

ROCKWELL DRIVE RECOVERY PROJECT FISHERIES ACT REQUEST FOR REVIEW SUPPORTING INFORMATION

February 2023



Prepared for:

Fisheries and Oceans Canada
Fish And Fish Habitat Protection Program

Vancouver, British Columbia

Hatfield Consultants LLP

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





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Prepared for:

FISHERIES AND OCEANS CANADA
FISH AND FISH HABITAT PROTECTION PROGRAM
200-401 BURRARD STREET
VANCOUVER, BC

Prepared by:

HATFIELD CONSULTANTS LLP
#200 - 850 HARBOURSIDE DRIVE
NORTH VANCOUVER, BC
CANADA V7P 0A3
TEL: 1.604.926.3261 • WWW.HATFIELDGROUP.COM

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TABLE OF CONTENTS

LIST OF TABLES	ii
LIST OF FIGURES.....	ii
LIST OF APPENDICES	ii
DISTRIBUTION LIST	iii
AMENDMENT RECORD	iii
1.0 PROJECT OVERVIEW	4
1.1 PROJECT AREA	4
1.2 PROPOSED PROJECT WORKS	7
1.3 PROJECT SCHEDULE.....	10
2.0 EXISTING CONDITIONS	11
2.1 FISH AND FISH HABITAT.....	11
2.1.1 Site DF1.....	11
2.1.2 Site DF2.....	12
2.1.3 Site DF3.....	15
3.0 ASSESSMENT OF IMPACTS.....	17
3.1 DESIGN.....	17
3.1.1 Culverts.....	17
3.1.2 Riprap Scour Protection.....	17
3.2 CONSTRUCTION.....	18
4.0 IMPACT MITIGATION STRATEGIES	20
4.1 DESIGN.....	20
4.1.1 Riparian Revegetation	20
4.2 CONSTRUCTION MITIGATION	21
4.2.1 Construction Methods.....	22
5.0 ASSESSMENT OF RESIDUAL IMPACTS	26
6.0 CLOSURE.....	27
7.0 REFERENCES.....	28

LIST OF TABLES

Table 1	Project coordinates by site for the Rockwell Drive Recovery Project.....	5
Table 2	Summary of fish habitat features at site DF2 (March 30, 2022).....	13
Table 3	Documented fish species in Harrison Lake.	15
Table 4	Habitat balance associated with Rockwell Drive culvert replacements, measured in square metres and/or linear metres of watercourse gain/loss.	17
Table 5	Plant species to be installed within disturbed riparian areas at site DF3.....	21
Table 6	Pathways of effects associated with Project WUA with the potential to adversely affect the aquatic environment.....	22
Table 7	Habitat balance associated with the Project WUA (sites DF1, DF2, and DF3 combined).	26

LIST OF FIGURES

Figure 1	Rockwell Drive Project area.....	6
Figure 2	Upstream view of site DF1 from within the 6535 Rockwell Drive property (December 14, 2021).	7
Figure 3	Downstream view of site DF2 showing erosion and debris along Rockwell Drive (December 14, 2021).	8
Figure 4	Watercourse avulsion at Site DF3 (December 14, 2021).	9
Figure 5	Photographs of Site DF1 (March 30, 2022).	12
Figure 6	Photographs of Site DF2 (March 30, 2022).	13
Figure 7	Short-term recovery works at site DF2 (April 26, 2022).....	14
Figure 8	Photographs of Site DF3 (March 30, 2022).	16
Figure 9	Assessment of impacts for site DF3, Rockwell Drive Recovery Project.....	19

LIST OF APPENDICES

Appendix A1	Engineering Designs
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DISTRIBUTION LIST

The following individuals/firms have received this document:

Name	Firm	Hardcopies	Email	FTP
Sivagar Sivabalan	McElhanney	-	✓	-
Krista Englund	Ministry of Transportation and Infrastructure	-	✓	-
Leigh Holt	WSP	-	✓	-
Fish and Fish Habitat Protection Program	Fisheries and Oceans Canada	-	✓	-

AMENDMENT RECORD

This report has been issued and amended as follows:

Issue	Description	Date	Approved by	
1	First version of Rockwell Drive Recovery Project – RFR – DRAFT	20230210	Garth Taylor Project Director	Tim Poulton Project Manager
2	Second version of Rockwell Drive Recovery Project – RFR –	20230214	 Garth Taylor Project Director	 Tim Poulton Project Manager

1.0 PROJECT OVERVIEW

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

Emergency and short-term repair works associated with the November 2021 flood event have been conducted at all three sites pursuant to *Water Sustainability Act* (WSA) Section 91 Order 268448, and MOTI intends to develop permanent (long-term) solutions for each site. Emergency and short-term repair work conducted in 2021 and 2022 aligned with the Fisheries and Oceans Canada (DFO) code of practice for culvert maintenance, except for site DF2 where repairs included regrading and armouring a watercourse upstream of the Rockwell Drive culvert (DFO File 22-HPAC-00359). Permanent long-term repairs at all three sites include culvert replacements; however, instream channel erosion protection is also required upstream of the site DF3 crossing (refer to Figure 9 in Section 3.0).

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.

All three unnamed watercourses are non-fish bearing and ephemeral with the exception of the site DF1 watercourse which appears to flow year-round, and there is the potential for fish to access the unnamed watercourse downstream of site DF2 from Harrison Lake during periods of surface flow; however the culvert at Rockwell drive and steep gradients upstream of Rockwell Drive present barriers to fish passage. 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*. An 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.

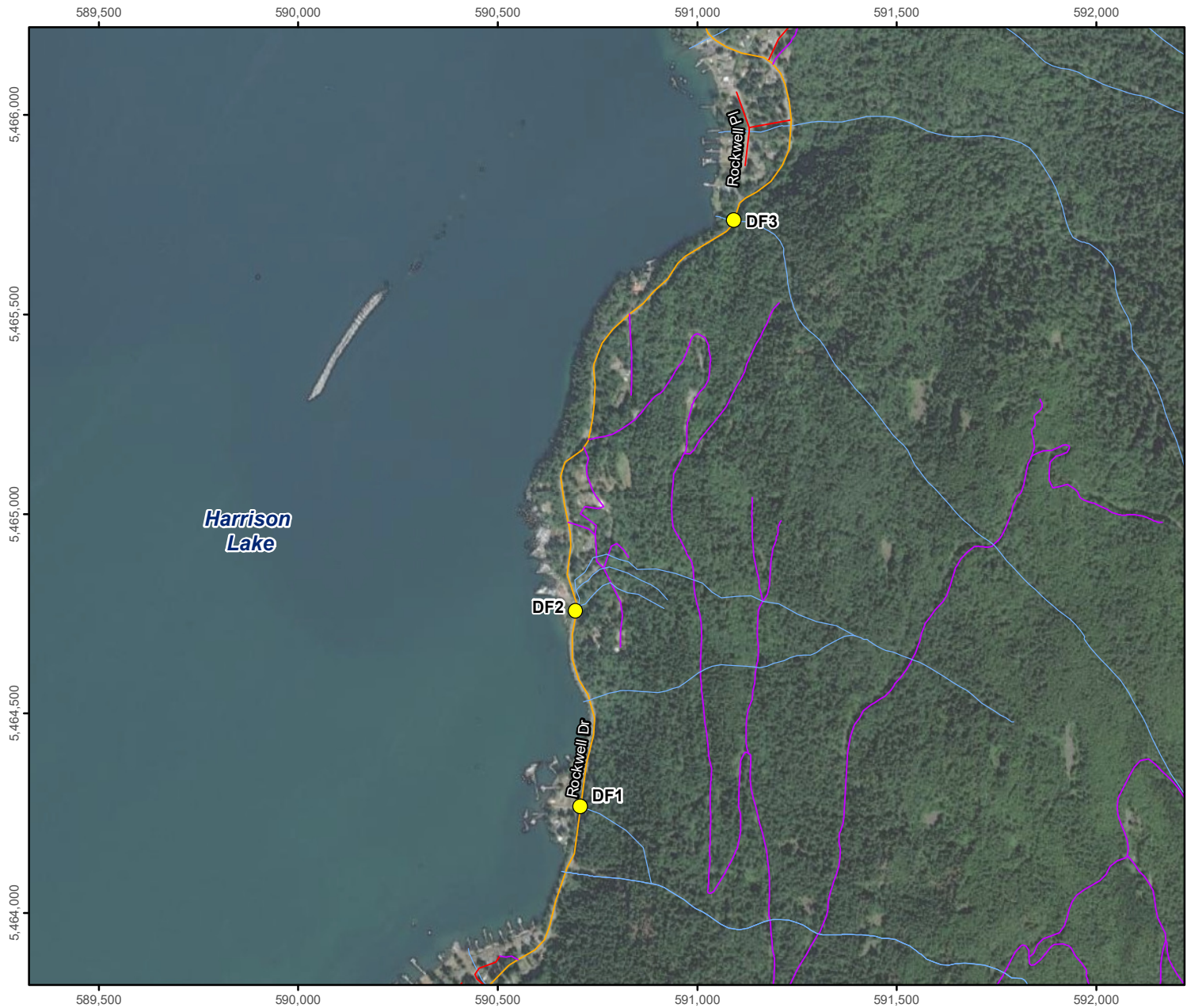
1.1 PROJECT AREA

The Project area is located along Rockwell Drive in the District of Kent, just north of Harrison Hot Springs at the southeast extent of Harrison Lake (Figure 1). All Project WUA will occur within MOTI's right-of-way except for site DF3 where a portion of the upstream erosion protection works will occur on private property. MOTI has received written permission from the landowner to access this private property.

Table 1 **Project coordinates by site for the Rockwell Drive Recovery Project.**

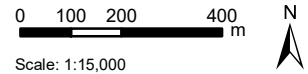
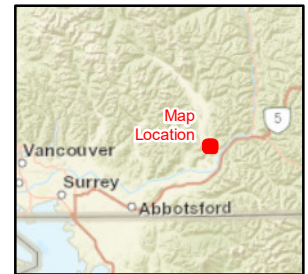
Site Name	Legal Description	Latitude	Longitude
DF1	MOTI Right of Way	49°19'27.32"N	121°45'6.32"W
DF2	MOTI Right of Way	49°19'44.22"N	121°45'6.13"W
DF3	MOTI Right of Way, and PLAN NWP 68927 REM PARCEL B	49° 20'19.78"N	121°44'39.45"W

Figure 1 Rockwell Drive Project area.



Legend

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



Scale: 1:15,000
 Projection: NAD 1983 UTM Zone 10N

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



Rockwell Drive Recovery Project

1.2 PROPOSED PROJECT WORKS

The 100% design drawings prepared by R.F. Binnie & Associates for each site are provided in Appendix A1.

Site DF1

At site DF1, the existing Rockwell Drive culvert was overwhelmed by an unnamed watercourse due to heavy mountain runoff, resulting in excess water running over the road, which eroded the roadway embankment and private property lands at 6535 Rockwell Drive, including the culverted portion of the watercourse within the property (Figure 2). Short-term emergency/recovery works included the removal of debris and placement of riprap adjacent to the private residence. The preferred long-term repair option includes upsizing and replacement of the existing culvert to current standards. The culvert will be replaced with a 9.5 m long by 2700 mm wide by 2400 mm high concrete box culvert complete with wing walls at the inlet. Class 250 kg riprap will be placed at the inlet along with field-fit ditch grading. A 250 kg riprap apron with a perimeter ditch and spillway will be installed at the outlet (Appendix A1). MOTI will not be conducting any WUA on the private property located at 6535 Rockwell Drive.

Figure 2 Upstream view of site DF1 from within the 6535 Rockwell Drive property (December 14, 2021).



Site DF2

At site DF2, a debris flow associated with an unnamed watercourse above a private residential access road located at 6969 Rockwell Drive deposited debris and incised a new stream channel in what was previously a driveway. The debris flow damaged the Rockwell Drive roadside drainage ditch and culvert inlet crossing Rockwell Drive that discharges to Harrison Lake (Figure 3). Emergency and short-term recovery works included the removal of debris deposited on Rockwell Drive, regrading and armouring the roadside ditch, and armouring the Rockwell Drive culvert inlet with riprap (Binnie 2022). Refer to the DFO avoid and mitigate letter dated April 7, 2022 (22-HPAC-00359) for a description of WUA associated with the DF2 short-term recovery works. The preferred long-term repair option includes upsizing and replacement of the existing culvert to current standards. The culvert will be replaced with a 28.5 m long by 2100 mm wide by 1800 mm high concrete box culvert with wing walls at the inlet and outlet. Class 100 kg riprap will be placed at the inlet and along the ditch to the north. The ditch upstream will be field fit to match the culvert invert and a riprap apron (100 kg) will be installed at the outlet (Appendix A1).

Figure 3 Downstream view of site DF2 showing erosion and debris along Rockwell Drive (December 14, 2021).



Site DF 3

The November 2021 atmospheric river resulted in a watercourse avulsion upstream of Rockwell Drive at site DF3. The avulsion resulted in the deposition of debris onto Rockwell Drive and the redirection of flows to the north (Figure 4). No drainage system has previously been constructed to accommodate water flow to the north, and as such flooding of private residences downstream of Rockwell Drive subsequently occurred. Emergency works included re-establishing the road shoulder and installing a catch basin near the eastern edge of the road to direct flows to the western roadside ditch away from the private residences, and short-term recovery works included the construction of an asphalt curb (Binnie 2022). The preferred long-term repair option includes upsizing and replacement of the existing culvert to current standards and redirecting the ditch back into the existing channel to avoid crossing Rockwell Drive at an unfavourable location (Binnie 2022). The culvert will be replaced with a 15.5 m long by 2000 mm diameter corrugated steel pipe culvert with wing walls at the inlet and outlet. A grouted 50 kg riprap apron will be installed at the outlet. Channel armouring to approximately 50 m upstream of the new culvert is required to prevent a future channel avulsion and/or erosion within the existing channel during a flood event. Channel armouring will include the installation of grouted riprap (50 kg), including the installation of a check dam to reduce water velocity approximately 32 m upstream of the culvert inlet. Approximately 20 m of the ditch along Rockwell Drive will be widened and deepened west of the Rockwell Drive culvert inlet. A 24.0 m long by 600 mm diameter corrugated steel pipe culvert will be installed into the ditch east of the Rockwell Drive culvert inlet complete with 25 kg riprap at the inlet and outlets (Appendix A1).

Figure 4 Watercourse avulsion at Site DF3 (December 14, 2021).



Construction means and methods will ultimately be determined by the successful contractor(s) awarded the Project per MOTI Standard Specifications (MOTI 2020); however, it is estimated that construction will proceed in the following sequence at each site (note, some steps will likely occur simultaneously):

1. Mobilization and site preparation including installation of sediment and erosion control measures, and flow diversion if required per DFO Interim Code of Practice for Temporary Cofferdams and Diversion Channels (approximately 3 days);
2. Tree clearing and grubbing within the Project footprint (approximately 7 days);
3. Establish a construction access path adjacent to the creek within the clear and grub limits with a small excavator (site DF3 only, approximately 3 days);
4. Channel grading at the culvert inlet and outlets with a small excavator working from the top of bank (approximately 5 days);
5. Removal of existing culverts and installation of new culverts with an excavator via single-lane alternating traffic (approximately 10 days);
6. Installation of upstream grouted riprap and check dam within the channel manually and with small machinery (e.g., skid steer) (site DF3 only, approximately 10 days);
7. Cast in place headwalls and grouted riprap at culvert inlet and outlets with an excavator working from the top of bank (approximately 15 days);
8. Regrading and decommissioning the avulsed channel (site DF3 only, approximately 3 days);
9. Grading, roadway widening and paving (5 days);
10. Concrete barrier installation along the roadway, sign installations and other miscellaneous work (5 days);
11. Demobilization (approximately 1 day); and
12. Riparian restoration seeding/planting in fall 2023 (approximately 3 days).

1.3 PROJECT SCHEDULE

The Project is expected to take approximately two months to complete and is planned for summer 2023. The proposed start date is July 15, 2023, with an estimated end date of September 15, 2023. Although the unnamed watercourses are non-fish-bearing instream works are planned to occur during the regional least-risk work window of August 1 to September 15 (MOE 2006). Works may proceed outside of this period if the watercourses are naturally dry or the creek is appropriately isolated from flowing water and monitored by an Appropriately Qualified Professional (AQP, also known as a QEP).

