measures to Protect Fish and Fish Habitat (DFO 2019a). The CEMP will 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 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 (including concrete leachate) and emergency response plan;
- Erosion and sediment control plan;
- Vegetation management plan (including management of invasive and noxious weeds);
- Wildlife protection plan; and
- Waste management plan.

Underwater Noise

To install the reinforced concrete piles with steel casings, we understand the contractor will have the option to either drill (i.e., bore) the piles or drive the piles with a down-hole hammer. A Pile Driving Procedure underwater noise management plan will be developed if the contractor chooses to use a downhole hammer with appropriate underwater noise monitoring equipment (e.g., hydrophone) and mitigations if required (e.g., bubble curtain). The contractor's Appropriately Qualified Professional (AQP) will be required to include the following mitigation measures in the underwater noise management plan:

- The environmental monitor will be on-site during all down-hole pile driving activities to monitor for fish observations and hydroacoustic monitoring at the limits of the fish exclusion zone;
- Commence pile driving with a soft start where the impact energy is gradually increased over a 10-minute period;
- Ensure at the boundary of the fish exclusion zone, Peak and cumulative Sound Exposure Levels do not exceed the thresholds summarized in Table 6 (Popper et al. 2006); and
- If monitoring indicates sound levels exceed the thresholds the work must be halted. The work will only resume after additional measures (e.g., bubble curtain) have been implemented to reduce sound levels below the thresholds (Table 6).

Table 6 Underwater pile driving noise thresholds typically referenced in regulatory approvals.

Monitoring Endpoint	Pile Driving Noise Criteria
Peak Sound Pressure Levels (SPL_{peak})	206 dB re 1 µpa
Cumulative Sound Exposure Levels (SEL)	186 dB re 1 $\mu pa^2 \cdot sec$

4.2.1 Least Risk Windows

Fish

Instream works will be conducted during the regional least risk work window of August 1 to September 15 to protect against potential effects on trout and salmon species (BC MOE 2006). It should be noted that the least risk window for fish does not apply if the watercourse is naturally dry. Instream works outside the least risk window may be permitted with a compelling rationale and appropriate mitigation measures. The contractor's EM must submit a site-specific mitigation plan to the Ministry Representative for review and approval prior to working outside of the window. The mitigation plan must outline the rationale for working outside of the least risk work window, associated risks, and site-specific mitigation measures. The plan and subsequent effectiveness of the plan will be included in the post-construction monitoring report for the Project.

Birds

Mitigation during construction should include work restrictions during the breeding bird window of March 15 to August 30 for this region (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). Pre-clearing bird nesting surveys by an Appropriately Qualified Professional (AQP as defined in MOTI SS 165) 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 field assessments; regardless, raptor nest surveys should be completed immediately prior to construction to ensure conditions have not changed.

5.0 ASSESSMENT OF RESIDUAL IMPACTS

Potential adverse residual impacts (i.e., impacts that may reasonably occur after all mitigation is considered) in the context of the death of fish or HADD are not expected to occur given the short duration of the WUA, the magnitude of temporary and permanent impacts (Table 7), ecosystem values sustained within the Project footprint, and proposed design and construction mitigation measures (Table 8). Overall, there will be a net gain of aquatic (655 m^2) and riparian (94 m^2) habitats realized by the Project which includes the enhancement of 474 m^2 of fish habitat features (i.e., boulder clusters and large woody debris), daylighting 276 m^2 of Trout Lake Creek via the removal of the culverts, and revegetation of approximately 1,676 m^2 of riparian habitat. Fish passage through Hick's Lake Road will also be improved from current and historical conditions. A habitat budget summary is provided in Table 7.

Table 7 Habitat balance associated with the Project works, undertakings, and activities.

Habitat Type	Area m^2					
	Habitat Enhancement	Temporary Loss	Permanent Loss	Permanent Gain	Riparian Revegetation	Net Gain/Loss
Aquatic	474	-	95	276	-	+655
Riparian	-	998	584	-	1,676	+94

In accordance with the Fish and Fish Habitat Protection Policy Statement (DFO 2019b), 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 to confirm if all Measures to Protect Fish and Fish Habitat (DFO 2019a) can be implemented. Our review concluded that all measures as described in DFO (2019a) can be followed except for:

- Avoid placing fill or other temporary or permanent structures below the high watermark;
- Disturbing or removing materials from the banks, shoreline, or waterbody bed;
- Maintaining an undisturbed vegetated buffer zone between areas on land and the high watermark; and
- Avoiding tree removal in the riparian area.

Although there will be temporary and permanent changes to fish habitat associated with the Project, the temporary changes as a result of Project WUA are short in duration (i.e., instream works for 1.5 months and within the least risk work window) and low in magnitude (i.e., instream footprint of approximately 500 m^2). Conventional BMPs are considered acceptable and practical to mitigate potential short-term construction-related impacts (Table 8) which will be detailed in the Project CEMP. Further, the permanent changes to fish habitat associated with the Project will provide a net gain in fish habitat (Table 7) and improve habitat quality including:

- Improved fish passage during moderate flows as a result of removing the perched culverts, reducing the channel slope, and installation of boulder clusters;
- Improved fish cover and resting areas during high flows as a result of the habitat enhancement features (i.e., boulder clusters and large woody debris);
- Resiliency to future flood events given the sizing of the new clear-span bridge to convey design flood and debris flows;
- Resiliency to future scour during flood events given the sour protection design features; and
- Improved long-term riparian function (e.g., allochthonous carbon input, shade, and LWD input) given the benefits of the Project landscape plan (Appendix A2).

Hatfield is confident that our assessment aligns with DFO's risk-based approach to the application of the fish and fish habitat protection provisions when considering the sensitivity of the fish and fish habitat in question.

Table 8 Description of potential pathways of effects and proposed mitigation measures.

WUA Description	Area of Impact (m^2)	Duration (Days)	Potential Pathway of Effect		Proposed Mitigation
			Land-Based Activities	In-Water Activities	
Mobilization and site preparation	-	7	▪ Grading ▪ Une of industrial equipment	▪ NA (works above high watermark)	▪ Install sediment and erosion control measures. ▪ Conduct work as quickly as possible and during favourable weather conditions. ▪ Environmental monitoring including turbidity monitoring. ▪ Ensure a fully stocked spill kit is available on site.
Clearing and grubbing of riparian vegetation	1,582	5	▪ Vegetation clearing ▪ Grading ▪ Use of industrial equipment	▪ NA (works above high watermark)	▪ Install sediment and erosion control measures. ▪ Environmental monitoring including turbidity monitoring. ▪ Conduct salvage for Pacific water shrew and install exclusion fencing if required following a habitat assessment. ▪ Conduct a breeding bird survey and install no work buffers if required. ▪ Ensure a fully stocked spill kit is available on site. ▪ Environmental monitoring including turbidity monitoring.
Removal of existing culverts and construction of new channel	877	7	▪ Excavation ▪ Grading ▪ Use of industrial equipment	▪ Structure removal ▪ Excavation ▪ Grading ▪ Use of industrial equipment	▪ Install sediment and erosion control measures. ▪ Complete works when the channel is naturally dry and/or within the least risk fisheries window. ▪ [1]Isolate work area from flows following a fish salvage if required. ▪ Environmental monitoring including turbidity monitoring.
Substructure construction	255	20	▪ Excavation ▪ Grading ▪ Use of industrial equipment	▪ NA (works above high watermark)	▪ Install sediment and erosion control measures. ▪ Complete work when the channel is naturally dry and/or within the least risk fisheries window. ▪ [1]Isolate the work area from flow following a fish salvage if required. ▪ Have a co_2 bubbler and concrete leachate management plan on site. ▪ Environmental monitoring including pH, turbidity, and noise monitoring (with hydrophone). Have a bubble curtain on site if required.

Table 8 (Contd.)

WUA Description	Area of Impact (m^2)	Duration (Days)	Potential Pathway of Effect		Proposed Mitigation
			Land-Based Activities	In-Water Activities	
Installation of riprap scour protection and bridge superstructure	877	25	▪ Excavation ▪ Grading ▪ Use of industrial equipment	▪ Placement of material or structures in water ▪ Excavation ▪ Grading ▪ Use of industrial equipment	▪ Install sediment and erosion control measures. ▪ Complete works when the channel is naturally dry and/or within the least risk fisheries window. ▪ [1]Isolate work area from flows following a fish salvage if required. ▪ Conduct work as quickly as possible and during favourable weather conditions. ▪ Ensure a fully stocked spill kit is available on site. ▪ Environmental monitoring including turbidity monitoring.
Installation of fish habitat enhancement features	474	3	▪ Excavation ▪ Grading ▪ Use of industrial equipment	▪ Placement of material or structures in water ▪ Excavation ▪ Grading ▪ Use of industrial equipment	▪ Install sediment and erosion control measures. ▪ Complete works when the channel is naturally dry and/or within the least risk fisheries window. ▪ [1]Isolate work area from flows following a fish salvage if required. ▪ Ensure a fully stocked spill kit is available on site. ▪ Environmental monitoring including turbidity monitoring.
Demobilization	-	5	▪ Grading ▪ Use of industrial equipment	▪ NA (works above high watermark)	▪ Install sediment and erosion control measures. ▪ Conduct work as quickly as possible and during favourable weather conditions. ▪ Ensure a fully stocked spill kit is available on site. ▪ Environmental monitoring including turbidity monitoring.
Riparian restoration seeding/planting in the fall.	1,676	7	▪ Riparian planting	▪ NA (works above high watermark)	▪ Install sediment and erosion control measures.

[1]Conducted in accordance with the interim code of practice: Temporary cofferdams and diversion channels, and Interim code of practice: End-of-pipe fish protection screens for small water intakes in freshwater.

6.0 CLOSURE

The Project includes the removal of existing culverts, installation of a clear span bridge, instream channel erosion protection, and fish habitat enhancement features at the Hick's Lake Road crossing of Trout Lake Creek. So long as the mitigation measures outlined in this application are followed it is our opinion that residual adverse impacts (i.e., the death of fish or HADD) will not occur as a result of this Project.

7.0 REFERENCES

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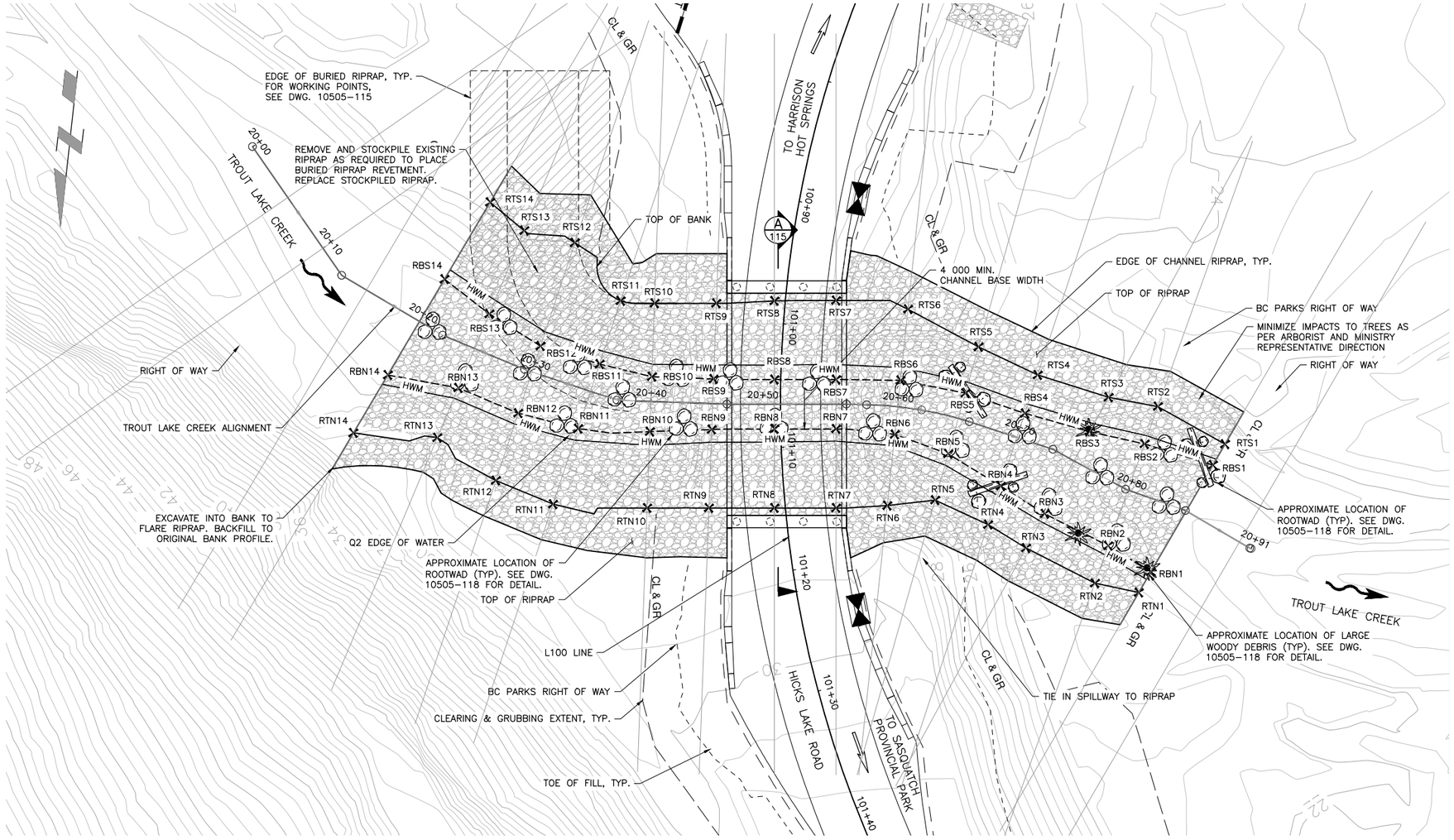
APPENDICES

Appendix A1

AE Design Drawings



PLAN
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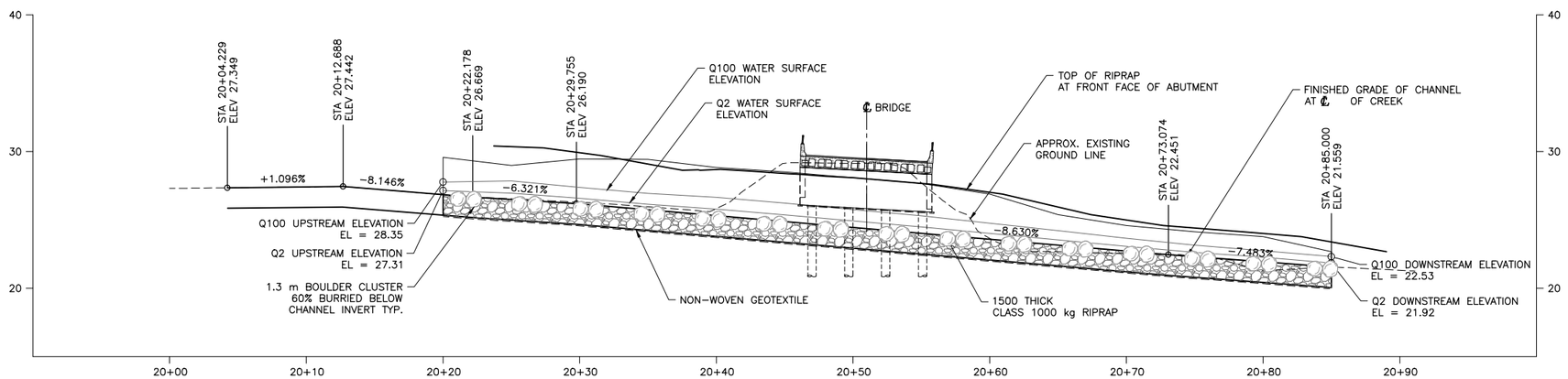

PROFILE
SCALE 1:200

NOTES:

1. HYDROTECHNICAL DESIGN BASED ON 1% ANNUAL EXCEEDANCE PROBABILITY (100–YEAR RETURN PERIOD) DESIGN FLOW (20% ALLOWANCE FOR FUTURE CLIMATE CHANGE) AND 10% BULKING FACTOR = 40.4 m^3/s.
2. RIPRAP PER BC MINISTRY OF TRANSPORATION STANDARD SPECIFICATIONS SECTION 205 (2020).
3. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
4. ALL ELEVATION AND STATIONS ARE IN METRES.
5. 0.5 m CONTOUR INTERVALS.

Consultant Logo

Associated Engineering

Rev	Date	Description	Init
B	2023–06–21	ISSUED FOR 100% DETAILED DESIGN	M.L.
A	2023–06–02	ISSUED FOR DRAFT REPORT	M.L.

REVISIONS

BRITISH COLUMBIA
Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK CULVERT REPLACEMENT

CHANNEL EMBANKMENT PROTECTION DETAILS – SHEET 1

PREPARED UNDER THE DIRECTION OF
ERIC FINNEY, P.ENG
ENGINEER OF RECORD
DATE 2023–06–21

DESIGNED E. FINNEY/L. WHITE DATE 2023–06–21
CHECKED M. MACLATCHY DATE 2023–06–21
DRAWN J. MORO/H. LEE DATE 2023–06–21
SCALE AS NOTED
NEGATIVE No.

FILE No.	PROJECT No.	REG.	DRAWING No.	
2022–2677–00	14048–0000	1	10505–114	B

CANCEL PRINTS BEARING PREVIOUS LETTER

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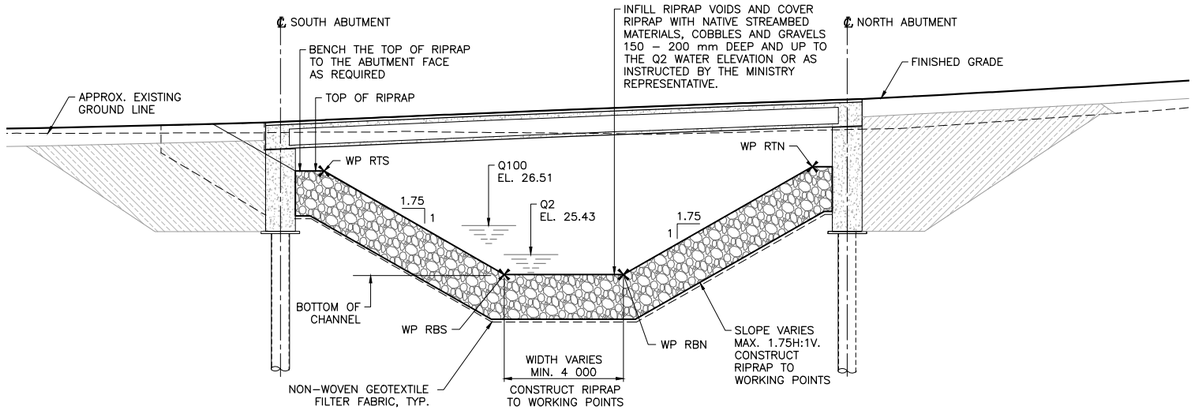
PLOTTED : August 3, 2023



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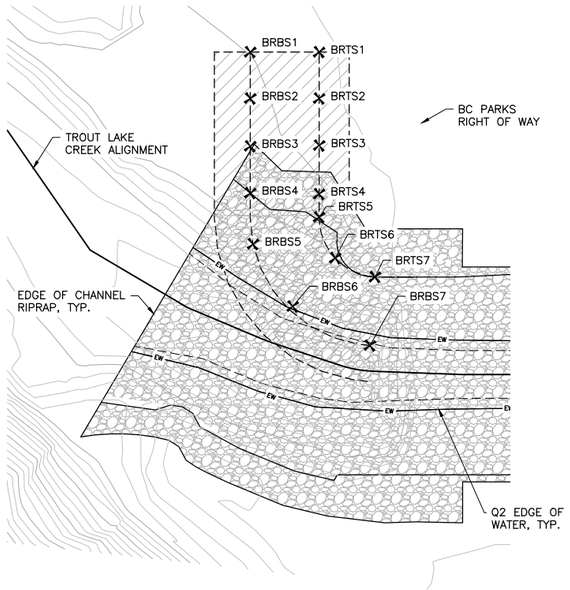

WORKING POINTS BURIED RIPRAP PLAN
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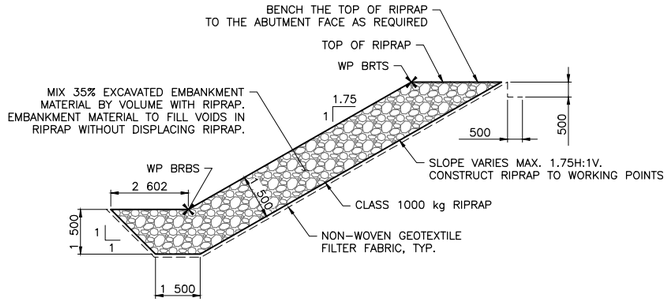


TYPICAL BURIED RIPRAP SECTION
SCALE 1:100

WORKING POINT TABLE				
NUMBER	DESCRIPTION	NORTHING	EASTING	ELEVATION
1	RBN1	466322.711	591232.912	21.559
2	RBN2	466321.007	591236.577	21.933
3	RBN3	466319.004	591241.971	22.307
4	RBN4	466317.178	591245.761	22.717
5	RBN5	466315.045	591250.287	23.148
6	RBN6	466313.965	591254.761	23.580
7	RBN7	466314.053	591259.538	24.011
8	RBN8	466314.608	591264.507	24.443
9	RBN9	466315.214	591269.546	24.874
10	RBN10	466315.947	591274.505	25.306
11	RBN11	466316.343	591280.310	25.737
12	RBN12	466315.644	591285.273	26.169
13	RBN13	466314.149	591290.324	26.491
14	RBN14	466313.746	591296.114	26.846
15	RTN1	466324.492	591233.698	22.671
16	RTN2	466324.137	591237.316	23.771
17	RTN3	466321.930	591243.173	24.115
18	RTN4	466320.381	591246.439	24.588
19	RTN5	466318.888	591250.927	25.374
20	RTN6	466319.762	591254.726	26.892
21	RTN7	466320.413	591258.827	27.669
22	RTN8	466320.968	591263.796	28.100
23	RTN9	466321.556	591269.071	28.509
24	RTN10	466322.112	591274.043	28.838
25	RTN11	466322.651	591281.653	29.423
26	RTN12	466321.266	591286.470	29.454
27	RTN13	466318.343	591291.559	28.989
28	RTN14	466318.714	591298.366	29.581
29	RBS1	466313.560	591228.871	21.559
30	RBS2	466312.487	591234.565	21.933
31	RBS3	466311.981	591239.085	22.307
32	RBS4	466311.102	591244.475	22.717
33	RBS5	466310.005	591249.448	23.148
34	RBS6	466309.563	591254.788	23.580
35	RBS7	466310.077	591259.982	24.011
36	RBS8	466310.633	591264.951	24.443
37	RBS9	466311.137	591269.857	24.874
38	RBS10	466311.500	591274.838	25.306
39	RBS11	466310.956	591279.163	25.737
40	RBS12	466310.043	591284.081	26.169
41	RBS13	466307.915	591288.489	26.491
42	RBS14	466305.521	591292.410	26.846
43	RTS1	466311.779	591228.085	22.671
44	RTS2	466309.356	591233.826	23.771
45	RTS3	466309.055	591237.882	24.115
46	RTS4	466307.898	591243.797	24.588
47	RTS5	466306.163	591248.808	25.374
48	RTS6	466303.766	591254.823	26.892
49	RTS7	466303.717	591260.693	27.669
50	RTS8	466304.305	591265.658	28.081
51	RTS9	466305.020	591270.315	28.380
52	RTS10	466305.575	591275.282	28.701
53	RTS11	466305.675	591278.039	28.636
54	RTS12	466301.417	591282.245	29.715
55	RTS13	466300.896	591286.423	30.269
56	RTS14	466298.922	591289.439	30.407

WORKING POINT TABLE				
NUMBER	DESCRIPTION	NORTHING	EASTING	ELEVATION
57	BRTS1	466287.545	591283.490	28.636
58	BRTS2	466291.403	591283.059	28.636
59	BRTS3	466295.320	591282.610	28.636
60	BRTS4	466299.354	591282.170	28.636
61	BRTS5	466301.290	591281.954	28.636
62	BRTS6	466304.542	591280.226	28.636
63	BRTS7	466305.739	591276.743	28.636
64	BRBS1	466288.186	591289.226	25.400
65	BRBS2	466292.044	591288.795	25.400
66	BRBS3	466296.020	591288.350	25.400
67	BRBS4	466299.921	591287.914	25.400
68	BRBS5	466304.140	591287.204	25.400
69	BRBS6	466308.963	591283.324	25.400
70	BRBS7	466311.497	591276.529	25.400

RIPRAP QUANTITIES	
CLASS	APPROXIMATE ESTIMATED QUANTITIES (m^3)
1000 kg	2961

Consultant Logo
Associated Engineering

Rev	Date	Description	Init
B	2023–06–21	ISSUED FOR 100% DETAILED DESIGN	M.L.
A	2023–06–02	ISSUED FOR DRAFT REPORT	M.L.

REVISIONS

BRITISH COLUMBIA
Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK CULVERT REPLACEMENT

CHANNEL EMBANKMENT PROTECTION DETAILS – SHEET 2

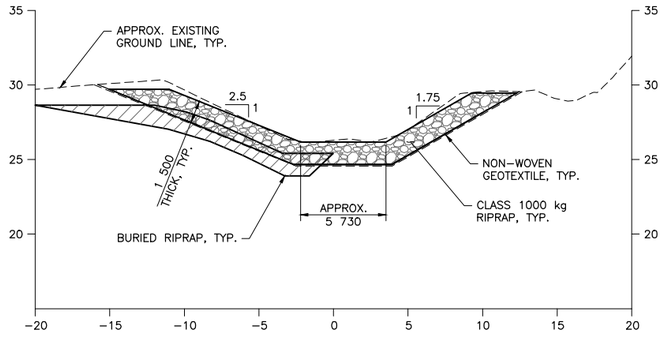
PREPARED UNDER THE DIRECTION OF
ERIC FINNEY, P.ENG
ENGINEER OF RECORD
DATE 2023–06–21

DESIGNED E. FINNEY/J. WHITE DATE 2023–06–21
CHECKED M. MACLATCHY DATE 2023–06–21
DRAWN J. MORO/H. LEE DATE 2023–06–21
SCALE AS NOTED
NEGATIVE No.

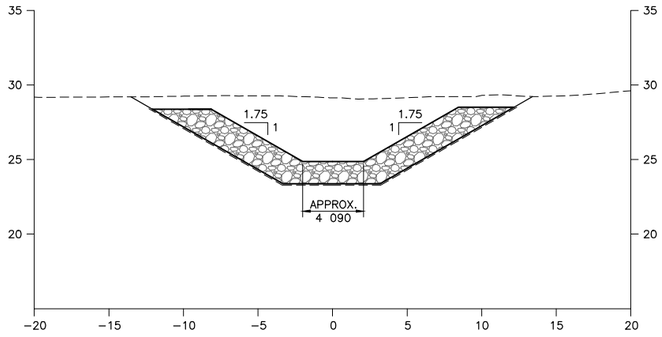
FILE No.	PROJECT No.	REG.	DRAWING No.	
2022–2677–00	14048–0000	1	10505–115	B

CANCEL PRINTS BEARING PREVIOUS LETTER

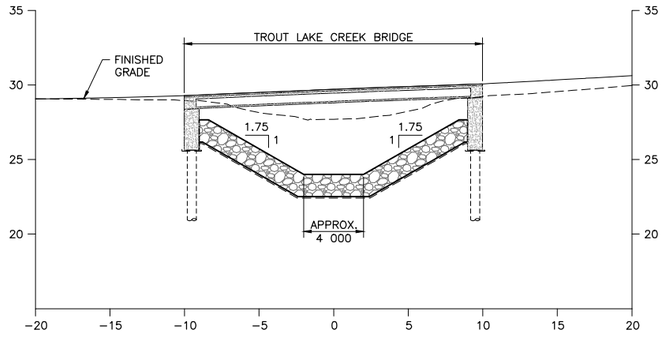
FILE: Q:\2022-2677-00\CIVIL\MODEL\MOTI_WORKING_DRAWINGS\DRAWINGPRODUCTION\100_SUBDISCIPLINES\STRUCTURAL\10505-114-117.DWG
PLOTTED : August 3, 2023



STA. 20+30



STA. 20+45



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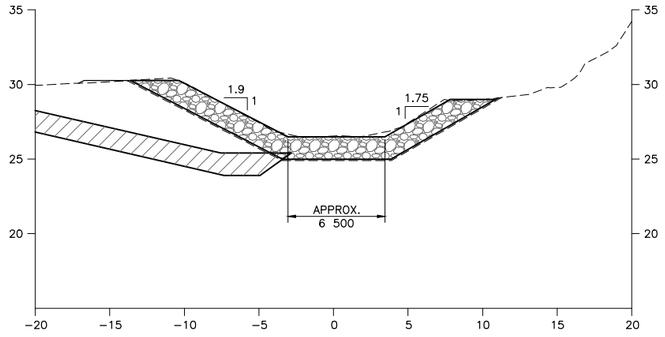

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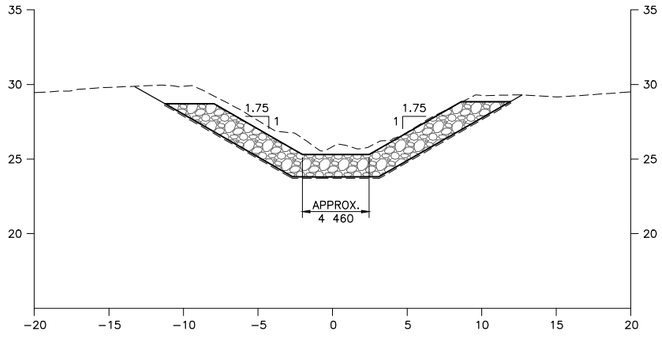
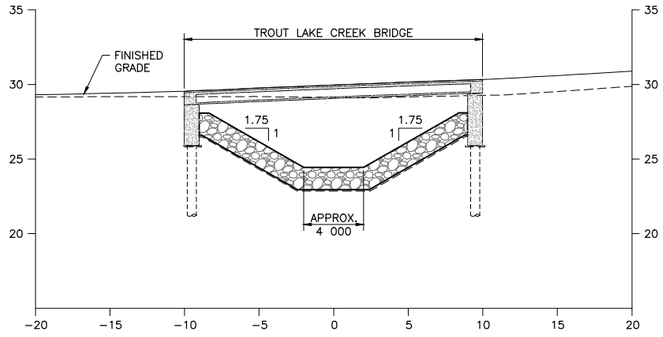
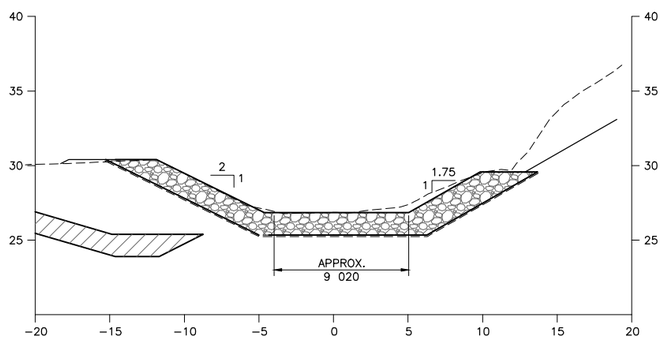


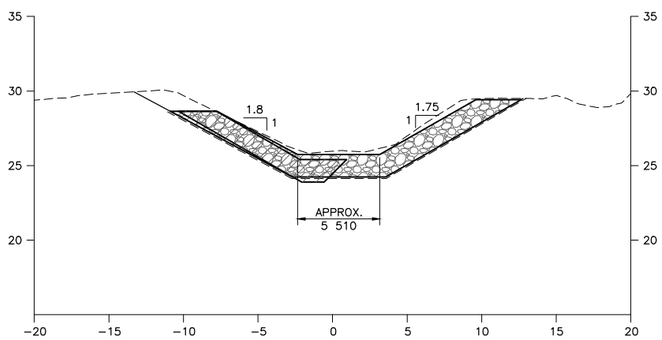
STA. 20+40



STA. 20+50



STA. 20+20



STA. 20+35

CHANNEL CROSS SECTIONS
SCALE 1:200

Consultant Logo

Associated Engineering

Rev	Date	Description	Init
B	2023-06-21	ISSUED FOR 100% DETAILED DESIGN	M.L.
A	2023-06-02	ISSUED FOR DRAFT REPORT	M.L.

REVISIONS

BRITISH COLUMBIA | Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK CULVERT REPLACEMENT

CHANNEL EMBANKMENT PROTECTION DETAILS – SHEET 3

PREPARED UNDER THE DIRECTION OF

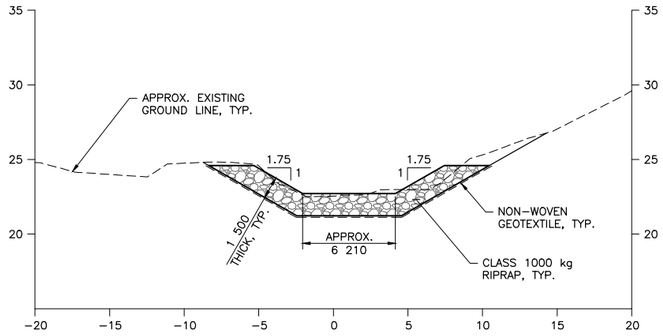
ERIC FINNEY, P.ENG
ENGINEER OF RECORD
DATE 2023-06-21

DESIGNED E. FINNEY/J. WHITE DATE 2023-06-21
CHECKED M. MACLATCHY DATE 2023-06-21
DRAWN J. MORO/H. LEE DATE 2023-06-21
SCALE AS NOTED
NEGATIVE No.