2.0 EXISTING CONDITIONS

2.1 FISH AND FISH HABITAT

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

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

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

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

Based on multiple visual observations in August and September 2022, sites DF2 and DF3 are ephemeral, with no surface flow during these months. Although existing fish distribution data does not occur, each watercourse is assumed to be non-fish bearing due to fish barriers (i.e., steep channel gradient and/or culverts) upstream of Harrison Lake and a lack of surface flow during the summer. The exception is site DF2 downstream of Rockwell Drive which is assumed to be potentially fish-bearing during periods of surface flow given its proximity to Harrison Lake and lower channel gradient (i.e., 7%).

2.1.1 Site DF1

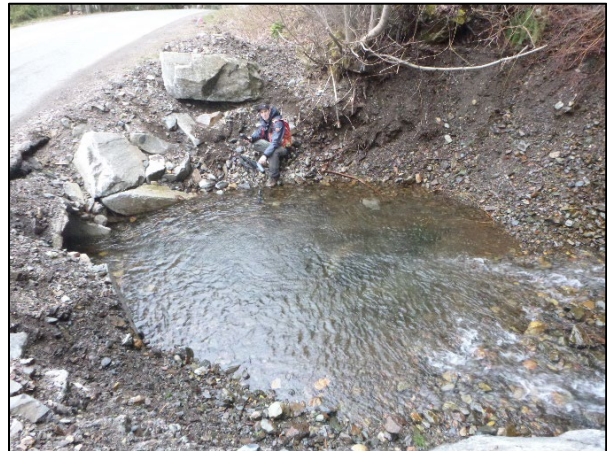
The site DF1 watercourse originates from Bear Lake and conveys flows west down the steep mountain slopes upstream of Rockwell Drive. Immediately upstream of the Rockwell Drive culvert, the unnamed watercourse is characterized by a large waterfall and plunge pool (Figure 5). The November 2021 atmospheric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

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

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



DF1 waterfall upstream of Rockwell Drive.



Large pool at the Rockwell Drive culvert inlet.



Downstream of Rockwell Drive, the DF1 watercourse is culverted on private property.



DF1 watercourse outlet at Harrison Lake.

2.1.2 Site DF2

Upstream of Rockwell Drive, the site DF2 watercourse has been historically altered within the private property located at 6969 Rockwell Drive. Prior to the November 2021 flood event, the watercourse was directed around the private residence to a corrugated steel pipe (CSP) culvert located at Rockwell Drive. Following the flood event, a portion of the watercourse incised a new stream channel in what was previously a driveway, conveying flows to the roadside ditch north of the Rockwell Drive culvert (Figure 6). Both the

original altered stream channel and newly incised flood channel converge at the Rockwell Drive culvert inlet. Short-term recovery works in April 2022 included armouring the roadside ditch with riprap to prevent further erosion during spring freshet (Figure 7).

Downstream of Rockwell drive, the site DF2 watercourse is conveyed for approximately 40 m over a gravel shoreline to Harrison Lake (Figure 6). A summary of fish habitat features at site DF2 is provided in Table 2. Water temperature, pH, dissolved oxygen, and conductivity at site DF2 were 7.6°C, 6.6, 12.1 mg/L, and 89 µs/cm, respectively, during the March 30, 2022 site assessment.

Table 2 Summary of fish habitat features at site DF2 (March 30, 2022).

Survey Reach	Average Channel Width (m)	Average Wetted Width (m)	Average Depth (m)	Average Velocity (m/s)	Channel Gradient (%)
1	2.8	2.1	0.18	0.2	7
2	3.2	1.8	0.17	0.3	7

Survey Reach 1 = Downstream of Rockwell Drive; Survey Reach 2 = Upstream Rockwell Drive within the roadside ditch.

Due to the steep culvert gradient at Rockwell Drive (i.e., approximately 50% at the inlet) and gradients upstream of Rockwell Drive, the site DF2 watercourse is considered non-fish bearing upstream of Rockwell Drive; however, there is the potential for fish access from Harrison Lake upstream to the culvert outlet during periods of sufficient surface flow.

The Lillooet River is the main inlet to Harrison Lake, which ultimately drains to the Fraser River via the Harrison River near Harrison Mills. Harrison Lake is inhabited by a variety of fish species (Table 3). Although fish access for a number of fish species from Harrison Lake is possible during periods of sufficient flow, suitable spawning, rearing, or overwintering habitat for salmonids was not observed, and limited for resident forage species such as sculpin (*Cottus* sp.) and stickleback (*Gasterosteus* sp.) due to the ephemeral nature of this watercourse and lack of instream or overhead cover (Figure 6).

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



The confluence of the DF2 watercourse with Harrison Lake. Upstream view of the Rockwell Drive culvert outlet.

Figure 6 (Cont'd.)



Upstream view of the roadside ditch along Rockwell Drive upstream of the culvert.



Downstream view of the Rockwell Drive culvert inlet where the roadside ditch and altered channel converge.

Figure 7 Short-term recovery works at site DF2 (April 26, 2022).



Table 3 Documented fish species in Harrison Lake.

Common name	Scientific name	SARA Schedule 1	Provincial Status
Cutthroat trout	<i>Oncorhynchus clarkii</i>	-	-
Coastal Cutthroat Trout	<i>Oncorhynchus clarkii clarkii</i>	-	Blue
Pygmy Longfin smelt	<i>Spirinchus thaleichthys</i>	-	Red
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	-	-
Chum Salmon	<i>Oncorhynchus keta</i>	-	-
Coho Salmon	<i>Oncorhynchus kisutch</i>	-	-
Coastrange Sculpin	<i>Cottus aleuticus</i>	-	-
Lamprey (General)	<i>Entosphenus</i> sp.	-	-
Threespine Stickleback	<i>Gasterosteus aculeatus</i>	-	-
Dolly Vardan	<i>Salvelinus malma</i>	-	-
Sockeye Salmon/Kokanee	<i>Oncorhynchus nerka</i>	-	-
Lake Whitefish	<i>Coregonus clupeaformis</i>	-	-
Mountain Whitefish	<i>Prosopium williamsoni</i>	-	-
Northern Pikeminnow	<i>Ptychocheilus oregonensis</i>	-	-
Pink Salmon	<i>Oncorhynchus gorbuscha</i>	-	-
Prickly Sculpin	<i>Cottus asper</i>	-	-
Rainbow Trout/Steelhead	<i>Oncorhynchus mykiss</i>	-	-
Redside shiner	<i>Richardsonius balteatus</i>	-	-

2.1.3 Site DF3

Upstream of Rockwell Drive, the site DF3 watercourse is conveyed down steep slopes (>45%) in a poorly defined channel with an average channel width and wetted width of 4.0 m and 0.75 m, respectively (Figure 8). Substrates are comprised primarily of boulders and cobbles. During the November 2021 flood, the channel avulsed just upstream of Rockwell Drive causing a new channel to form to the north of the existing channel. At Rockwell Drive, flows were directed back to the south within the existing roadside ditch as part of emergency works (Figure 8). Flows are conveyed across Rockwell Drive via a corrugated HDPE culvert that appears to have been recently installed as part of flood emergency works (Figure 8). The culvert outlets to a steep riprap road fill slope (approximately 35% gradient) west of Rockwell Drive ultimately draining to Harrison Lake across a gravel beach and private boat launch associated with 7370 Rockwell Drive (Figure 8). Water temperature, pH, dissolved oxygen, and conductivity at site DF3 were 7.7°C, 6.5, 12.2 mg/L, and 76 us/cm, respectively, during the March 30, 2022 site assessment.

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

Figure 8 **Photographs of Site DF3 (March 30, 2022).**



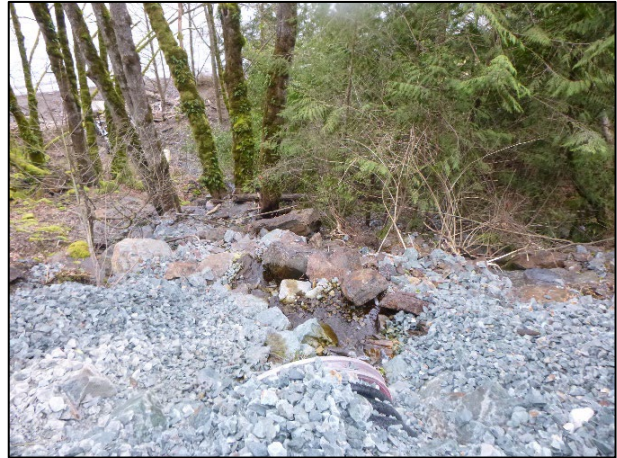
Upstream view of the site DF3 watercourse upstream of Rockwell Drive.



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



Rockwell Drive culvert inlet.



Rockwell Drive culvert outlet.

3.0 ASSESSMENT OF IMPACTS

The area used for assessing potential impacts to aquatic and terrestrial resources from the Project is based on the 100% design drawings (Appendix A1), guidelines associated with the Environmental Mitigation Policy (MOE 2014), Measures to Protect Fish and Fish Habitat (DFO 2019a), and the Fish and Fish Habitat Protection Policy Statement (DFO 2019b). Given the Project does not occur entirely within municipal boundaries, which typically define riparian setbacks on streams (e.g., Riparian Areas Protection Regulation), the *Forest and Range Practices Act* (FRPA) has been used as a guide. Under FRPA the unnamed watercourses are classified as S5 streams. S5 streams are non-fish-bearing with an average channel width of > 3 m and are prescribed a 30 m Riparian Management Area (RMA). As such, riparian impacts are assessed within the area 30 m landward of the watercourse top of bank and within the Project footprint.

The Project will be undertaken within and adjacent to the road right-of-way in an area already affected by anthropogenic disturbances. Habitat in the area is moderately disturbed because of highway right-of-way maintenance including regular vegetation management and a high level of disturbance from traffic noise, as well as disturbance from the flood and associated emergency works.

3.1 DESIGN

3.1.1 Culverts

Replacing the culverts to current design standards that consider climate change and debris flow events will reduce erosion and flooding of downstream environments, infrastructure, and property; however, increasing the size of the culverts to current standards will result in a minor loss of aquatic habitat (i.e, approximately 43 m²; Table 4).

Table 4 Habitat balance associated with Rockwell Drive culvert replacements, measured in square metres and/or linear metres of watercourse gain/loss.

Site	Average Channel Width (m)	Existing Culvert Length (m)	New Culvert Length (m)	Net Gain/Loss (m ² and/or m)
DF1	¹ N/A	10.9	9.5	+1.4 m
DF2	3.0	18.1	28.5	-31.2 m ² (-10.4 m)
DF3	4.0	12.5	15.5	-12.0 m ² (-3.0 m)
Total	-	41.5	53.5	~ -43.2 m² (-12.0 m)

¹Unknown channel width due to culverted stream on private property.

3.1.2 Riprap Scour Protection

Site DF1

Riprap scour protection will be placed around the culvert inlet and outlet to protect the new culvert and prevent scouring of the watercourse. Riprap at site DF1 will be placed primarily above the watercourse high watermark and in areas already impacted by the previous flood event and as such not result in the loss of aquatic or riparian habitats.

Site DF2

Similar to site DF1, riprap scour protection will be placed around the culvert inlet and outlet to protect the new culvert at site DF2; however, the riprap apron downstream of the culvert will result in the permanent modification of approximately 42 m² of aquatic habitat. Riprap placement above the culvert will occur in areas already impacted by the short-term recovery works (DFO file No. 22-HPAC-00359). Riparian vegetation within the footprint of riprap scour protection at site DF2 has already been impacted by the flood and as such there will be no new impacts on riparian habitat.

Site DF3

The Project will provide a long-term net benefit to the surrounding aquatic and terrestrial environment at site DF3 through the installation of scour protection. This scour protection will prevent future erosion of the watercourse and riparian environment, as well as reduce sediment delivery to downstream fish habitat (i.e., Harrison Lake); however, approximately 386 m² of aquatic habitat will be permanently modified as a result of the riprap scour protection and 72 m² of riparian habitat will be lost as a result of a 3 m wide access path required for future maintenance (Figure 9).

3.2 CONSTRUCTION

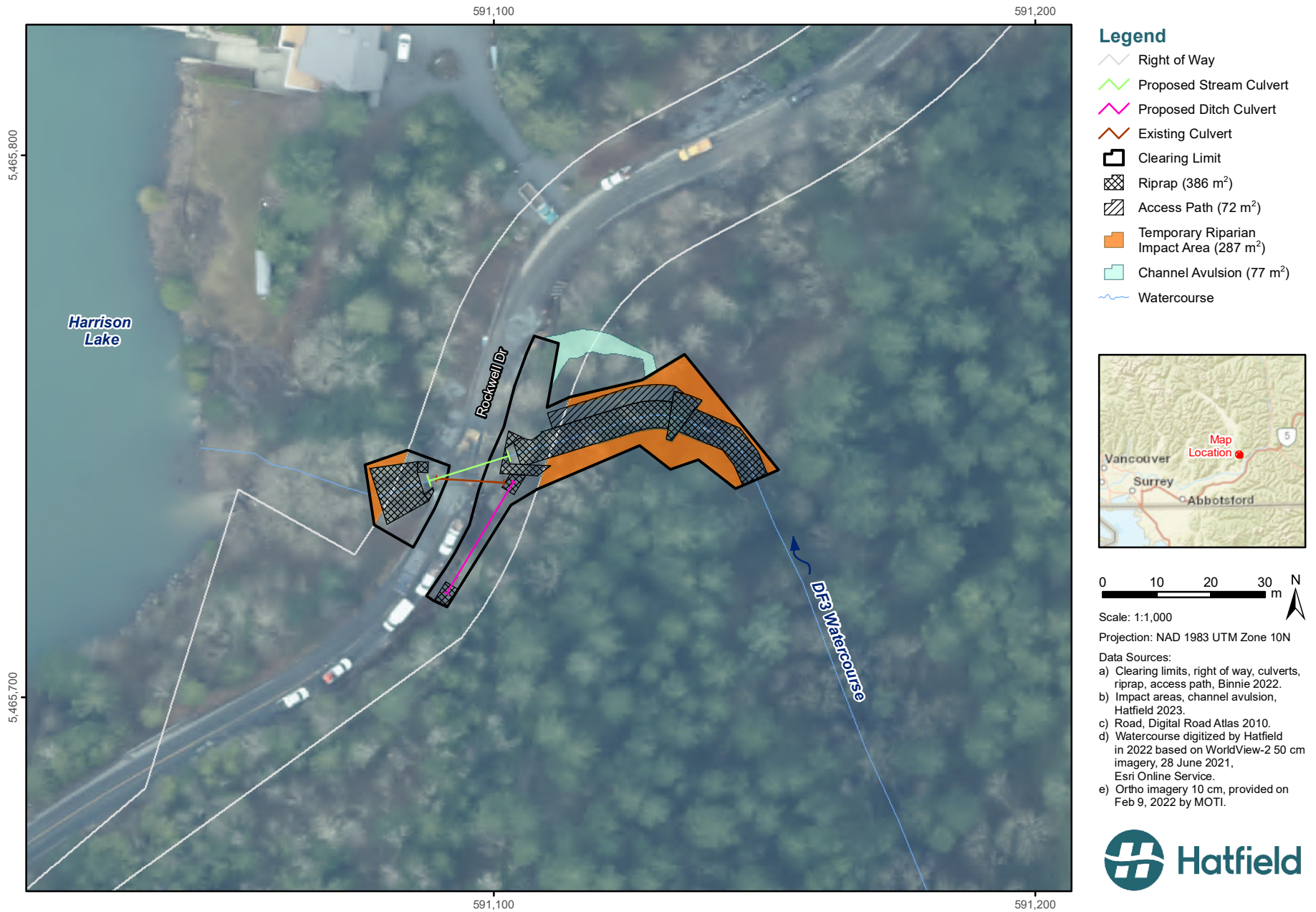
There is the potential for temporary impacts to aquatic and riparian environments within the Project area during culvert removal and replacement, placement of riprap scour protection, and restoration activities.

Potential impacts on fish are not expected to occur given the non-fish-bearing status and ephemeral nature of these watercourses; however, potential short-term impacts to fish habitat during construction include:

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

Approximately 287 m² of riparian habitat will be temporarily impacted during clearing and grubbing activities at site DF3 (Figure 9).

Figure 9 Assessment of impacts for site DF3, Rockwell Drive Recovery Project.



Rockwell Drive Recovery Project



4.0 IMPACT MITIGATION STRATEGIES

4.1 DESIGN

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

Site DF1

The design of the site DF1 culvert will not result in a net loss of aquatic or riparian habitats, and as such further design mitigation is not required.

Site DF2

Given the ephemeral nature of the unnamed watercourse and steep gradients upstream of Rockwell Drive at site DF2, upgrading the culvert to include fish passage features is not required. Riprap scour protection below the watercourse high watermark will be top-dressed with native stream substrates salvaged during excavation and the natural channel shape of the watercourse will be maintained.

Site DF3

Although there will be a permanent modification to the channel upstream of Rockwell Drive, the grouted riprap will be installed below the existing grade and finished with a rough surface (see the typical section on Drawing No. R1-1050-304; Appendix A1). Native substrate will ultimately migrate downstream and cover the grouted riprap during future high-flow events and create a more natural channel shape comprised of native substrates.

The channel avulsion that occurred as a result of the 2021 flood event damaged approximately 77 m² of riparian habitat (Figure 9) which will be regraded to pre-flood conditions and revegetated per Section 4.1.1 below.

4.1.1 Riparian Revegetation

Impacts to riparian areas associated with sites DF1 and DF2 will be minimal and occur within areas already disturbed during the flood and emergency repair works. These disturbed areas are subject to routine maintenance within the road right-of-way and will be revegetated with revegetation seeding according to MOTI Standard Specifications (MOTI 2020). Revegetation seeding shall be applied to all disturbed areas within the road right-of-way including all soil cuts and embankment slopes.

Disturbed riparian areas beyond 3 m of Rockwell Drive edge of pavement and outside of the maintenance access path at site DF3 will be replanted with native tree, shrub, and forb species suited to site conditions (Table 5). Plants will be of guaranteed nursery stock and installed at one plant per square metre density (BC MoE 2008). Prior to the installation of the plant material, a layer of growing medium (minimum 400 mm thick) will be placed within the planting area. Growing medium shall meet the specifications identified in Section 751 of the Standard Specifications for Highway Construction (MOTI 2020). Large woody debris

salvaged during clearing works will be placed within the planting area at a density of 5 to 10 pieces per side of the watercourse. Ideally, large woody debris pieces will have a minimum diameter of 30 cm and a minimum length of 6 m; however, this is contingent upon material sourced onsite.

Table 5 Plant species to be installed within disturbed riparian areas at site DF3.

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

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

4.2 CONSTRUCTION MITIGATION

The successful contractor(s) will be required to submit a detailed Construction Environmental Management Plan (CEMP) with Work Procedures prior to commencing construction. The CEMP shall be prepared in compliance with MOTI’s Standard Specifications for Highway Construction (MOTI 2020) Section 165 Protection of the Environment (SS 165) and must be accepted by MOTI. Special Provisions (SPs) contained in the Project tender package will identify any expectations that differ from MOTI SS 165 and will also include conditions of any environmental approvals. Mitigation measures and best management practices (BMPs) detailed in the CEMP will align with the Requirements and Best Management Practices for Making Changes in and About a Stream in British Columbia (BC Gov. 2022) and address environmental risks identified from potential pathways of effects (DFO 2018; Table 6).

Table 6 Pathways of effects associated with Project WUA with the potential to adversely affect the aquatic environment.

Project Activity	Description of Project Activity
Land-based Activities	
Vegetation Clearing	Clearing of vegetation within areas requiring riprap armouring
Excavation	Removal of old culverts and installation of new ones
Grading	Realignment and contouring of channels and ditches
Use of Industrial Equipment	Use of industrial equipment (e.g., excavator) to remove old culverts and install new culverts
Riparian Planting	Planting native plant species within disturbed riparian areas
In-water Activities	
Placement of Material or Structures in Water	Placement of riprap below the high watermark
Structure Removal	Removal of culverts

4.2.1 Construction Methods

The following general mitigation measures and BMPs will be followed to avoid or reduce the potential for adverse impacts:

- Conduct Project works during appropriate least-risk timing windows (August 1 to September 15) or when the watercourse is naturally dry;
- Minimize the extent and duration of instream works;
- Minimize the extent and duration of sediment disturbance;
- Implement erosion and sediment control measures to minimize sediment delivery to the watercourse during WUA;
- Carry out WUA during favourable weather conditions;
- Employ BMPs for all WUA with respect to fish and fish habitat, water quality, invasive species, waste materials management, and emergency spill response, in accordance with the CEMP;
- Review pertinent environmental information and emergency response procedures with crews prior to the start of works;
- Secure all permits, licenses, and authorizations for works prior to commencement; and
- Retain an AQP to monitor works during construction. The AQP shall have the authority to modify or suspend works if deemed necessary to protect fish and wildlife.

4.2.1.1 Instream Works

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

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

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

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

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

4.2.1.2 Erosion and Sediment Control

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

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

- Avoid tracking machinery through exposed soils or sediments during wet periods to the extent practicable;
- Install Erosion and Sediment Control (ESC) measures for managing water flow prior to works;

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

4.2.1.3 Spill Management

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

- All hazardous substances are properly labelled, stored, and contained;
- All work areas and machinery are tidy and free of excess oil, grease, and leaks;
- Required training for Project personnel on environmental awareness and emergency/spill response has been carried out prior to works;
- Emergency contact lists are kept on-site in an area accessible to all personnel;
- Spill kits are properly stocked and located at all active work areas, and at sites where hazardous substances are stored or in use, in a location readily accessible to Project personnel;
- The contractor's CEMP will include a management plan for accidental spills of cementitious material (i.e., uncured grout) including the provision of a CO₂ bubbler to regulate pH if required; and
- All equipment maintenance, fueling, and controlled substance storage areas are to be located a minimum of 30 m from any open water source.

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

- Spills reportable to the Provincial Emergency Program (PEP);
- Spills with the potential to introduce a harmful substance to the aquatic environment;
- Spills on land greater than 5 L or with a surface area greater than 1 m² and/or deeper than 300 mm, or any release of a hazardous substance that could cause contamination of the site or any lands or waters in the vicinity of the site;
- Any repetitive occurrence of construction activities that are not in compliance with the CEMP; and
- Any incident that has or could result in the violation of a law, regulation or guideline, including encroachment into sensitive areas, or disturbances to wildlife.

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

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

5.0 ASSESSMENT OF RESIDUAL IMPACTS

Potential adverse residual impacts (i.e., impacts that may reasonably occur after all mitigation is considered) are assessed in the context of the death of fish or HADD. The *Fisheries Act* requires that Project WUA avoid causing;

- The death of fish by means other than fishing; and
- HADD unless authorized by the Minister of Fisheries and Oceans Canada.

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:

- Maintaining an undisturbed vegetated buffer zone between areas of on-land activity and the high watermark of any waterbody;
- Avoid tree removal (tree removal will be required at site DF3);
- Avoid conducting any WUA in water (flows may be present at site DF1 during WUA);
- Avoid placing fill or other temporary or permanent structures below the high watermark; and
- Disturbing or removing materials from the banks, shoreline or waterbody bed.

The death of fish or HADD is not expected to occur, given the short duration of the WUA, ecosystem values sustained within the Project footprint, and proposed mitigation measures (refer to Section 4.0). Although the WUA will result in a minor loss of aquatic habitat (i.e., ~43 m²) and a temporary loss of riparian vegetation within the clearing limits, there will be no permanent loss of riparian habitat (Table 7). Further, the erosion protection works will prevent future erosion events such as the avulsion that occurred at site DF3. The unnamed watercourses are non-fish-bearing (except for site DF2 downstream of Rockwell Drive during periods of surface flow) and ephemeral, and as such provide limited water, food, and nutrient inputs to the much larger fish-bearing Harrison Lake downstream of the Project area.

Table 7 Habitat balance associated with the Project WUA (sites DF1, DF2, and DF3 combined).

Habitat Type	Area m ²					
	Permanent Modification	Temporary Loss	Permanent Loss	Permanent Gain	Revegetation	Net Gain/Loss
Aquatic	386	-	43	-	-	-43
Riparian	-	287	72	177	² 364	+5

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

² Includes the riparian areas temporarily disturbed (287 m²) and the avulsed channel that will be revegetated (77 m²).

6.0 CLOSURE

The Rockwell Drive Recovery Project includes culvert replacements and instream channel erosion protection works at three unnamed watercourse crossings along Rockwell Drive to prevent future erosional events and damage to the surrounding environment, infrastructure, and private property. 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 Project WUA. An application for a Change Approval pursuant to the *Water Sustainability Act* has been submitted to the Ministry of Forests (File No. 2010236), and records of consultation with Indigenous communities can be provided upon request.

7.0 REFERENCES

- BC Ministry of Forests and BC Environment. 2012. Fish-stream Crossing Guidebook Revised Edition. Forest Practices Code. Victoria, BC
- Binnie. 2022. Draft Option Analysis Report. Prepared for: Ministry of Transportation and Infrastructure, Rockwell Drive Recovery – Sites DF1 to DF3. May 17, 2022.
- [DFO] Fisheries and Oceans Canada. 2018. Pathways of Effects for Land-Based and In-Water Activities. Accessed February 6, 2023. <http://www.dfo-mpo.gc.ca/pnw-ppe/pathways-sequences/index-eng.html>
- DFO. 2019a. Measures to Protect Fish and Fish Habitat. Accessed December 5, 2022. <http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures-eng.htm>
- DFO. 2019b. Fish and Fish Habitat Protection Policy Statement. August 2019. Accessed February 5, 2023. <https://www.dfo-mpo.gc.ca/pnw-ppe/policy-politique-eng.html>
- Government of British Columbia. 2022. Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia. Appendix: Scope-specific Best Management Practices for Changes in and About a Stream under the WSA. A companion document to A user's Guide for Changes In and About a Stream in British Columbia.
- [MOTI] BC Ministry of Transportation and Infrastructure. 2020. 2020 Standard Specifications for Highway Construction.

APPENDICES

Appendix A1
Engineering Designs



Ministry of
Transportation
and Infrastructure

PROJECT NO. 14045

ROCKWELL DRIVE FLOOD RECOVERY

SITES DF1, DF2, AND DF3

ISSUED FOR ENVIRONMENTAL APPROVAL - JAN. 12, 2023

DRAFT

SOUTH COAST REGION

PROJECT NO. 14045

ROCKWELL DRIVE FLOOD RECOVERY

SITES DF1, DF2, AND DF3

L100-LINE (DF1 ROCKWELL DRIVE)

STA. 101+41.112 - STA. 103+01.972

0.16 km

L200-LINE (DF2 ROCKWELL DRIVE)

STA. 200+20.000 - STA. 201+48.159

0.13 km

L300-LINE (DF3 ROCKWELL DRIVE)

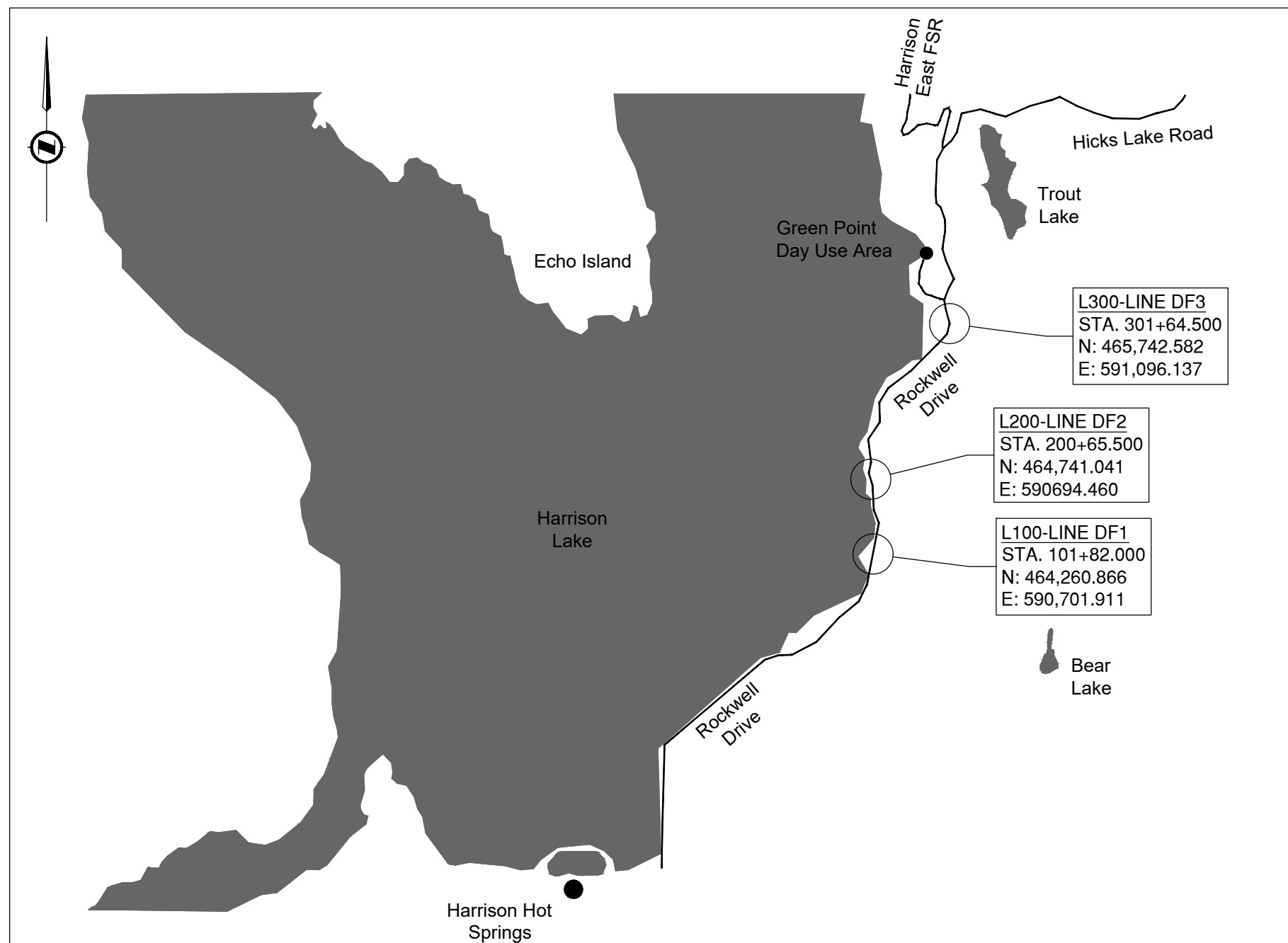
STA. 301+38.111 - STA. 301+89.252

0.05 km

DRAWING INDEX

R1-1050-001 to 003
 R1-1050-101 to 103
 R1-1050-201 to 206
 R1-1050-301 to 304
 R1-1050-401 to 403

KEY PLAN, SURVEY CONTROL POINTS, AND LEGEND
 PLANS
 PROFILES AND CULVERT SECTIONS
 TYPICAL SECTIONS
 GEOMETRICS, LANING, SIGNING,
 AND PAVEMENT MARKINGS



L300-LINE DF3
 STA. 301+64.500
 N: 465,742.582
 E: 591,096.137

L200-LINE DF2
 STA. 200+65.500
 N: 464,741.041
 E: 590694.460

L100-LINE DF1
 STA. 101+82.000
 N: 464,260.866
 E: 590,701.911

LOCATION MAP

N.T.S.