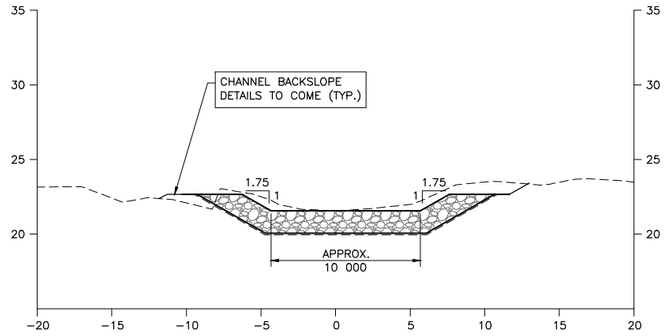
FILE No.	PROJECT No.	REG.	DRAWING No.
2022-2677-00	14048-0000	1	10505-116 B

CANCEL PRINTS BEARING PREVIOUS LETTER

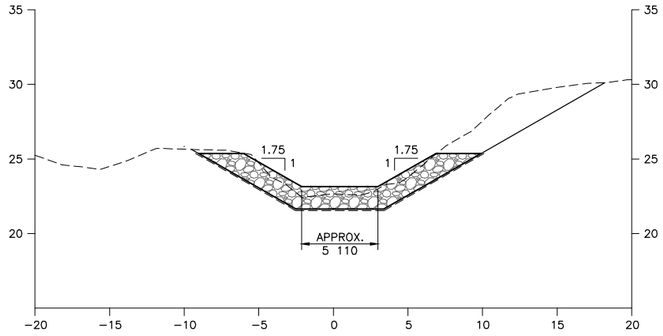
FILE: Q:\2022-2677-00\CIVIL\MODEL\MOTI_WORKING_DRAWINGS\DRAWINGPRODUCTION\1100_SUBDISCIPLINES\STRUCTURAL\10505-114-117.DWG
PLOTTED : August 3, 2023



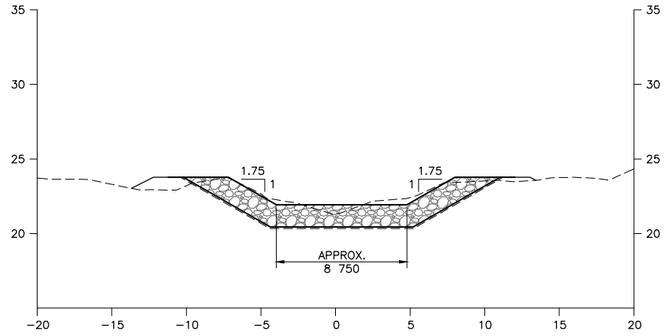
STA. 20+70



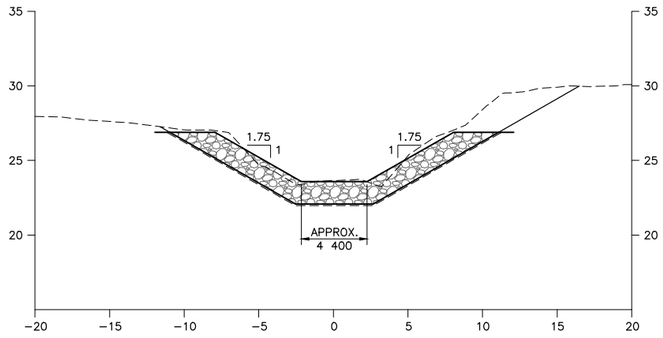
STA. 20+85



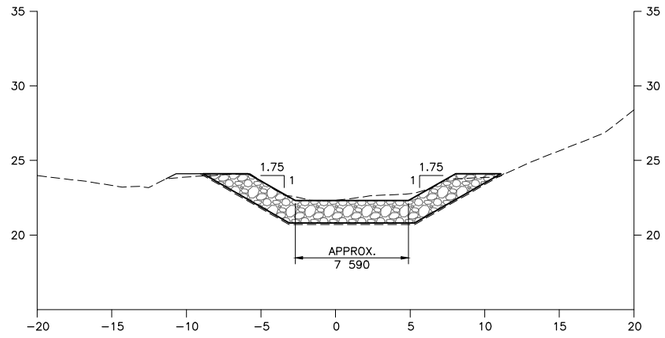
STA. 20+65



STA. 20+80



STA. 20+60



STA. 20+75

CHANNEL CROSS SECTIONS
SCALE 1:200

Consultant Logo

Associated Engineering

Rev	Date	Description	Init
B	2023-06-21	ISSUED FOR 100% DETAILED DESIGN	M.L.
A	2023-06-02	ISSUED FOR DRAFT REPORT	M.L.

REVISIONS

BRITISH COLUMBIA | Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK CULVERT REPLACEMENT

CHANNEL EMBANKMENT PROTECTION DETAILS – SHEET 4

PREPARED UNDER THE DIRECTION OF

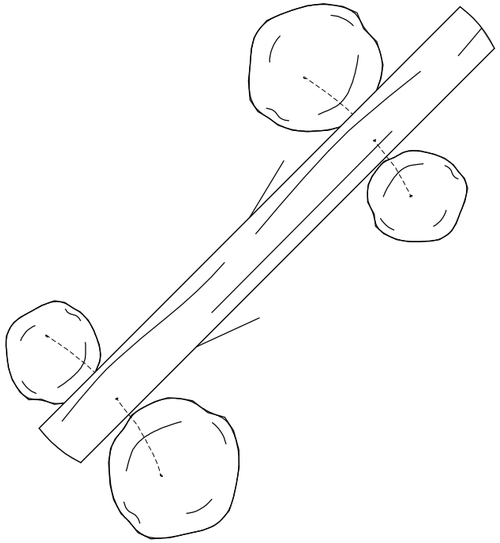
ERIC FINNEY, P.ENG
ENGINEER OF RECORD
DATE 2023-06-21

DESIGNED E. FINNEY/J. WHITE DATE 2023-06-21
CHECKED M. MACLATCHY DATE 2023-06-21
DRAWN J. MORO/H. LEE DATE 2023-06-21
SCALE AS NOTED
NEGATIVE No.

FILE No.	PROJECT No.	REG.	DRAWING No.	
2022-2677-00	14048-0000	1	10505-117	B

CANCEL PRINTS BEARING PREVIOUS LETTER

FILE: Q:\2022-2677-00\CIVIL\MODEL\MOTI_WORKING_DRAWINGS\DRAWINGPRODUCTION\1100_SUBDISCIPLINES\STRUCTURAL\10505-114-117.DWG
PLOTTED : August 3, 2023



DETAIL N.T.S.

LARGE WOODY DEBRIS

LARGE WOODY DEBRIS NOTES

1. LARGE WOODY DEBRIS SHALL BE COMPRISED OF MINIMUM 300 mm DIAMETER CEDAR OR DOUGLAS-FIR LOG WITH BARK LEFT LARGELY INTACT.
2. LOGS SHALL BE MINIMUM 6 m IN LENGTH.
3. ANGLE WOOD DOWNSTREAM AND ANCHOR ONE END TO CHANNEL BED AND THE OTHER TO CHANNEL BANK (SEE ANCHORING DETAIL). LOGS SHALL NOT EXTEND MORE THAN 1/3 OF THE CHANNEL WIDTH.
4. FOR STRUCTURES CONSISTING OF MORE THAN ONE PIECE OF LARGE WOODY DEBRIS, LOGS WILL BE CABLED TOGETHER PRIOR TO ANCHORING USING MINIMUM 1/4" DIAMETER STAINLESS STEEL AIRCRAFT CABLE.
5. ANCHOR TOP AND BOTTOM OF EACH LOG.

ROOT WAD NOTES

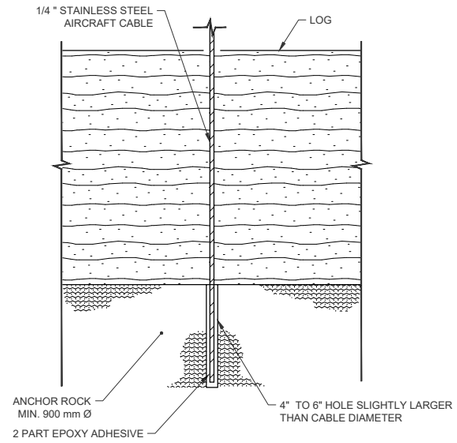
1. ROOT WADS SHALL BE COMPRISED OF WESTERN RED CEDAR OR DOUGLAS FIR.
2. ROOT WADS SHALL HAVE A MINIMUM ROOT MASS DIAMETER OF 0.3 m, WITH THE TRUNK CENTERED ON THE ROOT MASS.
3. 20-30% OF THE ROOT MASS SHALL BE BURIED IN THE CHANNEL.
4. ANCHOR ROOT WAD USING MINIMUM 1/4" STAINLESS STEEL AIRCRAFT CABLE WRAPPED AROUND TREE TRUNK. ANCHOR ONE END OF CABLE TO SHORE AND OTHER END TO STREAM BOTTOM, ACCORDING TO ANCHORING DETAIL.
5. ROOT WAD SHALL NOT EXTEND GREATER THAN 1/3 THE WIDTH OF THE STREAM CHANNEL.

ANCHORING NOTES

1. ANCHOR LOGS WITH MINIMUM 1/4" STAINLESS STEEL AIRCRAFT CABLE.
2. RUN CABLE THROUGH AXIS OF LOGS INTO TWO 900 mm TO 1200 mm BOULDERS, SECURING CABLE TO BOULDERS VIA ROCK DRILLING. ENSURE THE HOLE FACES PERPENDICULAR TO THE SHEAR STRESS OF THE LOAD.
3. DRILL HOLES MINIMUM 4" TO 6" DEEP INTO BOULDERS AND SECURE CABLE IN HOLES USING EITHER:
   A. 2 PART EPOXY ADHESIVE IN HOLES DRILLED SLIGHTLY LARGER THAN CABLE DIAMETER (HOLES TO BE CLEANED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS); OR
   B. AN EXPANDABLE ANCHOR BOLT (STAINLESS STEEL) INSERTED AT THE BOTTOM OF A ¾" HOLE. RUN CABLE THROUGH EYE OF BOLT, TWIST TOGETHER, AND SECURE AT SURFACE OF ROCK FACE USING STAINLESS WASHER (1/2" INSIDE DIAMETER AND 1 1/2" OUTSIDE DIAMETER) AND 1/4" WIRE ROPE CLIP.
4. FOR ALL ANCHORS, CABLE LENGTH (SLACK) SHOULD BE MINIMIZED TO THE EXTENT POSSIBLE TO PREVENT MOVEMENT OF LOGS AND ROOT WADS.

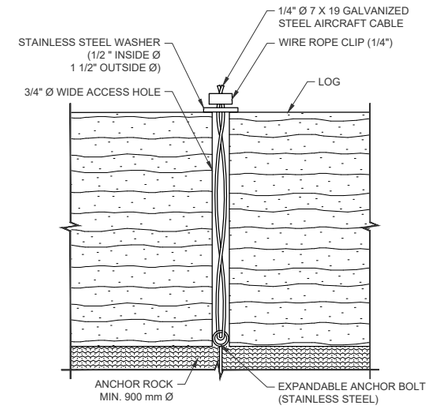
BOULDER CLUSTER NOTES

1. BOULDER CLUSTERS TO BE COMPRISED OF MINIMUM 1.3 m DIAMETER RIPRAP.
2. 60% OF THE BOULDER PROFILE SHALL BE BURIED IN THE CHANNEL.



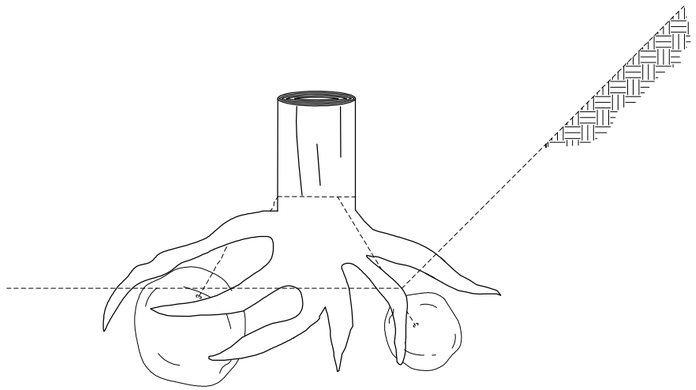
ANCHOR DETAIL OPTION A

N.T.S.



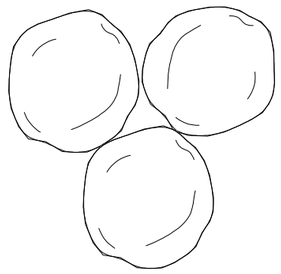
ANCHOR DETAIL OPTION B

N.T.S.



DETAIL N.T.S.

ROOT WAD



DETAIL N.T.S.

BOULDER CLUSTER

Consultant Logo

Associated Engineering

Rev	Date	Description	Init
A	2023-06-21	ISSUED FOR 100% DETAILED DESIGN	M.L.

REVISIONS

BRITISH COLUMBIA | Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK CULVERT REPLACEMENT

MISCELLANEOUS DETAILS

PREPARED UNDER THE DIRECTION OF

ERIC FINNEY, P.ENG
ENGINEER OF RECORD
DATE 2023-06-21

DESIGNED E. FINNEY/I. WHITE DATE 2023-06-21
CHECKED M. MACLATCHY DATE 2023-06-21
DRAWN J. MORO/H. LEE DATE 2023-06-21
SCALE AS NOTED
NEGATIVE No.

FILE No.	PROJECT No.	REG.	DRAWING No.	
2022-2677-00	14048-0000	1	10505-118	A

CANCEL PRINTS BEARING PREVIOUS LETTER

FILE: Q:\2022-2677-00\CIVIL\MODEL\MOTI_WORKING_DRAWINGS\DRAWINGPRODUCTION\1100_SUBDISCIPLINES\STRUCTURAL\10505-114-117.DWG
PLOTTED : August 3, 2023

LOT 5
PLAN LMP8249
PID 018-056-741

CROWN PIN: 35740021
PART LEGAL SUBDIVISION 5
SW1/4 SEC.32, TP4, R28, W6M
NEW WESTMINSTER DISTRICT

LEGAL SUBDIVISION 3
SW1/4 SEC.32, TP4, R28, W6M
NEW WESTMINSTER DISTRICT

CROWN LAND

TO HARRISON HOT SPRINGS

TO SASQUATCH PROVINCIAL PARK

HICKS LAKE ROAD

SERVICE ROAD

TROUT LAKE CREEK

SRW PLAN NWP10235

POT 100+00

BC 100+10

45°49'14"

EC 100+36.350

BC 100+46.925

22°35'37"

EC 100+60.031

BC 100+71.532

15°53'43"

PI 100+23.359
N 466292.971
E 591244.581

PI 100+54.484
N 466268.513
E 591295.980

LIMIT OF CONSTRUCTION
TIE TO EXISTING

LIMIT OF CONSTRUCTION
POC 100+57.253
TIE TO EXISTING
N 466264.199
E 591252.453

R 65.000 Lt
Δ 23°13'38"
Tc 13.359
Arc 26.350
Ec 1.359

R 95.000 Lt
Δ 6°41'53"
Tc 5.559
Arc 11.106
Ec 0.163

R 90.000 Lt
Δ 44°36'16"
Tc 36.916
Arc 70.065
Ec 7.277

SPILLWAY c/w DRAINAGE BARRIER WITH RIPRAP OUTFALL AS PER SP504-05 (TYP.)

SPILLWAY AND RIPRAP OUTFALL AS PER SP504-04 (TYP.)

REMOVE EXISTING 1500 mm DIA. CULVERTS

PI 101+08.447
N 466513.425
E 591271.483

REINFORCED SOIL SLOPE WITH GEOGRID REINFORCEMENT
APPROX. STA. 101+20.775 TO 101+80.000
REFER TO DWG. R1-1070-302 FOR DETAILS.

EC 101+41.596

POT 101+96.433

331°10'22"

MAINTAIN EXISTING DITCH

REMOVE EXISTING BARRIERS AND LOCKBLOCKS

REMOVE EXISTING BARRIERS

TROUT LAKE CREEK BRIDGE No. 10505-23
SEE BRIDGE DRAWINGS FOR DETAILS

LIMIT OF CONSTRUCTION
POT 101+91.417
TIE TO EXISTING
N 466389.499
E 591229.798

P6730–22
N. 466226.255
E. 591230.721
Z. 28.381
REBAR

P6731–22
N. 466300.186
E. 591280.816
Z. 30.209
REBAR

P6732–22
N. 466400.322
E. 591228.471
Z. 38.364
REBAR

P6733–22
N. 466329.775
E. 591206.991
Z. 21.593
REBAR

P6734–22
N. 466302.726
E. 591249.510
Z. 25.776
REBAR

P6735–22
N. 466329.775
E. 591206.991
Z. 21.593
REBAR

LEGEND
- SAWCUT
- ASPHALT MILL AND OVERLAY
- FULL DEPTH PAVEMENT CONSTRUCTION
- PAVEMENT REMOVAL
- GEOGRID REINFORCEMENT EXTENTS

FOR PROFILE
SEE DWG. No. R1-1070-201

FOR TYPICAL SECTIONS
SEE DWG. No. R1-1070-301 TO 302

FOR GEOMETRICS AND LANING / SPOT ELEVATIONS
SEE DWG. No. R1-1070-401

FOR SIGNING AND PAVEMENT MARKINGS
SEE DWG. No. R1-1070-601

GENERAL NOTES:

1. INFORMATION SHOWN ON THESE DRAWINGS REGARDING EXISTING UTILITIES MAY NOT BE COMPLETE OR FULLY ACCURATE. PRIOR TO CONSTRUCTION THE CONTRACTOR SHALL CONFIRM THE EXISTING LOCATIONS AND ELEVATIONS OF ALL EXISTING UTILITIES AND ADVISE THE MINISTRY REPRESENTATIVE OF ANY POTENTIAL CONFLICTS. CONTACT BC ONE CALL A WEEK PRIOR TO EXCAVATION FOR THE SITE LOCATES.
2. CONTOURS ARE SHOWN AT 2.0 m INTERVAL.
3. INFORMATION REGARDING TOPOGRAPHY, EXISTING UNDERGROUND SERVICES AND LEGAL PLANS PROVIDED BY BINNIE & ASSOCIATES (JUNE 2022).
4. REFER TO DRAWING No. R1-1070-601 FOR SIGNING REMOVAL AND RELOCATION REQUIREMENTS.
5. REFER TO DRAWING No. R1-1070-001 FOR SURVEY CONTROL TABLE AND COORDINATE CONVERSION.
6. SEED ALL FINAL SLOPES IN ACCORDANCE WITH FINAL ENVIRONMENTAL PLANTING PLAN FOR EROSION CONTROL.

KEY PLAN

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
Engineers & Geoscientists BC

Professional Seal
For Road Works
Professional Seal
For Drainage Works

Associated Engineering

SCALE 0 2 1:250 12m
CAD FILENAME R1-1070-101
PLOT DATE 2023-08-01

REV	DATE	REVISIONS	NAME

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

PLAN / DRAINAGE

HICKS LAKE ROAD
TROUT LAKE CREEK BRIDGE No. 10505
STA. 100+57.253 TO STA. 101+91.417

M. DU TOIT, P. ENG.
E. FINNEY, P. ENG.
ENGINEER OF RECORD
DATE 2023-08-01

DESIGNED	D. BRAGAGNINI / E. FINNEY / M. DU TOIT	DATE	2023-08-01
QUALITY CONTROL	E. FINNEY / ~~P. STANCOMBE~~	DATE	2023-08-01
QUALITY ASSURANCE	J. THIESSEN	DATE	2023-08-01
DRAWN	D. BRAGAGNINI	DATE	2023-08-01

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
2022-2677-00	14048-0000	1	R1-1070-101	

PLOT DATE: 2023/08/03 Q:\2022-2677-00\civil\model\MoTI_Working_Drawings\DrawingProduction\100_Plans\R1-1070-101.dwg

BRITISH COLUMBIA

Ministry of Transportation and Infrastructure

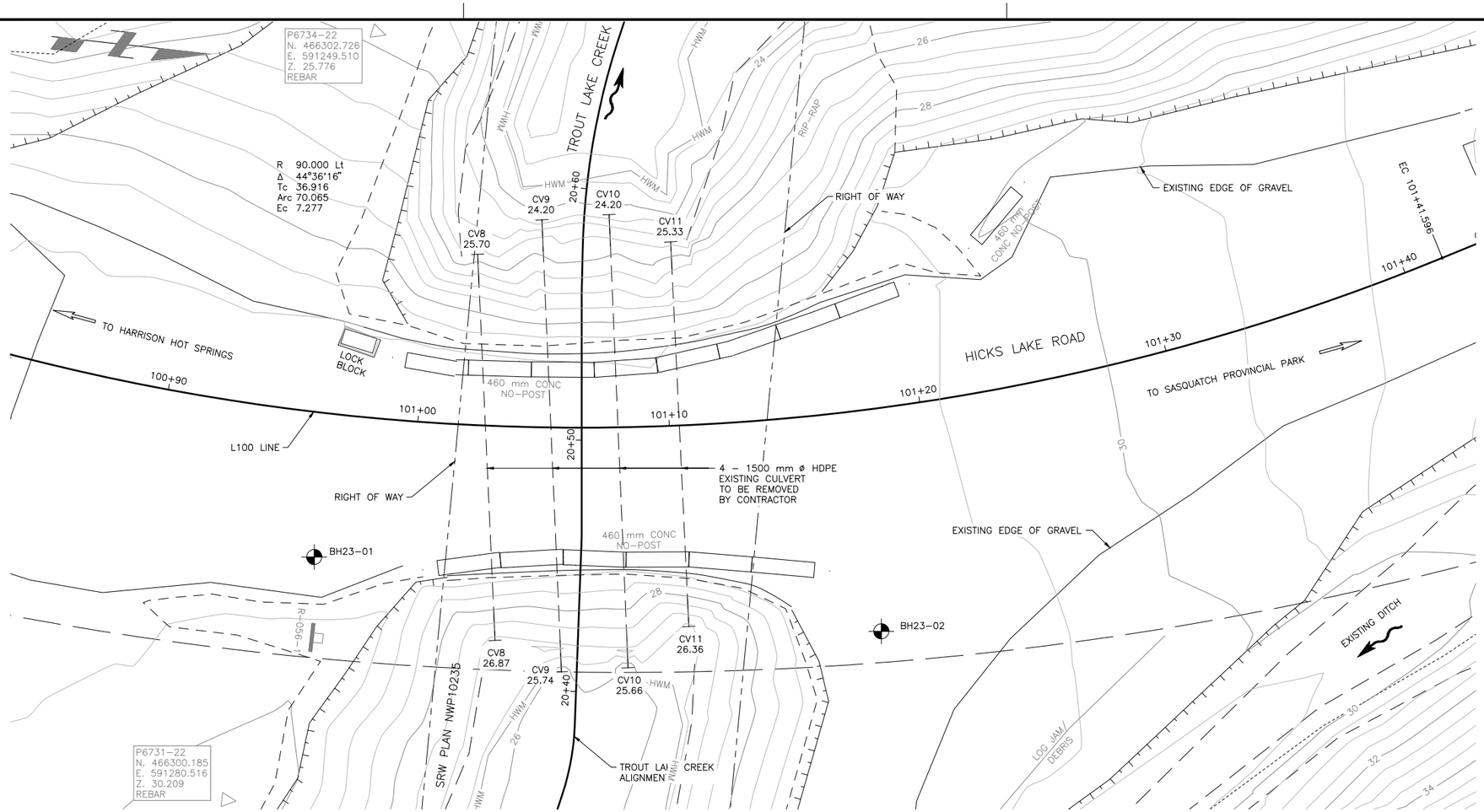
Bridge Project

No. 14048-0000

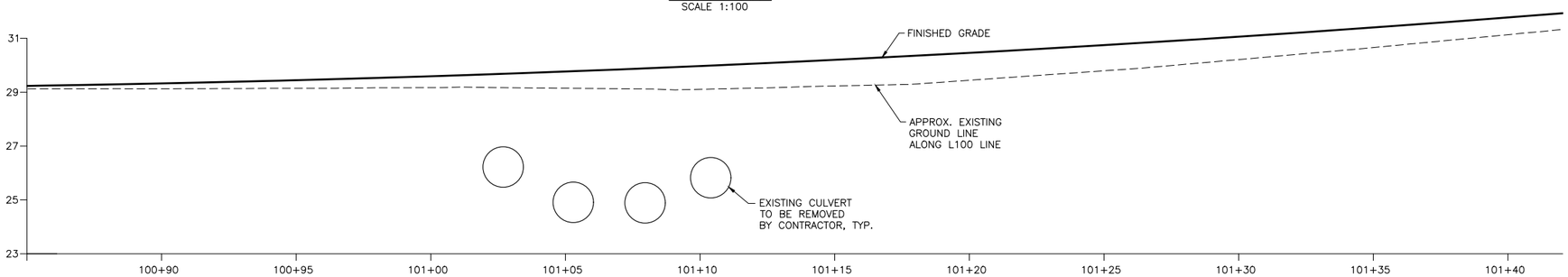
TROUT LAKE CREEK BRIDGE NO. 10505

HICKS LAKE ROAD

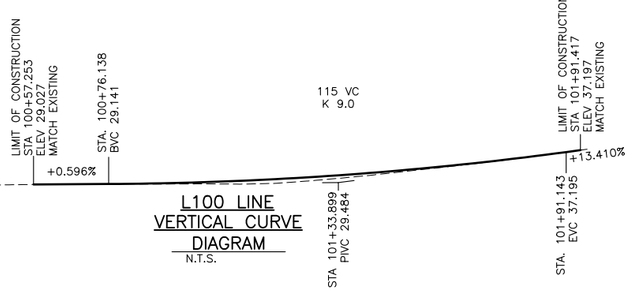
H-508h-pe(10-03)



SITE PLAN
SCALE 1:100



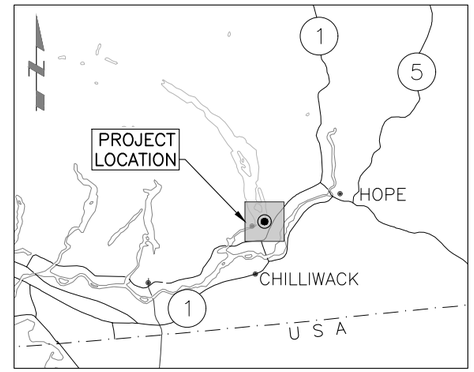
PROFILE – L100
SCALE 1:100



L100 LINE
VERTICAL CURVE
DIAGRAM
N.T.S.

NOTES:

1. SURVEY BY: R.F. BINNIE & ASSOCIATES LTD.
2. HORIZONTAL DATUM: UTM NAD83 (CSRS) Z10N
3. VERTICAL DATUM: CGVD28 HT2.0
4. SURVEY CONTROL / MONUMENT TABLE: REFER TO DWG. NO. R1-1070-101.
5. ALL ELEVATION AND STATIONS ARE IN METRES.
6. FOR BOREHOLE DATA, SEE DWG. NO. 10505-113.



THIS BRIDGE IS LOCATED ON HICKS LAKE ROAD, APPROXIMATELY 5 km NORTH OF HARRISON HOT SPRINGS, BC.

LOCATION PLAN
N.T.S.

DRAWING NO.	DRAWING TITLE
10505-100	COVER SHEET
10505-101	SITE PLAN
10505-102	GENERAL ARRANGEMENT
10505-103	PILE LAYOUT AND DETAILS
10505-104	SOUTH ABUTMENT CONCRETE OUTLINE
10505-105	NORTH ABUTMENT CONCRETE OUTLINE
10505-106	ABUTMENT REINFORCEMENT DETAILS
10505-107	PRECAST PRESTRESSED BOX STRINGER – SHEET 1
10505-108	PRECAST PRESTRESSED BOX STRINGER – SHEET 2
10505-109	PRECAST PRESTRESSED BOX STRINGER – SHEET 3
10505-110	SUPERSTRUCTURE DETAILS
10505-111	PARAPET DETAILS
10505-112	PARAPET STEEL BICYCLE RAILING
10505-113	BOREHOLE LOG SUMMARY
10505-114	CHANNEL EMBANKMENT PROTECTION DETAILS – SHEET 1
10505-115	CHANNEL EMBANKMENT PROTECTION DETAILS – SHEET 2
10505-116	CHANNEL EMBANKMENT PROTECTION DETAILS – SHEET 3
10505-117	CHANNEL EMBANKMENT PROTECTION DETAILS – SHEET 4
10505-118	MISCELLANEOUS HABITAT FEATURE DETAILS

Consultant Logo

Associated Engineering

Rev	Date	Description	Init

REVISIONS

BRITISH COLUMBIA
Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK BRIDGE NO. 10505

SITE PLAN

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
Engineers & Geoscientists BC

AUTHORIZED BY

REGIONAL MANAGER ENGINEERING — DATE

REGIONAL DIRECTOR, HIGHWAYS — DATE

PREPARED UNDER THE DIRECTION OF

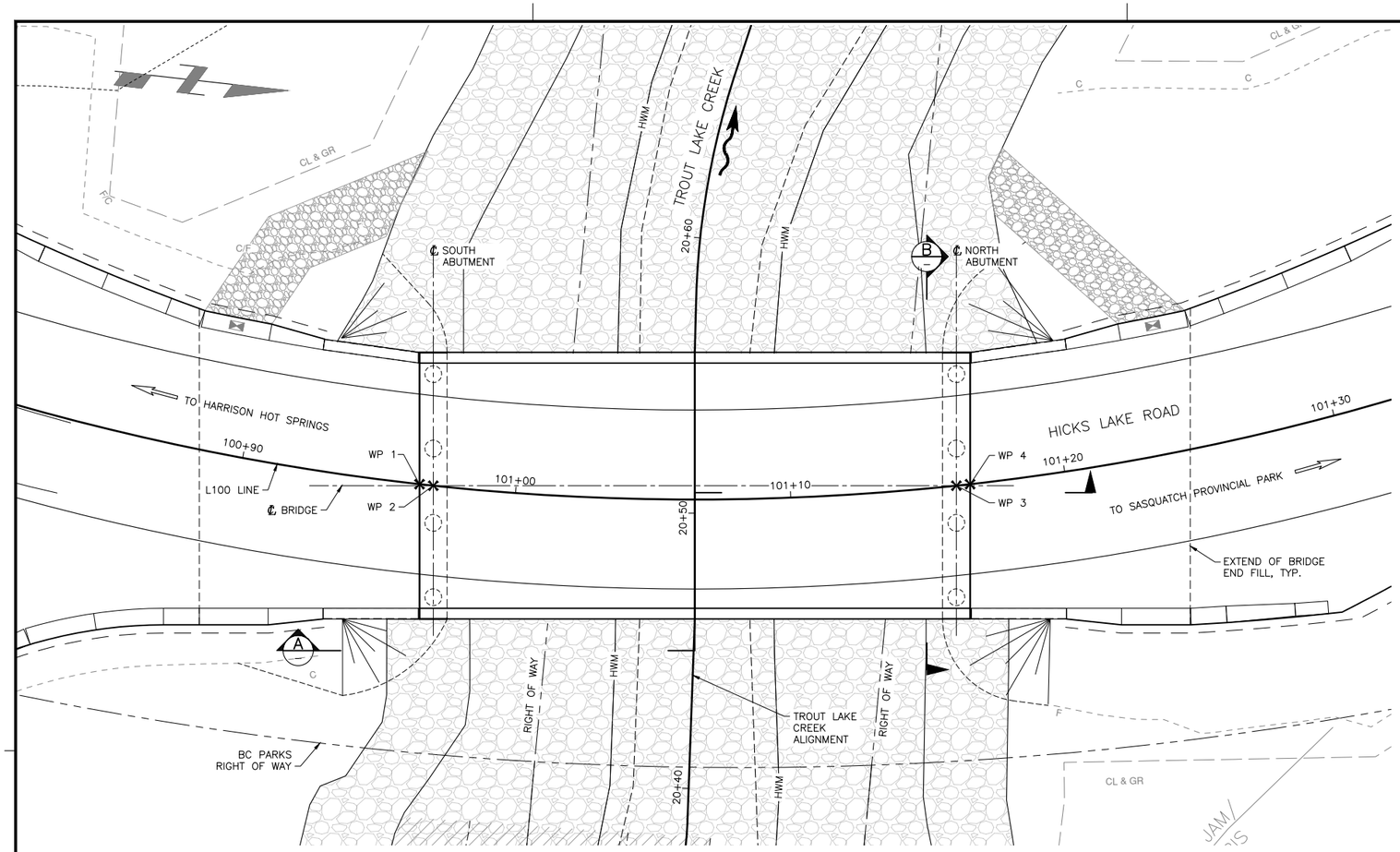
MIKE LUMB, P.ENG
ENGINEER OF RECORD
DATE 2023-06-21

DESIGNED M. LUMB DATE 2023-06-21
CHECKED K. KAVEH DATE 2023-06-21
DRAWN J. MORO DATE 2023-06-21
SCALE AS NOTED
NEGATIVE No.

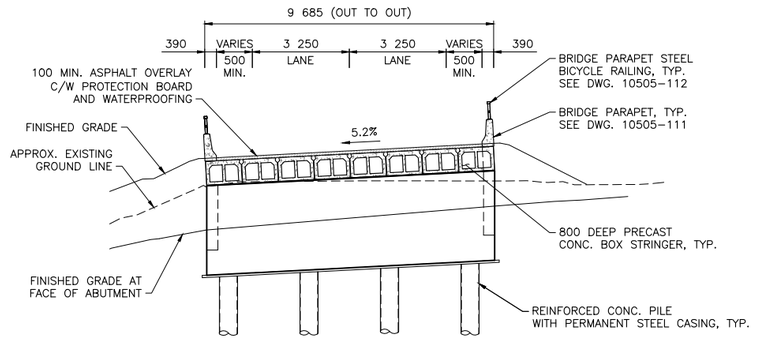
FILE No.	PROJECT No.	REG.	DRAWING No.
2022-2677-00	14048-0000	1	10505-101

CANCEL PRINTS BEARING PREVIOUS LETTER

FILE: Q:\2022-2677-00\CIVIL\MODEL\MOTI_WORKING_DRAWINGS\DRAWINGPRODUCTION\1100_SUBDISCIPLINES\STRUCTURAL\10505-101.DWG
PLOTTED: Tuesday, August 15, 2023



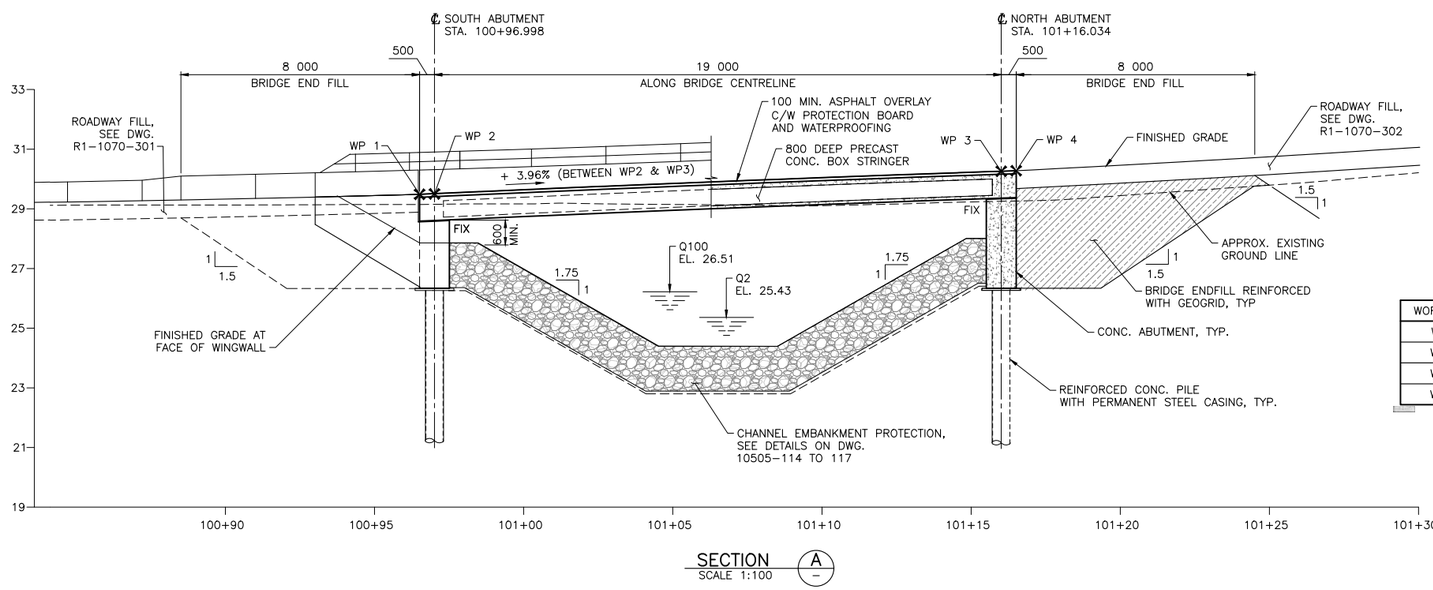
PLAN
SCALE 1:100



SECTION B
SCALE 1:100

NOTES:

1. DESIGN SPECIFICATION:
   a. CSA S6–19 CANADIAN HIGHWAY BRIDGE DESIGN CODE (CHBDC)
   b. B.C. MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE BRIDGE STANDARDS AND PROCEDURES MANUAL (BSM) VOL. 1 SUPPLEMENT TO CHBDC S6–19 (JULY 2022)
   c. B.C. MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION (SS), 2020
2. LIVE LOAD:
   a. LIVE LOAD: CL–800 , EXCEPT BCL–625 FOR LOCAL COMPONENTS (IN ACCORDANCE WITH BSM)
   b. DYNAMIC LOAD ALLOWANCE IN ACCORDANCE WITH CHBDC CL. 3.8.4.5
   c. GIRDER TRUCK LOAD FRACTION: 0.28
3. CLIMATIC DATA:
   a. MAXIMUM DAILY MEAN TEMPERATURE 30°C
   b. MINIMUM DAILY MEAN TEMPERATURE –25°C
   c. RAINFALL 8 mm / 15 MINUTES
   d. WIND LOAD: 1/50 YEAR REFERENCE 0.755 kPa
4. SITE SEISMICITY:
   a. PGA (2475 YEAR) 0.254 g
   b. SEISMIC PERFORMANCE CATEGORY 3
   c. SITE CLASSIFICATION C
   d. IMPORTANCE CATEGORY: OTHER BRIDGE
5. DESIGN SPEED: 40 km/hr
6. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
7. ALL ELEVATION AND STATIONS ARE IN METRES.
8. DIMENSIONS ARE SHOWN AT 15 °C.
9. CONTRACTOR TO VERIFY ALL NECESSARY DIMENSIONS IN THE FIELD PRIOR TO ORDERING AFFECTED MATERIAL, PRODUCING SHOP OR TEMPORARY WORKS DRAWINGS OR FABRICATING AFFECTED COMPONENTS.



SECTION A
SCALE 1:100

WORKPOINT	NORTHING	EASTING	STATION	ELEVATION
WP 1	466302.565	591264.794	100+96.495	29.486
WP 2	466303.068	591264.793	100+96.998	29.509
WP 3	466321.951	591262.683	101+16.034	30.261
WP 4	466322.442	591262.573	101+16.537	30.278

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
Engineers & Geoscientists BC

Consultant Logo
Associated Engineering

Rev	Date	Description	Init

REVISIONS

BRITISH COLUMBIA
Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK BRIDGE NO. 10505

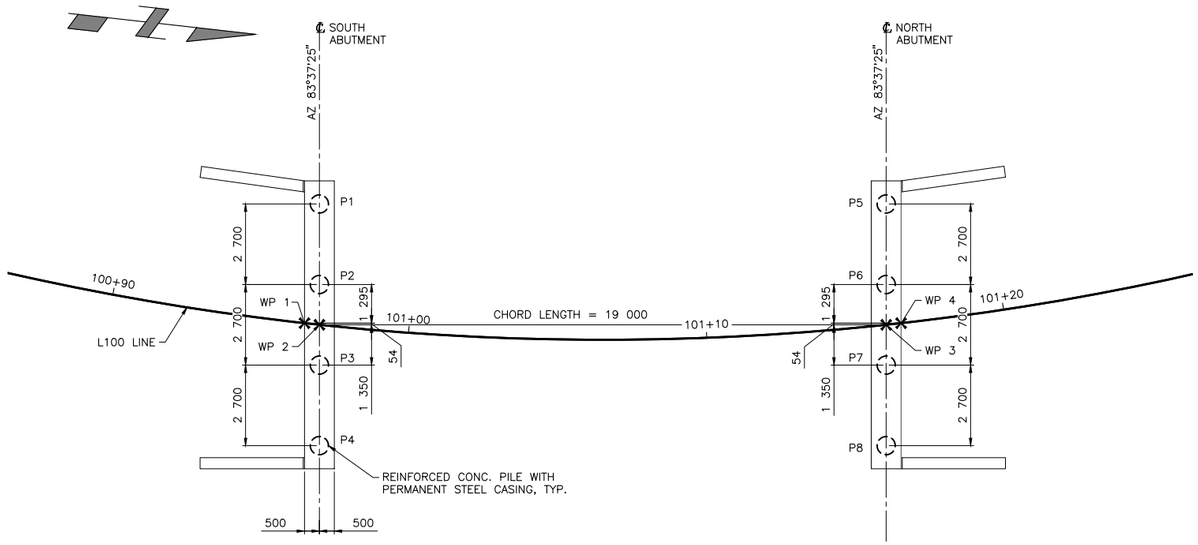
GENERAL ARRANGEMENT

PREPARED UNDER THE DIRECTION OF
MIKE LUMB, P.ENG
ENGINEER OF RECORD
DATE 2023–06–21

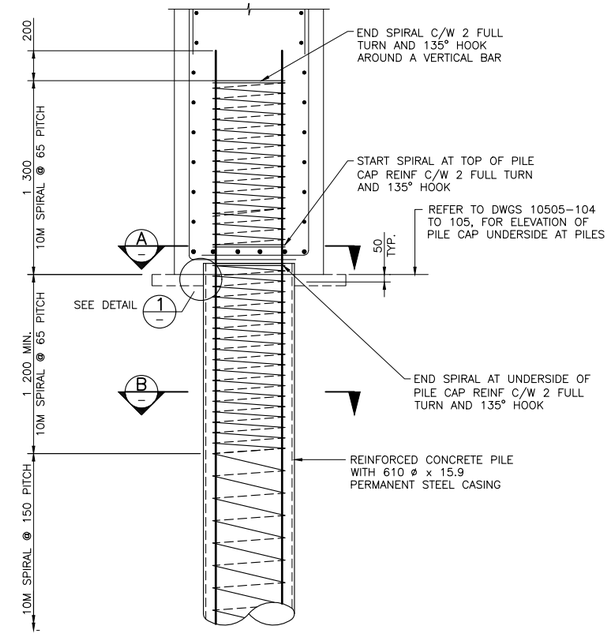
DESIGNED M. LUMB DATE 2023–06–21
CHECKED K. KAVEH DATE 2023–06–21
DRAWN J. MORO DATE 2023–06–21
SCALE AS NOTED
NEGATIVE No.

FILE No.	PROJECT No.	REG.	DRAWING No.
2022–2677–00	14048–0000	1	10505–102

CANCEL PRINTS BEARING PREVIOUS LETTER



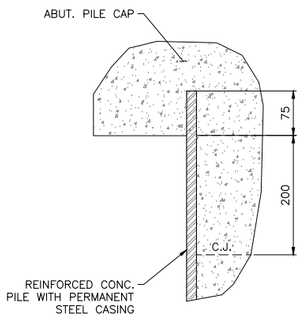
PILE LAYOUT
SCALE 1:100



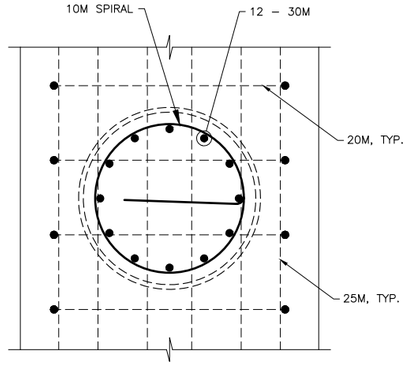
TYPICAL PILE DETAIL
SCALE 1:20

PILE INSTALLATION TABLE (m)				
PILE NUMBER	CUT-OFF ELEVATION	ANTICIPATED DESIGN LENGTH	ANTICIPATED PILETIP ELEV	MAX. PILE TIP ELEV.
P1	26.202	19.5	6.8	6.8
P2	26.343	19.6	6.8	6.8
P3	26.483	19.7	6.8	6.8
P4	26.623	19.9	6.8	6.8
P5	26.204	11.7	14.6	14.6
P6	26.345	11.8	14.6	14.6
P7	26.485	11.9	14.6	14.6
P8	26.626	12.1	14.6	14.6

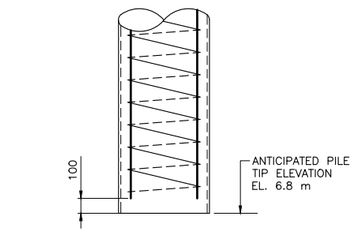
PILE DESIGN LOADS (kN)			
	AXIAL COMPRESSION	TRANSVERSE SHEAR	LONGITUDINAL SHEAR
SLS	1100	0	60
ULS	1600	45	135
ULS 5 (TRANSVERSE)	1360	310	60
ULS 5 (LONGITUDINAL)	960	100	130



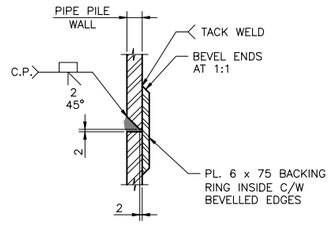
DETAIL 1
SCALE 1:5



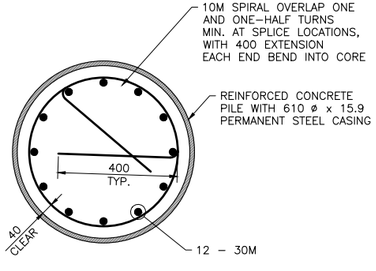
SECTION A
SCALE 1:10



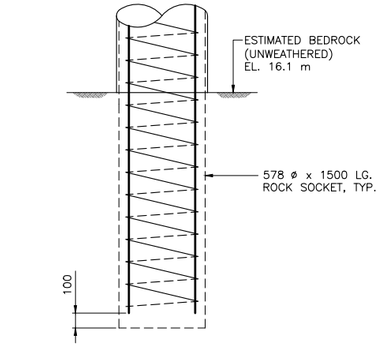
SOUTH ABUTMENT PILE TIP DETAIL
SCALE 1:20



TYPICAL PILE SPLICE DETAIL
SCALE 1:2.5



SECTION B
SCALE 1:10



NORTH ABUTMENT PILE TIP DETAIL
SCALE 1:20

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
Engineers & Geoscientists BC

NOTES:

1. FOR CONCRETE AND REINFORCING NOTES, SEE DWG. 10505-104.
2. ALL STEEL PIPE SHALL CONFORM TO ASTM A252 GRADE 3.
3. ALL PILES SHALL BE INSTALLED TO ELEVATIONS SHOWN OR TO SUCH ELEVATIONS AS MAY BE ORDERED BY THE MINISTRY REPRESENTATIVE.
4. MISCELLANEOUS STEELWORK SHALL CONFORM TO CSA G40.21 GRADE 300W.
5. SPLICING OF PILE LONGITUDINAL REINFORCEMENT IS NOT PERMITTED WITHIN 3000 OF UNDERSIDE OF CONCRETE CAP. PILE LONGITUDINAL LAP SPLICE LENGTH SHALL BE 1550 MIN.
6. THE ANNULUS BETWEEN THE SURROUNDING SOIL AND THE CASING SHALL BE FILLED WITH SELF CONSOLIDATING CONCRETE WITH 10 mm AGGREGATE AND COMPRESSION STRENGTH OF NOT LESS THAN 20 MPa AT 28 DAYS.

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Associated Engineering

Rev	Date	Description	Init

REVISIONS

BRITISH COLUMBIA
Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK BRIDGE NO. 10505

PILE LAYOUT AND DETAILS

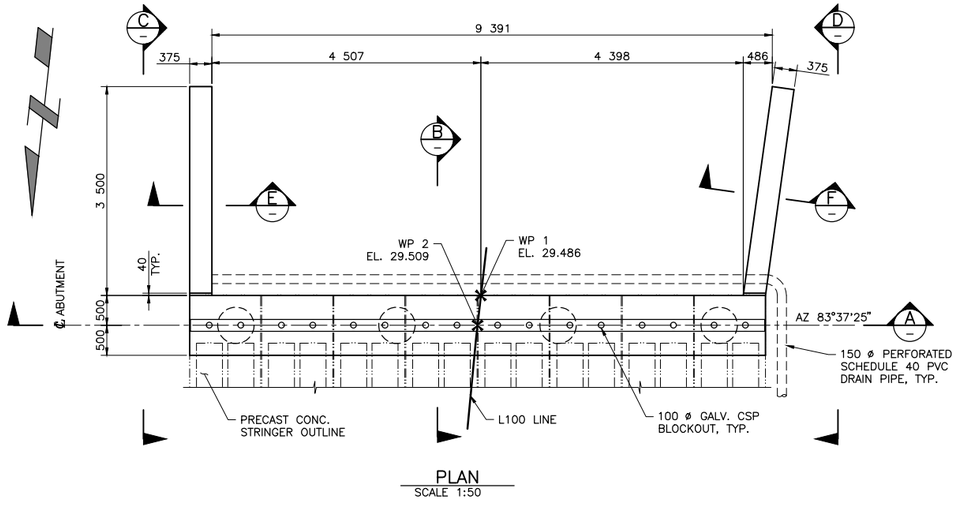
PREPARED UNDER THE DIRECTION OF
MIKE LUMB, P.ENG
ENGINEER OF RECORD
DATE 2023-06-21

DESIGNED M. LUMB DATE 2023-06-21
CHECKED K. KAVEH DATE 2023-06-21
DRAWN J. MORO DATE 2023-06-21
SCALE AS NOTED
NEGATIVE No.

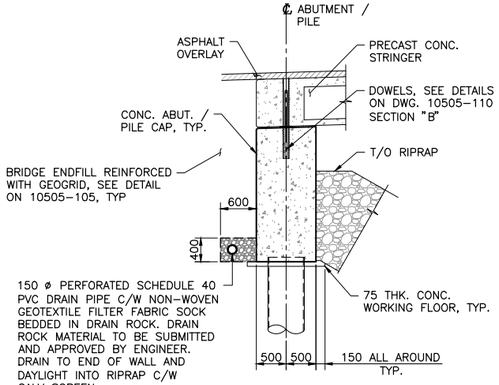
FILE No.	PROJECT No.	REG.	DRAWING No.
2022-2677-00	14048-0000	1	10505-103

CANCEL PRINTS BEARING PREVIOUS LETTER

FILE: Q:\2022-2677-00\CAD\MODEL\MOTI_WORKING_DRAWINGS\DRAWINGPRODUCTION\1100_SUBDISCIPLINES\STRUCTURAL\10505-103.DWG
PLOTTED: Tuesday, August 15, 2023



PLAN
SCALE 1:50



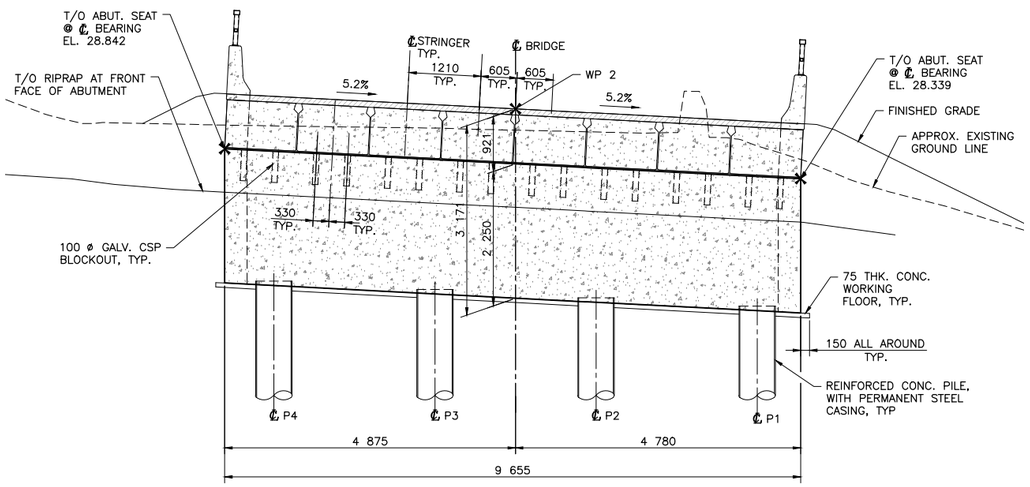
SECTION B
SCALE 1:50

NOTES:

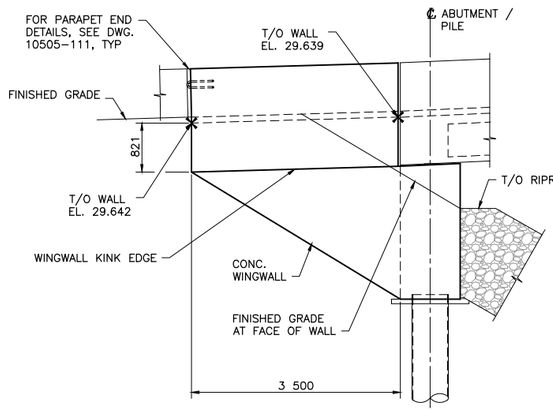
1. ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 35 MPa AT 28 DAYS UNLESS NOTED OTHERWISE.
2. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 20 mm UNLESS NOTED OTHERWISE.
3. ALL REINFORCING STEEL SHALL CONFORM TO CSA G30.18, GRADE 400W UNLESS NOTED OTHERWISE.
4. ALL REINFORCING MARKED "MS" IS STAINLESS STEEL. ALL STAINLESS STEEL REINFORCING SHALL CONFORM TO ASTM A955 GRADE 420.
5. ALL REINFORCING STEEL SHALL HAVE 70 mm COVER UNLESS NOTED OTHERWISE.
6. ALL LAPS OF REINFORCING STEEL FOR SPLICES SHALL BE AS FOLLOWS UNLESS NOTED OTHERWISE.

	BARS	TOP BARS *
10M / 10MS	320	420
15M / 15MS	480	630
20M / 20MS	640	840
25M /25MS	990	1290
30M	1190	1550
35M	1390	1810
* HORIZONTAL REINFORCEMENT WITH MORE THAN 300 mm CONCRETE BELOW BARS.		

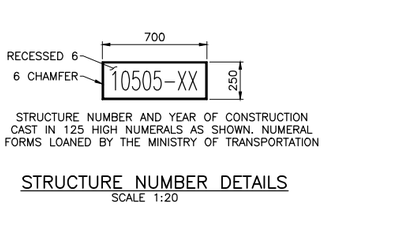
7. LAP SPLICES TO BE STAGGERED SO THAT NO MORE THAN EVERY SECOND BAR IS SPLICED AT ANY SECTION.
8. CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF ALL STRUCTURAL ELEMENTS UNTIL COMPLETION OF THE WORK.
9. WELDING OF REINFORCEMENT IS NOT PERMITTED.
10. BEARINGS TO BE OZONE RESISTING NATURAL RUBBER TO CSA–S6–19 CLAUSE 11.6.6 GRADE ±55 DUROMETER.
11. BACKFILL SHALL NOT BE PLACED ABOVE ABUTMENT SEAT ELEVATION UNTIL THE GIRDER KEYWAY CONCRETE AND ANCHOR GROUT HAS REACHED 75% OF ITS SPECIFIED STRENGTH. BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND BOTH ABUTMENTS, KEEPING THE HEIGHT OF THE BACK FILL APPROXIMATELY THE SAME. AT NO TIME SHALL THE DIFFERENCE IN HEIGHT OF BACKFILL BE GREATER THAN 500 mm.
12. ALL DOWELS SHALL CONFORM TO ASTM F1554 GRADE 105 SMOOTH DOWEL AND SHALL BE GALVANIZE AFTER FABRICATION IN ACCORDANCE WITH ASTM A123.
13. CONSTRUCTION JOINTS SHALL BE KEPT TO A MINIMUM AND CONCEALED BY A NATURAL BREAK OR LINE IN THE STRUCTURAL IF POSSIBLE.



SECTION A
SCALE 1:50

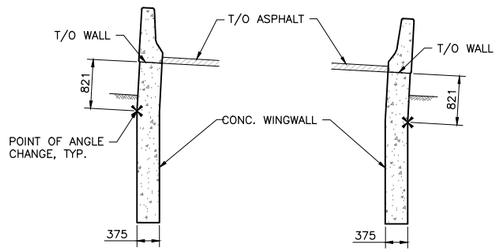


SECTION C
SCALE 1:50



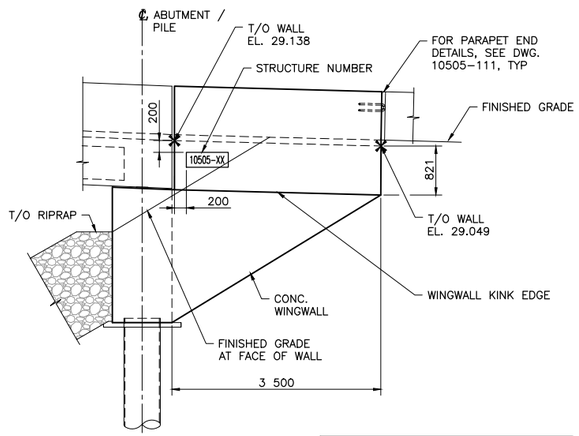
STRUCTURE NUMBER AND YEAR OF CONSTRUCTION CAST IN 125 HIGH NUMERALS AS SHOWN. NUMERAL FORMS LOANED BY THE MINISTRY OF TRANSPORTATION

STRUCTURE NUMBER DETAILS
SCALE 1:20



SECTION E
SCALE 1:50

SECTION F
SCALE 1:50



SECTION D
SCALE 1:50

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
Engineers & Geoscientists BC

Consultant Logo

Associated Engineering

Rev	Date	Description	Init

REVISIONS

BRITISH COLUMBIA
Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK BRIDGE NO. 10505

SOUTH ABUTMENT CONCRETE OUTLINE

PREPARED UNDER THE DIRECTION OF

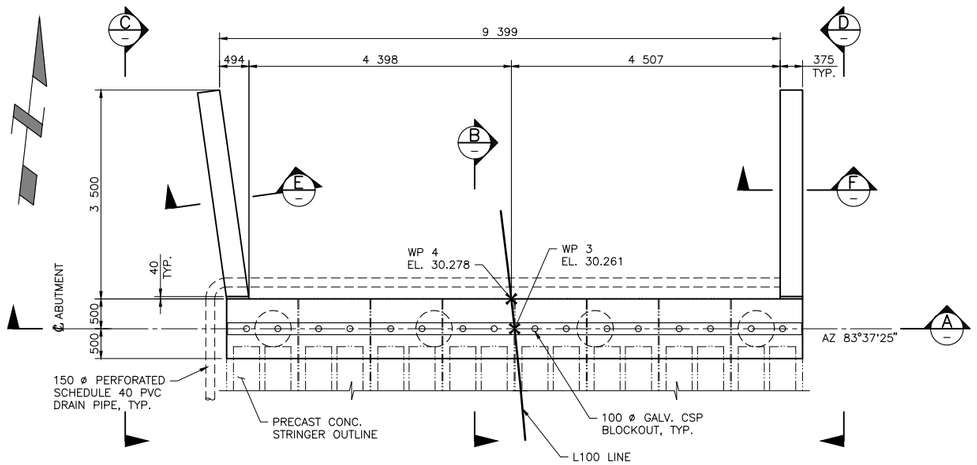
MIKE LUMB, P.ENG
ENGINEER OF RECORD
DATE 2023–06–21

DESIGNED M. LUMB DATE 2023–06–21
CHECKED K. KAVEH DATE 2023–06–21
DRAWN J. MORO DATE 2023–06–21
SCALE AS NOTED
NEGATIVE No.

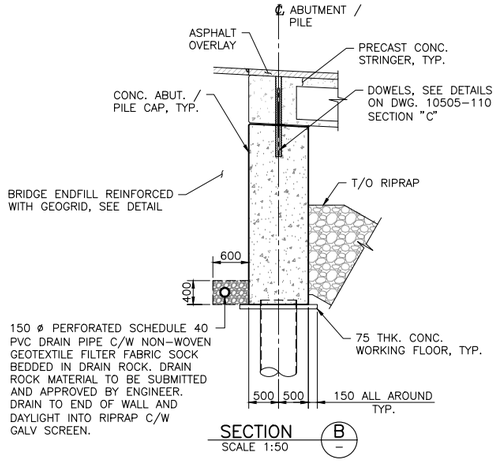
FILE No.	PROJECT No.	REG.	DRAWING No.
2022–2677–00	14048–0000	1	10505–104

CANCEL PRINTS BEARING PREVIOUS LETTER

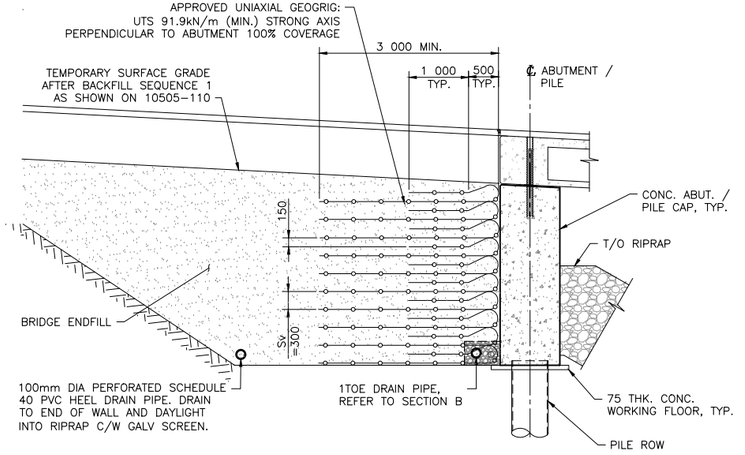
FILE: Q:\2022-2677-00\CIVIL\MODEL\MOTI_WORKING_DRAWINGS\DRAWINGPRODUCTION\1100_SUBDISCIPLINES\STRUCTURAL\10505-104.DWG
PLOTTED : Tuesday, August 15, 2023



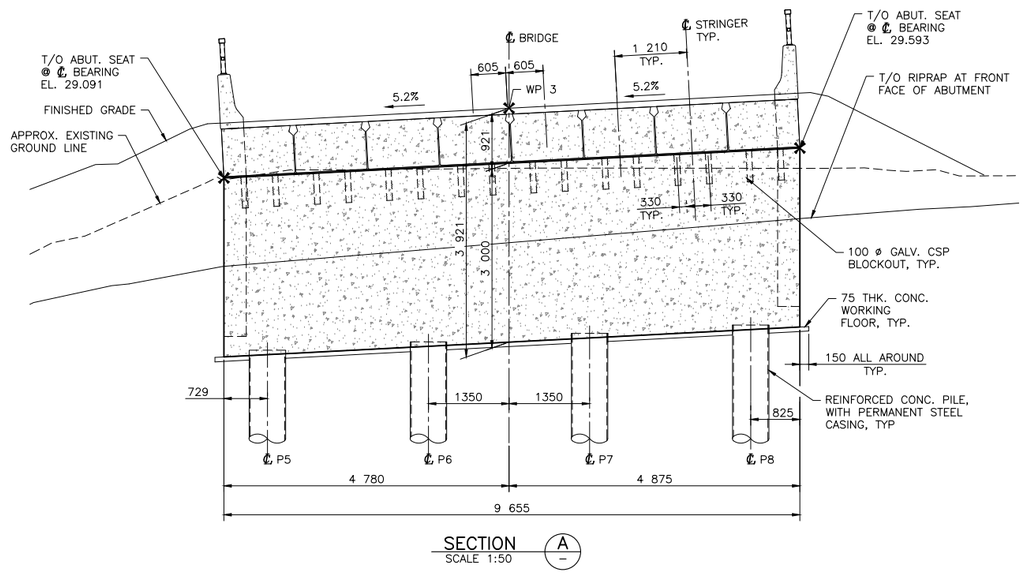
PLAN
SCALE 1:50



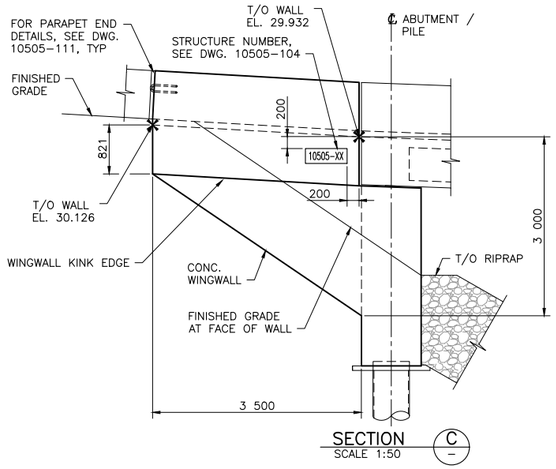
SECTION B
SCALE 1:50



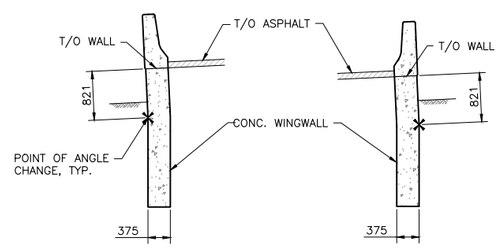
TYPICAL BRIDGE END FILL REINFORCED WITH GEOGRID DETAIL
SCALE 1:50



SECTION A
SCALE 1:50

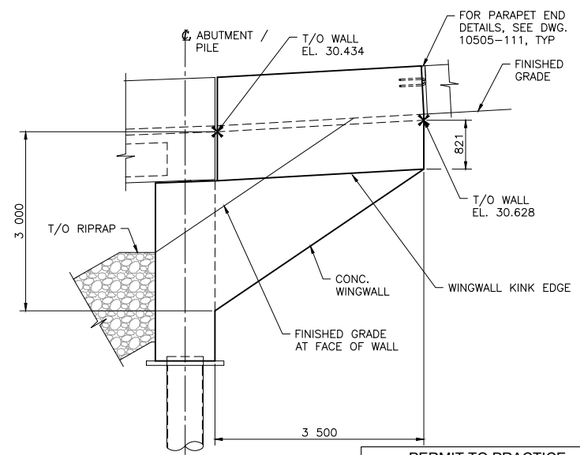


SECTION C
SCALE 1:50



SECTION E
SCALE 1:50

SECTION F
SCALE 1:50



SECTION D
SCALE 1:50

NOTES:

1. FOR NOTES, SEE DWG. NO. 10505–104.
2. BRIDGE END FILL GEOGRID REINFORCING BASED ON DESIGN BY WESTREK GEOTECHNICAL SERVICES LTD.

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
Engineers & Geoscientists BC

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Associated Engineering

Rev	Date	Description	Init

REVISIONS

BRITISH COLUMBIA | Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK BRIDGE NO. 10505

NORTH ABUTMENT CONCRETE OUTLINE

PREPARED UNDER THE DIRECTION OF

MIKE LUMB, P.ENG
ENGINEER OF RECORD
DATE 2023–06–21

DESIGNED M. LUMB DATE 2023–06–21
CHECKED K. KAVEH DATE 2023–06–21
DRAWN J. MORO DATE 2023–06–21
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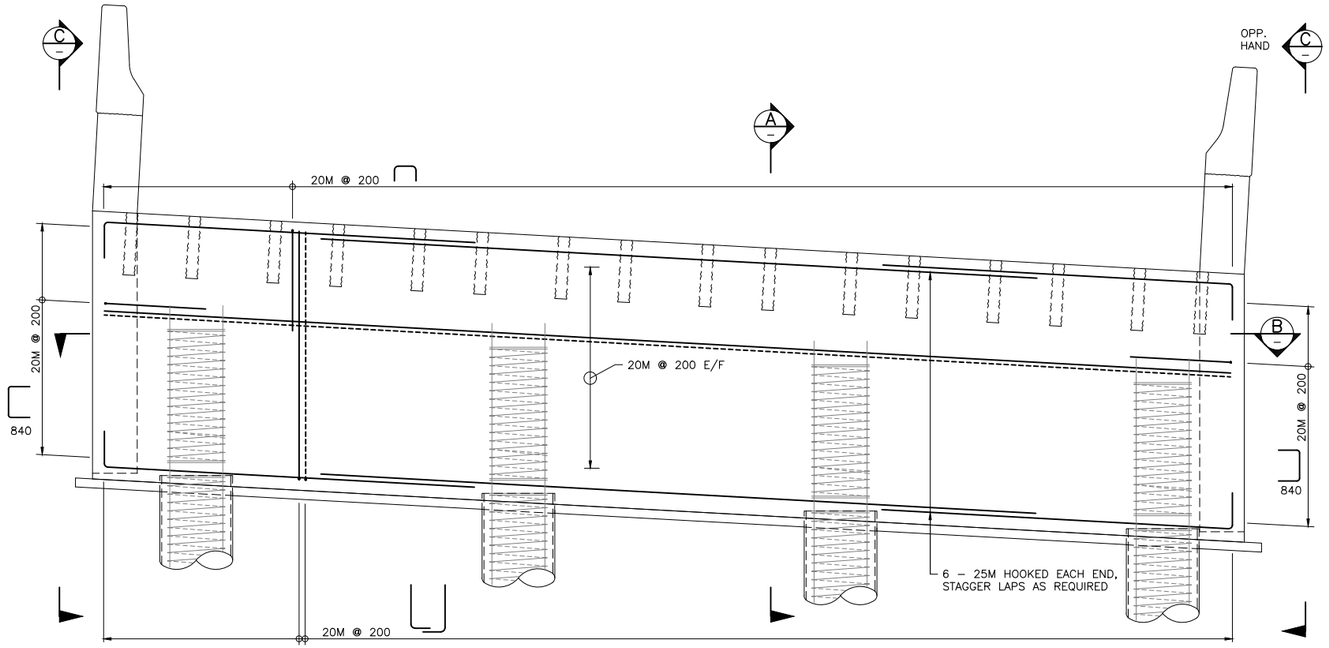
NEGATIVE No.