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<p>R.F. BINNIE & ASSOCIATES LTD. 300 - 4940 Canada Way, Burnaby, BC V5G 4K6 TEL 604 420 1723 BINNIE.com</p>		<p>MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE SOUTH COAST REGION HIGHWAY ENGINEERING AND GEOMETRICS</p>																																																						
SCALE N.T.S. CAD FILENAME: 000KP-ROCKWELL-DF1_21-1067.DWG DATE: 2023-01-12 FILE NUMBER: 21-1067		<p>KEY PLAN ROCKWELL DRIVE FLOOD RECOVERY SITES DF1, DF2, AND DF3</p>																																																						
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Date: February 04, 2022		Origin: CZ47 derived from TRSI Static Network from CHWK								
Project: Rockwell Drive @ Harrison Lake - Sites DF1 to DF4				Tack Point: P6718-22		ACSF: 0.999713				
Horizontal Datum: UTM NAD83 (CSRS) Z10N				Vertical Datum: CGVD28 HT2_0						
Point ID	Local		Orthometric Height		UTM		Ellipsoidal Height	C.S.F.	Class	Type
	Northing	Easting	CGG2013a	HT2_0	Northing	Easting				
GCZ47-21	-	-	-	14.621	5458088.163	588549.861	-2.918	0.999697	CORRIDOR	9" SPIKE
G897019-22	-	-	-	14.396	5459420.545	588655.547	-3.104	0.999697	PROJECT	GCM753988
P6710-22	464119.556	590686.159	-	16.421	5464120.002	590686.251	-0.869	0.999701	PROJECT	REBAR
P6711-22	464264.563	590707.230	-	23.229	5464264.968	590707.316	5.939	-	PROJECT	REBAR
P6712-22	464285.406	590601.150	-	10.326	5464285.805	590601.267	-6.964	0.999702	PROJECT	REBAR
P6713-22	464433.453	590730.374	-	14.399	5464433.809	590730.454	-2.891	-	PROJECT	REBAR
P6714-22	464610.608	590699.980	-	13.029	5464610.913	590700.069	-4.249	0.999702	PROJECT	REBAR
P6715-22	464742.588	590663.848	-	12.407	5464742.855	590663.947	-4.869	0.999702	PROJECT	REBAR
P6716-22	464787.086	590704.708	-	18.820	5464787.341	590704.795	1.544	-	PROJECT	REBAR
P6717-22	464861.090	590674.279	-	27.376	5464861.324	590674.374	10.100	-	PROJECT	REBAR
P6718-22	465674.192	591007.581	-	36.493	5465674.192	591007.581	19.235	0.999699	PROJECT	REBAR
P6719-22	465708.004	591078.936	-	28.686	5465707.995	591078.915	11.428	-	PROJECT	REBAR
P6720-22	465792.685	591115.754	-	26.853	5465792.651	591115.723	9.601	0.999700	PROJECT	REBAR
P6721-22	465830.136	591187.755	-	26.738	5465830.091	591187.703	9.486	-	PROJECT	REBAR
P6722-22	465927.538	591242.052	-	31.012	5465927.465	591241.984	13.760	-	PROJECT	REBAR
P6723-22	466026.688	591222.256	-	35.302	5466026.587	591222.195	18.050	-	PROJECT	REBAR
P6724-22	466104.042	591216.613	-	33.207	5466103.919	591216.553	15.955	-	PROJECT	REBAR
P6725-22	466147.062	591172.786	-	26.801	5466146.926	591172.739	9.562	0.999701	PROJECT	REBAR
P6726-22	466166.260	591073.539	-	16.756	5466166.118	591073.520	-0.483	-	PROJECT	REBAR
P6727-22	466196.283	591028.916	-	13.637	5466196.133	591028.910	-3.602	-	PROJECT	REBAR
P6728-22	466283.532	591020.439	-	13.014	5466283.357	591020.436	-4.233	-	PROJECT	REBAR
P6729-22	466185.794	590959.371	-	10.670	5466185.648	590959.385	-6.577	0.999703	PROJECT	REBAR
P6730-22	466226.255	591230.721	-	28.381	5466226.096	591230.657	11.134	-	PROJECT	REBAR
P6731-22	466300.185	591280.516	-	30.209	5466300.005	591280.438	12.979	0.999700	PROJECT	REBAR
P6732-22	466400.322	591228.471	-	38.364	5466400.113	591228.407	21.135	-	PROJECT	REBAR
P6733-22	464909.548	590682.006	-	30.243	5464909.767	590682.099	12.972	0.999699	PROJECT	REBAR
P6734-22	466302.726	591249.510	-	25.776	5466302.545	591249.441	8.505	-	PROJECT	REBAR
P6735-22	466329.775	591206.991	-	21.593	5466329.587	591206.934	4.322	-	PROJECT	REBAR
P6736-22	466280.400	591098.732	-	17.721	5466280.226	591098.706	0.450	-	PROJECT	REBAR

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

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

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 The people behind your infrastructure.	R.F. BINNIE & ASSOCIATES LTD. 300 - 4940 Canada Way, Burnaby, BC V5G 4K6 TEL 604 420 1723 BINNIE.com	 BRITISH COLUMBIA	MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE SOUTH COAST REGION HIGHWAY ENGINEERING AND GEOMATICS																																																		
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	DRAWN: _____ N.B. DATE: JAN. 2023																																																				
PROJECT NUMBER: 14045	REG: 1	DRAWING NUMBER: R1-1050-002	REV: _____																																																		

LEGEND

AERIAL UTILITIES (EXISTING)

Deadman	○→
Anchor / Guy Wire	→
High Tension Pole	⊙
High Tension Tower	⊠
Power Guy Pole	⊙
Power / Phone Guy Pole	⊙
Power Poles	⊙
Power Pole with Transformer	⊙
Power / Phone Pole with Transformer	⊙
Power / Phone Pole	⊙
Telephone Pole	○
Telephone Guy Pole	○
Pedestal (B.C. Tel.)	□ PED
Telephone Booth	⊠

SURVEY (EXISTING)

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

DETAIL (EXISTING)

Septic Field	⊠
Concrete Pillar	○
Guard Post	○ Post
Piling	○ Piling
Gate Post	⊙
Swamp	⊠
Road Sign	⊠
Well	⊠
Tree	✱
Decorative Tree	⊙
Delineator Post	○ DP
Flag Pole	○ FP
Mail Box	○ MB
Top of Bank	⊠

DRAINAGE (EXISTING)

Catch Basin / Manhole	■
Culvert Outlet	→ CO
Culvert Inlet	← CI
Culvert Headwall	⊠
Drainage Grate	■
Manhole	⊙
Catch Basin	■
Culvert Kink	•
Asphalt Spillway	⊠

METERS (EXISTING)

Service Meter	⊙ SV
Water Meter	⊙ WM
Valve	⊙ V
Water valve	⊙ WV
Fire Hydrant	⊙ FH
Gas Valve	⊙ GV
Observation Well	⊠ OW

UNDERGROUND (EXISTING)

Filler Cap	○ FC
Fuel / Gas Pump	○ FP
Fuel Tank	⊠ FT
Septic Tank	⊠ ST
Underground Marker	⊙ UM
Breather / Vent Pipe	○ BP

ELECTRICAL (EXISTING)

Traffic Signal Control Box	⊠
Electrical Outlet	⊙
Junction Box	○ JB
Kiosk	⊠
Lamp Standard	○ LS
Traffic Signal	⊠
Traffic Counter	○

LEGAL LINETYPES (EXISTING)

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

MAN MADE FEATURES LINETYPES (EXISTING)

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

UNDERGROUND UTILITIES LINETYPES (EXISTING)

Gas Main	⊠
Oil	⊠
Sanitary Sewer Line	⊠
Storm / Sewer Drain	⊠
Electrical Cable	⊠
Miscellaneous	⊠
Telephone Cable	⊠
Water Main	⊠
Culvert	⊠

OVERHEAD UTILITIES LINETYPES (EXISTING)

High Tension Wire	⊠
-------------------	---

HYDRAULIC LINETYPES (EXISTING)

Creek / Ditch / Stream	⊠
Edge of Water	⊠
Major Catchment Boundary	⊠
Sub-Catchment Boundary	⊠

GEOTECHNICAL (EXISTING)

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

DRAINAGE (PROPOSED)

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

SIGNS (PROPOSED)

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

LEGAL LINETYPES (PROPOSED)

Highway Right of Way	⊠
Easement	⊠

CONSTRUCTION DETAILS LINETYPES (PROPOSED)

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

SURFACE (PROPOSED)

Centerline Alignment	⊠
Edge of Pavement	⊠
Concrete Barrier	⊠
Slope Stake Line	⊠
Fence	⊠
Retaining Wall	⊠
Paint Lines - Solid	⊠
Paint Lines - Dashed	⊠
Curb Line	⊠
Trail	⊠

UNDERGROUND (PROPOSED)

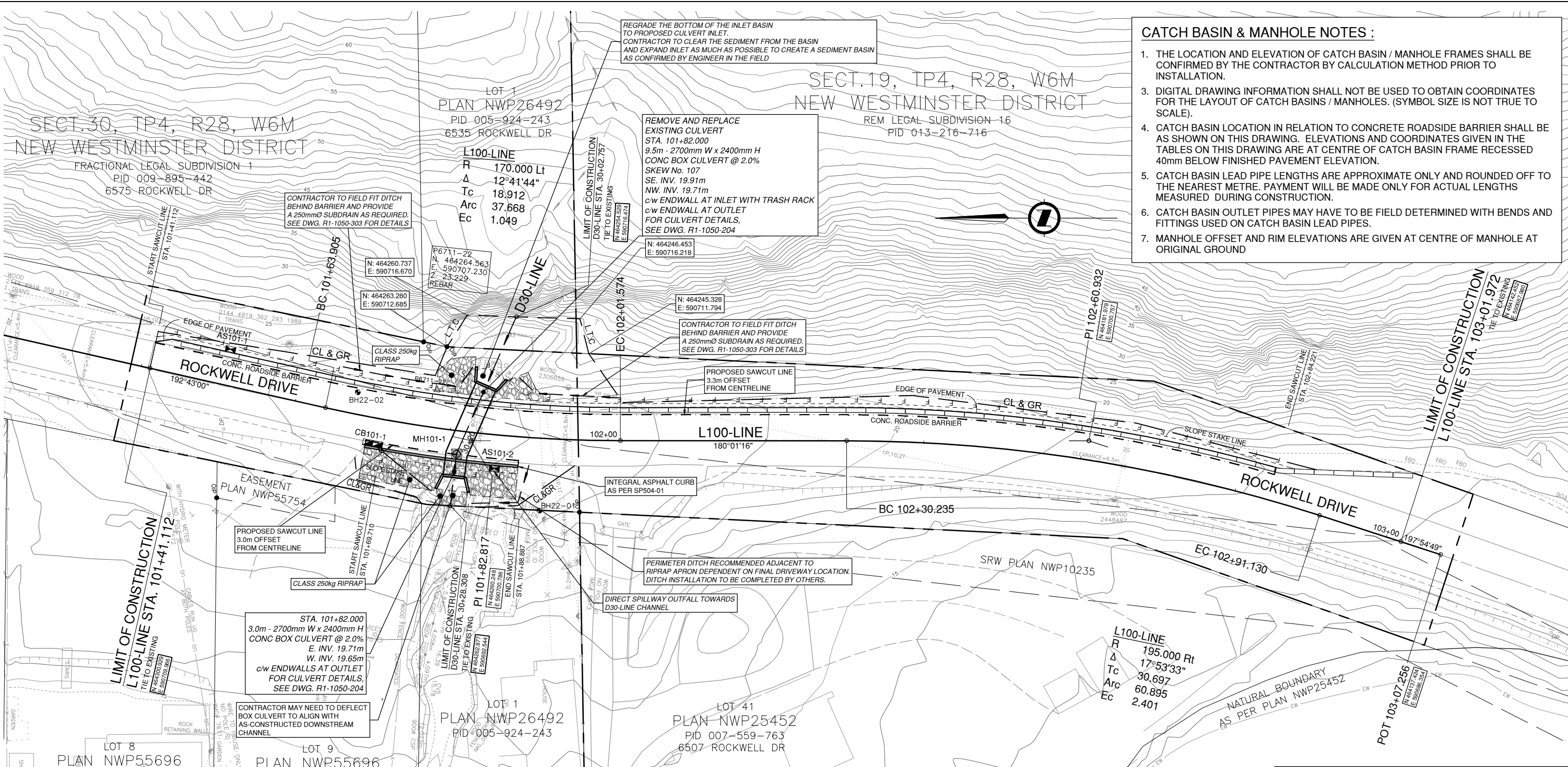
Gas Main	⊠
Oil	⊠
Sanitary Sewer Line	⊠
Storm / Sewer Drain	⊠
Electrical Cable	⊠
Miscellaneous	⊠
Telephone Cable	⊠
Water Main	⊠
Culvert	⊠

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			<p>SCALE 0 10 1:1000 50m</p> <p>CAD FILENAME 000KP-ROCKWELL-DF1_21-1067.DWG DATE 2023-01-12 FILE NUMBER 21-1067</p> <table border="1"> <thead> <tr> <th>REV</th> <th>DATE</th> <th>REVISIONS</th> <th>SIGNATURE</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>	REV	DATE	REVISIONS	SIGNATURE																																	<p>R.F. BINNIE & ASSOCIATES LTD. EGBC PERMIT TO PRACTICE NUMBER 1001128</p> <p>DESIGNED: _____ J.T. DATE JAN. 2023 QUALITY CONTROL: _____ M.C. DATE JAN. 2023 QUALITY ASSURANCE: _____ A.M. DATE JAN. 2023 DRAWN: _____ N.B. DATE JAN. 2023</p> <p>MICHAEL CARREIRA ENGINEER OF RECORD DATE</p> <table border="1"> <tr> <td>PROJECT NUMBER</td> <td>REG</td> <td>DRAWING NUMBER</td> <td>REV</td> </tr> <tr> <td>14045</td> <td>1</td> <td>R1-1050-003</td> <td> </td> </tr> </table>	PROJECT NUMBER	REG	DRAWING NUMBER	REV	14045
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ISSUED FOR ENVIRONMENTAL APPROVAL - JAN. 12, 2023

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CATCH BASIN & MANHOLE NOTES :

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

MANHOLE SUMMARY - DWG No. R1-1050-101

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

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

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

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

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

CONSTRUCTION NOTES:

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

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

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

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

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

DRAFT

CLEARING AND GRUBBING
TOTAL THIS SHEET: 0.0606 ha

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SCALE 0 2 1:250 12m

CAD FILENAME 100PL-ROCKWELL-DF1 21-1067.DWG
DATE 2023-01-12
FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

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

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

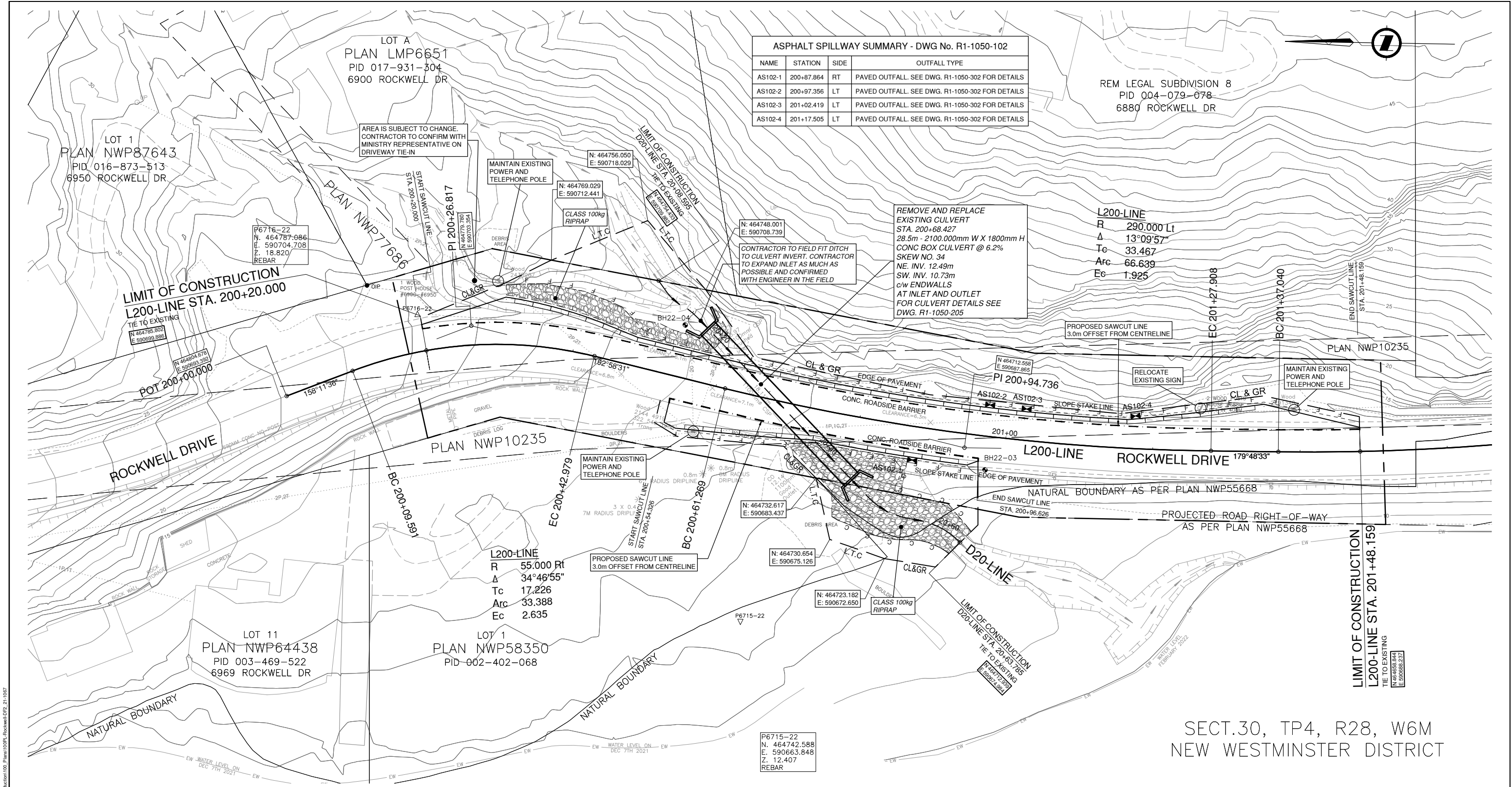
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QUALITY CONTROL: M.C. DATE: JAN. 2023
QUALITY ASSURANCE: A.M. DATE: JAN. 2023
DRAWN: J.T. DATE: JAN. 2023

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MICHAEL CARREIRA
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DATE

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

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

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

REM LEGAL SUBDIVISION 8
PID 004-079-078
6880 ROCKWELL DR



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- FOR PLANS SEE DWG. R1-1050-101 to 103
- FOR PROFILES AND CULVERT SECTIONS SEE DWG. R1-1050-201 to 206
- FOR TYPICAL SECTIONS SEE DWG. R1-1050-301 to 304
- FOR GEOMETRICS, LANING, SIGNING, AND PAVEMENT MARKINGS SEE DWG. R1-1050-401 to 403

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CLEARING AND GRUBBING TOTAL THIS SHEET: 0.0928 ha

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HIGHWAY ENGINEERING AND GEOMATICS

SCALE 0 2 1:250 12m

CAD FILENAME 100PL-ROCKWELL-DF2_21-1067.DWG
DATE 2023-01-12
FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

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

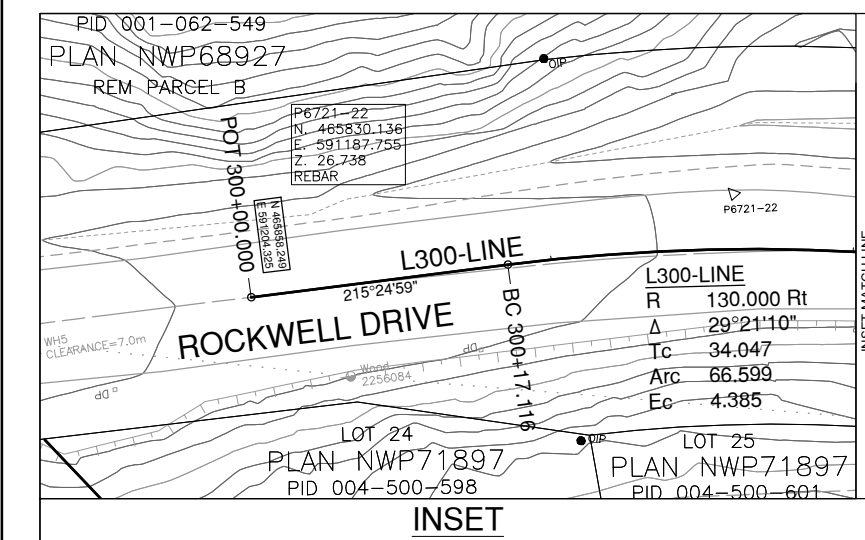
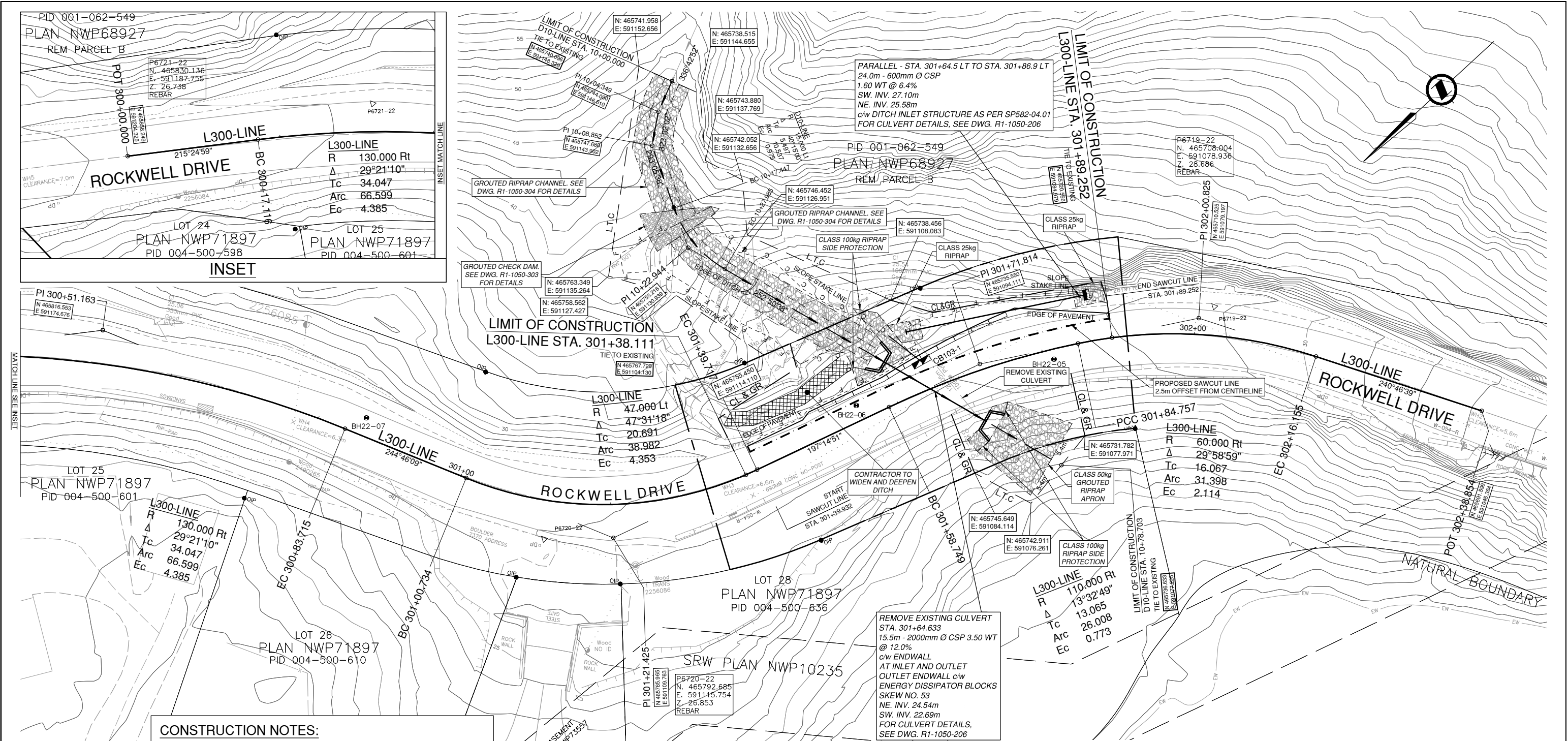
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DRAWN: J.T. DATE: JAN. 2023

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

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- CONSTRUCTION NOTES:**
- CLEARING AND GRUBBING SHALL BE FROM THE EXISTING EDGE OF PAVEMENT TO THE RIGHT OF WAY OR TLCA BOUNDARY UNLESS OTHERWISE NOTED.
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- THE LOCATION AND ELEVATION OF CATCH BASIN FRAMES SHALL BE CONFIRMED BY THE CONTRACTOR BY CALCULATION METHOD PRIOR TO INSTALLATION.
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 - OUTLET PIPES MAY HAVE TO BE FIELD DETERMINED WITH BENDS AND FITTINGS USED ON CATCH BASIN LEAD PIPES.

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

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

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

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

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

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

DRAFT

CLEARING AND GRUBBING
TOTAL THIS SHEET: 0.1099 ha

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SCALE 0 2 1:250 12m

CAD FILENAME 100PL-ROCKWELL-DF3_21-1067.DWG
DATE 2023-01-12
FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

BRITISH COLUMBIA

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

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

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NUMBER 1001128

MICHAEL CARREIRA
ENGINEER OF RECORD
DATE

DESIGNED	N.B. / A.M.	DATE
		JAN. 2023

QUALITY CONTROL	M.C.	DATE
		JAN. 2023

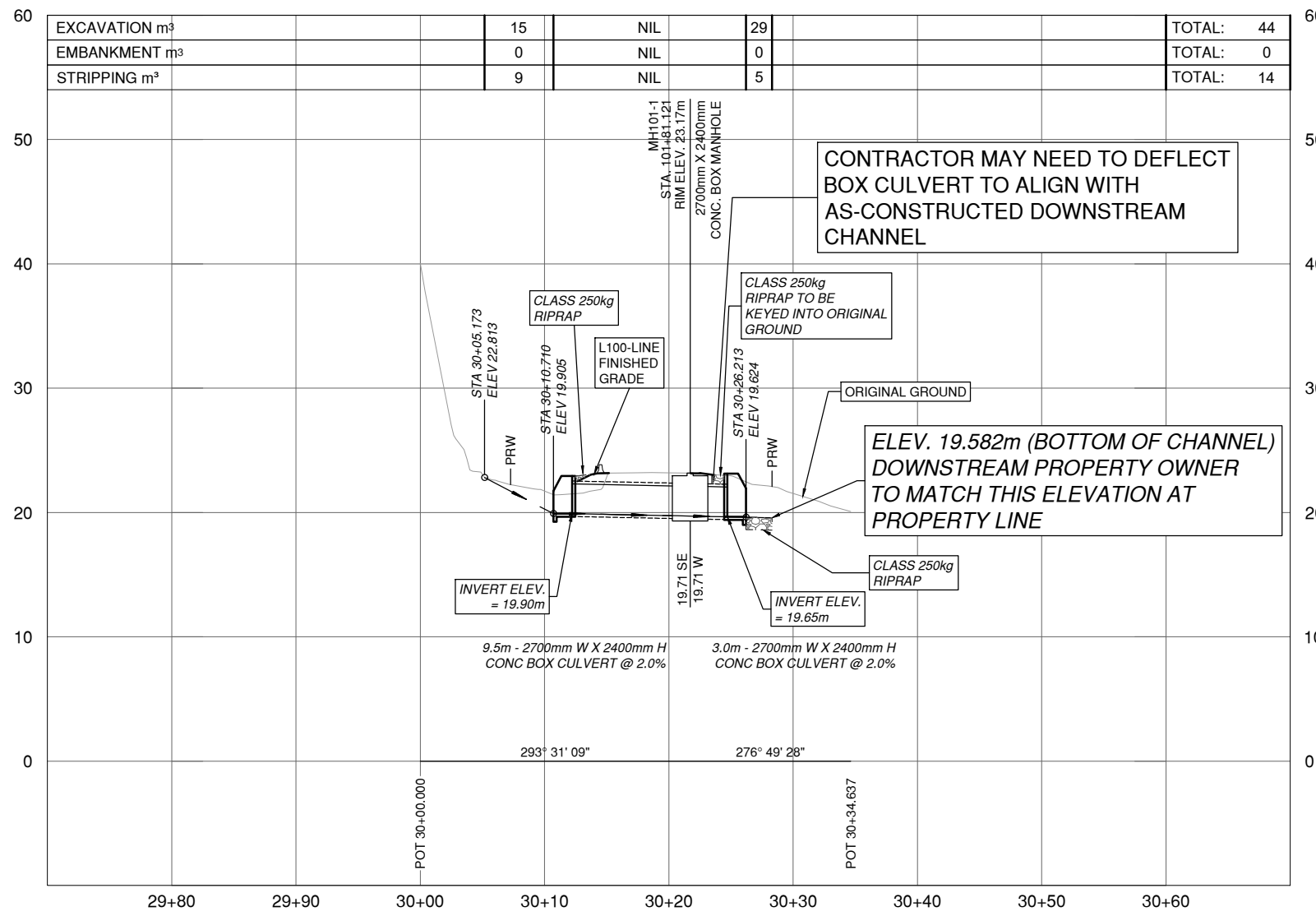
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		JAN. 2023

DRAWN	N.B.	DATE
		JAN. 2023

PROJECT NUMBER	REG	DRAWING NUMBER	REV
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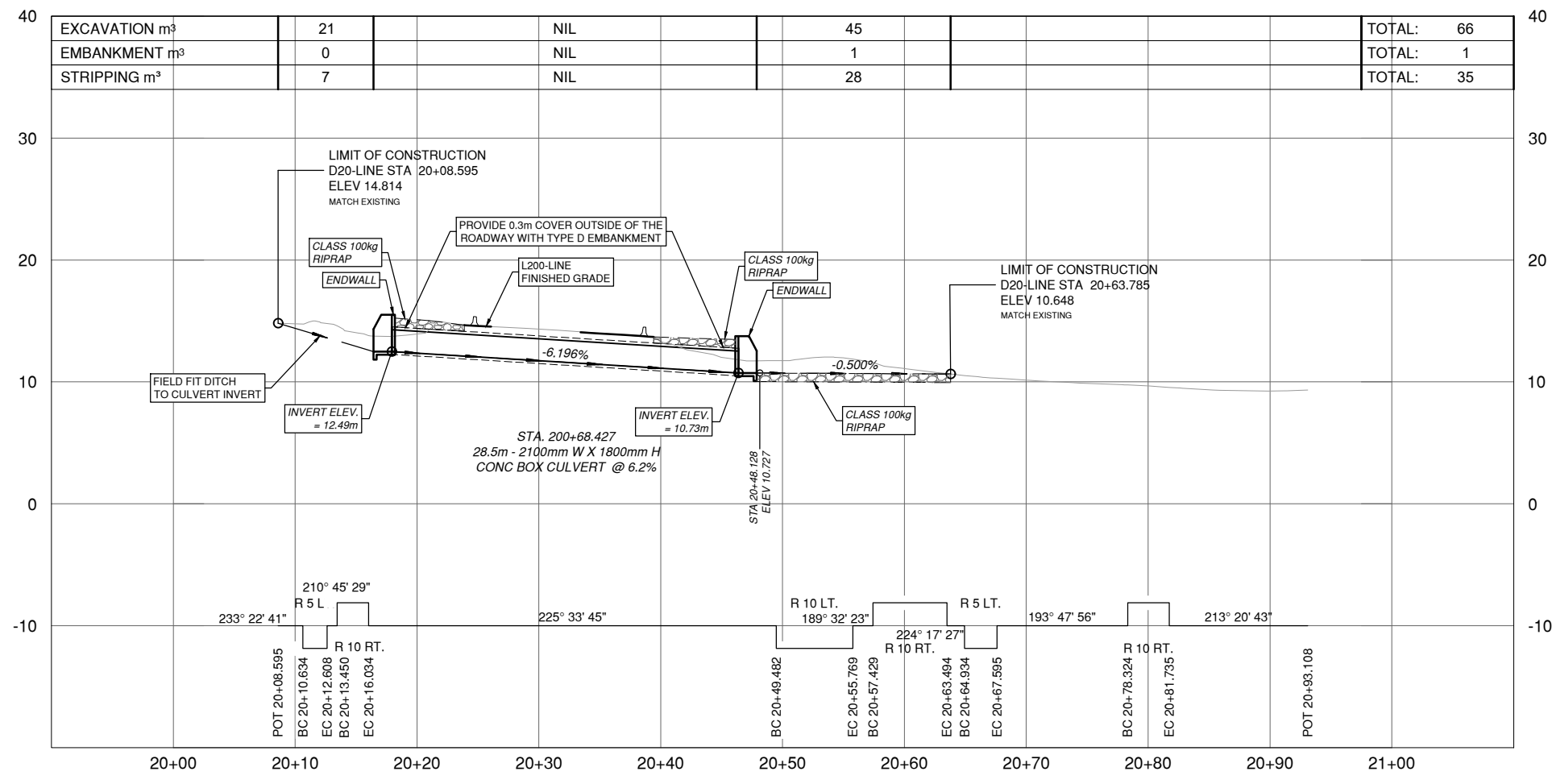
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STRIPPING m ³	9	NIL	5	TOTAL:	14