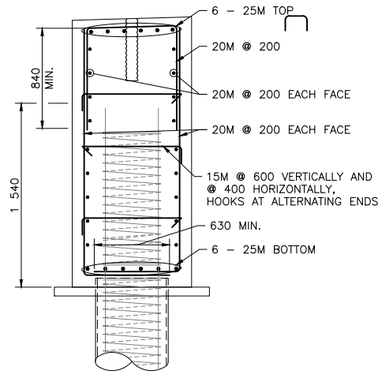
FILE No.	PROJECT No.	REG.	DRAWING No.
2022–2677–00	14048–0000	1	10505–105

CANCEL PRINTS BEARING PREVIOUS LETTER

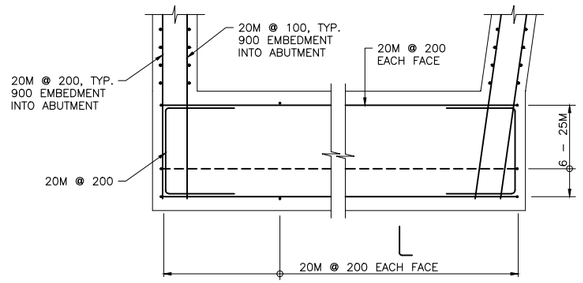
FILE: Q:\2022–2677–00\CIVIL\MODEL\MOTI_WORKING_DRAWINGS\DRAWINGPRODUCTION\1100_SUBDISCIPLINES\STRUCTURAL\10505–105.DWG
PLOTTED : Tuesday, August 15, 2023



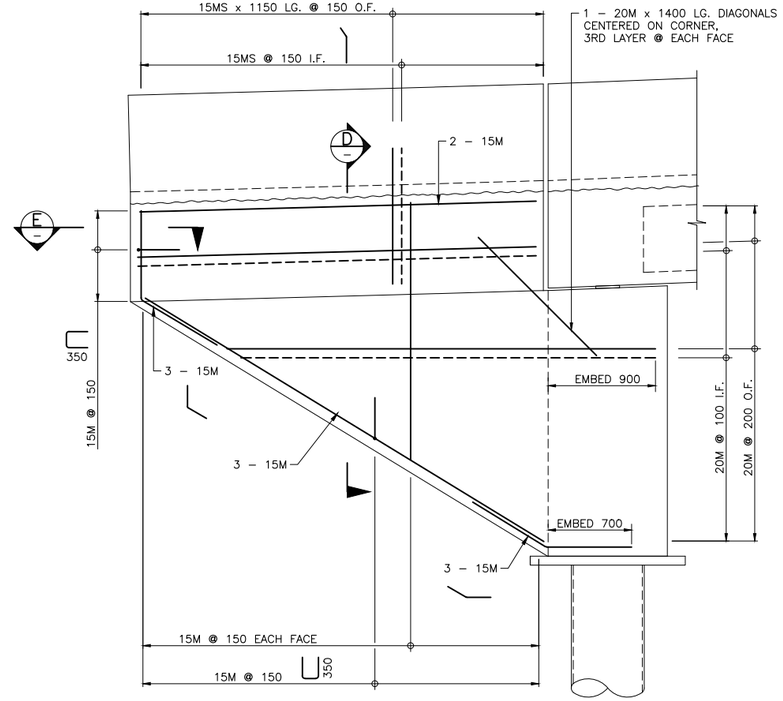
TYPICAL ABUTMENT REINFORCEMENT ELEVATION
SCALE 1:25



SECTION A
SCALE 1:25



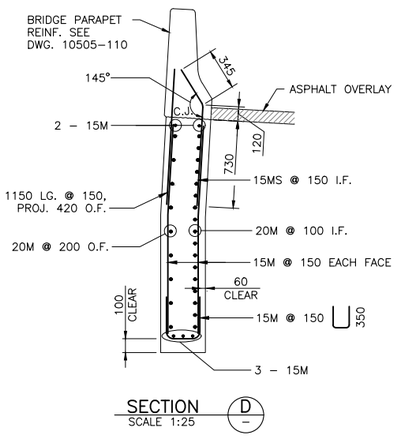
SECTION B
SCALE 1:25



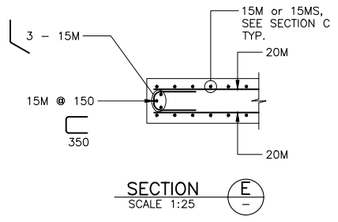
NOTE: WINGWALL AT SOUTH ABUTMENT SHOWN, AT NORTH ABUTMENT OPPOSITE HAND SIMILAR

SECTION C
SCALE 1:25

(ABUTMENT AND PARAPET REINFORCEMENT NOT SHOWN FOR CLARITY)



SECTION D
SCALE 1:25



SECTION E
SCALE 1:25

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
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NOTES:

1. FOR NOTES, SEE DWG. 10505–104.

Consultant Logo

Associated Engineering

Rev	Date	Description	Init

REVISIONS

BRITISH COLUMBIA
Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK BRIDGE NO. 10505

ABUTMENT REINFORCEMENT DETAILS

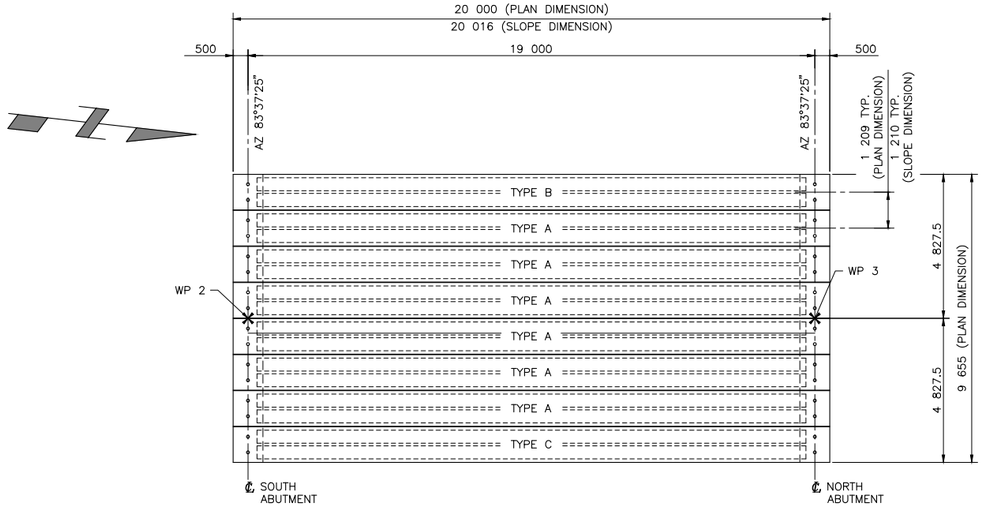
PREPARED UNDER THE DIRECTION OF

MIKE LUMB, P.ENG
ENGINEER OF RECORD
DATE 2023–06–21

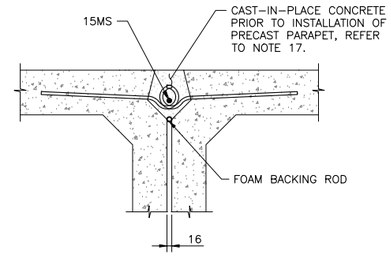
DESIGNED M. LUMB DATE 2023–06–21
CHECKED K. KAVEH DATE 2023–06–21
DRAWN J. MORO DATE 2023–06–21
SCALE AS NOTED
NEGATIVE No.

FILE No.	PROJECT No.	REG.	DRAWING No.
2022–2677–00	14048–0000	1	10505–106

CANCEL PRINTS BEARING PREVIOUS LETTER



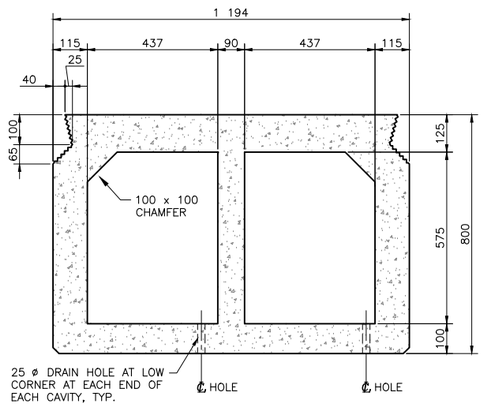
STRINGER LAYOUT PLAN
SCALE 1:100



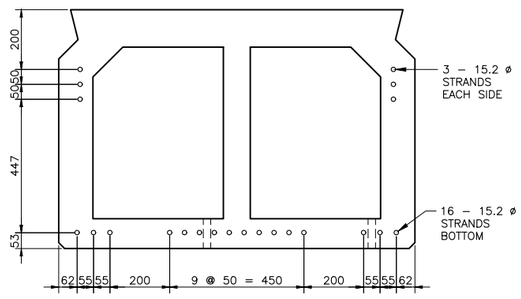
TYPICAL KEYWAY DETAIL
SCALE 1:10

PRECAST CONCRETE STRINGER NOTES:

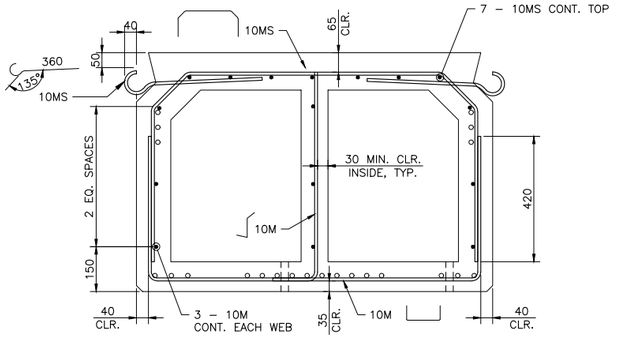
1. PRESTRESSING STRAND:
   - NOMINAL 15.2 DIA – 7 WIRE UNCOATED LOW RELAXATION STRANDS, CONFORMING TO ASTM A416, GRADE 1862 MPa
   - MINIMUM ULTIMATE TENSILE STRENGTH: 260 kN / STRAND
   - TENSION IMMEDIATELY PRIOR TO RELEASE: 195 kN / STRAND
3. CONCRETE
   - 35 MPa @ RELEASE
   - 45 MPa @ 28 DAYS
4. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 20 mm UNLESS NOTED OTHERWISE.
5. FOR REINFORCING STEEL NOTES, SEE DRAWING 10505–104.
6. ALL BOX STRINGER REINFORCING STEEL SHALL HAVE 35 mm MINIMUM COVER UNLESS NOTED OTHERWISE.
7. KEYWAYS SHALL HAVE A ROUGHENED FINISH WITH THE COARSE AGGREGATE PARTIALLY EXPOSED.
8. TOP OF BOXES SHALL HAVE A SMOOTH FLOAT FINISH.
9. CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF MEMBERS UNTIL COMPLETION OF THE WORK.
10. STRINGERS SHALL BE SUPPORTED ONLY AT POINTS DIRECTLY BELOW LIFTING DEVICES WHILE BEING STORED OR TRANSPORTED.
11. STRINGERS SHALL BE KEPT IN AN UPRIGHT POSITION DURING HANDLING AND TRANSPORTING.
12. CONTRACTOR SHALL FIELD SURVEY STRINGER CAMBER AND SUBMIT TO THE MINISTRY REPRESENTATIVE FOR REVIEW AND FINAL CALCULATIONS OF ACTUAL ASPHALT OVERLAY THICKNESS.
13. LIFTING DEVICES SATISFACTORY TO THE ENGINEER SHALL BE PROVIDED OVER THE BEARINGS, ONLY VERTICAL LIFTS WILL BE PERMITTED. CARE SHALL BE TAKEN TO PREVENT SUDDEN IMPACT LOADS ON THE STRINGERS.
14. THE CONCRETE IMMEDIATELY SURROUNDING ALL LIFTING DEVICES SHALL HAVE A FORMED RECESS 65 mm DEEP. THE RECESS SHALL BE THOROUGHLY SANDBLASTED IN THE SHOP.
15. AFTER ERECTION, THE LIFTING DEVICES SHALL BE BURNT OFF AT THE BOTTOM OF THE RECESS AND THE RECESS SHALL BE PATCHED WITH AN APPROVED NON–SHRINK GROUT.
16. ENDS OF PRESTRESSING STRANDS SHALL BE GROUND FLUSH AND SHALL BE PAINTED WITH A MINIMUM 3 COATS OF THIXOTROPIC EPOXY.
17. KEYWAYS BETWEEN ADJACENT BOXES SHALL BE FILLED WITH 12 mm AGGREGATE CONCRETE HAVING A MINIMUM COMPRESSIVE STRENGTH OF 35 MPa AT 28 DAYS.
18. DOWELS TO BE ENCASED IN A PLASTIC SLEEVE FIT SNUGLY, PROJECTING 25 ABOVE TOP OF DOWEL AND COVERED AT THE TOP. BOTTOM OF SLEEVE TO EXTEND TO TOP OF BEARING PAD.
19. PARAPETS TO BE FORMED AND CONCRETE PLACED AFTER KEYWAYS HAVE ATTAINED A MINIMUM COMPRESSIVE STRENGTH OF 15 MPa.
20. ALLOWANCE IN LENGTH SHALL BE MADE FOR THE EFFECTS OF ELASTIC SHORTENING, SHRINKAGE, AND CREEP.
21. ALL GIRDERS TO BE CAST A MINIMUM OF 30 DAYS PRIOR TO PLACING KEYWAY CONCRETE.



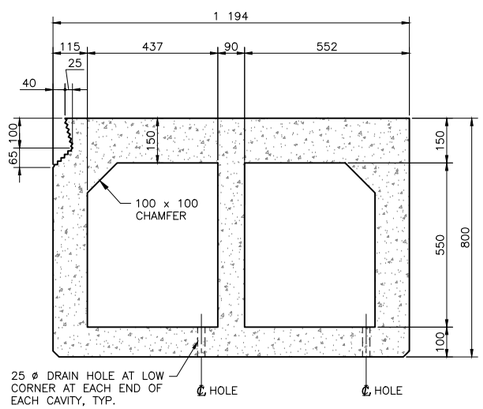
STRINGER SECTION – TYPE 'A'
SCALE 1:10



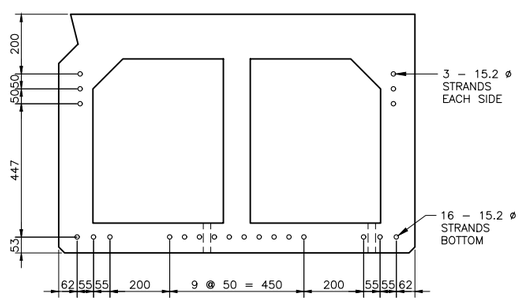
STRAND LAYOUT – TYPE 'A'
SCALE 1:10



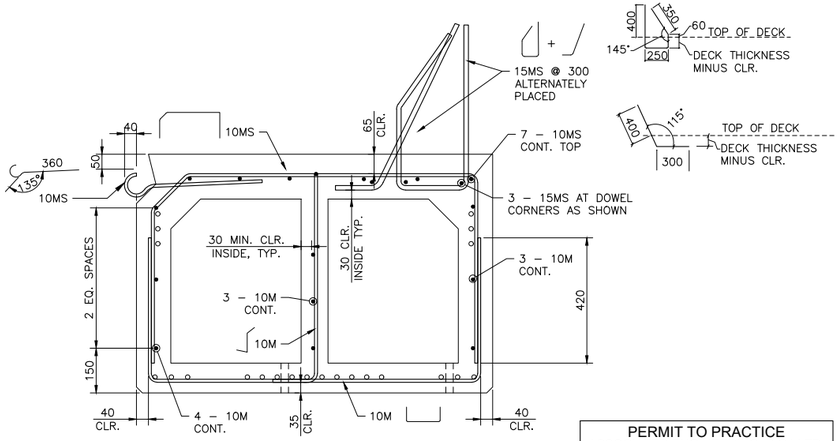
STRINGER REINFORCEMENT DETAILS – TYPE 'A'
SCALE 1:10



STRINGER SECTION – TYPE 'B'
SCALE 1:10
TYPE 'B' SHOWN, TYPE 'C' SIMILAR



STRAND LAYOUT – TYPE 'B'
SCALE 1:10
TYPE 'B' SHOWN, TYPE 'C' SIMILAR



STRINGER REINFORCEMENT DETAILS – TYPE 'B'
SCALE 1:10
TYPE 'B' SHOWN, TYPE 'C' SIMILAR

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REVISIONS

BRITISH COLUMBIA | Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK BRIDGE NO. 10505

PRECAST PRESTRESSED BOX STRINGER – SHEET 1

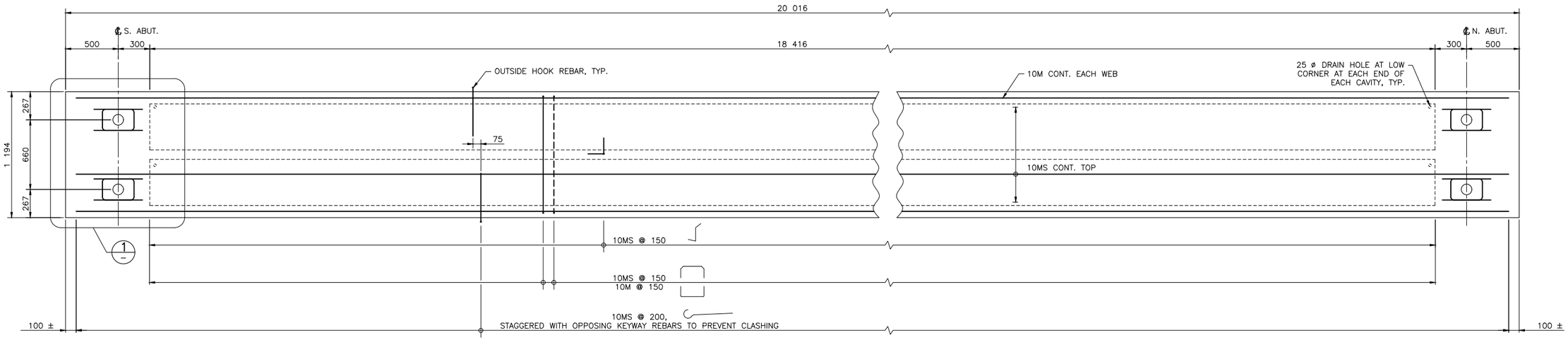
PREPARED UNDER THE DIRECTION OF
MIKE LUMB, P.ENG
ENGINEER OF RECORD
DATE 2023–06–21

DESIGNED M. LUMB DATE 2023–06–21
CHECKED K. KAVEH DATE 2023–06–21
DRAWN J. MORO DATE 2023–06–21
SCALE AS NOTED
NEGATIVE No.

FILE No.	PROJECT No.	REG.	DRAWING No.
2022–2677–00	14048–0000	1	10505–107

CANCEL PRINTS BEARING PREVIOUS LETTER

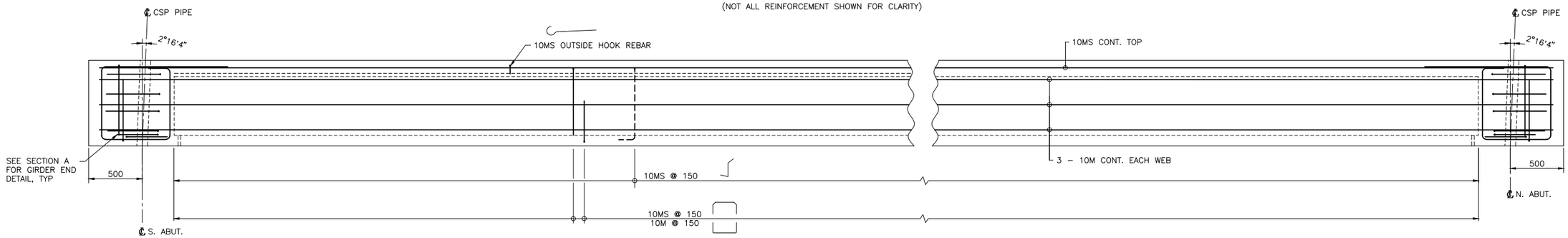
FILE: Q:\2022–2677–00\CIVIL\MODEL\MOTI_WORKING_DRAWINGS\DRAWINGPRODUCTION\1100_SUBDISCIPLINES\STRUCTURAL\10505–107.DWG
PLOTTED : Tuesday, August 15, 2023



PLAN – STRINGER TYPE 'A'

SCALE 1:20

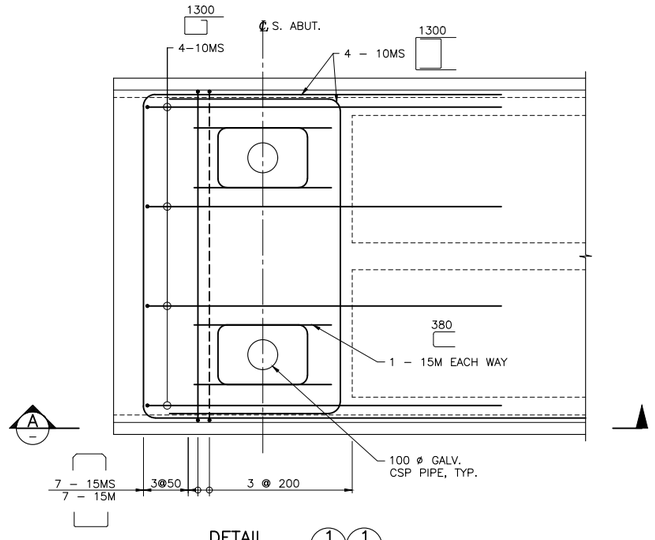
(NOT ALL REINFORCEMENT SHOWN FOR CLARITY)



ELEVATION – STRINGER TYPE 'A'

SCALE 1:20

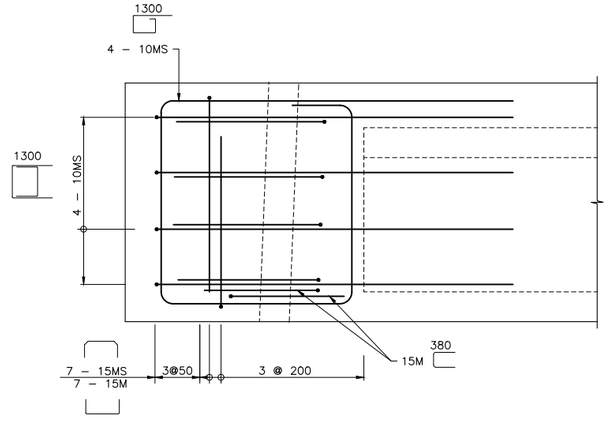
(NOT ALL REINFORCEMENT SHOWN FOR CLARITY)



DETAIL 1/1

SCALE 1:10

(ANCHOR RODS NOT SHOWN FOR CLARITY)



SECTION A

SCALE 1:10

NOTES:

1. FOR PRECAST CONCRETE STRINGER NOTES, SEE DWG. NO. 10505–107.

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REVISIONS

BRITISH COLUMBIA
Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK BRIDGE NO. 10505

PRECAST PRESTRESSED BOX STRINGER – SHEET 2

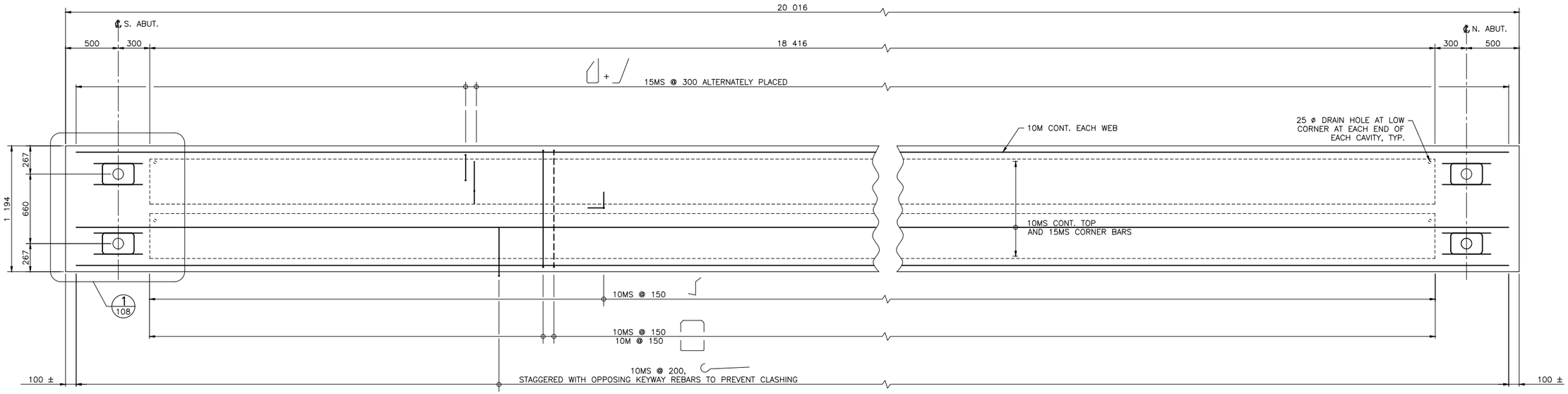
PREPARED UNDER THE DIRECTION OF

MIKE LUMB, P.ENG
ENGINEER OF RECORD
DATE 2023-06-21

DESIGNED M. LUMB DATE 2023-06-21
CHECKED K. KAVEH DATE 2023-06-21
DRAWN J. MORO DATE 2023-06-21
SCALE AS NOTED
NEGATIVE No.

FILE No.	PROJECT No.	REG.	DRAWING No.
2022-2677-00	14048-0000	1	10505-108

CANCEL PRINTS BEARING PREVIOUS LETTER

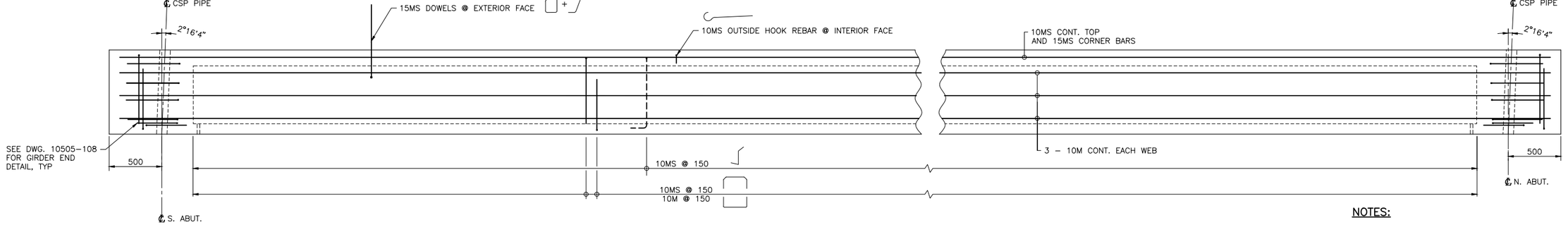


PLAN – STRINGER TYPE 'B'

SCALE 1:20

TYPE 'B' SHOWN, TYPE 'C' SIMILAR

(NOT ALL REINFORCEMENT SHOWN FOR CLARITY)



ELEVATION – STRINGER TYPE 'B'

SCALE 1:20

TYPE 'B' SHOWN, TYPE 'C' SIMILAR

(NOT ALL REINFORCEMENT SHOWN FOR CLARITY)

NOTES:

1. FOR PRECAST CONCRETE STRINGER NOTES, SEE DWG. NO. 10505–107.

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
Engineers & Geoscientists BC

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REVISIONS

BRITISH COLUMBIA

Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK BRIDGE NO. 10505

PRECAST PRESTRESSED BOX STRINGER – SHEET 3

PREPARED UNDER THE DIRECTION OF

MIKE LUMB, P.ENG
ENGINEER OF RECORD
DATE 2023–06–21

DESIGNED M. LUMB DATE 2023–06–21
CHECKED K. KAVEH DATE 2023–06–21
DRAWN J. MORO DATE 2023–06–21
SCALE AS NOTED
NEGATIVE No.

FILE No.	PROJECT No.	REG.	DRAWING No.
2022–2677–00	14048–0000	1	10505–109

CANCEL PRINTS BEARING PREVIOUS LETTER

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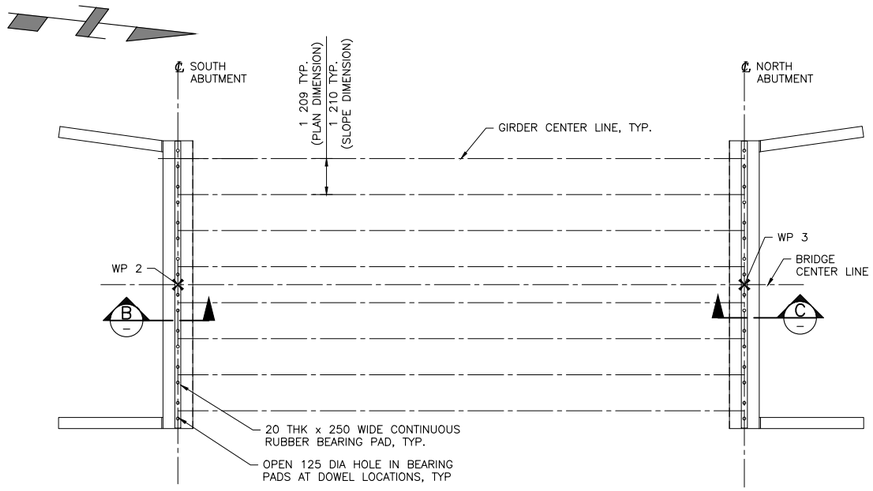
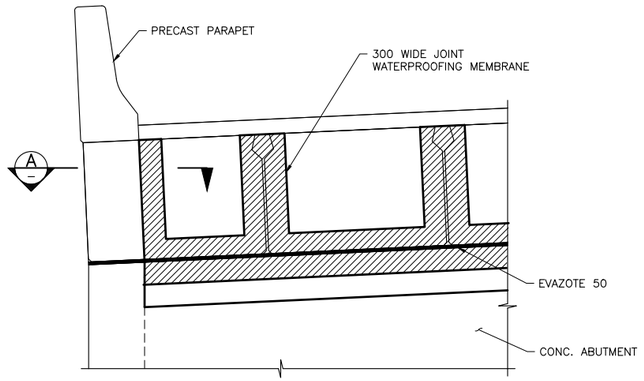
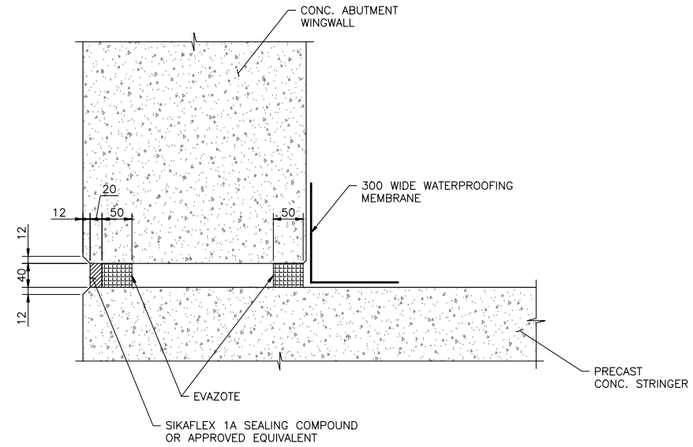
PLOTTED: Tuesday, August 15, 2023



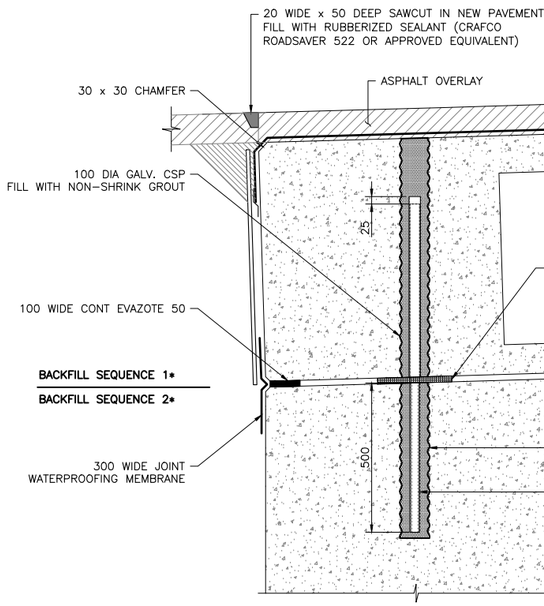
BEARING PAD LAYOUT
SCALE 1:100



TYPICAL VIEW AT BACK OF ABUTMENT
SCALE 1:20

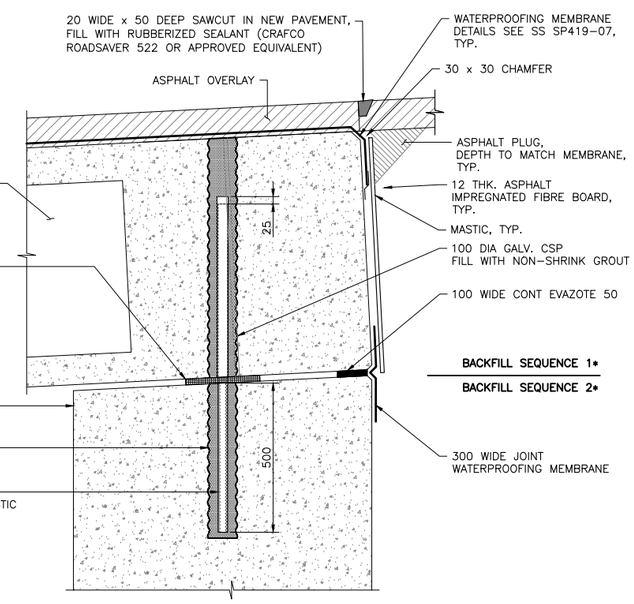


SECTION A
SCALE 1:5



SECTION B
SCALE 1:10

DOWEL AT SOUTH ABUTMENT FIXED BEARING



SECTION C
SCALE 1:10

DOWEL AT NORTH ABUTMENT FIXED BEARING

PRECAST CONC. STRINGER

20 THK x 250 WIDE CONTINUOUS RUBBER BEARING PAD PLACED ON GROUT BED OR SECURED WITH RUBBER CEMENT ON CAP (OPEN 125 DIA HOLES AT DOWEL LOCATIONS)

ABUTMENT

100 DIA GALV. CSP, FILL WITH NON-SHRINK GROUT

32 DIA x 1100 LG. ASTM F1554 GRADE 105 SMOOTH DOWEL IN PLASTIC SLEEVE ABOVE STRIP BEARING ONLY. INSTALL AFTER STRINGER IS PLACED

* BACKFILL SEQUENCE

1. BACKFILL TO TOP OF NEW ABUTMENT / PILE CAP PRIOR TO GIRDER INSTALLATION.
2. BACKFILLING SHALL BE COMPLETED TO TOP OF GIRDER AFTER DOWELS ARE INSTALLED, AND GROUT HAS REACHED 75% DESIGN STRENGTH MINIMUM.