- FOR PLANS
SEE DWG. R1-1050-101 to 103
- FOR PROFILES AND
CULVERT SECTIONS
SEE DWG. R1-1050-201 to 206
- FOR TYPICAL SECTIONS
SEE DWG. R1-1050-301 to 304
- FOR GEOMETRICS, LANING
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SEE DWG. R1-1050-401 to 403

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SCALE CAD FILENAME 200PR-ROCKWELL-DF1_21-1067.DWG DATE 2022-12-08 FILE NUMBER 21-1067		D30-LINE PROFILE ROCKWELL DRIVE FLOOD RECOVERY SITES DF1, DF2, AND DF3 DF1																																				
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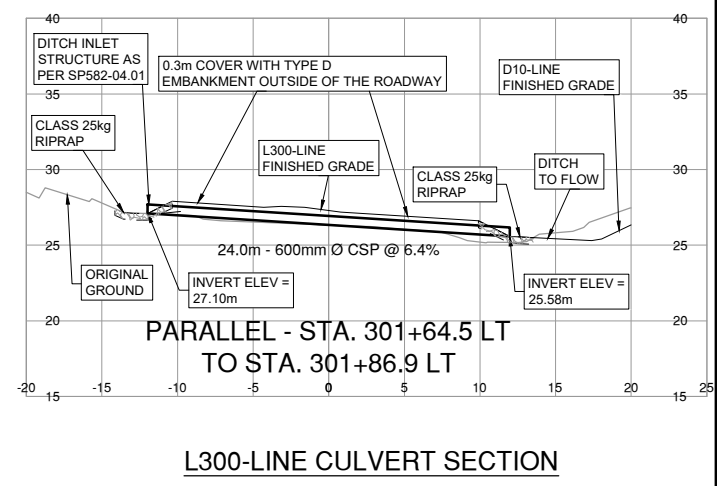
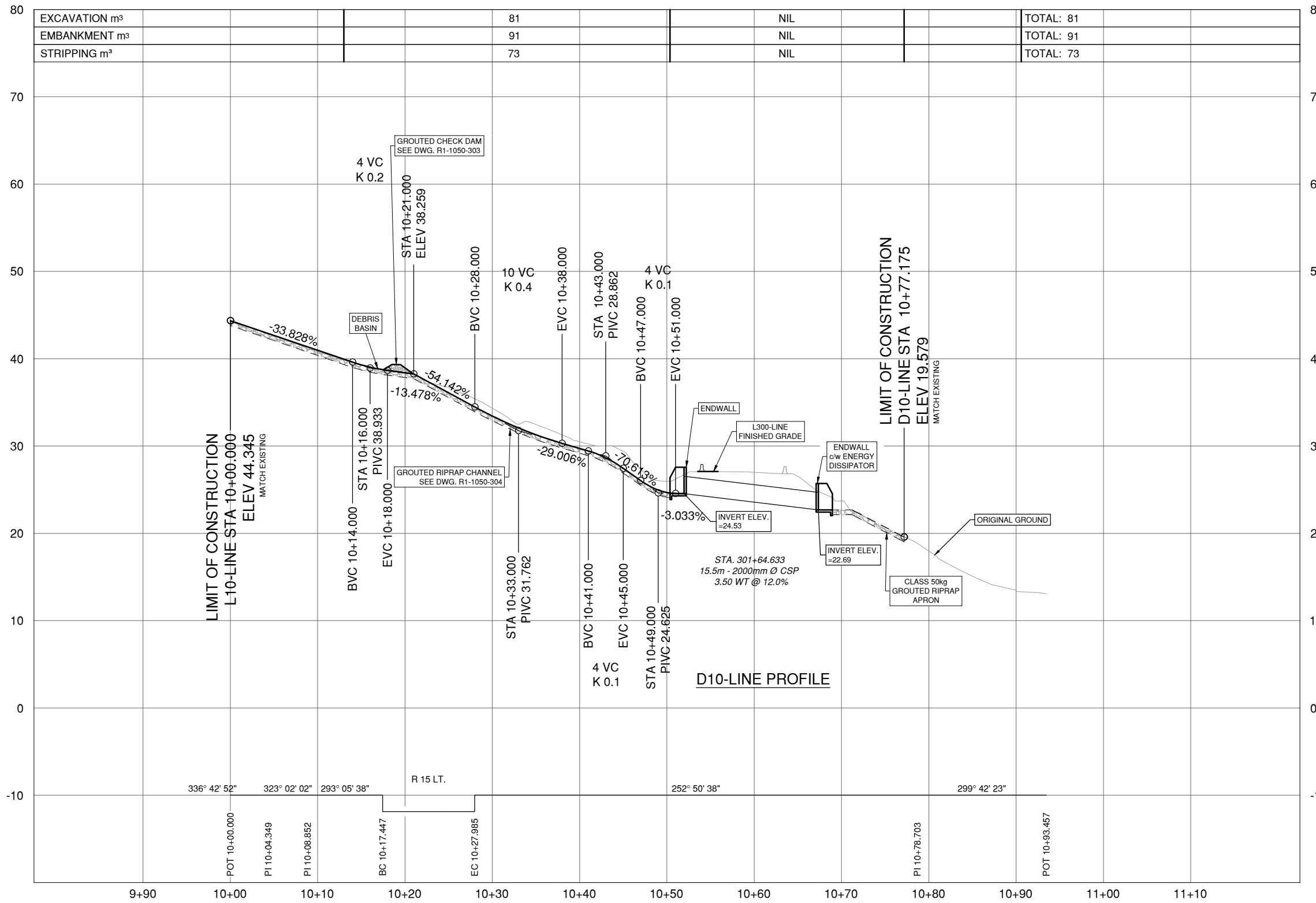
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- FOR PLANS
SEE DWG. R1-1050-101 to 103
- FOR PROFILES AND
CULVERT SECTIONS
SEE DWG. R1-1050-201 to 206
- FOR TYPICAL SECTIONS
SEE DWG. R1-1050-301 to 304
- FOR GEOMETRICS, LANING
SIGNING, AND PAVEMENT MARKINGS
SEE DWG. R1-1050-401 to 403

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ISSUED FOR ENVIRONMENTAL APPROVAL - JAN. 12, 2023

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SCALE $\frac{0 \quad 2 \quad 1:250 \quad 12m}{\rule{1.5cm}{0.4pt}}$		D20-LINE PROFILE ROCKWELL DRIVE FLOOD RECOVERY SITES DF1, DF2, AND DF3 DF2																																												
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REV	DATE	REVISIONS	SIGNATURE																																											
PROJECT NUMBER: 14045 REG: 1		DRAWING NUMBER: R1-1050-205 REV: _____																																												



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

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- FOR PLANS
SEE DWG. R1-1050-101 to 103
- FOR PROFILES AND
CULVERT SECTIONS
SEE DWG. R1-1050-201 to 206
- FOR TYPICAL SECTIONS
SEE DWG. R1-1050-301 to 304
- FOR GEOMETRICS, LANING
SIGNING, AND PAVEMENT MARKINGS
SEE DWG. R1-1050-401 to 403

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SCALE 0 2 1:250 12m CAD FILENAME 200PR-ROCKWELL_DFS_21-1067.DWG

DATE 2022-12-08 FILE NUMBER 21-1067

REV	DATE	REVISIONS	SIGNATURE

BRITISH COLUMBIA

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

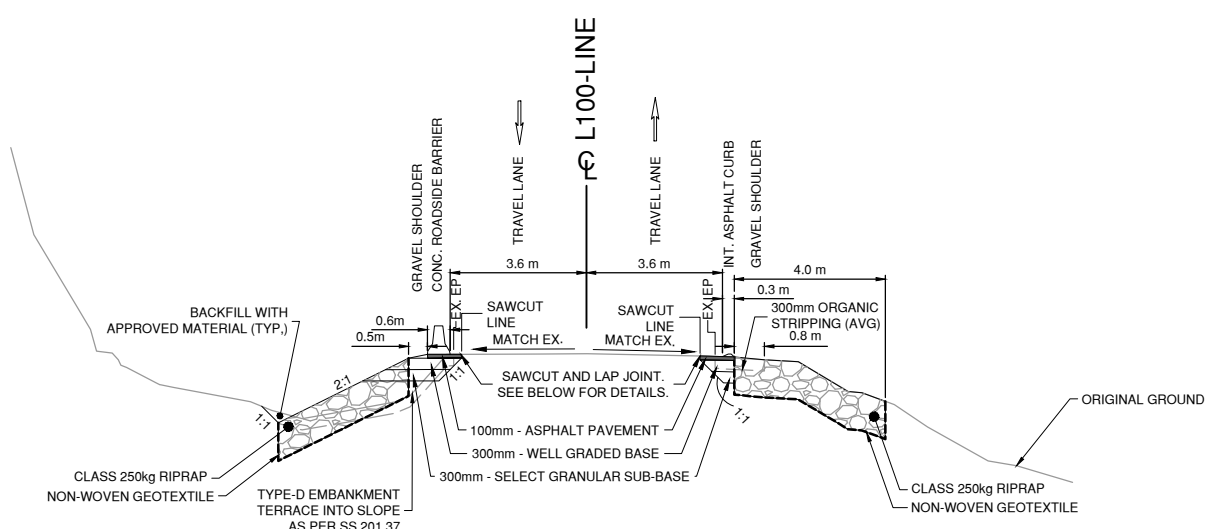
D10-LINE PROFILE AND CULVERT SECTION
ROCKWELL DRIVE FLOOD RECOVERY
SITES DF1, DF2, AND DF3
DF3

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

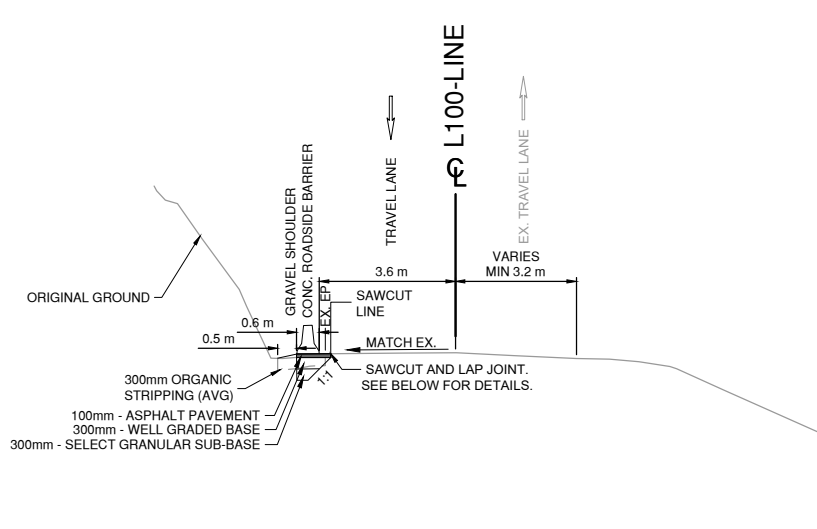
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QUALITY ASSURANCE	_____	A.M.	DATE	_____	JAN. 2023
DRAWN	_____	N.B.	DATE	_____	JAN. 2023

MICHAEL CARREIRA
ENGINEER OF RECORD
DATE _____

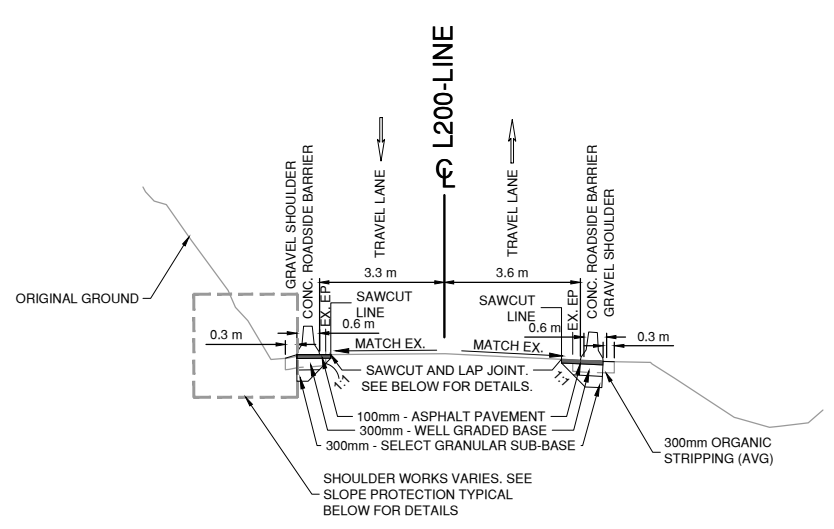
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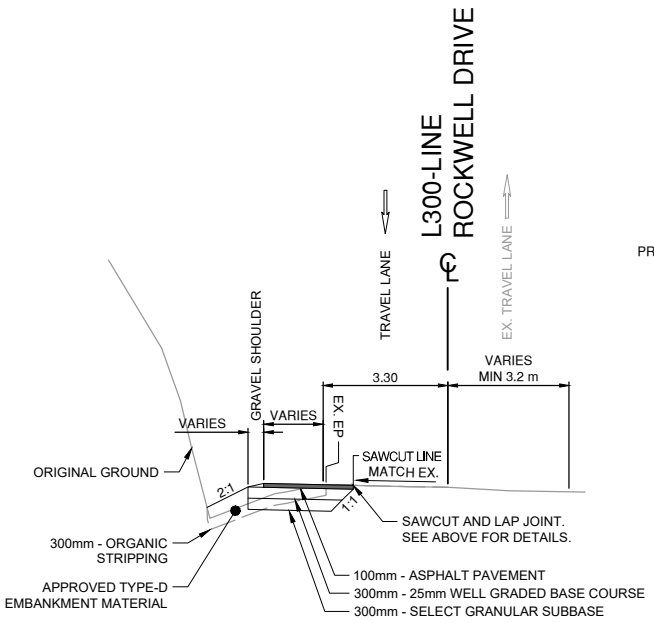
ROCKWELL DRIVE DF1 (L100-LINE)
TYPICAL SECTION - WIDENING BOTH SIDES
 STA. 101+80.420 LT TO STA. 101+86.000 LT
 STA. 101+69.710 RT TO STA. 101+88.888 RT



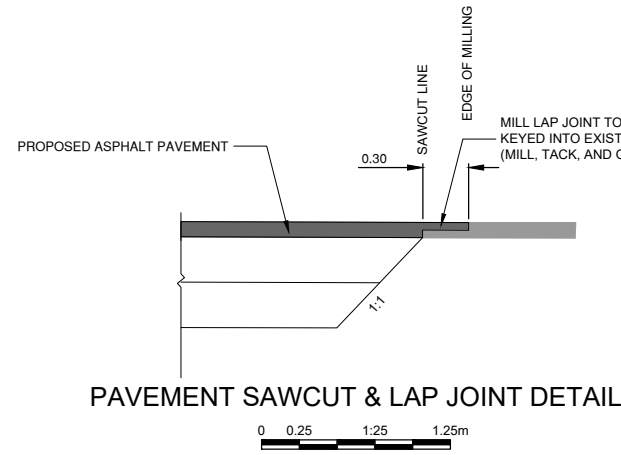
ROCKWELL DRIVE DF1 (L100-LINE)
TYPICAL SECTION - WIDENING WESTBOUND
 STA. 101+43.112 LT TO STA. 101+80.420 LT
 STA. 101+86.000 LT TO STA. 102+86.473 LT



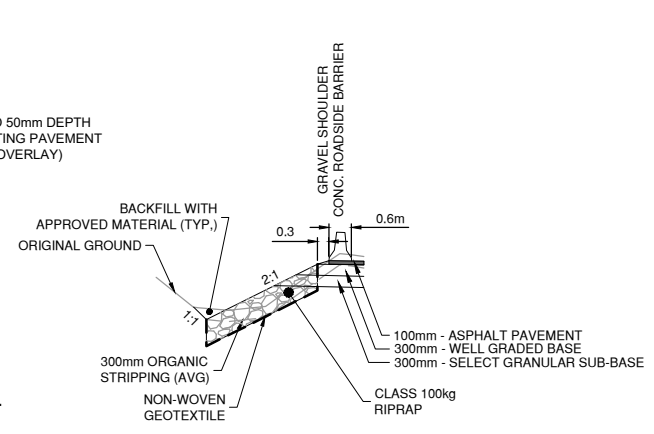
ROCKWELL DRIVE DF2 (L200-LINE)
TYPICAL SECTION - WIDENING



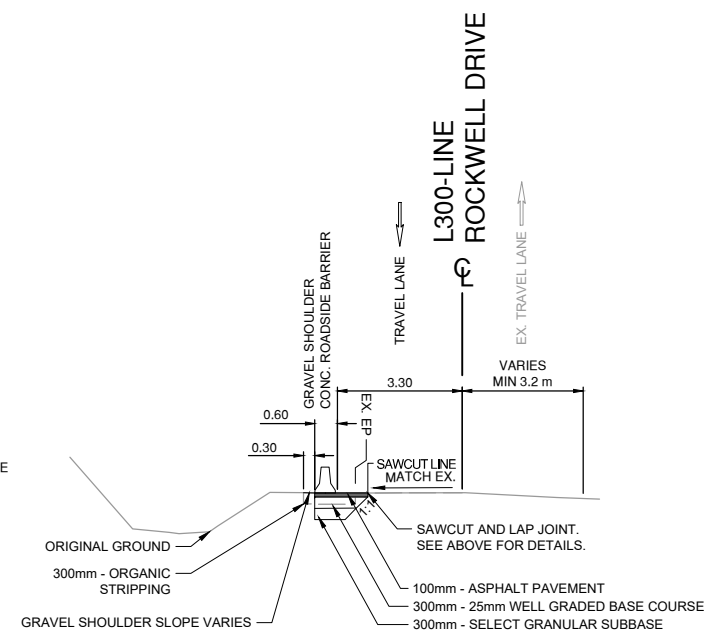
ROCKWELL DRIVE DF3 (L300-LINE) - OPEN SHOULDER
TYPICAL SECTION - WIDENING
 STA. 301+39.932 TO STA. 301+49.788
 STA. 301+78.000 TO STA. 301+89.253



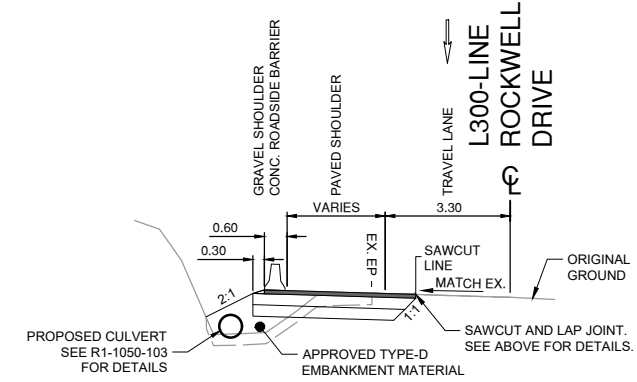
PAVEMENT SAWCUT & LAP JOINT DETAIL



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



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



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

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

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

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

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

NOTES:
 1. HYDROSEED ALL CUT AND FILL SLOPES.

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CAD FILENAME: 300TS-ROCKWELL-DF1 21-1067.DWG
 DATE: 2022-12-08
 FILE NUMBER: 21-1067

REV	DATE	REVISIONS	SIGNATURE

BRITISH COLUMBIA

MINISTRY OF TRANSPORTATION
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 SOUTH COAST REGION
 HIGHWAY ENGINEERING AND GEOMATICS

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

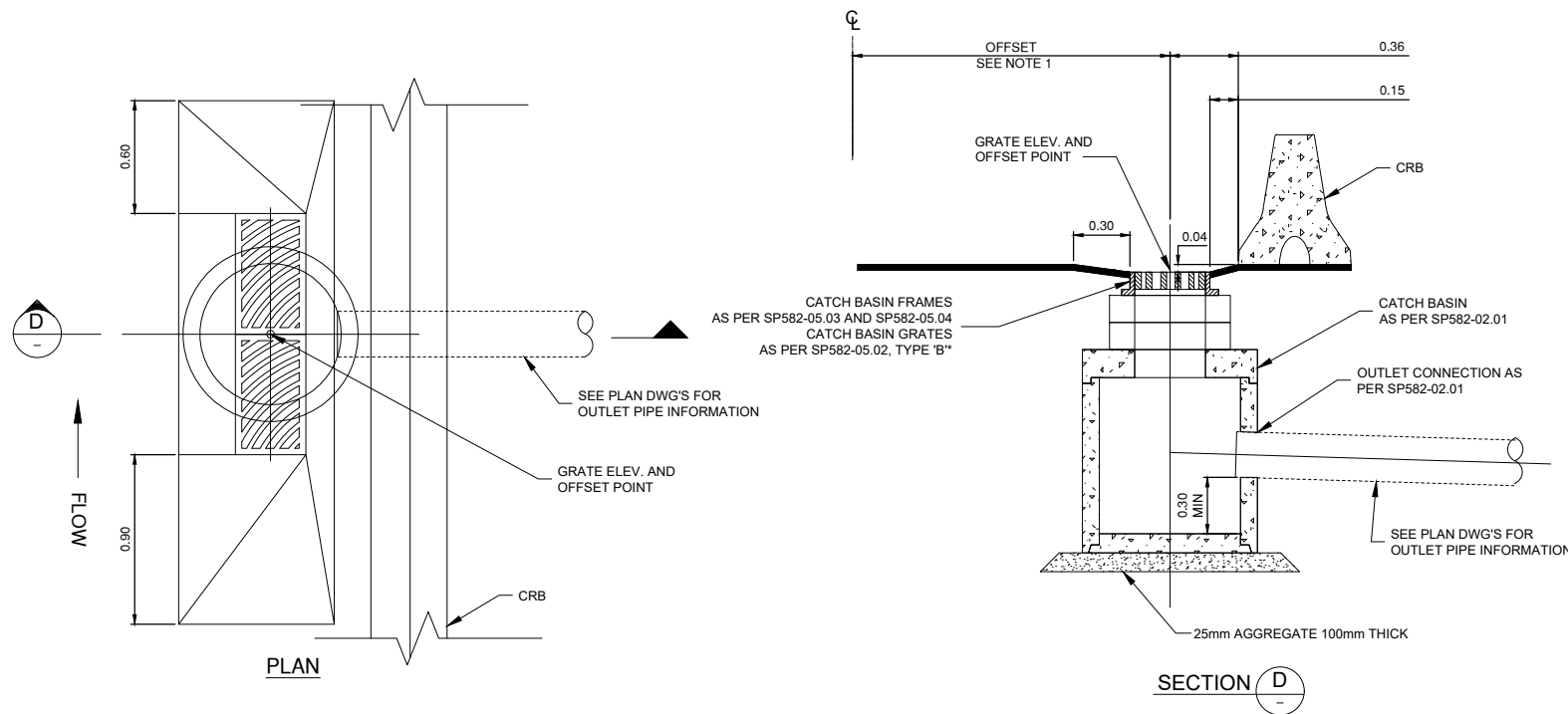
DESIGNED	J.T. (A.M.)	DATE	JAN. 2023
QUALITY CONTROL	M.C.	DATE	JAN. 2023
QUALITY ASSURANCE	A.M.	DATE	JAN. 2023
DRAWN	J.T.	DATE	JAN. 2023

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

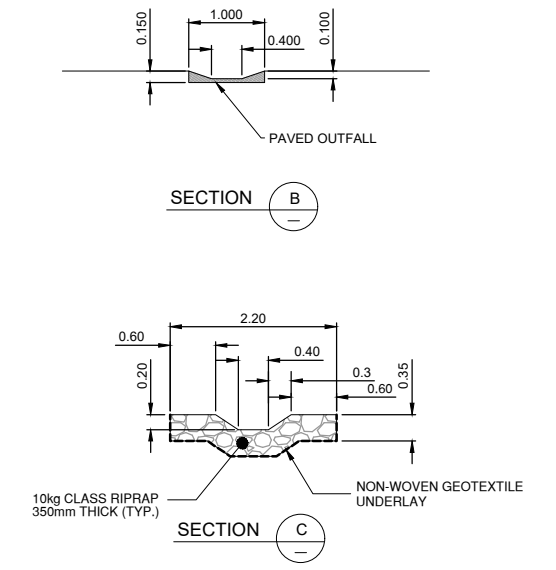
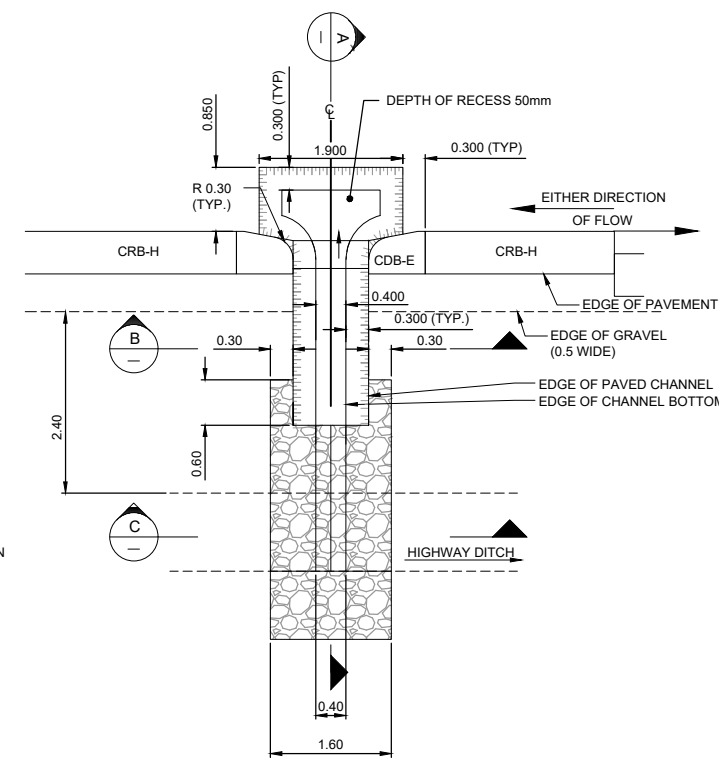
MICHAEL CARREIRA
 ENGINEER OF RECORD
 DATE

PROJECT NUMBER	REG	DRAWING NUMBER	REV
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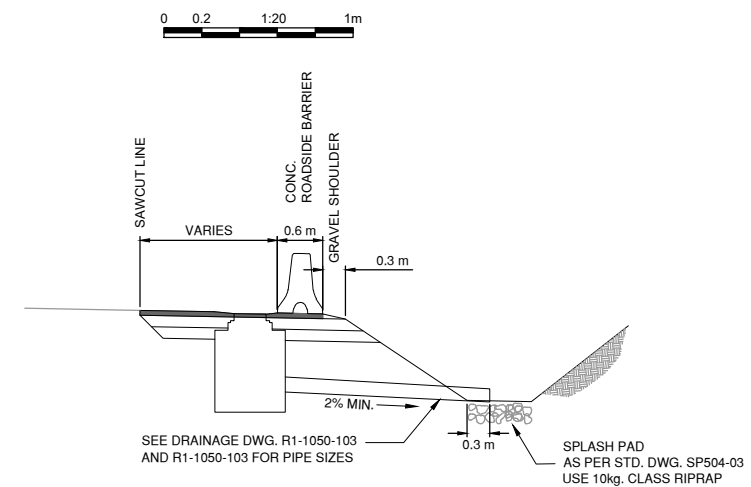
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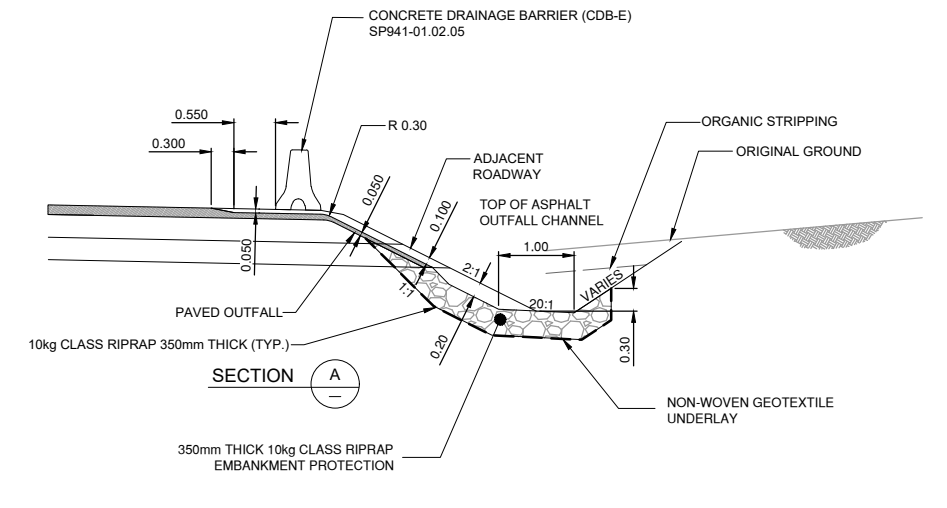
* SEE PLAN DRAWINGS FOR LOCATION AND TYPE
 NOTE 1: SEE PLAN DRAWINGS R1-1050-101 AND R1-1050-103 FOR CATCH BASIN OFFSETS AND GRATE ELEVATIONS



CATCH BASIN ADJACENT TO CONCRETE BARRIER



CATCH BASIN WITH BARRIER AND PIPED OUTFALL TO DITCH



PAVED OUTFALL IN CUT
 LOCATIONS AS SHOWN ON PLAN DRAWINGS

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

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

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

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

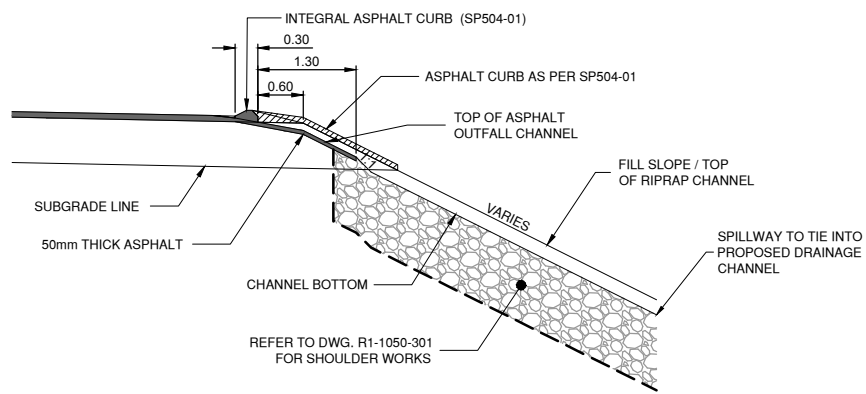
NOTES:
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DRAFT