NOTES:

1. FOR ABUTMENT NOTES, SEE DWG. 10505-104
2. GROUT TO BE SHRINKAGE-COMPENSATING CEMENTITIOUS GROUT, 40 MPa MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS.
3. JOINT WATERPROOFING MEMBRANE SHALL BE A 300 mm WIDE PREFABRICATED MEMBRANE DETAILING STRIP. THE MEMBRANE SHALL BE A SELF-ADHERING INTERNALLY REINFORCED SHEET OF RUBBERIZED ASPHALT AND SHALL BE 1.50mm THICK AND INSTALLED IN ACCORDANCE WITH SS419.

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REVISIONS

BRITISH COLUMBIA
Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK BRIDGE NO. 10505

SUPERSTRUCTURE DETAILS

PREPARED UNDER THE DIRECTION OF

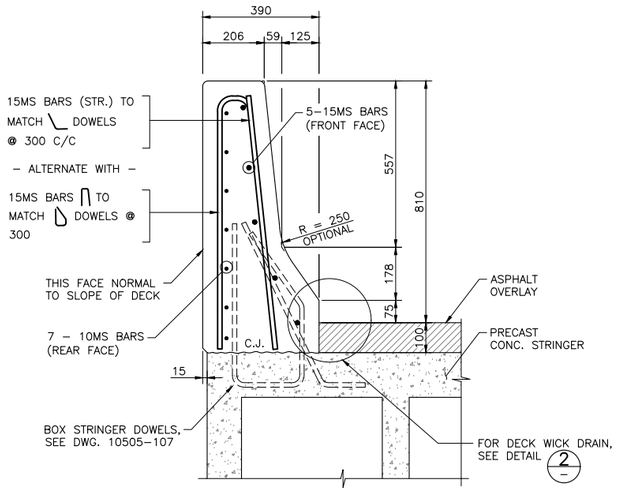
MIKE LUMB, P.ENG
ENGINEER OF RECORD
DATE 2023-06-21

DESIGNED M. LUMB DATE 2023-06-21
CHECKED K. KAVEH DATE 2023-06-21
DRAWN J. MORO DATE 2023-06-21
SCALE AS NOTED
NEGATIVE No.

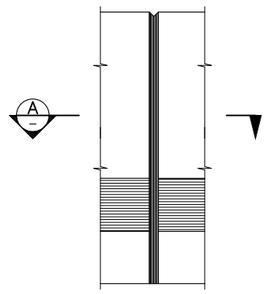
FILE No.	PROJECT No.	REG.	DRAWING No.
2022-2677-00	14048-0000	1	10505-110

CANCEL PRINTS BEARING PREVIOUS LETTER

FILE: Q:\2022-2677-00\CIVIL\MOBE\MOTI_WORKING_DRAWINGS\DRAWINGPRODUCTION\1100_SUBDISCIPLINES\STRUCTURAL\10505-110.DWG
PLOTTED : Tuesday, August 15, 2023

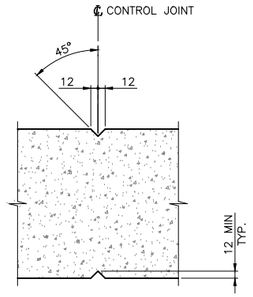


PARAPET REINFORCING SECTION
SCALE 1:10

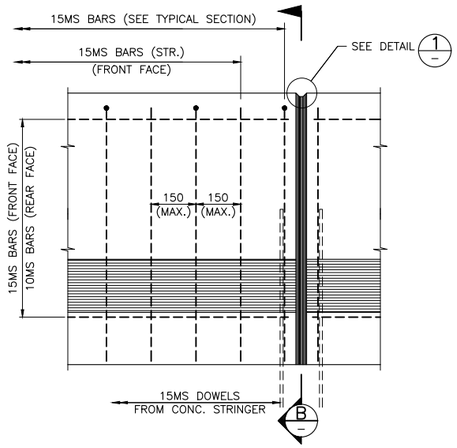


PARAPET CONTROL JOINT
SCALE 1:10

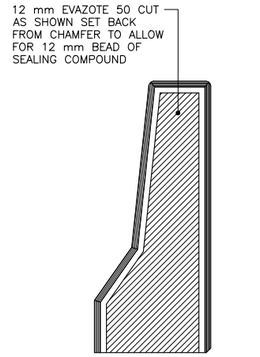
(MAXIMUM SPACING 3000 mm, SPACING SHALL BE EQUAL FOR LENGTH OF PARAPET)



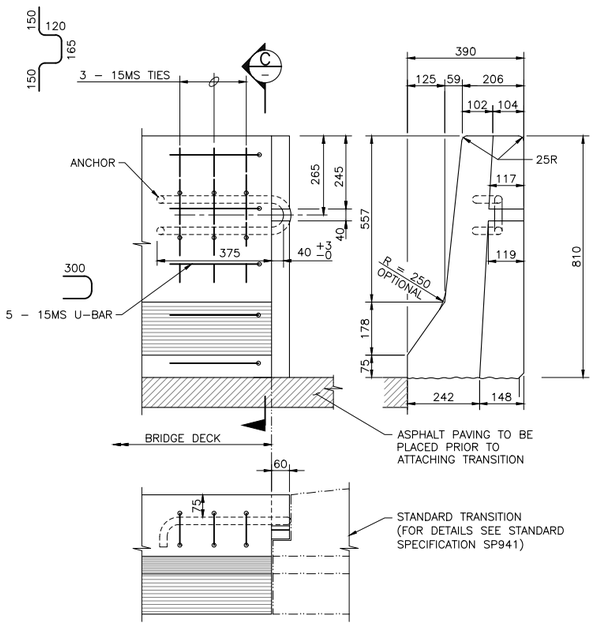
SECTION A
SCALE 1:5



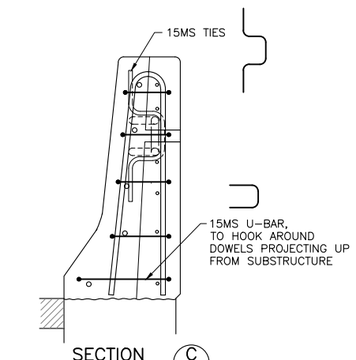
PARAPET JOINT AT WINGWALLS
SCALE 1:10



SECTION B
SCALE 1:10

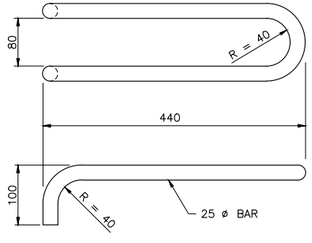


DETAIL AT END OF PARAPET
SCALE 1:10



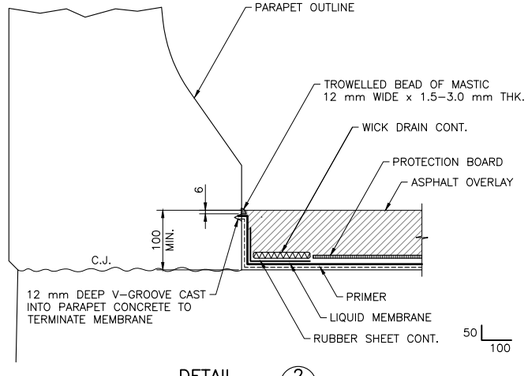
SECTION C
SCALE 1:10

NOTE: WINGWALL AND DOWELS FROM WINGWALL NOT SHOWN FOR CLARITY



DETAIL OF ANCHOR
MASS = 4.1 kg EACH
SCALE 1:5

DETAIL 1
SCALE 1:2



DETAIL 2
N.T.S.

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Engineers & Geoscientists BC

NOTES:

1. PARAPET CONCRETE SHALL HAVE A COMPRESSIVE STRENGTH OF 35 MPa AT 28 DAYS.
2. CONCRETE SURFACES SHALL BE GIVEN A CLASS 3 FINISH.
3. EXPOSED EDGES TO BE CHAMFERED 20 mm EXCEPT AS NOTED.
4. REINFORCING STEEL TO HAVE 50 mm MIN. COVER EXCEPT AS NOTED.
5. ALL REINFORCING STEEL DESIGNATED 'MS' IS STAINLESS STEEL.
6. LAP LENGTH FOR SPLICES SHALL BE AS FOLLOWS:
   10MS BARS – 610 mm
   15MS BARS – 860 mm
   SPLICES TO BE STAGGERED.
7. NO PART OF THE PARAPET CONCRETE ABOVE THE CONSTRUCTION JOINT SHALL BE PLACED UNTIL ALL SECTIONS OF THE DECK SLAB AND DECK JOINT COMPONENTS HAVE BEEN PLACED.
8. PARAPETS TO BE CAST IN FIXED FORMS.
9. STEEL FOR ANCHORS TO CONFORM TO CSA–G40.21M GRADE 300W.
10. ANCHORS TO BE GALVANIZED AFTER FABRICATION. GALVANIZING TO BE IN ACCORDANCE WITH ASTM A153.
11. WICK DRAIN – NILEX MD–7407 FULL LENGTH OF DECK: INSTALL WHEN MEMBRANE IS TACKY.

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Associated Engineering

Rev	Date	Description	Init

REVISIONS

BRITISH COLUMBIA
Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK BRIDGE NO. 10505

PARAPET DETAILS

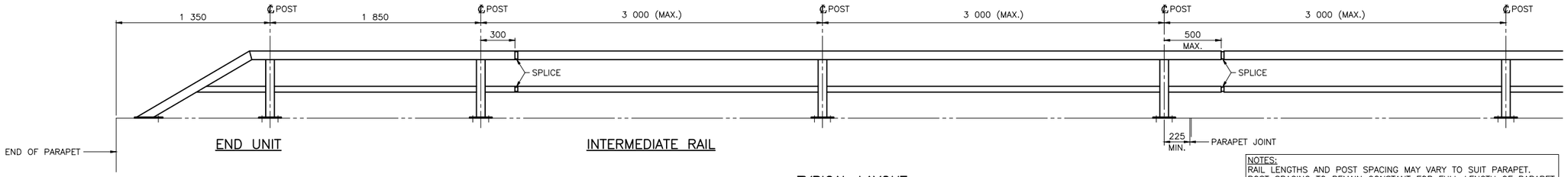
PREPARED UNDER THE DIRECTION OF
MIKE LUMB, P.ENG
ENGINEER OF RECORD
DATE 2023–06–21

DESIGNED M. LUMB DATE 2023–06–21
CHECKED K. KAVEH DATE 2023–06–21
DRAWN J. MORO DATE 2023–06–21
SCALE AS NOTED
NEGATIVE No.

FILE No.	PROJECT No.	REG.	DRAWING No.
2022–2677–00	14048–0000	1	10505–111

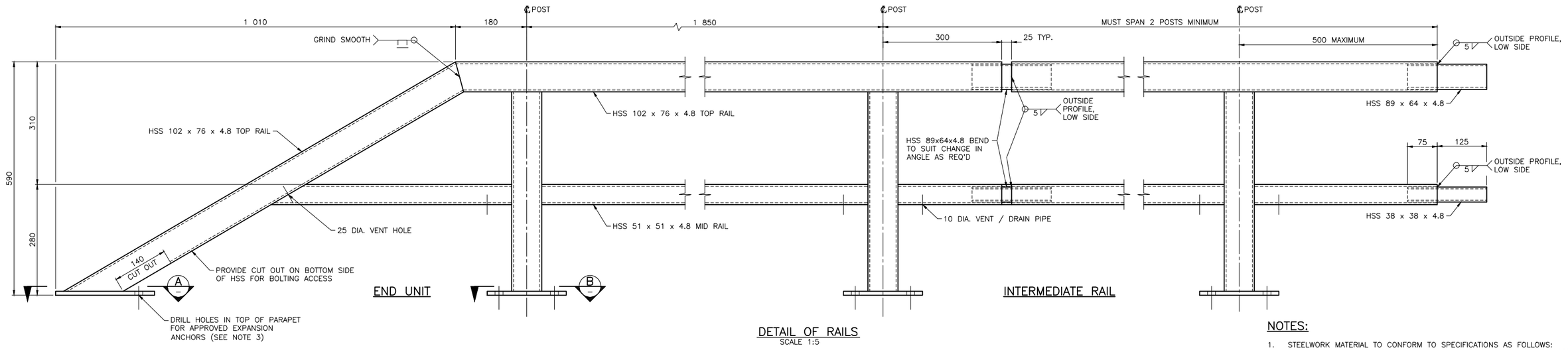
CANCEL PRINTS BEARING PREVIOUS LETTER

FILE: Q:\2022-2677-00\CAD\MODEL\MOTI_WORKING_DRAWINGS\DRAWINGPRODUCTION\1100_SUBDISCIPLINES\STRUCTURAL\10505-111.DWG
PLOTTED: Tuesday, August 15, 2023

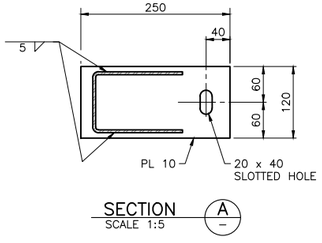


TYPICAL LAYOUT
SCALE 1:20

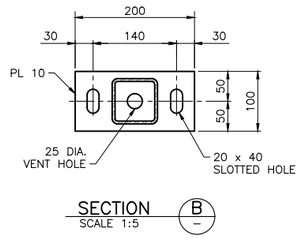
NOTES:
RAIL LENGTHS AND POST SPACING MAY VARY TO SUIT PARAPET. POST SPACING TO REMAIN CONSTANT FOR FULL LENGTH OF PARAPET EXCEPT AT END PANELS WHICH MAY VARY SLIGHTLY. RAILS MUST SPAN 2 POSTS MINIMUM AND 3 POSTS WHERE POSSIBLE.



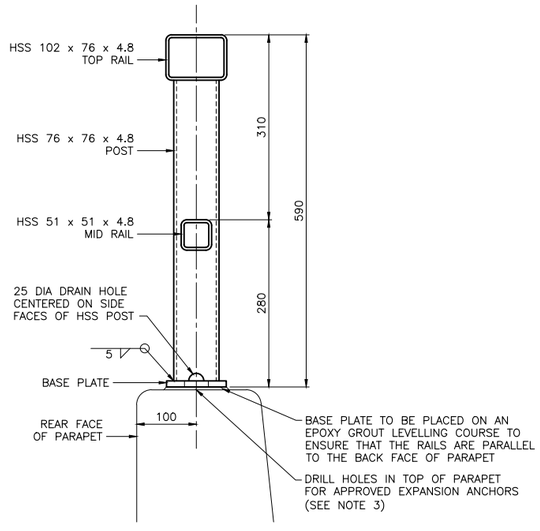
DETAIL OF RAILS
SCALE 1:5



SECTION A
SCALE 1:5



SECTION B
SCALE 1:5



DETAIL OF POST
SCALE 1:5

NOTES:

1. STEELWORK MATERIAL TO CONFORM TO SPECIFICATIONS AS FOLLOWS:
   a. HOLLOW STRUCTURAL SECTION – G40.21M GRADE 350W CLASS C
   b. BOLTS – ASTM F3125 GRADE A325
   c. PLATES – G40.21M GRADE 260W
2. ALL STEELWORK TO BE GALVANIZED AFTER FABRICATION, GALVANIZING TO BE IN ACCORDANCE WITH MINISTRY OF TRANSPORTATION & INFRASTRUCTURE STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION SECTION 422.36.
3. POSTS TO BE ANCHORED TO THE PARAPET WITH 16 DIA. (5/8" DIA.) ASTM A449 TYPE 1 GALVANIZED THREADED RODS EMBEDDED 200 mm MIN IN A CLEAN DRY HOLE WITH HILTI HY–200 ADHESIVE FOLLOWING MANUFACTURER'S SPECIFICATIONS.
4. EPOXY MORTAR BEDDING TO BE SIKADUR HI–MOD APPLIED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS AND AS SHOWN ON THE DRAWINGS.

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
Engineers & Geoscientists BC

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Associated Engineering

Rev	Date	Description	Init

REVISIONS

BRITISH COLUMBIA
Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK BRIDGE NO. 10505

PARAPET STEEL BICYCLE RAILING

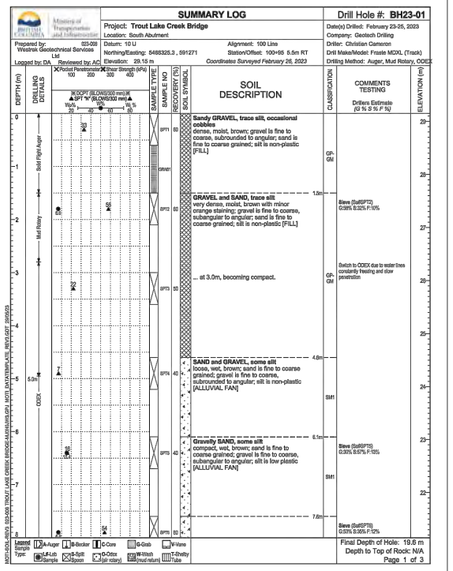
PREPARED UNDER THE DIRECTION OF
MIKE LUMB, P.ENG
ENGINEER OF RECORD
DATE 2023–06–21

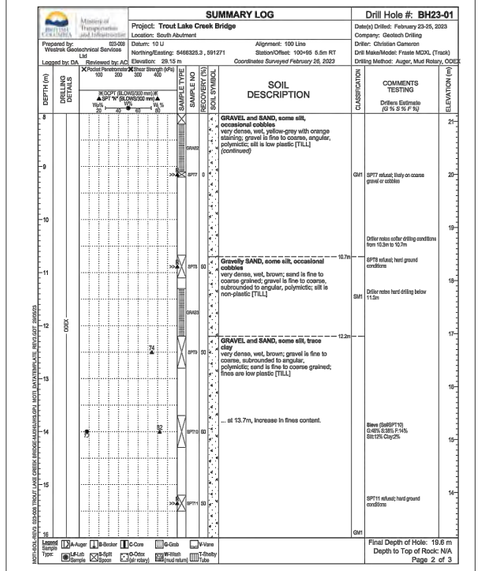
DESIGNED M. LUMB DATE 2023–06–21
CHECKED K. KAVEH DATE 2023–06–21
DRAWN J. MORO DATE 2023–06–21
SCALE AS NOTED
NEGATIVE No.

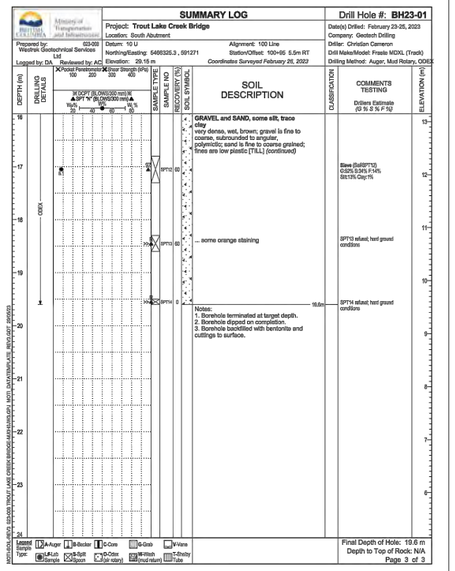
FILE No.	PROJECT No.	REG.	DRAWING No.
2022–2677–00	14048–0000	1	10505–112

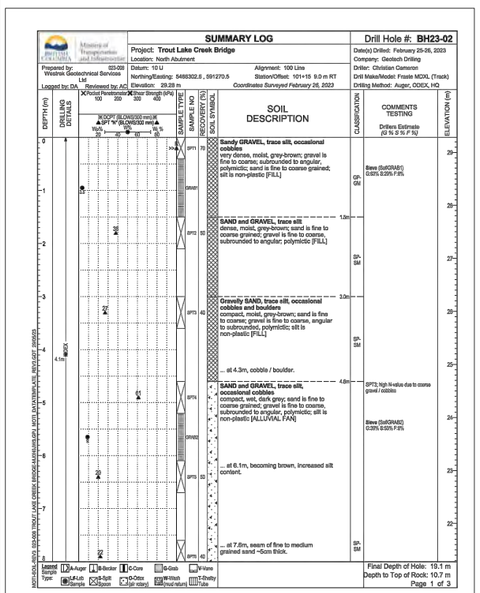
CANCEL PRINTS BEARING PREVIOUS LETTER

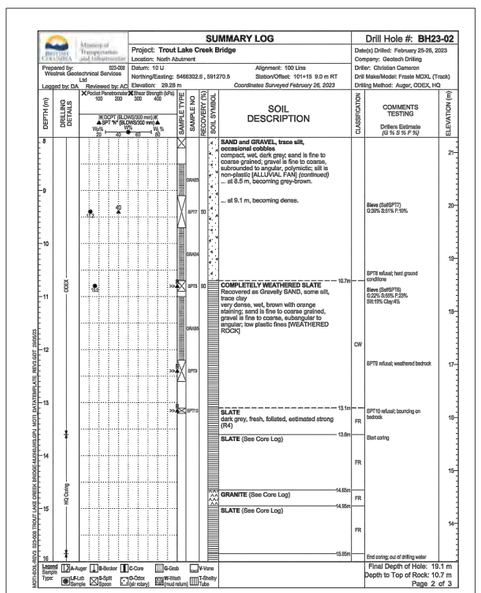
FILE: Q:\2022-2677-00\CAD\MODEL\MOTI_WORKING_DRAWINGS\DRAWINGPRODUCTION\1100_SUBDISCIPLINES\STRUCTURAL\10505-112.DWG
PLOTTED: Tuesday, August 15, 2023

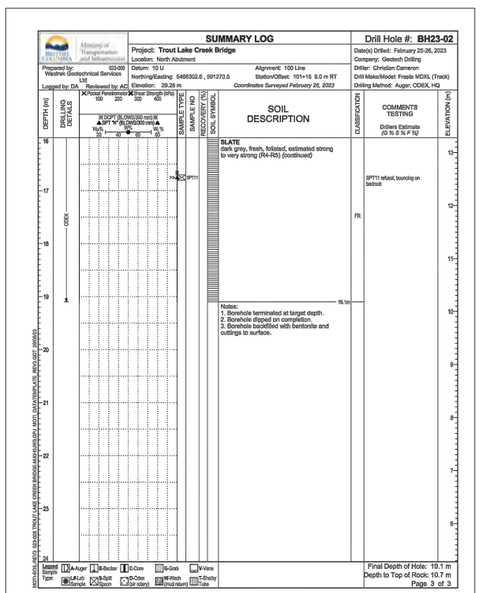


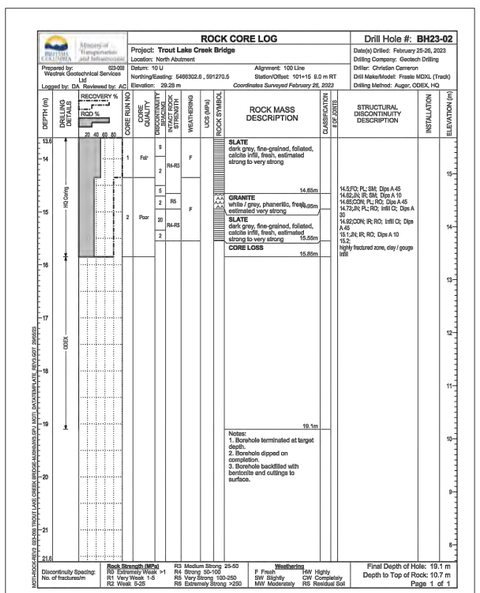












MATERIALS CLASSIFICATION LEGEND

MAJOR DIVISIONS		SYMBOL	SOIL TYPE
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	WELL GRADED GRAVELS OR GRAVEL–SAND MIXTURES, < 5% FINES
		GP	POORLY–GRADED GRAVELS OR GRAVEL–SAND MIXTURES, < 5% FINES
		GM*	SILTY GRAVELS, GRAVEL–SAND–SILT MIXTURES
		GC*	CLAYEY GRAVELS, GRAVEL–SAND–CLAY MIXTURES
	SAND AND SANDY SOILS	SW	WELL–GRADED SANDS OR GRAVELLY SANDS, < 5% FINES
		SP	POORLY–GRADED SANDS OR GRAVELLY SANDS, < 5% FINES
		SM*	SILTY SANDS SAND–SILT MIXTURES
		SC*	CLAYEY SANDS SAND–CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS WI <50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS AND ORGANIC SILT–CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS WI >50	MH	INORGANIC SILTS, MICACEOUS OR DIATOM–ACEOUS FINE SANDY OR SILTY SOILS, PLASTIC SILTS
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
ORGANIC SOILS		Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS
TOPSOIL		TS	TOPSOIL WITH ROOTS, ETC.
COBBLES		SB	ROCK FRAGMENTS AND COBBLES, PARTICLE SIZE 75mm TO 300mm
BOULDERS		LB	BOULDERS, PARTICLE SIZE OVER 300mm
BEDROCK		BR	BEDROCK

FOR SOILS HAVING 5 – 12% PASSING .075 SIEVE, USE DUAL SYMBOL

*GM1; GC1; SM1; SC1; 12 – 20%
GM2; GC2; SM2; SC2; 20 – 30%
GM3; GC3; SM3; SC3; 30 – 40%
GM4; GC4; SM4; SC4; 40 – 50%
} PASSING .075mm SIEVE

REV. 90–04–26

NOTES:

1. FOR TEST LOCATIONS, SEE DWG. NO. 10505–101.
2. ALL GEOTECHNICAL INFORMATION PROVIDED FOR THIS PROJECT HAS BEEN COMPILED FOR BRITISH COLUMBIA MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE FOR DESIGN PURPOSES ONLY. INFORMATION WAS COMPILED FROM TROUT LAKE CREEK BRIDGE GEOTECHNICAL ASSESSMENT, JUNE 20 2023 BY WESTREK GEOTECHNICAL SERVICES LTD. ADDITIONAL INFORMATION IS AVAILABLE IN THE REPORT AND SHOULD BE EXAMINED AND SUPPLEMENTED AS REQUIRED. ALL DISCLAIMERS IN THIS REPORT ARE APPLICABLE AND IN CASE OF DISCREPANCY, THE GEOTECHNICAL REPORT GOVERNS.

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REVISIONS

BRITISH COLUMBIA | Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK BRIDGE NO. 10505

BOREHOLE LOG SUMMARY

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
Engineers & Geoscientists BC

PREPARED UNDER THE DIRECTION OF

WYATT PARK, P. ENG
ENGINEER OF RECORD
DATE 2023–06–21

DESIGNED D. ALPHONSO DATE 2023–06–21
CHECKED A. CHIEM DATE 2023–06–21
DRAWN J. MORO DATE 2023–06–21
SCALE AS NOTED
NEGATIVE No.

FILE No.	PROJECT No.	REG.	DRAWING No.
2022–2677–00	14048–0000	1	10505–113

CANCEL PRINTS BEARING PREVIOUS LETTER

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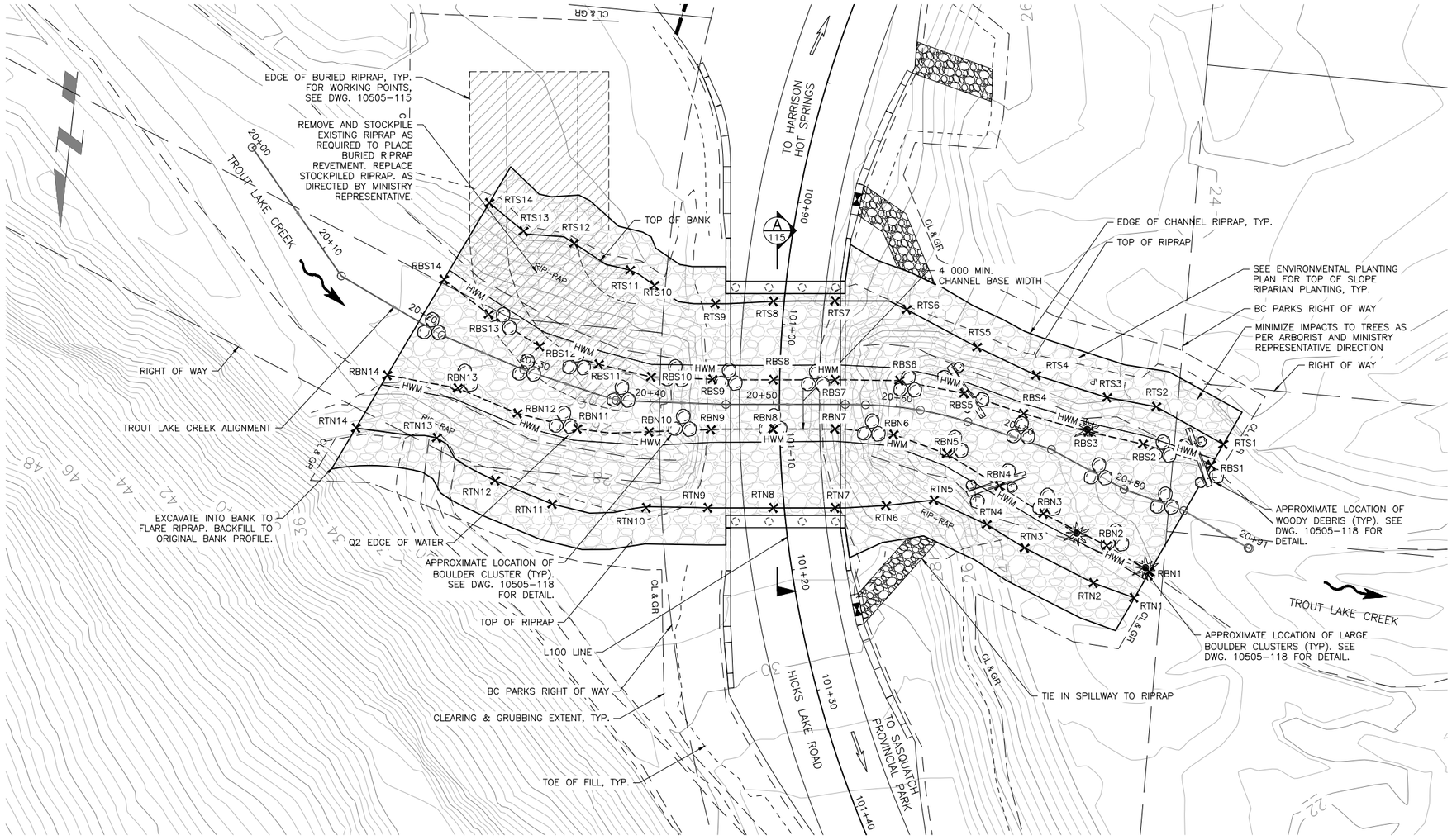
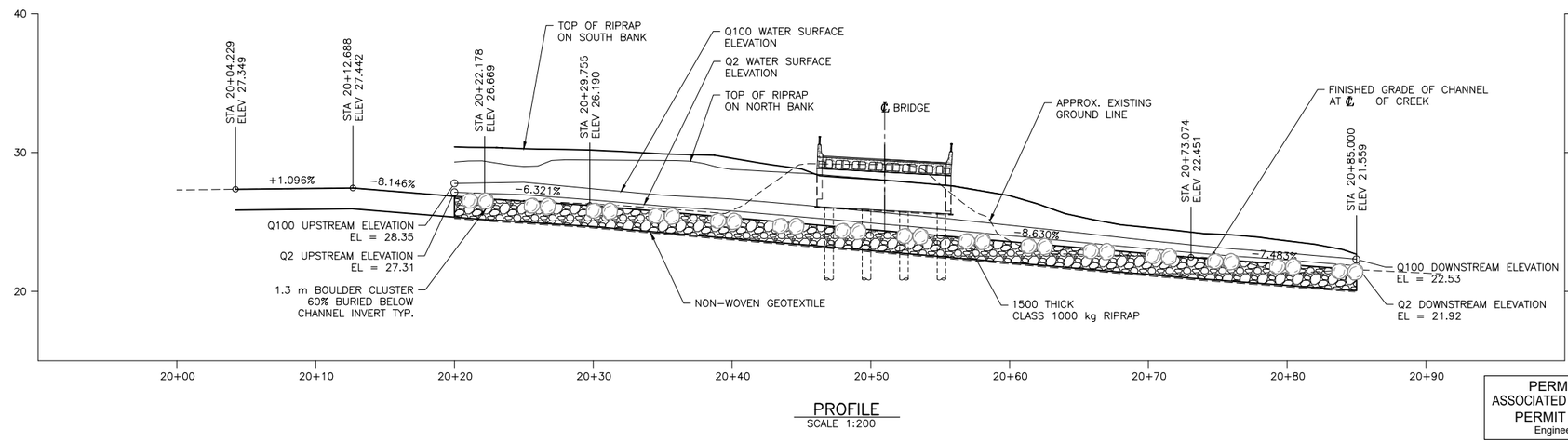
PLOTTED: - Tuesday, August 15, 2023



PLAN
SCALE 1:200



PROFILE
SCALE 1:200

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
Engineers & Geoscientists BC

NOTES:

1. HYDROTECHNICAL DESIGN BASED ON 1% ANNUAL EXCEEDANCE PROBABILITY (100–YEAR RETURN PERIOD) DESIGN FLOW (20% ALLOWANCE FOR FUTURE CLIMATE CHANGE) AND 10% BULKING FACTOR = 40.4 m^3/s.
2. RIPRAP PER BC MINISTRY OF TRANSPORATION STANDARD SPECIFICATIONS SECTION 205 (2020).
3. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
4. ALL ELEVATION AND STATIONS ARE IN METRES.
5. 0.5 m CONTOUR INTERVALS.

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Rev	Date	Description	Init

REVISIONS

BRITISH COLUMBIA
Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK BRIDGE NO. 10505

CHANNEL EMBANKMENT PROTECTION DETAILS – SHEET 1

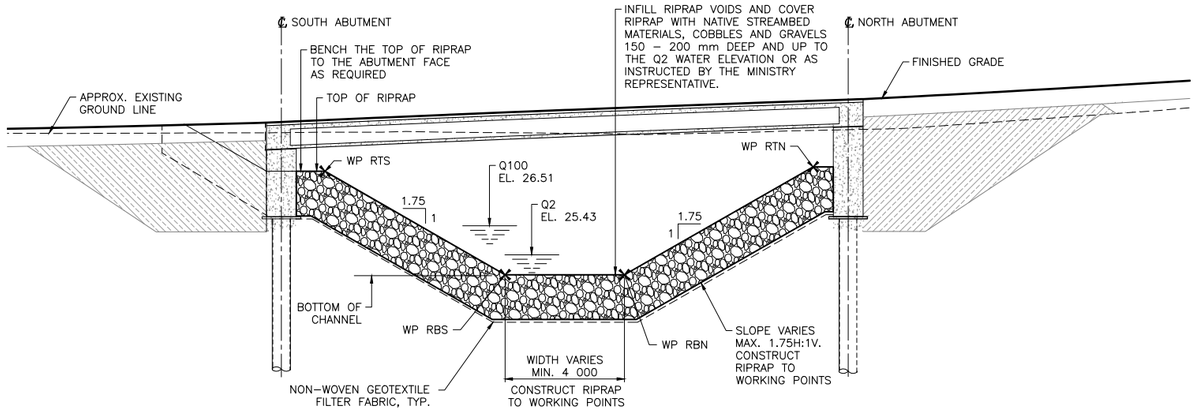
PREPARED UNDER THE DIRECTION OF
ERIC FINNEY, P.ENG
ENGINEER OF RECORD
DATE 2023–06–21

DESIGNED E. FINNEY/A. WHITE DATE 2023–06–21
CHECKED J. THIESSEN DATE 2023–06–21
DRAWN J. MORO/H. LEE DATE 2023–06–21
SCALE AS NOTED
NEGATIVE No.

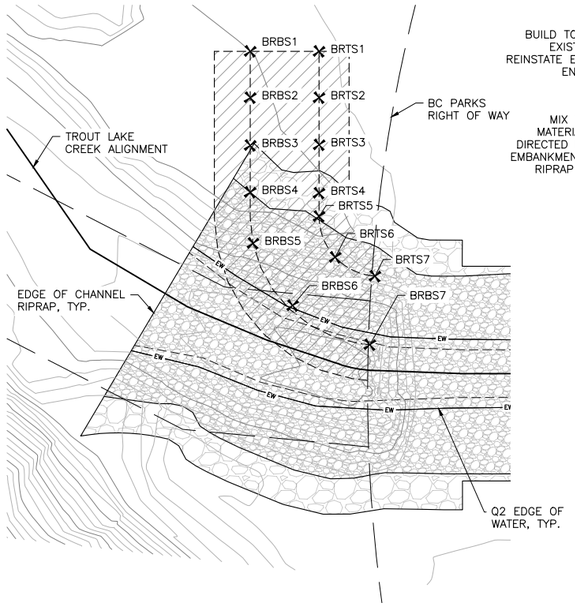
FILE No.	PROJECT No.	REG.	DRAWING No.
2022–2677–00	14048–0000	1	10505–114

CANCEL PRINTS BEARING PREVIOUS LETTER

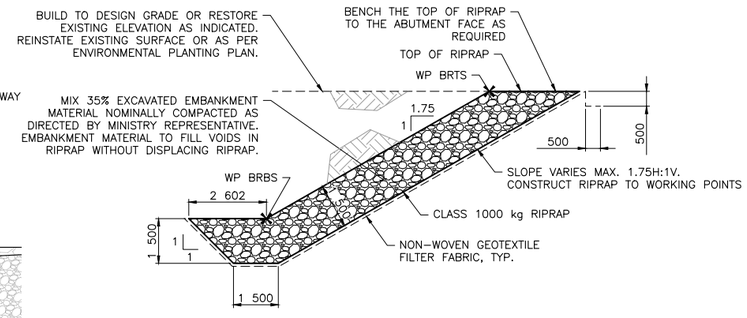
FILE: Q:\2022-2677-00\CAD\MODEL\MOTI_WORKING_DRAWINGS\DRAWINGPRODUCTION\1100_SUBDISCIPLINES\STRUCTURAL\10505-118.DWG
PLOTTED: Tuesday, August 15, 2023



SECTION A 114
SCALE 1:100



WORKING POINTS BURIED RIPRAP PLAN
SCALE 1:250



TYPICAL BURIED RIPRAP SECTION
SCALE 1:100

WORKING POINT TABLE				
NUMBER	DESCRIPTION	NORTHING	EASTING	ELEVATION
1	RBN1	466322.707	591232.907	21.565
2	RBN2	466321.002	591236.573	21.933
3	RBN3	466319.000	591241.967	22.331
4	RBN4	466317.174	591245.757	22.717
5	RBN5	466315.041	591250.283	23.146
6	RBN6	466313.961	591254.757	23.579
7	RBN7	466314.048	591259.534	24.011
8	RBN8	466314.604	591264.503	24.442
9	RBN9	466315.210	591269.542	24.874
10	RBN10	466315.943	591274.501	25.306
11	RBN11	466316.339	591280.306	25.737
12	RBN12	466315.640	591285.269	26.169
13	RBN13	466314.145	591290.320	26.490
14	RBN14	466313.746	591296.114	26.846
15	RTN1	466324.955	591233.902	22.671
16	RTN2	466324.133	591237.312	23.768
17	RTN3	466321.926	591243.169	24.115
18	RTN4	466320.377	591246.435	24.584
19	RTN5	466318.883	591250.923	25.315
20	RTN6	466319.758	591254.722	26.889
21	RTN7	466320.409	591258.823	27.666
22	RTN8	466320.964	591263.792	28.098
23	RTN9	466321.552	591269.067	28.500
24	RTN10	466322.108	591274.039	28.782
25	RTN11	466322.647	591281.649	29.420
26	RTN12	466321.262	591286.466	29.451
27	RTN13	466318.343	591291.559	28.989
28	RTN14	466318.284	591298.157	29.311
29	RBS1	466313.560	591228.871	21.559
30	RBS2	466312.483	591234.561	21.936
31	RBS3	466311.977	591239.081	22.307
32	RBS4	466311.098	591244.471	22.719
33	RBS5	466310.001	591249.444	23.193
34	RBS6	466309.559	591254.784	23.582
35	RBS7	466310.073	591259.978	24.013
36	RBS8	466310.629	591264.947	24.445
37	RBS9	466311.133	591269.853	24.877
38	RBS10	466311.496	591274.834	25.308
39	RBS11	466310.952	591279.159	25.740
40	RBS12	466310.039	591284.077	26.171
41	RBS13	466307.911	591288.485	26.493
42	RBS14	466305.521	591292.410	26.846
43	RTS1	466311.775	591228.080	22.671
44	RTS2	466309.352	591233.822	23.771
45	RTS3	466309.051	591237.878	24.102
46	RTS4	466307.894	591243.793	24.588
47	RTS5	466306.159	591248.804	25.384
48	RTS6	466303.762	591254.819	26.891
49	RTS7	466303.713	591260.689	27.668
50	RTS8	466304.301	591265.654	28.081
51	RTS9	466305.160	591270.311	28.812
52	RTS10	466304.089	591275.393	29.580
53	RTS11	466303.080	591277.487	29.580
54	RTS12	466301.413	591282.241	30.170
55	RTS13	466300.892	591286.419	30.269
56	RTS14	466298.921	591289.438	30.407

WORKING POINT TABLE				
NUMBER	DESCRIPTION	NORTHING	EASTING	ELEVATION
57	BRTS1	466287.545	591283.490	28.636
58	BRTS2	466291.403	591283.059	28.636
59	BRTS3	466295.320	591282.610	28.636
60	BRTS4	466299.354	591282.170	28.636
61	BRTS5	466301.290	591281.954	28.636
62	BRTS6	466304.542	591280.226	28.636
63	BRTS7	466305.739	591276.743	28.636
64	BRBS1	466288.186	591289.226	25.400
65	BRBS2	466292.044	591288.795	25.400
66	BRBS3	466296.020	591288.350	25.400
67	BRBS4	466299.921	591287.914	25.400
68	BRBS5	466304.140	591287.204	25.400
69	BRBS6	466308.963	591283.324	25.400
70	BRBS7	466311.497	591276.529	25.400

RIPRAP QUANTITIES	
CLASS	APPROXIMATE ESTIMATED QUANTITIES (m^3)
1000 kg	3359

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
Engineers & Geoscientists BC

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Associated Engineering

Rev	Date	Description	Init

REVISIONS

BRITISH COLUMBIA
Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD
TROUT LAKE CREEK BRIDGE NO. 10505
CHANNEL EMBANKMENT PROTECTION DETAILS – SHEET 2

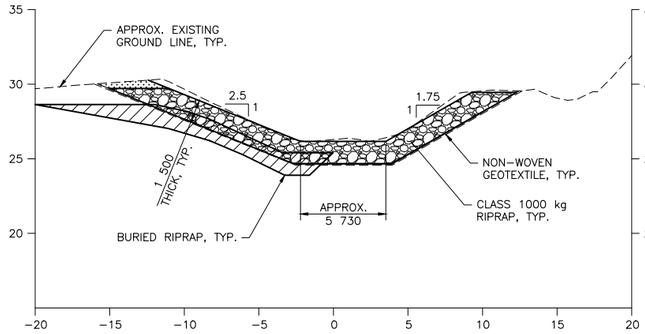
PREPARED UNDER THE DIRECTION OF
ERIC FINNEY, P.ENG
ENGINEER OF RECORD
DATE 2023–06–21

DESIGNED E. FINNEY/A. WHITE DATE 2023–06–21
CHECKED J. THIESSEN DATE 2023–06–21
DRAWN J. MORO/H. LEE DATE 2023–06–21
SCALE AS NOTED
NEGATIVE No.

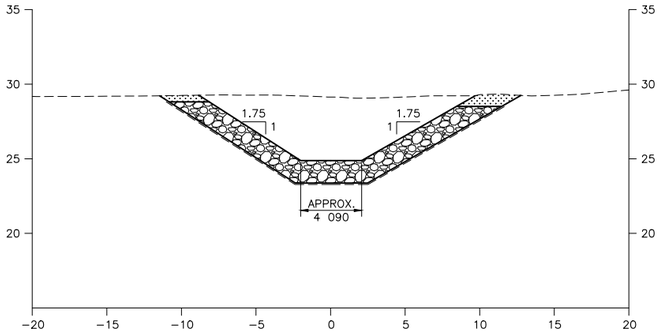
FILE No.	PROJECT No.	REG.	DRAWING No.
2022–2677–00	14048–0000	1	10505–115

CANCEL PRINTS BEARING PREVIOUS LETTER

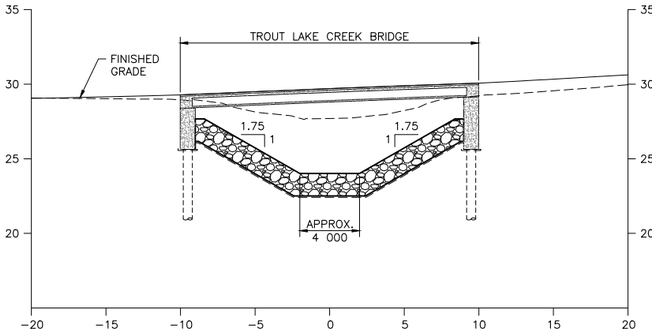
FILE: Q:\2022-2677-00\CAD\MODEL\MOTI_WORKING_DRAWINGS\DRAWINGPRODUCTION\1100_SUBDISCIPLINES\STRUCTURAL\10505-118.DWG
PLOTTED: Tuesday, August 15, 2023



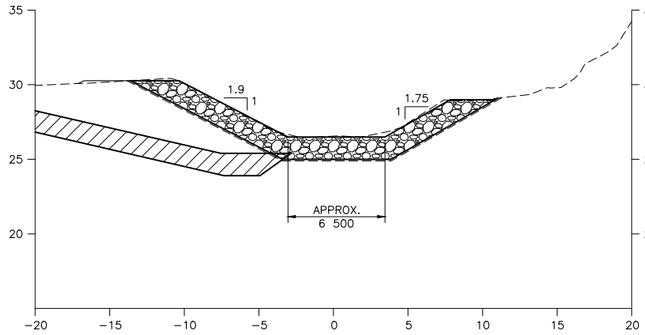
STA. 20+30



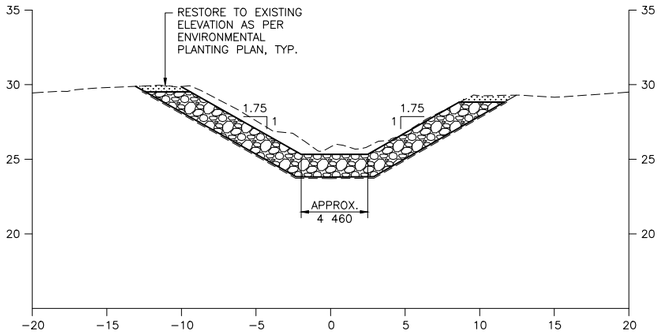
STA. 20+45



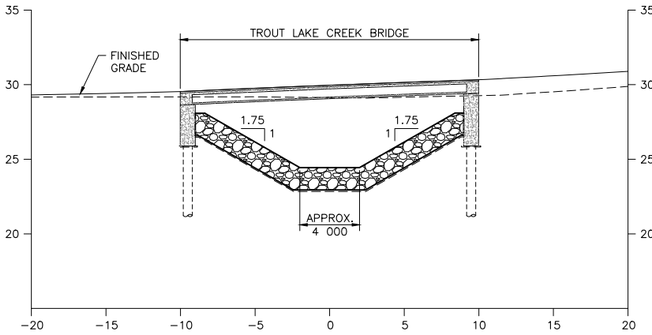
STA. 20+55



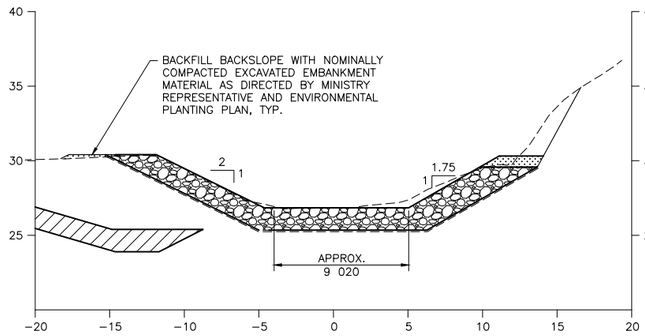
STA. 20+25



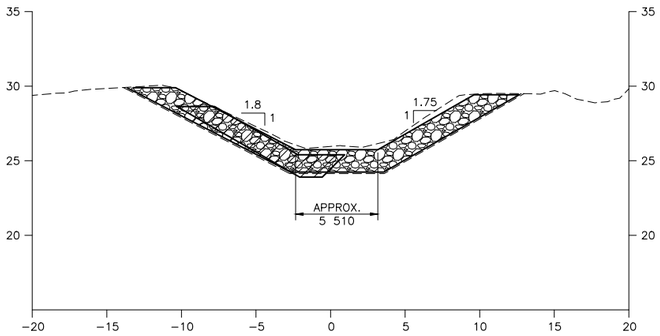
STA. 20+40



STA. 20+50



STA. 20+20



STA. 20+35

CHANNEL CROSS SECTIONS
SCALE 1:200

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
Engineers & Geoscientists BC

Consultant Logo

Associated Engineering

Rev	Date	Description	Init

REVISIONS

BRITISH COLUMBIA | Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK BRIDGE NO. 10505

CHANNEL EMBANKMENT PROTECTION DETAILS – SHEET 3

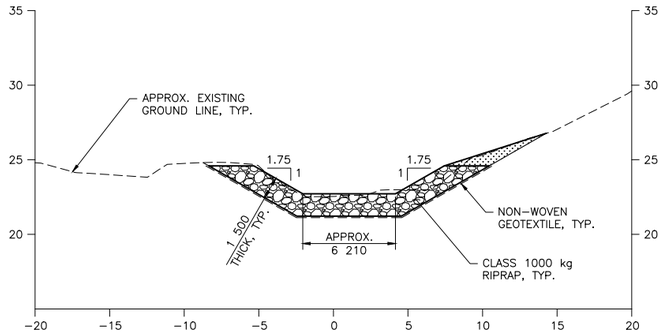
PREPARED UNDER THE DIRECTION OF
ERIC FINNEY, P.ENG
ENGINEER OF RECORD
DATE 2023-06-21

DESIGNED E. FINNEY/A. WHITE DATE 2023-06-21
CHECKED J. THIESSEN DATE 2023-06-21
DRAWN J. MORO/H. LEE DATE 2023-06-21
SCALE AS NOTED
NEGATIVE No.

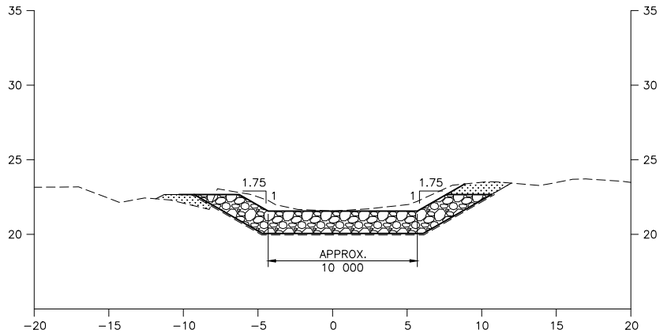
FILE No.	PROJECT No.	REG.	DRAWING No.
2022-2677-00	14048-0000	1	10505-116

CANCEL PRINTS BEARING PREVIOUS LETTER

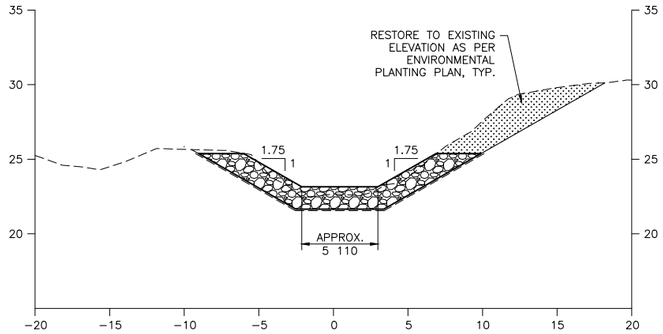
FILE: Q:\2022-2677-00\CIVIL\MOTI_WORKING_DRAWINGS\DRAWINGPRODUCTION\1100_SUBDISCIPLINES\STRUCTURAL\10505-118.DWG
PLOTTED: Tuesday, August 15, 2023



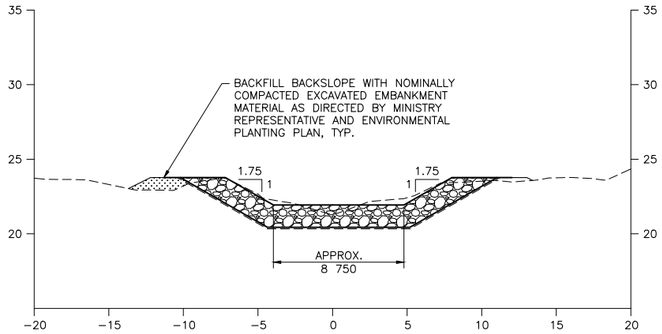
STA. 20+70



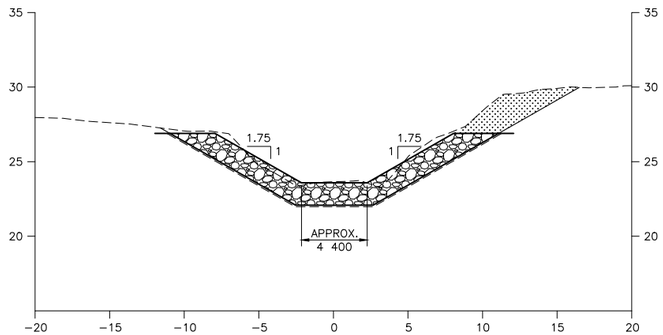
STA. 20+85



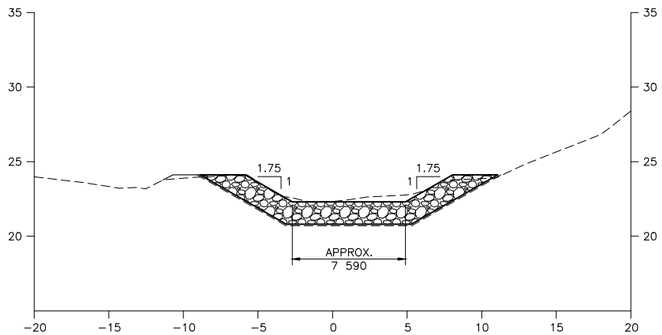
STA. 20+65



STA. 20+80



STA. 20+60



STA. 20+75

CHANNEL CROSS SECTIONS
SCALE 1:200

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Associated Engineering

Rev	Date	Description	Init

REVISIONS

BRITISH COLUMBIA | Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK BRIDGE NO. 10505

CHANNEL EMBANKMENT PROTECTION DETAILS – SHEET 4

PREPARED UNDER THE DIRECTION OF

ERIC FINNEY, P.ENG
ENGINEER OF RECORD
DATE 2023–06–21

DESIGNED E. FINNEY/A. WHITE DATE 2023–06–21
CHECKED J. THIESSEN DATE 2023–06–21
DRAWN J. MORO/H. LEE DATE 2023–06–21
SCALE AS NOTED
NEGATIVE No.

FILE No.	PROJECT No.	REG.	DRAWING No.
2022–2677–00	14048–0000	1	10505–117

CANCEL PRINTS BEARING PREVIOUS LETTER

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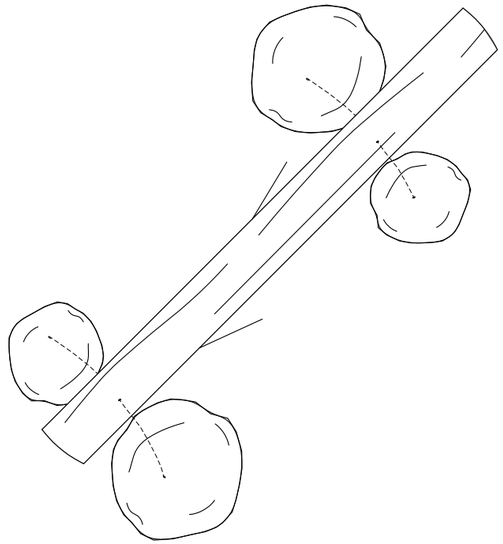
PLOTTED : Tuesday, August 15, 2023



DETAIL N.T.S.
LARGE WOODY DEBRIS

LARGE WOODY DEBRIS NOTES

1. LARGE WOODY DEBRIS SHALL BE COMPRISED OF MINIMUM 300 mm DIAMETER CEDAR OR DOUGLAS-FIR LOG WITH BARK LEFT LARGELY INTACT.
2. LOGS SHALL BE MINIMUM 6 m IN LENGTH.
3. ANGLE WOOD DOWNSTREAM AND ANCHOR ONE END TO CHANNEL BED AND THE OTHER TO CHANNEL BANK (SEE ANCHORING DETAIL). LOGS SHALL NOT EXTEND MORE THAN 1/3 OF THE CHANNEL WIDTH.
4. FOR STRUCTURES CONSISTING OF MORE THAN ONE PIECE OF LARGE WOODY DEBRIS, LOGS WILL BE CABLED TOGETHER PRIOR TO ANCHORING USING MINIMUM 1/4" DIAMETER STAINLESS STEEL AIRCRAFT CABLE.
5. ANCHOR TOP AND BOTTOM OF EACH LOG.

ROOT WAD NOTES

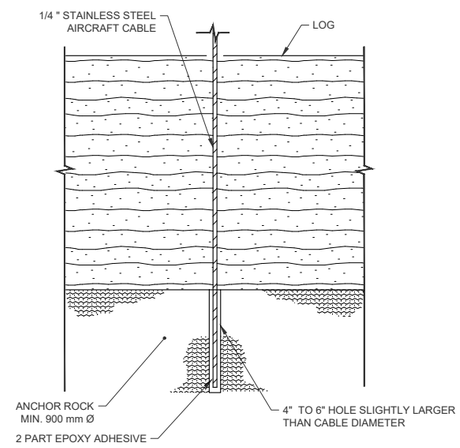
1. ROOT WADS SHALL BE COMPRISED OF WESTERN RED CEDAR OR DOUGLAS FIR.
2. ROOT WADS SHALL HAVE A MINIMUM ROOT MASS DIAMETER OF 0.3 m, WITH THE TRUNK CENTERED ON THE ROOT MASS.
3. 20-30% OF THE ROOT MASS SHALL BE BURIED IN THE CHANNEL.
4. ANCHOR ROOT WAD USING MINIMUM 1/4" STAINLESS STEEL AIRCRAFT CABLE WRAPPED AROUND TREE TRUNK. ANCHOR ONE END OF CABLE TO SHORE AND OTHER END TO STREAM BOTTOM, ACCORDING TO ANCHORING DETAIL.
5. ROOT WAD SHALL NOT EXTEND GREATER THAN 1/3 THE WIDTH OF THE STREAM CHANNEL.

ANCHORING NOTES

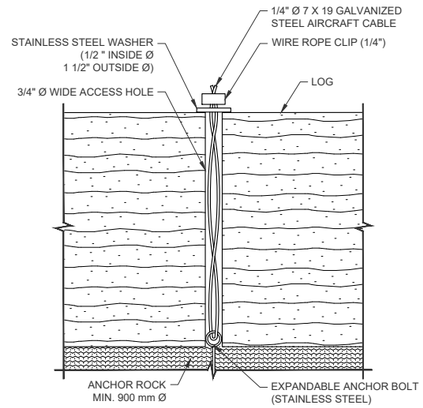
1. ANCHOR LOGS WITH MINIMUM 1/4" STAINLESS STEEL AIRCRAFT CABLE.
2. RUN CABLE THROUGH AXIS OF LOGS INTO TWO 900 mm TO 1200 mm BOULDERS, SECURING CABLE TO BOULDERS VIA ROCK DRILLING. ENSURE THE HOLE FACES PERPENDICULAR TO THE SHEAR STRESS OF THE LOAD.
3. DRILL HOLES MINIMUM 4" TO 6" DEEP INTO BOULDERS AND SECURE CABLE IN HOLES USING EITHER:
   A. 2 PART EPOXY ADHESIVE IN HOLES DRILLED SLIGHTLY LARGER THAN CABLE DIAMETER (HOLES TO BE CLEANED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS); OR
   B. AN EXPANDABLE ANCHOR BOLT (STAINLESS STEEL) INSERTED AT THE BOTTOM OF A ¾" HOLE. RUN CABLE THROUGH EYE OF BOLT, TWIST TOGETHER, AND SECURE AT SURFACE OF ROCK FACE USING STAINLESS WASHER (1/2" INSIDE DIAMETER AND 1 1/2" OUTSIDE DIAMETER) AND 1/4" WIRE ROPE CLIP.
4. FOR ALL ANCHORS, CABLE LENGTH (SLACK) SHOULD BE MINIMIZED TO THE EXTENT POSSIBLE TO PREVENT MOVEMENT OF LOGS AND ROOT WADS.

BOULDER CLUSTER NOTES

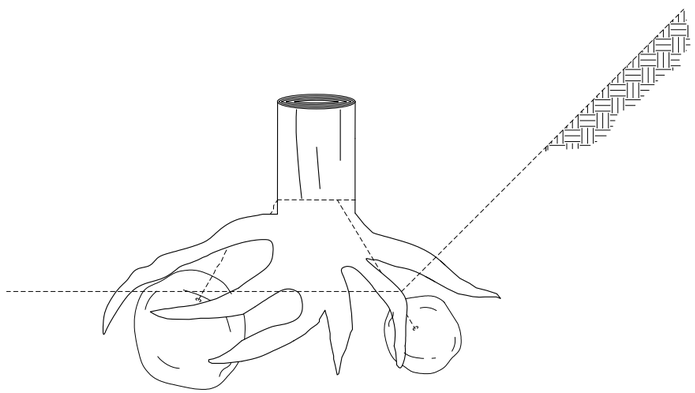
1. BOULDER CLUSTERS TO BE COMPRISED OF MINIMUM 1.3 m DIAMETER RIPRAP.
2. 60% OF THE BOULDER PROFILE SHALL BE BURIED IN THE CHANNEL.



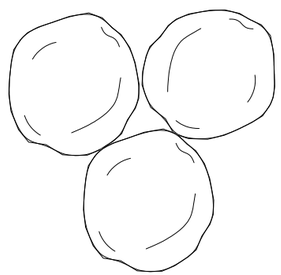
ANCHOR DETAIL OPTION A
N.T.S.



ANCHOR DETAIL OPTION B
N.T.S.



DETAIL N.T.S.
ROOT WAD



DETAIL N.T.S.
BOULDER CLUSTER

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
Engineers & Geoscientists BC

Consultant Logo
Associated Engineering

Rev	Date	Description	Init

REVISIONS

BRITISH COLUMBIA
Ministry of Transportation and Infrastructure
South Coast Region

LOWER MAINLAND DISTRICT
HICKS LAKE ROAD

TROUT LAKE CREEK BRIDGE NO. 10505

MISCELLANEOUS HABITAT FEATURE DETAILS

PREPARED UNDER THE DIRECTION OF
ERIC FINNEY, P.ENG
ENGINEER OF RECORD
DATE 2023-06-21

DESIGNED E. FINNEY/A. WHITE DATE 2023-06-21
CHECKED J. THIESSEN DATE 2023-06-21
DRAWN J. MORO/H. LEE DATE 2023-06-21
SCALE AS NOTED
NEGATIVE No.

FILE No.	PROJECT No.	REG.	DRAWING No.
2022-2677-00	14048-0000	1	10505-118

CANCEL PRINTS BEARING PREVIOUS LETTER

FILE: Q:\2022-2677-00\CIVIL\MOBE\\MOTI_WORKING_DRAWINGS\DRAWINGPRODUCTION\1100_SUBDISCIPLINES\STRUCTURAL\10505-118.DWG
PLOTTED : Tuesday, August 15, 2023

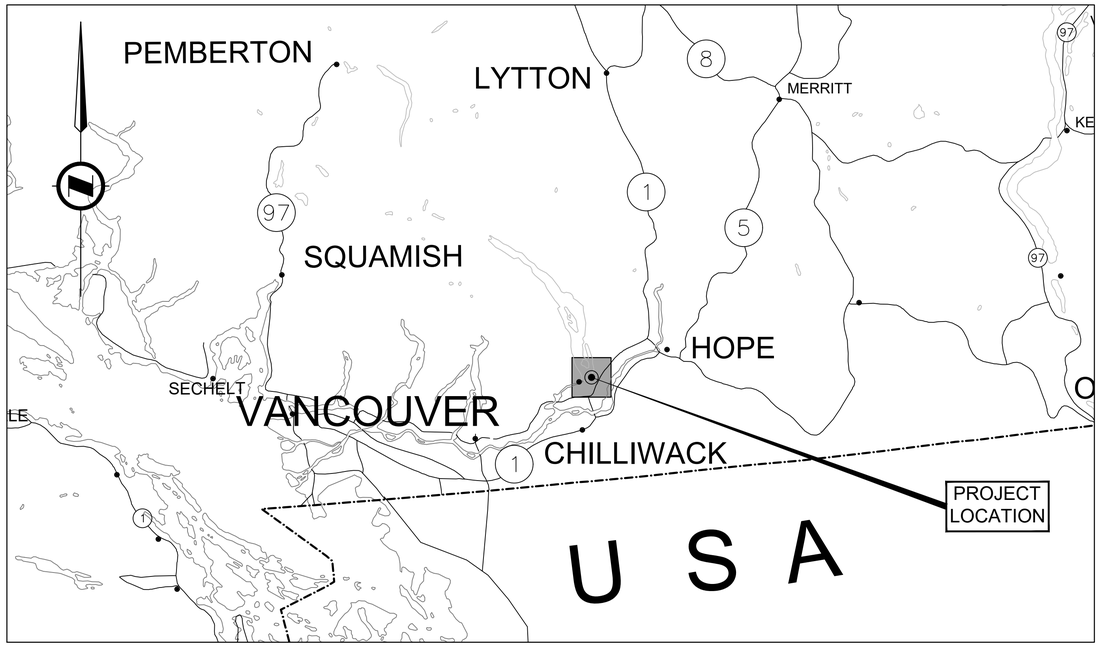
BRITISH COLUMBIA

Ministry of Transportation and Infrastructure

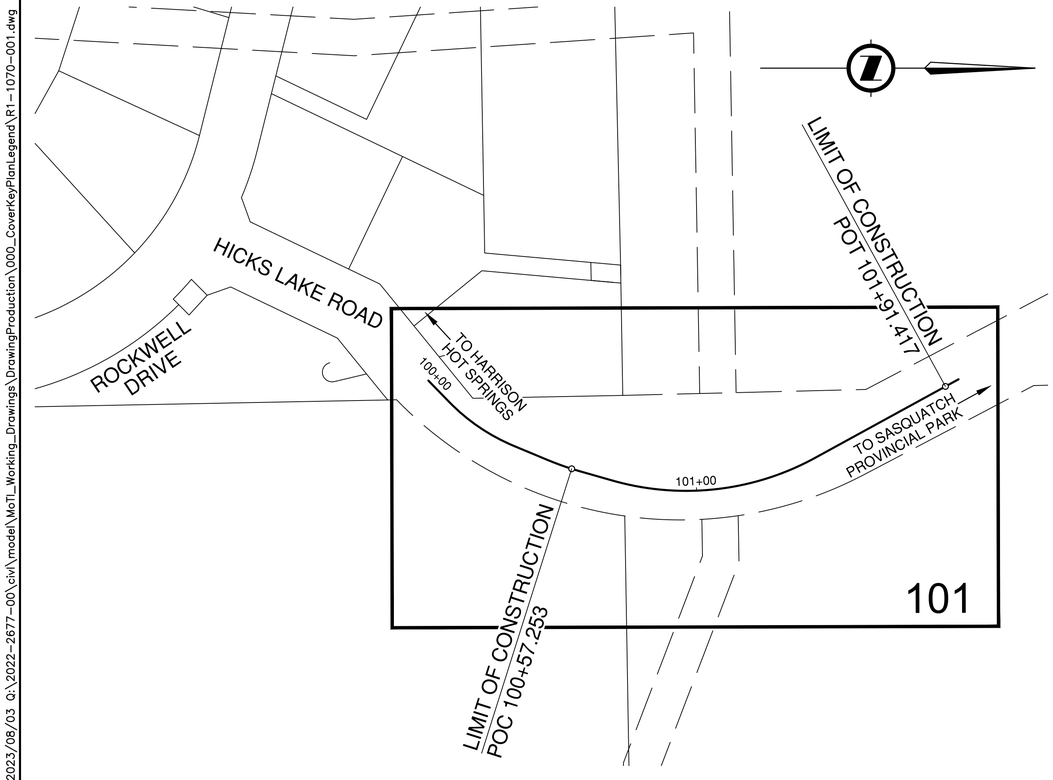
PROJECT NO. 14048-0000

HICKS LAKE ROAD
TROUT LAKE CREEK BRIDGE No. 10505

Associated Engineering



LOCATION MAP
N.T.S.