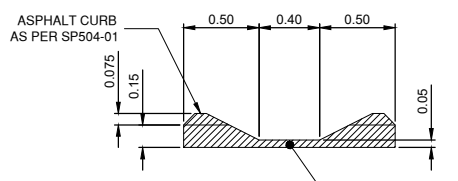
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			<p>SCALE AS SHOWN</p> <p>CAD FILENAME: 300TS-ROCKWELL-DF1_21-1067.DWG DATE: 2022-12-08 FILE NUMBER: 21-1067</p>	<table border="1"> <thead> <tr> <th>REV</th> <th>DATE</th> <th>REVISIONS</th> <th>SIGNATURE</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>	REV	DATE	REVISIONS	SIGNATURE																																					
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<p>MICHAEL CARREIRA ENGINEER OF RECORD DATE</p>		<table border="1"> <tr> <th>PROJECT NUMBER</th> <th>REG</th> <th>DRAWING NUMBER</th> <th>REV</th> </tr> <tr> <td>14045</td> <td>1</td> <td>R1-1050-302</td> <td> </td> </tr> </table>		PROJECT NUMBER	REG	DRAWING NUMBER	REV	14045	1	R1-1050-302																																			
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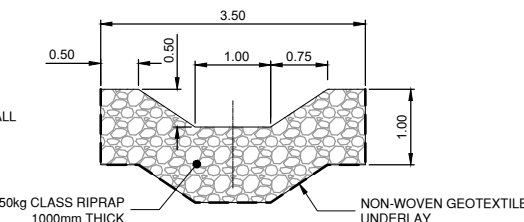
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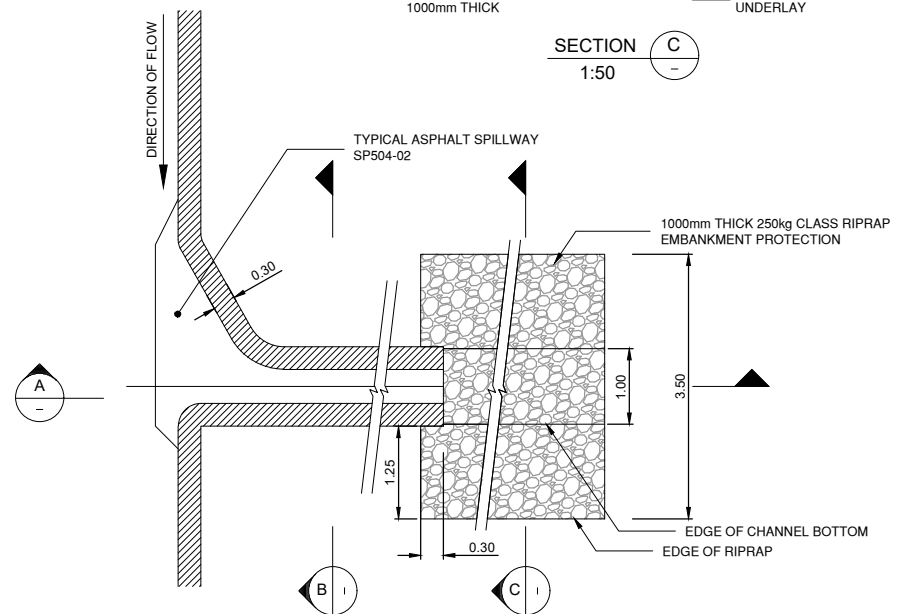
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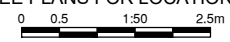
SECTION B
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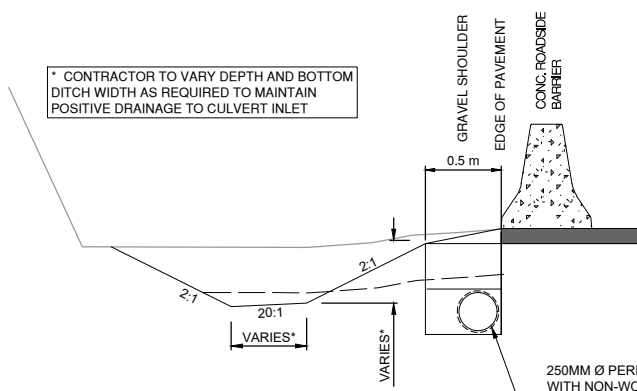
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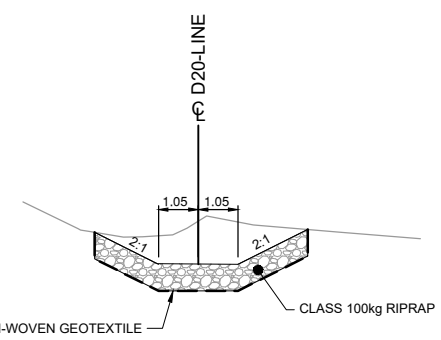
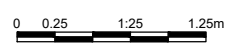
ASPHALT SPILLWAY WITH CURB & RIPRAP OUTFALL
(SEE PLANS FOR LOCATIONS)



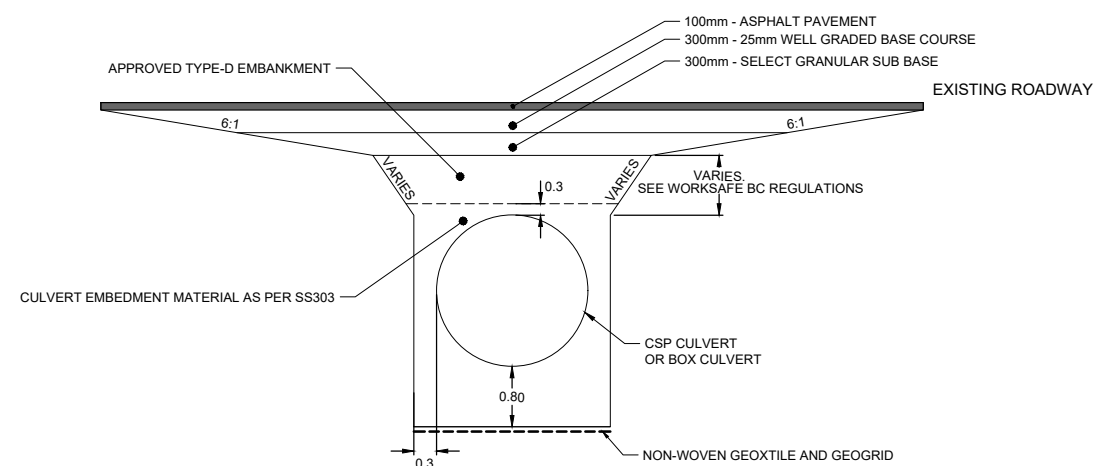
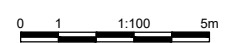
* CONTRACTOR TO VARY DEPTH AND BOTTOM DITCH WIDTH AS REQUIRED TO MAINTAIN POSITIVE DRAINAGE TO CULVERT INLET



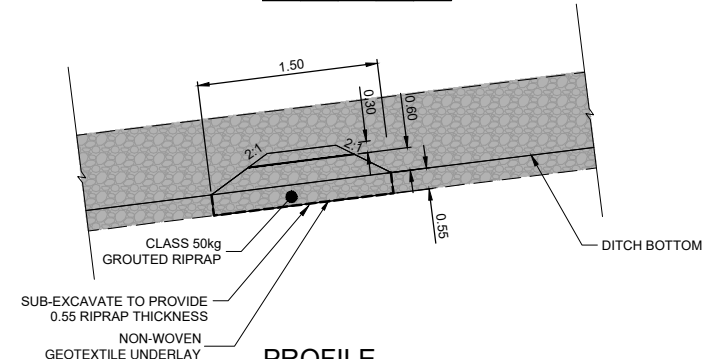
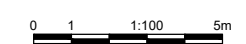
ROCKWELL DRIVE DF1 (L100-LINE)
FIELD FIT DITCH DETAIL



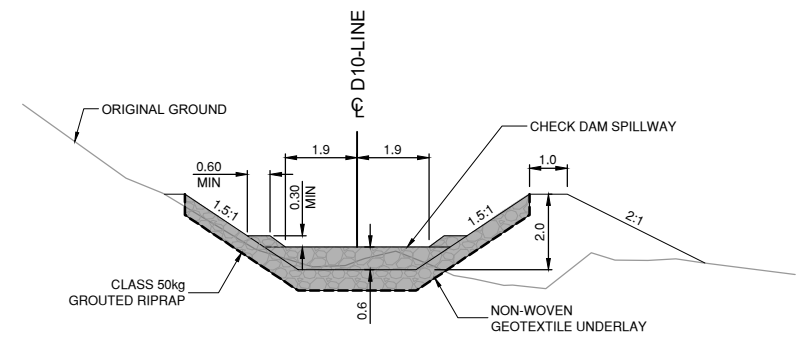
DF2 - D20-LINE
TYPICAL SECTION



TRENCHING DETAIL WITHIN EXISTING ROADWAY



PROFILE
N.T.S.



D10-LINE - DITCH CHECK DAM
SECTION A-A



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

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

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

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

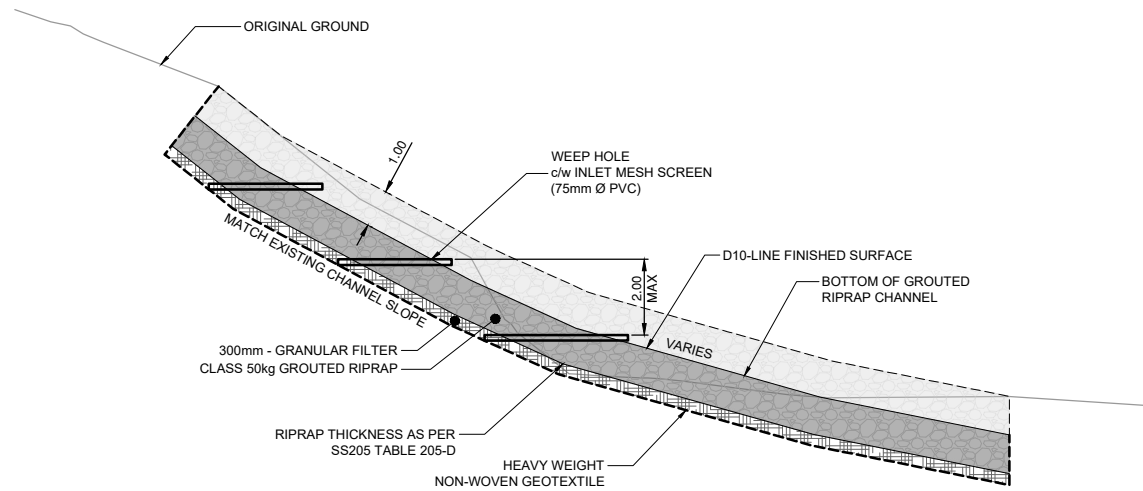
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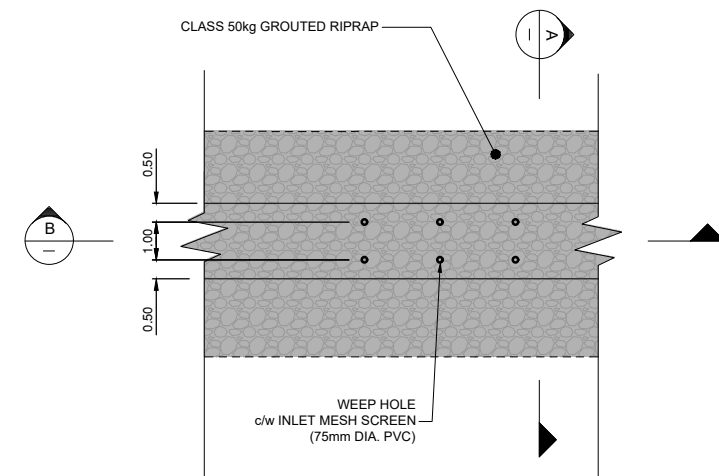
ISSUED FOR ENVIRONMENTAL APPROVAL - JAN. 12, 2023

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<p>SCALE AS SHOWN</p>		<p>CAD FILENAME: 300TS-ROCKWELL-DF1 21-1067.DWG DATE: 2022-12-08 FILE NUMBER: 21-1067</p>		<p>TYPICAL SECTIONS ROCKWELL DRIVE FLOOD RECOVERY SITES DF1, DF2, AND DF3</p>		
REV	DATE	REVISIONS	SIGNATURE	<p>DESIGNED: J.T. / A.M. DATE: JAN. 2023 QUALITY CONTROL: M.C. DATE: JAN. 2023 QUALITY ASSURANCE: A.M. DATE: JAN. 2023 DRAWN: J.T. DATE: JAN. 2023</p>		
			<p>R.F. BINNIE & ASSOCIATES LTD. EGBC PERMIT TO PRACTICE NUMBER 1001128</p>		<p>PROJECT NUMBER: 14045 REG: 1 DRAWING NUMBER: R1-1050-303</p>	
			<p>MICHAEL CARREIRA ENGINEER OF RECORD DATE:</p>		<p>DATE</p>	

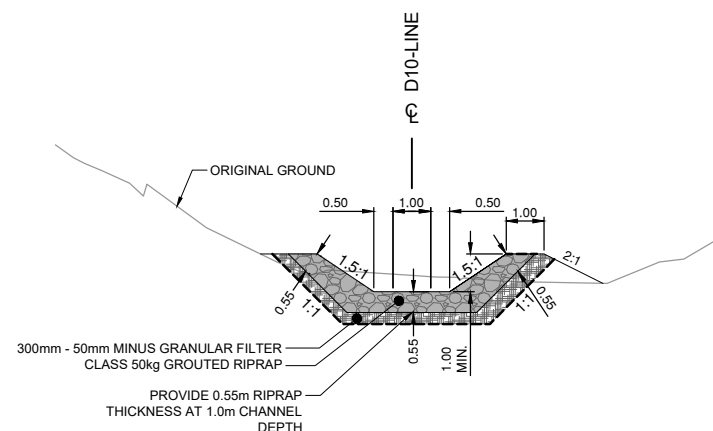
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SECTION B-B
GROUDED RIPRAP CHANNEL

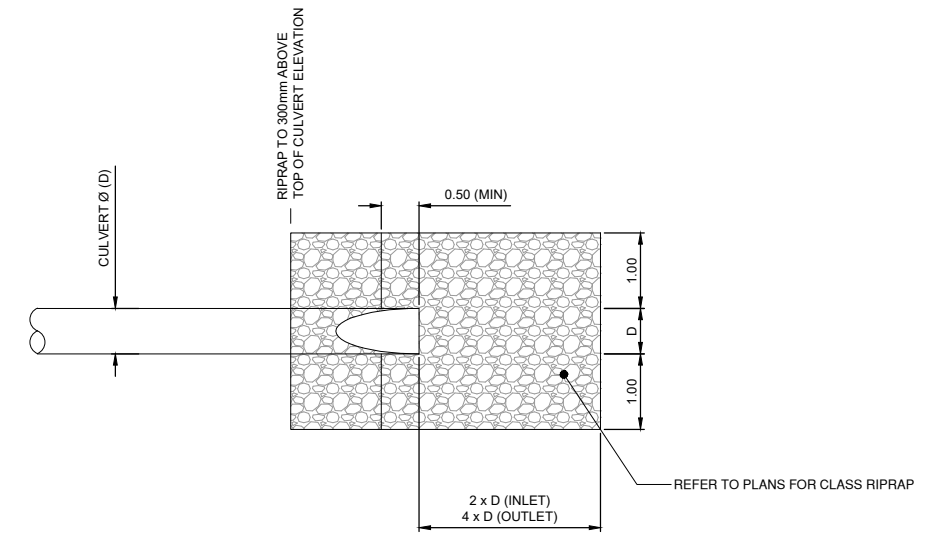


PLAN
GROUDED RIPRAP CHANNEL

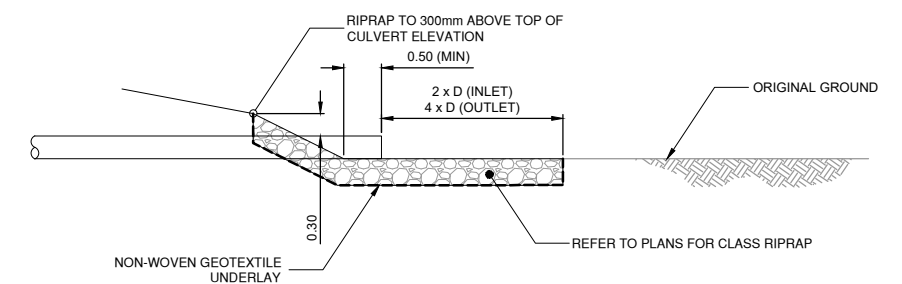


SECTION A-A
GROUDED RIPRAP CHANNEL

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



CULVERT RIPRAP IN FILL (PLAN)



CULVERT RIPRAP IN FILL (SECTION)

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

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

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

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

NOTES:

- HYDROSEED ALL CUT AND FILL SLOPES.

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<p>SCALE AS SHOWN</p>		<p>CAD FILENAME 300TS-ROCKWELL-DF1 21-1067.DWG DATE 2022-12-08 FILE NUMBER 21-1067</p>		<p>TYPICAL SECTIONS ROCKWELL DRIVE FLOOD RECOVERY SITES DF1, DF2, AND DF3</p>	
REV	DATE	REVISIONS	SIGNATURE	<p>R.F. BINNIE & ASSOCIATES LTD. EGBC PERMIT TO PRACTICE NUMBER 1001128</p>	
				<p>DESIGNED: J.T. DATE JAN. 2023 QUALITY CONTROL: M.C. DATE JAN. 2023 QUALITY ASSURANCE: A.M. DATE JAN. 2023 DRAWN: J.T. DATE JAN. 2023</p>	
				<p>MICHAEL CARREIRA ENGINEER OF RECORD DATE</p>	
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