KEY PLAN
0 10 1:1000 50m

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.

BRITISH COLUMBIA | Ministry of Transportation and Infrastructure

PROJECT No. 14048-0000

HICKS LAKE ROAD

TROUT LAKE CREEK BRIDGE No. 10505

STA. POC 100+57.253 - STA. POT 101+91.417

0.134 km

GRADING, PAVING & BRIDGE CONTRACT

DRAWING INDEX

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
Engineers & Geoscientists BC

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

LOCATION MAP / KEY PLAN / DRAWING INDEX

HICKS LAKE ROAD

TROUT LAKE CREEK BRIDGE No. 10505

DIRECTOR, ENGINEERING — DATE

EXECUTIVE DIRECTOR, SOUTH COAST REGION — DATE

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
2022-2677-00	14048-0000	1	R1-1070-001	

PLOT DATE: 2023/08/03 Q:\2022-2677-00\civil\model\MoTI_Working_Drawings\DrawingProduction\000_CoverKeyPlanLegend\R1-1070-001.dwg

LEGEND

EXISTING SYMBOLS

SURVEY

- SPOT ELEVATION
- BENCHMARK
- REFERENCE POINT
- DETAIL HUB
- STANDARD IRON PIN (OIP)
- CONCRETE POST MONUMENT (MON)
- CONTROL MONUMENT
- ROCK POST MONUMENT (MON)
- STANDARD BRASS CAP MONUMENT (MON)
- LEAD PLUG
- TEST HOLE (TH)
- TEST PIT
- WOODEN POST
- ALUMINUM POST
- ANGLE IRON POST
- WITNESS POST (WT)
- DOMINION IRON POST
- NON-STD. ROUND IRON POST
- NON-STD. SQUARE IRON POST
- MONITOR POINT (MC)

AERIAL UTILITIES

- POWER GUY POLE
- TELEPHONE GUY POLE
- POWER / TELEPHONE GUY POLE
- DEADMAN
- ANCHOR GUY WIRE
- HIGH TENSION POLE
- HIGH TENSION TOWER (HT)
- POWER POLE
- TELEPHONE POLE
- POWER / TELEPHONE POLE
- POWER POLE WITH TRANSFORMER
- POWER / TELEPHONE WITH TRANSFORMER
- PEDESTAL (TELUS) (PED)
- TELEPHONE BOOTH (T)

DETAIL

- GATE POST (GP)
- GUARD POST (Post)
- FLAG POLE (FP)
- DELINEATOR POST (DP)
- MAILBOX (MB)
- DECORATIVE TREE
- TREE
- WELL
- COMMERCIAL SIGN
- SWAMP
- POST MOUNTED DELINEATOR (YELLOW)
- POST MOUNTED DELINEATOR (WHITE)
- TOP MOUNTED BI-DIRECTIONAL REFLECTOR
- TOP OR SIDE MOUNTED MONO-DIRECTIONAL YELLOW REFLECTOR
- TOP OR SIDE MOUNTED MONO-DIRECTIONAL WHITE REFLECTOR
- RAISED PAVEMENT MARKERS (WHITE AND YELLOW)

DRAINAGE & UTILITIES

- MANHOLE
- SANITARY/STORM CLEANOUT MANHOLE (MH Clean)
- POWER MANHOLE (MH Power)
- SANITARY SEWER MANHOLE (MH San)
- STORM SEWER MANHOLE (MH Storm)
- TELEPHONE MANHOLE (MH Tel)
- UNKNOWN MANHOLE (MH Unk)
- VAULT MANHOLE (MH Vault)
- WATER MANHOLE (MH Water)
- MH/CB DRYWELL (MH/CB Drywell)
- CB LAWN (CB Lawn)
- CATCH BASIN
- CATCH BASIN MANHOLE
- ASPHALT SPILLWAY
- DRAINAGE GRATE
- CULVERT
- CULVERT INLET (CI)
- CULVERT OUTLET (CO)
- CULVERT KINK
- RIPRAP

UNDERGROUND

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

ELECTRICAL

- JUNCTION BOX (JB)
- UTILITY POLE (UP)
- ELECTRICAL OUTLET
- LAMP STANDARD (LS)
- KIOSK
- TRAFFIC SIGNAL
- TRAFFIC COUNTER
- TRAFFIC SIGNAL CONTROL BOX

METERS

- VALVE (V)
- SERVICE VALVE (SV)
- GAS VALVE (GV)
- WATER VALVE (WV)
- WATER METER (WM)
- FIRE HYDRANT (FH)
- STANDPIPE WATER BLOWOFF (SD)
- AIR RELEASE VALVE (AIR)

ROAD SIGNS

- ONE-POST SIGN
- TWO-POST SIGN
- BREAKAWAY STEEL
- STD. DAVIT POLE - TYPE 3
- STD. COMBINATION POLE - TYPE 1
- HEAVY DUTY DAVIT POLE - TYPE 6
- H.D. COMBINATION POLE - TYPE 7
- HEAVY POLE - TYPE H
- H. COMBINATION POLE - TYPE H
- CANTILEVER STRUCTURE
- SIGN BRIDGE STRUCTURE

EXISTING LINE TYPES

MAN-MADE FEATURES

- CONCRETE ROAD BARRIER
- BROKEN WHITE LINE
- SOLID WHITE LINE
- SOLID YELLOW LINE
- DOUBLE YELLOW LINE
- CENTRELINE
- ROAD SHOULDER
- PAVEMENT EDGE
- ASPHALT CURB
- GRAVEL ROAD
- SIDEWALK
- FENCE
- GARDEN, LAWNS, VEGETATION
- HEDGE, BUSH LINE & TREE LINE
- RETAINING WALL
- CN TRACK BED

TOPOGRAPHY

- BOTTOM OF BANK
- TOP OF BANK

BOUNDARIES

- EASEMENT
- GAZETTE BOUNDARY
- PARCEL BOUNDARY
- QUARTER SECTION LINE
- SECTION LINE & DISTRICT LOT BOUNDARY
- RIGHT OF WAY BOUNDARY

HYDROLOGY

- EDGE OF WATER
- DITCH CENTER / DRAINAGE
- EDGE OF DITCH
- CENTER OF CREEK
- STORM SEWER, MANHOLE & FLOW ARROW

UTILITIES

- SANITARY SEWER, MANHOLE & FLOW ARROW
- UNDERGROUND DRAIN PIPE
- WATER MAIN
- UNDERGROUND ELECTRICAL
- GAS MAIN
- UNDERGROUND MISCELLANEOUS
- UNDERGROUND TELEPHONE
- OIL
- COMMUNICATIONS AERIAL

PROPOSED SYMBOLS

AERIAL UTILITIES

- POWER GUY POLE
- TELEPHONE GUY POLE
- POWER / TELEPHONE GUY POLE
- DEADMAN
- ANCHOR GUY WIRE
- HIGH TENSION POLE
- HIGH TENSION TOWER (HT)
- POWER POLE
- TELEPHONE POLE
- POWER / TELEPHONE POLE
- POWER POLE WITH TRANSFORMER
- POWER / TELEPHONE WITH TRANSFORMER
- PEDESTAL (TELUS) (PED)
- TELEPHONE BOOTH (T)

DETAIL

- GATE POST (GP)
- GUARD POST (Post)
- FLAG POLE (FP)
- DELINEATOR POST (DP)
- MAILBOX (MB)
- POST MOUNTED DELINEATOR (YELLOW)
- POST MOUNTED DELINEATOR (WHITE)
- TOP MOUNTED BI-DIRECTIONAL REFLECTOR
- TOP OR SIDE MOUNTED MONO-DIRECTIONAL YELLOW REFLECTOR
- TOP OR SIDE MOUNTED MONO-DIRECTIONAL WHITE REFLECTOR
- RAISED PAVEMENT MARKERS (WHITE AND YELLOW)

ROAD SIGNS

- ONE-POST SIGN
- TWO-POST SIGN
- BREAKAWAY STEEL
- STD. DAVIT POLE - TYPE 3
- STD. COMBINATION POLE - TYPE 1
- HEAVY DUTY DAVIT POLE - TYPE 6
- H.D. COMBINATION POLE - TYPE 7
- HEAVY POLE - TYPE H
- H. COMBINATION POLE - TYPE H
- CANTILEVER STRUCTURE
- SIGN BRIDGE STRUCTURE

DRAINAGE & UTILITIES

- MANHOLE
- SANITARY/STORM CLEANOUT MANHOLE (MH Clean)
- POWER MANHOLE (MH Power)
- SANITARY SEWER MANHOLE (MH San)
- STORM SEWER MANHOLE (MH Storm)
- TELEPHONE MANHOLE (MH Tel)
- UNKNOWN MANHOLE (MH Unk)
- VAULT MANHOLE (MH Vault)
- WATER MANHOLE (MH Water)
- MH/CB DRYWELL (MH/CB Drywell)
- VERTICAL SEEPAGE PIT (VSP)
- CATCH BASIN (SINGLE)
- CATCH BASIN (TWIN)
- LAWN BASIN
- RIPRAP SPILLWAY C/W DRAINAGE BARRIER
- CLEANOUT (CO)
- STORM WATER TREATMENT DEVICE
- CULVERT INLET / OUTLET C/W RIPRAP
- CULVERT HEADWALL C/W TRASH RACK
- RIPRAP

UNDERGROUND

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

ELECTRICAL

- JUNCTION BOX (JB)
- UTILITY POLE (UP)
- ELECTRICAL OUTLET
- LAMP STANDARD
- KIOSK
- TRAFFIC SIGNAL
- TRAFFIC COUNTER
- TRAFFIC SIGNAL CONTROL BOX

METERS

- VALVE (V)
- SERVICE VALVE (SV)
- GAS VALVE (GV)
- WATER VALVE (WV)
- WATER METER (WM)
- FIRE HYDRANT (FH)
- STANDPIPE WATER BLOWOFF (SD)
- AIR RELEASE VALVE (AIR)

PROPOSED LINE TYPES

FEATURES

- ROAD CENTRELINE (10+100 / 100 LINE)
- PAVEMENT EDGE
- GRAVEL SHOULDER
- ASPHALT CURB
- CURB AND GUTTER
- CONCRETE ROADSIDE BARRIER
- RETAINING WALL
- SOLID WHITE LINE
- SOLID YELLOW LINE
- BROKEN WHITE LINE
- DECELERATION OR ACCELERATION LANE
- CUT / FILL LINE (C / C/F / F)
- SAWCUT LINE (SAWCUT)
- CLEARING & GRUBBING (CL & GR)
- BERM
- SOUNDWALL
- HABITAT / PEDESTRIAN / CYCLE FENCE
- FENCE REMOVAL
- LIMIT OF OVERBURDEN REMOVAL
- RAILING

UTILITIES

- DITCH
- EDGE OF DITCH
- CULVERT
- SUBDRAIN (SGD)
- SWALE
- BIOSWALE (BIO)
- FILTER STRIP
- STORM SEWER, MANHOLE & FLOW ARROW (MH Storm)
- SANITARY SEWER, MANHOLE & FLOW ARROW (SAN / MH San)
- WATER MAIN (W)
- GAS MAIN (G)
- UTILITY ABANDONED

BOUNDARIES

- RIGHT OF WAY BOUNDARY
- LICENSE TO CONSTRUCT

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
Engineers & Geoscientists BC

Associated Engineering

SCALE N.T.S.

CAD FILENAME R1-1070-002
PLOT DATE 2023-08-01

REV	DATE	REVISIONS	NAME

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

LEGEND
HICKS LAKE ROAD
TROUT LAKE CREEK BRIDGE No. 10505

M. DU TOIT, P. ENG.
ENGINEER OF RECORD
DATE 2023-08-01

DESIGNED D. BRAGAGNINI DATE 2023-08-01
QUALITY CONTROL M. DU TOIT DATE 2023-08-01
QUALITY ASSURANCE P. STANCOMBE DATE 2023-08-01
DRAWN D. BRAGAGNINI DATE 2023-08-01

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
2022-2677-00	14048-0000	1	R1-1070-002	

PLOT DATE: 2023/08/03 Q:\2022-2677-00\civil\model\MoTI_Working_Drawings\DrawingProduction\000_CoverKeyPlanLegend\R1-1070-002.dwg

LOT 5
PLAN LMP8249
PID 018-056-741

CROWN PIN: 35740021
PART LEGAL SUBDIVISION 5
SW1/4 SEC.32, TP4, R28, W6M
NEW WESTMINSTER DISTRICT

LIMIT OF CONSTRUCTION
POT 101+91.417
TIE TO EXISTING
N 466389.499
E 591229.798

LEGAL SUBDIVISION 3
SW1/4 SEC.32, TP4, R28, W6M
NEW WESTMINSTER DISTRICT

CROWN LAND

TO HARRISON HOT SPRINGS

TO SASQUATCH PROVINCIAL PARK

HICKS LAKE ROAD

SERVICE ROAD

TROUT LAKE CREEK

SRW PLAN NWP10235

100 LINE

POT 100+00

BC 100+10

45°49'14"

EC 100+36.350

BC 100+48.925

EC 100+60.031

BC 100+71.532

22°35'37"

15°53'43"

PI 100+23.359
N 466292.971
E 591244.581

PI 100+54.484
N 466268.513
E 591295.980

POC 100+57.253
TIE TO EXISTING
N 466264.109
E 591252.454

R 65.000 Lt
Δ 23°13'38"
Tc 13.359
Arc 26.350
Ec 1.359

R 95.000 Lt
Δ 6°41'53"
Tc 5.559
Arc 11.106
Ec 0.163

R 90.000 Lt
Δ 44°36'16"
Tc 36.916
Arc 70.065
Ec 7.277

EC 101+41.596

POT 101+96.433

331°17'22"

PI 101+08.447
N 466313.425
E 591271.483

P6730–22
N. 466226.255
E. 591230.721
Z. 28.381
REBAR

P6731–22
N. 466300.186
E. 591280.816
Z. 30.709
REBAR

P6732–22
N. 466400.322
E. 591228.471
Z. 38.364
REBAR

P6733–22
N. 466329.775
E. 591206.991
Z. 21.593
REBAR

P6734–22
N. 466302.726
E. 591249.510
Z. 25.776
REBAR

SPILLWAY c/w DRAINAGE BARRIER WITH RIPRAP OUTFALL AS PER SP504-05 (TYP.)

SPILLWAY AND RIPRAP OUTFALL AS PER SP504-04 (TYP.)

REINFORCED SOIL SLOPE WITH GEOGRID REINFORCEMENT
APPROX. STA. 101+20.775 TO 101+80.000
REFER TO DWG. R1-1070-302 FOR DETAILS.

MAINTAIN EXISTING DITCH

REMOVE EXISTING 1500 mm DIA. CULVERTS

REMOVE EXISTING BARRIERS AND LOCKBLOCKS

REMOVE EXISTING BARRIERS

TROUT LAKE CREEK BRIDGE No. 10505-23
SEE BRIDGE DRAWINGS FOR DETAILS

LIMIT OF CONSTRUCTION
TIE TO EXISTING

SAWCUT

PAVEMENT EDGE

EXISTING EDGE OF PAVEMENT

CL & GR

LEGEND
- SAWCUT
- ASPHALT MILL AND OVERLAY
- FULL DEPTH PAVEMENT CONSTRUCTION
- PAVEMENT REMOVAL
- GEOGRID REINFORCEMENT EXTENTS

FOR PROFILE
SEE DWG. No. R1-1070-201

FOR TYPICAL SECTIONS
SEE DWG. No. R1-1070-301 TO 302

FOR GEOMETRICS AND LANING / SPOT ELEVATIONS
SEE DWG. No. R1-1070-401

FOR SIGNING AND PAVEMENT MARKINGS
SEE DWG. No. R1-1070-601

GENERAL NOTES:

1. INFORMATION SHOWN ON THESE DRAWINGS REGARDING EXISTING UTILITIES MAY NOT BE COMPLETE OR FULLY ACCURATE. PRIOR TO CONSTRUCTION THE CONTRACTOR SHALL CONFIRM THE EXISTING LOCATIONS AND ELEVATIONS OF ALL EXISTING UTILITIES AND ADVISE THE MINISTRY REPRESENTATIVE OF ANY POTENTIAL CONFLICTS. CONTACT BC ONE CALL A WEEK PRIOR TO EXCAVATION FOR THE SITE LOCATES.
2. CONTOURS ARE SHOWN AT 2.0 m INTERVAL.
3. INFORMATION REGARDING TOPOGRAPHY, EXISTING UNDERGROUND SERVICES AND LEGAL PLANS PROVIDED BY BINNIE & ASSOCIATES (JUNE 2022).
4. REFER TO DRAWING No. R1-1070-601 FOR SIGNING REMOVAL AND RELOCATION REQUIREMENTS.
5. REFER TO DRAWING No. R1-1070-001 FOR SURVEY CONTROL TABLE AND COORDINATE CONVERSION.
6. SEED ALL FINAL SLOPES IN ACCORDANCE WITH FINAL ENVIRONMENTAL PLANTING PLAN FOR EROSION CONTROL.

CL & GR TOTAL THIS SHEET
0.18 ha

KEY PLAN
TO HARRISON HOT SPRINGS
TO SASQUATCH PROVINCIAL PARK
HICKS LAKE ROAD
101

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
Engineers & Geoscientists BC

Professional Seal
For Road Works
Professional Seal
For Drainage Works

Associated Engineering

SCALE 0 2 1:250 12m
CAD FILENAME R1-1070-101
PLOT DATE 2023-08-01

REV	DATE	REVISIONS	NAME

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

PLAN / DRAINAGE
HICKS LAKE ROAD
TROUT LAKE CREEK BRIDGE No. 10505
STA. 100+57.253 TO STA. 101+91.417

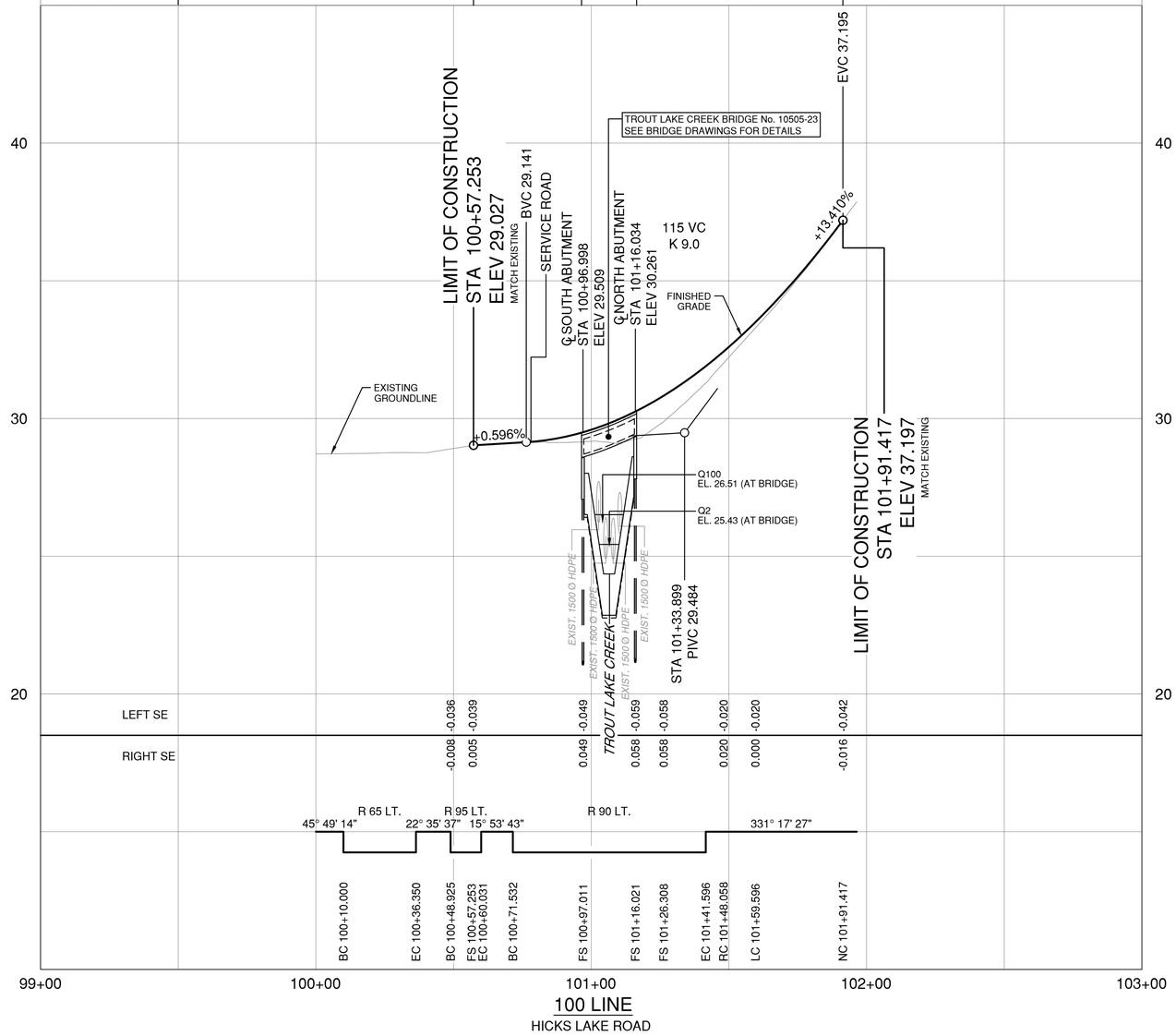
M. DU TOIT, P. ENG.
E. FINNEY, P. ENG.
ENGINEER OF RECORD
DATE 2023-08-01

D. BRAGAGNINI DESIGNED E. FINNEY DATE 2023-08-01
M. DU TOIT QUALITY CONTROL E. FINNEY P. STANCOMBE DATE 2023-08-01
J. THIESSEN QUALITY ASSURANCE DATE 2023-08-01
D. BRAGAGNINI DRAWN DATE 2023-08-01

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
2022-2677-00	14048-0000	1	R1-1070-101	

PLOT DATE: 2023/08/10 Q:\2022-2677-00\civil\model\MoTI_Working_Drawings\DrawingProduction\100_Plans\R1-1070-101.dwg

EXCAVATION	m³	225	BRIDGE	1,235	TOTAL 1,460
EMBANKMENT	m³	30	BRIDGE	180	TOTAL 210
STRIPPING	m³	75	BRIDGE	165	TOTAL 240



100 LINE
HICKS LAKE ROAD

DESIGN SPEED 100 LINE 40 km/h

FOR PLAN / DRAINAGE
SEE DWG. No. R1-1070-101

FOR TYPICAL SECTIONS
SEE DWG. No. R1-1070-301 TO 302

FOR GEOMETRICS AND LANING / SPOT ELEVATIONS
SEE DWG. No. R1-1070-401

FOR SIGNING AND PAVEMENT MARKINGS
SEE DWG. No. R1-1070-601

NOTES:

1. ELEVATIONS SHOWN ARE FINISHED GRADE.
2. MAXIMUM SUPERELEVATION IS 6.0%.
3. REFER TO STRUCTURAL DRAWING SERIES 10505 -100 FOR TROUT LAKE CREEK BRIDGE No. 10505-23

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ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
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SCALE 0 10 H 1:1000 50m
0 1 V 1:100 5m

CAD FILENAME R1-1070-201
PLOT DATE 2023-08-01

REV	DATE	REVISIONS	NAME

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

PROFILE

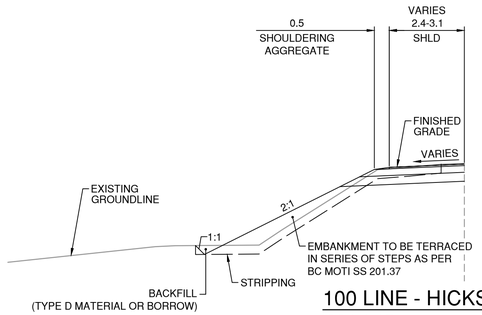
HICKS LAKE ROAD
TROUT LAKE CREEK BRIDGE No. 10505
STA. 100+57.253 TO STA. 101+91.417

M. DU TOIT, P. ENG.
ENGINEER OF RECORD
DATE 2023-08-01

DESIGNED D. BRAGAGNINI DATE 2023-08-01
QUALITY CONTROL M. DU TOIT DATE 2023-08-01
QUALITY ASSURANCE P. STANCOMBE DATE 2023-08-01
DRAWN D. BRAGAGNINI DATE 2023-08-01

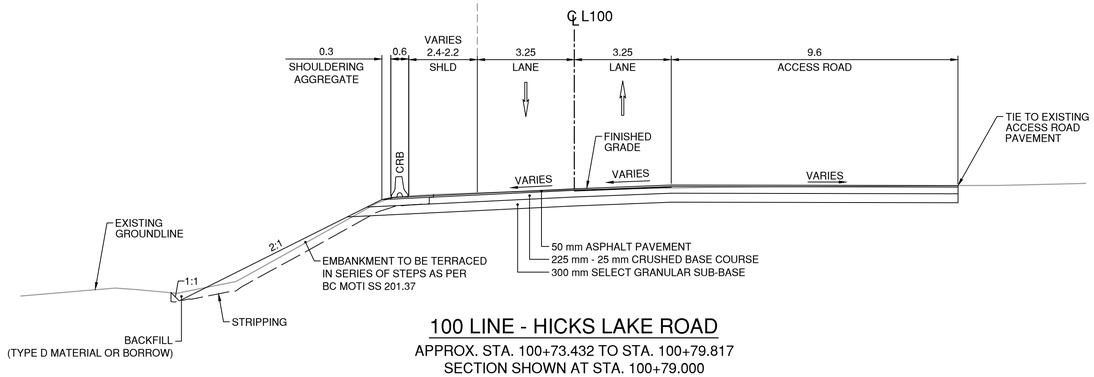
FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
2022-2677-00	14048-0000	1	R1-1070-201	

PLOT DATE: 2023/08/08 Q:\2022-2677-00\civil\model\MoTI_Working_Drawings\DrawingProduction\200_Profiles\R1-1070-201.dwg



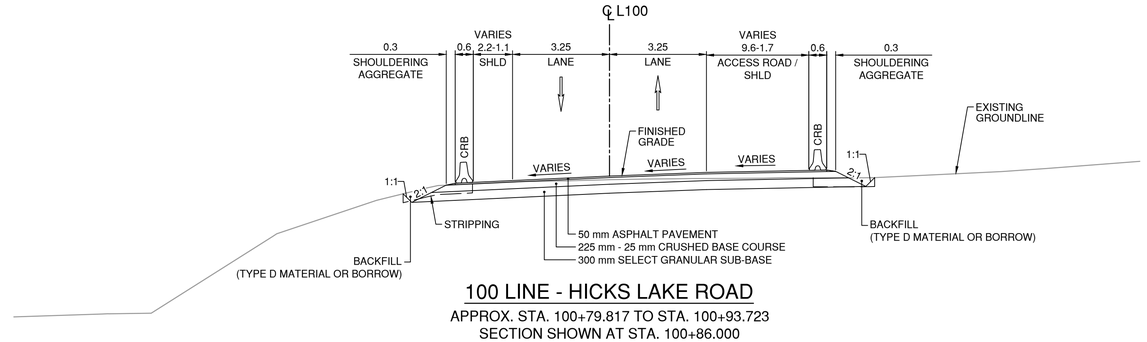
100 LINE - HICKS LAKE ROAD

APPROX. STA. 100+73.432 TO STA. 100+76.510
SECTION SHOWN AT STA. 100+74.000



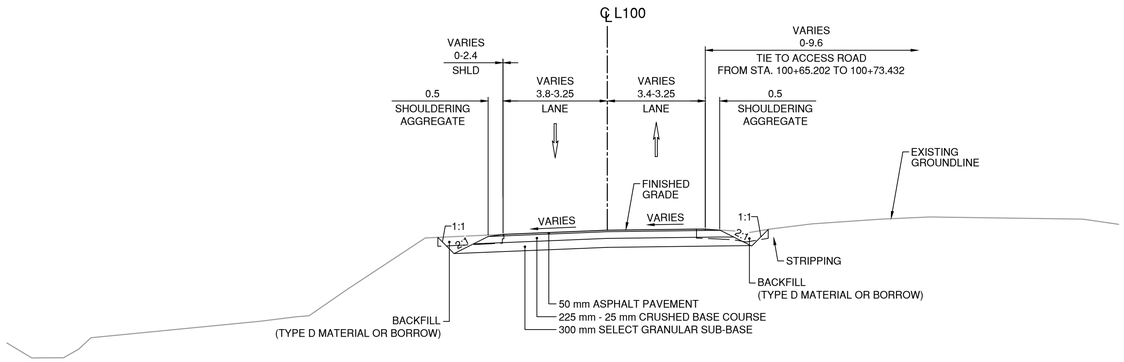
100 LINE - HICKS LAKE ROAD

APPROX. STA. 100+73.432 TO STA. 100+79.817
SECTION SHOWN AT STA. 100+79.000



100 LINE - HICKS LAKE ROAD

APPROX. STA. 100+79.817 TO STA. 100+93.723
SECTION SHOWN AT STA. 100+86.000



100 LINE - HICKS LAKE ROAD

APPROX. STA. 100+57.253 TO STA. 100+73.432
SECTION SHOWN AT STA. 100+63.000

GENERAL NOTE:

1. ALL DIMENSIONS SHOWN IN METRES UNLESS OTHERWISE NOTED.

FOR PLAN / DRAINAGE
SEE DWG. No. R1-1070-101

FOR PROFILE
SEE DWG. No. R1-1070-201

FOR GEOMETRICS AND LANING / SPOT ELEVATIONS
SEE DWG. No. R1-1070-401

FOR SIGNING AND PAVEMENT MARKINGS
SEE DWG. No. R1-1070-601

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SCALE 0 1 1:100 5m

CAD FILENAME R1-1070-301
PLOT DATE 2023-08-01

REV	DATE	REVISIONS	NAME

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

TYPICAL SECTIONS

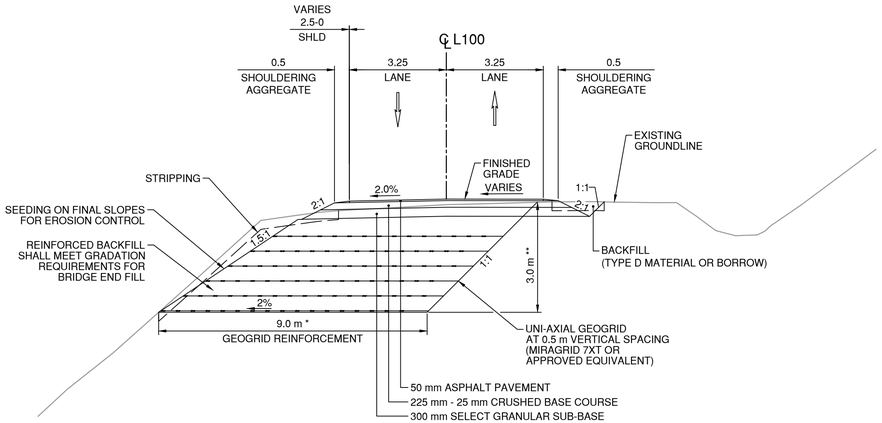
HICKS LAKE ROAD
TROUT LAKE CREEK BRIDGE No. 10505

M. DU TOIT, P. ENG.
ENGINEER OF RECORD
DATE 2023-08-01

DESIGNED D. BRAGAGNINI DATE 2023-08-01
QUALITY CONTROL M. DU TOIT DATE 2023-08-01
QUALITY ASSURANCE P. STANCOMBE DATE 2023-08-01
DRAWN D. BRAGAGNINI DATE 2023-08-01

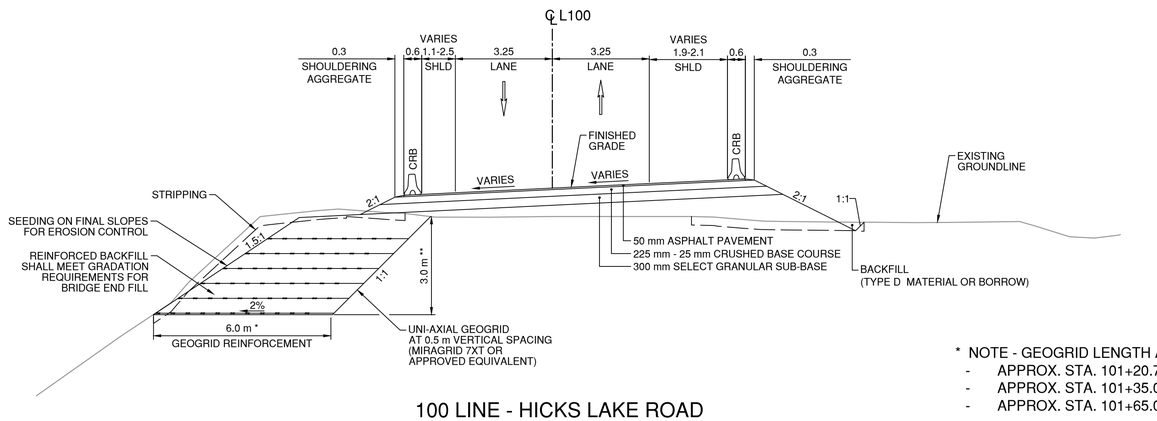
FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
2022-2677-00	14048-0000	1	R1-1070-301	

PLOT DATE: 2023/08/03 Q:\2022-2677-00\civil\model\MoTI_Working_Drawings\DrawingProduction\300_TypicalSections\R1-1070-301.dwg



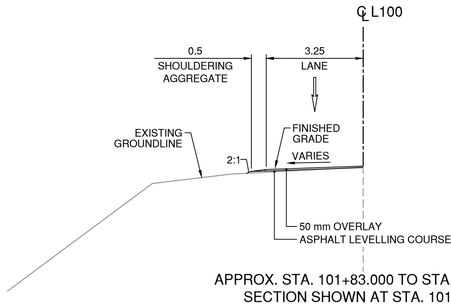
100 LINE - HICKS LAKE ROAD

APPROX. STA. 101+35.000 TO STA. 101+72.000
SECTION SHOWN AT STA. 101+62.000

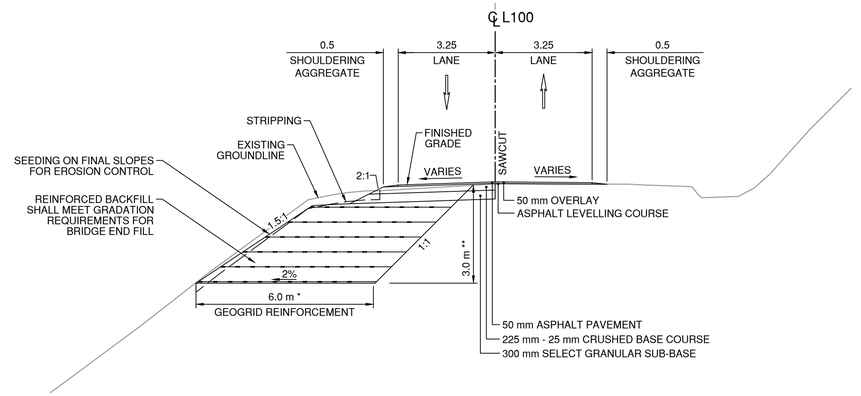


100 LINE - HICKS LAKE ROAD

APPROX. STA. 101+20.775 TO STA. 101+35.000
SECTION SHOWN AT STA. 101+25.000



APPROX. STA. 101+83.000 TO STA. 101+91.417
SECTION SHOWN AT STA. 101+85.000



100 LINE - HICKS LAKE ROAD

APPROX. STA. 101+72.000 TO STA. 101+91.417
SECTION SHOWN AT STA. 101+77.000

* NOTE - GEOGRID LENGTH AT BASE:
- APPROX. STA. 101+20.775 TO 101+35.000, LENGTH IS 6 m
- APPROX. STA. 101+35.000 TO 101+65.000, LENGTH IS 9 m
- APPROX. STA. 101+65.000 TO 101+80.000, LENGTH IS 6 m

** NOTE - REINFORCED SOIL SLOPE HEIGHT TO BE CONSISTENT 3 m.

GENERAL NOTE:

1. ALL DIMENSIONS SHOWN IN METRES UNLESS OTHERWISE NOTED.

FOR PLAN / DRAINAGE
SEE DWG. No. R1-1070-101

FOR PROFILE
SEE DWG. No. R1-1070-201

FOR GEOMETRICS AND LANING / SPOT ELEVATIONS
SEE DWG. No. R1-1070-401

FOR SIGNING AND PAVEMENT MARKINGS
SEE DWG. No. R1-1070-601

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
Engineers & Geoscientists BC

Professional Seal
for road works
Professional Seal
for geotechnical

Associated Engineering
westrek geotechnical services ltd.

SCALE 0 1 1:100 5m
CAD FILENAME R1-1070-302
PLOT DATE 2023-08-01

REV	DATE	REVISIONS	NAME

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

TYPICAL SECTIONS

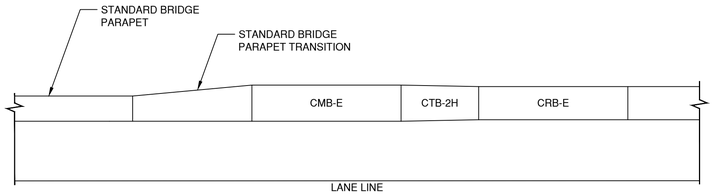
HICKS LAKE ROAD
TROUT LAKE CREEK BRIDGE No. 10505

M. DU TOIT, P. ENG.
ANDY CHIEM, P. ENG.
ENGINEER OF RECORD
DATE 2023-08-01

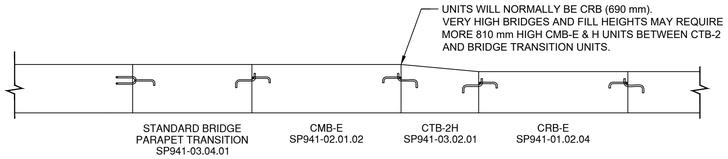
D. BRAGAGNINI
DESIGNED A. CHIEM DATE 2023-08-01
QUALITY CONTROL M. DU TOIT DATE 2023-08-01
QUALITY ASSURANCE P. STANCOMBE DATE 2023-08-01
DRAWN D. BRAGAGNINI DATE 2023-08-01

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
2022-2677-00	14048-0000	1	R1-1070-302	

PLOT DATE: 2023/08/03 Q:\2022-2677-00\civil\model\MoTI_Working_Drawings\DrawingProduction\300_TypicalSections\R1-1070-301.dwg



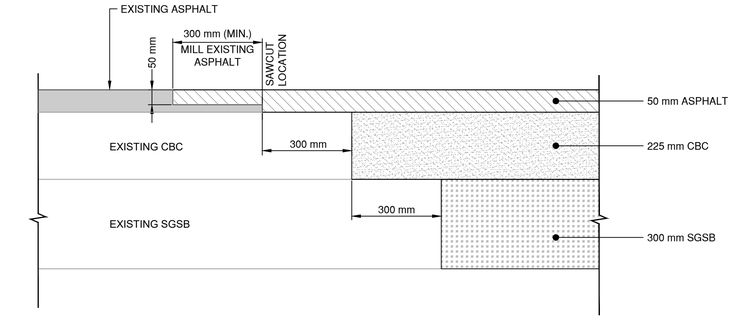
TOP VIEW



SIDE VIEW

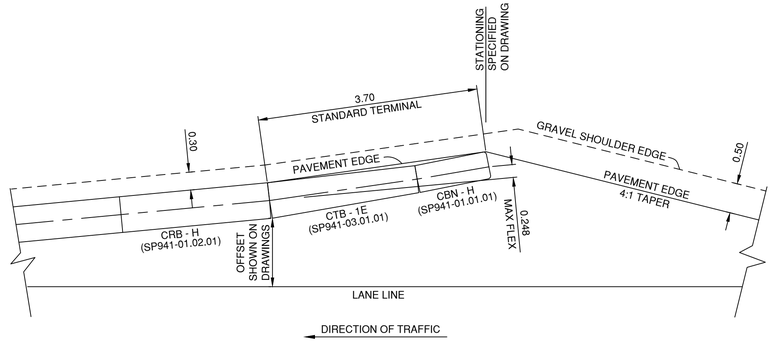
BARRIER TRANSITION FROM CONCRETE BRIDGE PARAPET TO CRB

0 0.5 1:50 2.5m



LONGITUDINAL AND TRANSVERSE PAVEMENT JOINT DETAIL

0 0.1 1:10 0.5m



DETAIL 1:50

STANDARD TERMINAL TREATMENT

0 0.5 1:50 2.5m

GENERAL NOTE:

1. ALL DIMENSIONS SHOWN IN METRES UNLESS OTHERWISE NOTED.

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
Engineers & Geoscientists BC

Professional Seal

Associated Engineering

SCALE AS SHOWN

CAD FILENAME R1-1070-351

PLOT DATE 2023-08-01

REV	DATE	REVISIONS	NAME

BRITISH COLUMBIA

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

MISCELLANEOUS DETAILS - ROADWORKS

HICKS LAKE ROAD

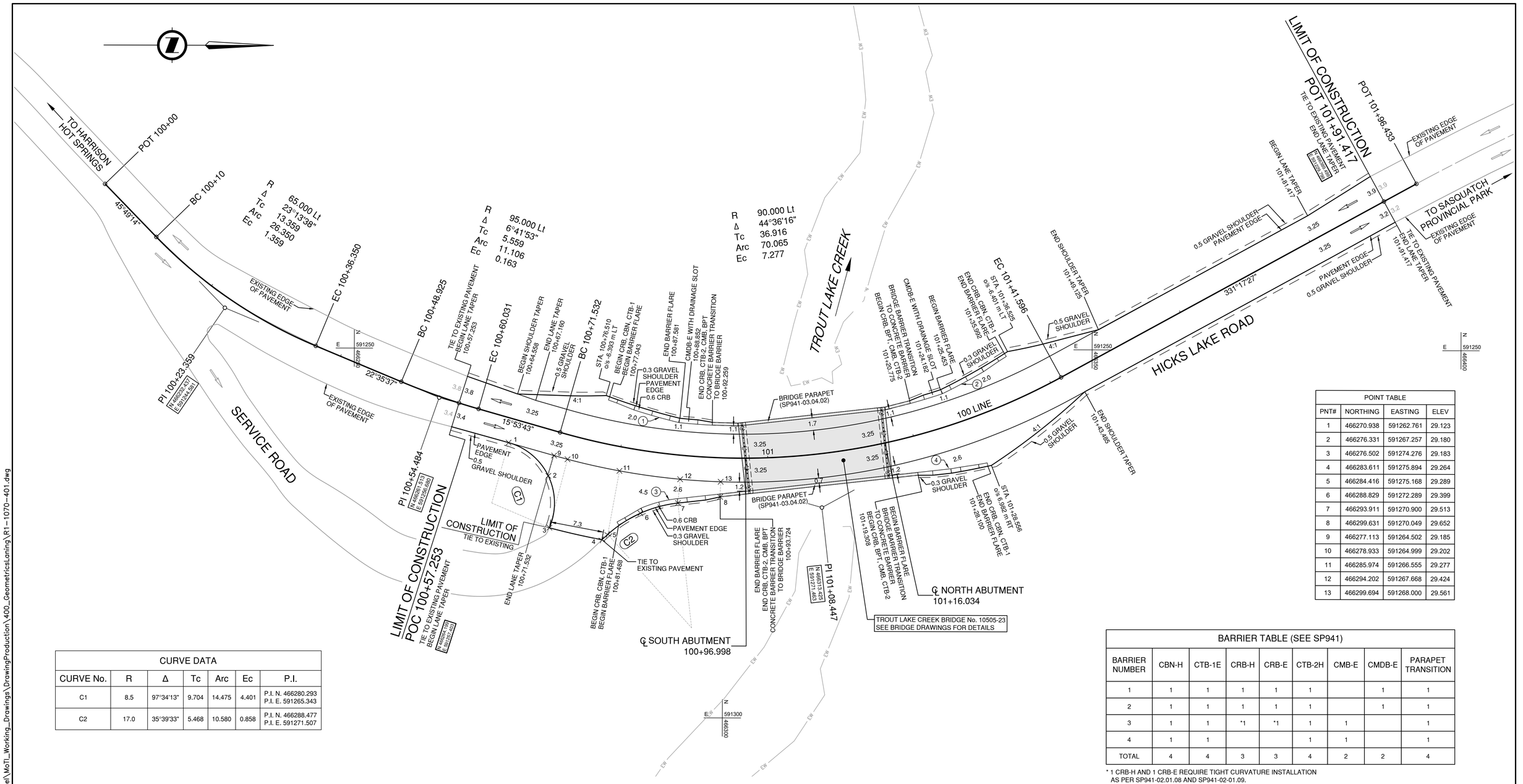
TROUT LAKE CREEK BRIDGE No. 10505

M. DU TOIT, P. ENG.
ENGINEER OF RECORD
DATE 2023-08-01

DESIGNED D. BRAGAGNINI DATE 2023-08-01
QUALITY CONTROL M. DU TOIT DATE 2023-08-01
QUALITY ASSURANCE P. STANCOMBE DATE 2023-08-01
DRAWN D. BRAGAGNINI DATE 2023-08-01

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
2022-2677-00	14048-0000	1	R1-1070-351	

PLOT DATE: 2023/08/11 Q:\2022-2677-00\civil\model\MoTI_Working_Drawings\DrawingProduction\350_Details\R1-1070-351.dwg



POINT TABLE			
PNT#	NORTHING	EASTING	ELEV
1	466270.938	591262.761	29.123
2	466276.331	591267.257	29.180
3	466276.502	591274.276	29.183
4	466283.611	591275.894	29.264
5	466284.416	591275.168	29.289
6	466288.829	591272.289	29.399
7	466293.911	591270.900	29.513
8	466299.631	591270.049	29.652
9	466277.113	591264.502	29.185
10	466278.933	591264.999	29.202
11	466285.974	591266.555	29.277
12	466294.202	591267.668	29.424
13	466299.694	591268.000	29.561

CURVE DATA						
CURVE No.	R	Δ	Tc	Arc	Ec	P.I.
C1	8.5	97°34'13"	9.704	14.475	4.401	P.I. N. 466280.293 P.I. E. 591265.343
C2	17.0	35°39'33"	5.468	10.580	0.858	P.I. N. 466288.477 P.I. E. 591271.507

BARRIER TABLE (SEE SP941)								
BARRIER NUMBER	CBN-H	CTB-1E	CRB-H	CRB-E	CTB-2H	CMB-E	CMDB-E	PARAPET TRANSITION
1	1	1	1	1	1		1	1
2	1	1	1	1	1		1	1
3	1	1	*1	*1	1	1		1
4	1	1			1	1		1
TOTAL	4	4	3	3	4	2	2	4

* 1 CRB-H AND 1 CRB-E REQUIRE TIGHT CURVATURE INSTALLATION AS PER SP941-02.01.08 AND SP941-02-01.09.

DESIGN VEHICLE I-BUS / LG5

DESIGN SPEED 100 LINE 40 km/h

FOR PLAN / DRAINAGE
SEE DWG. No. R1-1070-101

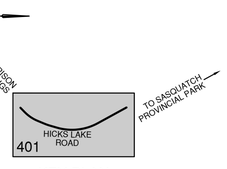
FOR PROFILE
SEE DWG. No. R1-1070-201

FOR TYPICAL SECTIONS
SEE DWG. No. R1-1070-301 TO 302

FOR SIGNING AND PAVEMENT MARKINGS
SEE DWG. No. R1-1070-601

GENERAL NOTE:

1. HOLLOW ARROWS INDICATE TRAFFIC DIRECTION ONLY AND ARE NOT PAVEMENT MARKINGS.
2. BARRIER NUMBER (1) REFER TO BARRIER TABLE.



KEY PLAN

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
Engineers & Geoscientists BC

Professional Seal

Associated Engineering

SCALE 0 2 1:250 12m

CAD FILENAME R1-1070-401
PLOT DATE 2023-08-01

REV	DATE	REVISIONS	NAME

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

GEOMETRICS AND LANING / SPOT ELEVATIONS

HICKS LAKE ROAD

TROUT LAKE CREEK BRIDGE No. 10505

STA. 100+57.253 TO STA. 101+91.417

M. DU TOIT, P. ENG.
ENGINEER OF RECORD
DATE 2023-08-01

DESIGNED D. BRAGAGNINI DATE 2023-08-01
QUALITY CONTROL M. DU TOIT DATE 2023-08-01
QUALITY ASSURANCE P. STANCOMBE DATE 2023-08-01
DRAWN D. BRAGAGNINI DATE 2023-08-01

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
2022-2677-00	14048-0000	1	R1-1070-401	

PLOT DATE: 2023/08/08 Q:\2022-2677-00\civil\model\MoTI_Working_Drawings\DrawingProduction\400_GeometricsLaning\R1-1070-401.dwg


TO HARRISON HOT SPRINGS
TO SASQUATCH PROVINCIAL PARK
LIMIT OF CONSTRUCTION POC 100+57.253
TIE TO EXISTING
LIMIT OF CONSTRUCTION POT 101+91.417
TIE TO EXISTING
TROUT LAKE CREEK
HICKS LAKE ROAD
SERVICE ROAD
100 LINE
TIE TO EXISTING PAVEMENT BEGIN LANE TAPER 100+57.253
BEGIN SHOULDER TAPER 100+64.558
END LANE TAPER 100+67.160
STA. 100+76.510 o/s -6.393 m LT
BEGIN CRB, CBN, CTB-1 BEGIN BARRIER FLARE 100+77.043
END BARRIER FLARE 100+87.581
END CRB, CTB-2, CMB, BPT CONCRETE BARRIER TRANSITION TO BRIDGE BARRIER 100+92.259
W-054-L
R-015-L
G-009
W-054-R
Trout Lake Creek
BRIDGE BARRIER TRANSITION TO CONCRETE BARRIER BEGIN CRB, BPT, CMB, CTB-2 101+20.775
BEGIN BARRIER FLARE 101+25.453
STA. 101+36.525 o/s -6.401 m LT
END CRB, CBN, CTB-1 END BARRIER FLARE 101+35.992
REMOVE AND DISPOSE OF EXISTING W-051 SIGN
END SHOULDER TAPER 101+49.125
BEGIN LANE TAPER 101+81.417
TIE TO EXISTING PAVEMENT END LANE TAPER 101+91.417
END 100 mm SOLID YELLOW LINE TIE TO EXISTING 101+91.417
INDICATES LANE EDGE AND ARE NOT PAVEMENT MARKINGS (TYP.)
END SHOULDER TAPER 101+43.485
STA. 101+28.556 o/s 6.962 m RT
END CRB, CBN, CTB-1 END BARRIER FLARE 101+28.100
BEGIN BARRIER FLARE BRIDGE BARRIER TRANSITION TO CONCRETE BARRIER BEGIN CRB, BPT, CMB, CTB-2 101+19.308
℄ NORTH ABUTMENT 101+16.034
REMOVE AND DISPOSE OF EXISTING R-056-1 SIGN
END BARRIER FLARE END CRB, CTB-2, CMB, BPT CONCRETE BARRIER TRANSITION TO BRIDGE BARRIER 100+93.724
℄ SOUTH ABUTMENT 100+96.998
BEGIN CRB, CBN, CTB-1 BEGIN BARRIER FLARE 100+81.488
START 100 mm SOLID YELLOW LINE TIE TO EXISTING 100+57.253
W-021 (EXISTING)
W-051 (EXISTING)
3.25
2.0
4:1
2.6
4.5
101

SIGNS ASSOCIATED WITH THIS DRAWING

SIGN TYPE	No. REQUIRED SIGNS	No. REQUIRED POSTS	LOCATION	DESCRIPTION
W-054-L R-015-L	1 1	- -	STA. 100+88	NEW: HAZARD MARKER - LEFT NEW: NO LEFT TURN SYMBOL MOUNT ON BARRIER
W-054-R	1	-	STA. 100+89	NEW: HAZARD MARKER - RIGHT MOUNT ON BARRIER
G-009	1	1	STA. 100+92	NEW: "Trout Lake Creek" SIGN EDGE TO BE CLEAR OF EDGE OF PAVEMENT
W-054-L	1	-	STA. 101+23	NEW: HAZARD MARKER - LEFT MOUNT ON BARRIER
G-009	1	1	STA. 101+23	NEW: "Trout Lake Creek" SIGN EDGE TO BE CLEAR OF EDGE OF PAVEMENT
W-054-R	1	-	STA. 101+25	NEW: HAZARD MARKER - RIGHT MOUNT ON BARRIER

DESIGN VEHICLE I-BUS / LG5

DESIGN SPEED 100 LINE 40 km/h

FOR PLAN / DRAINAGE SEE DWG. No. R1-1070-101

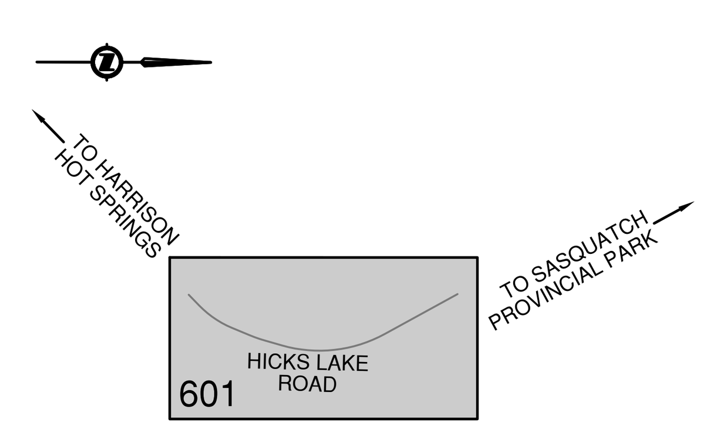
FOR PROFILE SEE DWG. No. R1-1070-201

FOR TYPICAL SECTIONS SEE DWG. No. R1-1070-301 TO 302

FOR GEOMETRICS AND LANING / SPOT ELEVATIONS SEE DWG. No. R1-1070-401

GENERAL NOTES:

1. ALL SIGNS AND PAVEMENT MARKINGS SHALL CONFORM TO THE BC MoTI MANUAL OF STANDARD TRAFFIC SIGNS & PAVEMENT MARKINGS AND/OR THE CATALOGUE OF STANDARD TRAFFIC SIGNS WHICHEVER SIGN CODE IS MORE CURRENT.
2. HOLLOW ARROWS INDICATE TRAFFIC DIRECTION ONLY AND ARE NOT PAVEMENT MARKINGS.
3. EXISTING SIGNS TO REMAIN UNLESS NOTED OTHERWISE.
4. SIGNS MAY BE INSTALLED ±5m FROM DRAWING LOCATION TO SUIT FIELD CONDITIONS.
5. CONFLICTING SIGNS AND MARKINGS TO BE REMOVED OR RELOCATED.
6. "START" AND "END" STATIONS ARE IN DIRECTION OF TRAFFIC.



KEY PLAN

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
PERMIT NUMBER: 1000163
Engineers & Geoscientists BC

Professional Seal

Associated Engineering

SCALE 0 2 1:250 12m

CAD FILENAME R1-1070-601
PLOT DATE 2023-08-01

REV	DATE	REVISIONS	NAME

BRITISH COLUMBIA

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

SIGNING AND PAVEMENT MARKINGS

HICKS LAKE ROAD
TROUT LAKE CREEK BRIDGE No. 10505
STA. 100+57.253 TO STA. 101+91.417

M. DU TOIT, P. ENG.
ENGINEER OF RECORD
DATE 2023-08-01

DESIGNED D. BRAGAGNINI DATE 2023-08-01
QUALITY CONTROL M. DU TOIT DATE 2023-08-01
QUALITY ASSURANCE P. STANCOMBE DATE 2023-08-01
DRAWN D. BRAGAGNINI DATE 2023-08-01

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
2022-2677-00	14048-0000	1	R1-1070-601	

PLOT DATE: 2023/08/09 Q:\2022-2677-00\civ\model\MoTI_Working_Drawings\DrawingProduction\600_SignagePavementMarkings\R1-1070-601.dwg

Appendix A2

Landscape Plan

591,225 591,250 591,275 591,300 591,325

5,466,350 5,466,325 5,466,300 5,466,275

Sasquatch Park

Hicks Lake Road

Sasquatch Park

Trout Lake Creek

Legend

- Watercourse
- BC Parks Boundary
- ESA Boundary
- Proposed Clearing and Grubbing Extent
- Proposed Q2 High Water Mark
- Proposed Top of Bank
- Geogrid Reinforcements
- Buried Riprap
- Surface Riprap
- Large Woody Debris (41 pieces)

Planting Plan

- Mixed Trees and Shrubs Riparian Zone - 400 mm soil depth (931 m^2)
- Shrub Geogrid Riparian Zone - 300 mm soil depth and coir logs (221 m^2)
- Shrub Riparian Zone - 400 mm soil depth and mulch (375 m^2)
- Willow Live Staking (149 m^2)

0 5 10 m

Scale: 1:400

Projection: NAD 1983 UTM Zone 10N

N

Data Sources:
a) Linework, Associated Engineering, 2023.
b) Planting plan, Hatfield, 2023.
c) Watercourse, BC Freshwater Atlas, 2011.
d) BC Parks boundary, digitized from "Trout Lake Creek Bridge No. 10505" Associated Engineering 2022, by Hatfield 2023.
e) Ortho imagery 10 cm, provided on Feb 9, 2022 by MOTI.

Consultant Logo

Hatfield

Rev	Date	Description	Init
	20230822	Draft for Internal Review	TP
	20230905	Issued for Regulatory Approval	TP

REVISIONS

BRITISH COLUMBIA | Ministry of Transportation & Infrastructure
South Coast Region

DISTRICT
HIGHWAY

TROUT LAKE CREEK CULVERT REPLACEMENT PROJECT LANDSCAPE PLAN

PREPARED UNDER THE DIRECTION OF
Tim Poulton, RPBio

DESIGNED BK DATE 2023-08-18
CHECKED N/A DATE ND
DRAWN LC DATE 2023-08-29
SCALE AS NOTED
NEGATIVE No.

FILE No.	PROJECT No.	REG.	DRAWING No.
	MOTI10866		10866-02

CANCEL PRINTS BEARING PREVIOUS LETTER

H-308-11-(07-08)

Plant species and specifications for the Trout Lake Creek landscape plan.

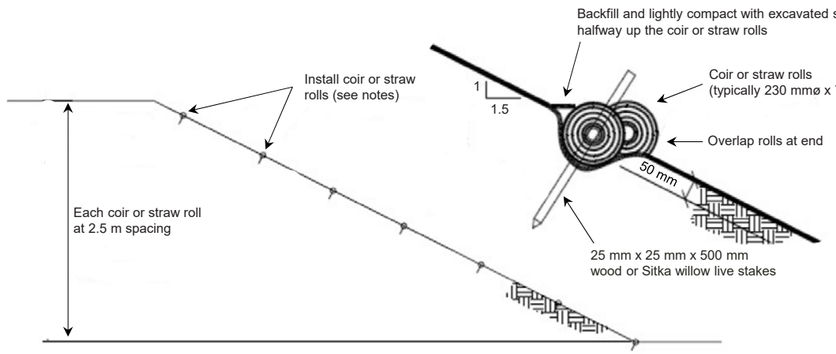
Vegetation Layer	Common Name	Botanical Name	% of Area	Number	Stock Size	Density
Mixed trees and shrubs riparian zone (400 mm soil depth)						
Trees	Black cottonwood	*Populus balsamifera ssp. trichocarpa*	10	14	No. 5 pot	1 plant per 5 m^2
	Red alder	*Alnus rubra*	15	21	No. 5 pot	1 plant per 5 m^2
	Bigleaf maple	*Acer macrophuyllum*	10	14	No. 5 pot	1 plant per 5 m^2
Shrubs	Red-osier dogwood	*Cornus stolonifera*	10	71	No. 2 pot	1 plant per m^2
	Red huckleberry	*Vaccinium parvifolium*	10	71	No. 2 pot	1 plant per m^2
	Pacific ninebark	*Physocarpus capitatus*	10	71	No. 2 pot	1 plant per m^2
	Pacific willow	*Salix lucida*	10	71	No. 2 pot	1 plant per m^2
	Common snowberry	*Symphoricarpos albus*	10	71	No. 2 pot	1 plant per m^2
	Dull Oregon grape	*Mahonia nervosa*	5	35	No. 2 pot	1 plant per m^2
Forbs	Sword fern	*Polystichum munitum*	5	35	No. 1 pot	1 plant per m^2
	[1]Stinging nettle	*Urtica dioica*	5	71	No. 1 pot	2 plants per m^2
Shrub riparian zone (400 mm soil depth and mulch)						
Shrubs	Red-osier dogwood	*Cornus stolonifera*	20	76	No. 2 pot	1 plant per m^2
	Red huckleberry	*Vaccinium parvifolium*	15	57	No. 2 pot	1 plant per m^2
	Pacific ninebark	*Physocarpus capitatus*	20	76	No. 2 pot	1 plant per m^2
	Pacific willow	*Salix lucida*	15	57	No. 2 pot	1 plant per m^2
	Common snowberry	*Symphoricarpos albus*	10	38	No. 2 pot	1 plant per m^2
	Dull Oregon grape	*Mahonia nervosa*	10	38	No. 2 pot	1 plant per m^2
Forbs	Sword fern	*Polystichum munitum*	5	19	No. 1 pot	1 plant per m^2
	Stinging nettle	*Urtica dioica*	5	19	No. 1 pot	1 plant per m^2
Shrub geogrid riparian zone (300 mm soil depth and coir logs)						
Shrubs	Thimbleberry	*Rubus parviflorus*	15	27	No. 2 pot	1 plant per m^2
	[2]Red-osier dogwood	*Cornus stolonifera*	10	18	No. 2 pot	1 plant per m^2
	Red huckleberry	*Vaccinium parvifolium*	15	27	No. 2 pot	1 plant per m^2
	Pacific ninebark	*Physocarpus capitatus*	15	27	No. 2 pot	1 plant per m^2
	Pacific willow	*Salix lucida*	15	27	No. 2 pot	1 plant per m^2
	Common snowberry	*Symphoricarpos albus*	10	18	No. 2 pot	1 plant per m^2
	Baldhip rose	*Rosa gymnocarpa*	10	18	No. 2 pot	1 plant per m^2
Forbs	Sword fern	*Polystichum munitum*	5	9	No. 1 pot	1 plant per m^2
	Deer fern	*Blechnum spicant*	5	9	No. 1 pot	1 plant per m^2
Willow Live Staking						
Stakes	Sitka Willow	*Salix sitchensis*	100	298	Live Stakes	2 stakes per m^2

[1] Plant in clusters around bigleaf maple. [2] Plant along the lower slope.

General Landscape Specifications

- Planting is to occur in the fall (following the last drought period in September to October) or spring (April to May). Willow live stakes to be installed during the dormant season per typical detail.
- All works associated with site preparation of planting areas are to be conducted per the BC Landscape Standards.
- Plants in containers shall have a well-established root system, reaching the sides of the container to maintain a firm ball when removed from the container, but shall not be root bound.
- The landscape contractor shall provide maintenance including, watering, removal of invasive species, and replacement of dead stock for one year after planting.
- After planting, all exposed soils are to be stabilized using Riparian Area Seed Mix per MOTI SS 757 applied at 75 kg/ha.
- Growing medium shall meet the table specifications per MOTI SS 751.
- It is recommended that growing medium be tested by an accredited soil testing laboratory to verify that the material meets specifications (see table).
- Growing medium will be applied to planting areas with a minimum thickness of 400 mm with the exception of the shrub geogrid riparian zone which shall have a minimum thickness of 300 mm. Growing medium shall be free of subsoil, wood (including woody plant parts), toxic materials, stones over 30 mm, foreign objects, propagules of plant species designated as noxious under the BC Weed Control Act and Regulation, and other invasive or undesirable plant species.
- Mulch shall be applied to the shrub riparian zone after watering to an even depth of 50 mm per MOTI SS 754 to assist with water retention over the riprap subgrade.
- Coir logs to be installed along the steeper slope (1.5:1) shrub geogrid riparian planting zone to help stabilize growing medium and reduce surface erosion (see typical detail).

Typical Coir or Straw Roll Detail

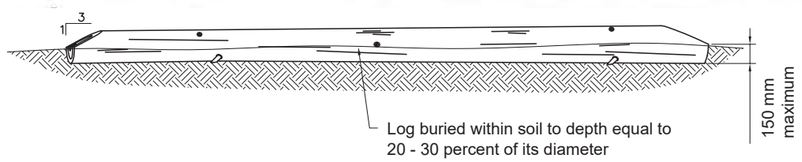


Notes:
1. Install coir or straw rolls perpendicular to the expected flow direction (parallel to the slope contour).
2. Dig small trenches across the slope on contour. The trench should be deep enough to contain the bottom-half of the roll.
3. Commence the installation from the bottom of the slope and work uphill.
4. Lay in trenches, fitting them snugly against the soil so no caps exist between the roll and the rear wall of the trench.
5. Make pilot holes through the center of the fiber rolls using a straight metal rod (i.e., rebar) and then insert the wooden stakes or Sitka willow live stakes. Ensure the stakes do not interfere with geogrid below the growing medium.
6. When rolls are placed end-to-end the ends of each roll shall overlap by at least 300 mm.

Growing medium specifications (MOTI SS 751-A)

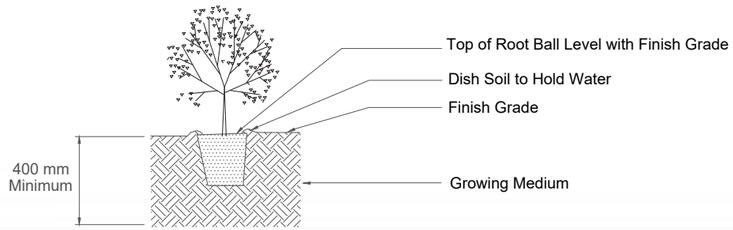
Particle size/pH/Drainage	Criteria
Gravel 2 - 40 mm	≤ 10% of dry weight
Sand 0.05 – 2 mm	30 – 70% of dry weight
Silt and clay combined	Max of 60% of dry weight
Organic content	2 – 10% of dry weight
Hydraulic conductivity	2 cm/hour
pH	6.0 – 7.0

Typical Log on Ground Detail

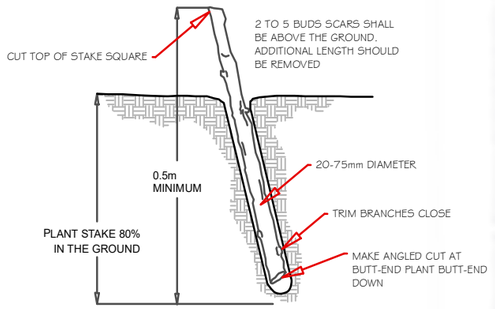


LWD pieces will have a minimum diameter of 30 cm and range in length from 4-6 m.

Typical Container Shrub Planting Detail



Live Staking Detail (N.T.S.)



NOTES:
1. HARVEST AND PLANT STAKES DURING THE DORMANT SEASON
2. USE HEALTHY, STRAIGHT AND LIVE WOOD AT LEAST 1 YEAR OLD.
3. MAKE CLEAN CUTS AND DO NOT DAMAGE STAKES OR SPLIT ENDS DURING INSTALLATION, USE A PILOT BAR IN FIRM SOILS.
4. INSTALL STAKES AT A DENSITY OF 1.2 STAKES PER SQUARE METRE.

Consultant
Hatfield

Rev	Date	Description	Init
	20230822	Draft for Internal Review	TP
	20230905	Issued for Regulatory Approval	TP

REVISIONS

BRITISH COLUMBIA | Ministry of Transportation & Infrastructure
South Coast Region

DISTRICT HIGHWAY

TROUTLAKE CREEK CULVERT REPLACEMENT PROJECT LANDSCAPE PLAN

PREPARED UNDER THE DIRECTION OF
Tim Poulton, RPBio
ENGINEER OF RECORD
DATE
DESIGNED BK 2023-08-18
CHECKED N/A
DRAWN LC 2023-08-28
SCALE AS NOTED
NEGATIVE No.
FILE No.
PROJECT No. MOTI10866
REG.
DRAWING No. 10866-02

CANCEL PRINTS BEARING PREVIOUS LETTER