

PGL File #: 0346-65.01
DATE: July 28, 2023
TO: FrontCounter BC
FROM: Stewart Brown, R.P.Bio., P.Ag.

Re: Change Approval Application Number 100403050 for Kenyon Creek and Flume Creek Culvert and Bank Stabilization Works

PGL Environmental Consultants (PGL) previously submitted a Change Approval application for Changes In and About a Stream (Tracking Number 100403050) on behalf of the Ministry of Transportation and Infrastructure (MOTI) for permanent culvert replacement and stream bank stabilization works at three roadway stream crossing sites (Table A) within the Sunshine Coast Regional District (SCRD) in response to widespread flooding from an atmospheric rain event in November 2021. The sites include:

- Where Kenyon Creek crosses under Redrooffs Road;
- Where Flume Creek crosses under Margaret Road; and
- Where Flume Creek crosses Beach Avenue.

Table A: Road Names (Site Names), Stream Names, Municipality within the SCR D, and Site Coordinates

Road Name (Site Name)	Stream Name	Location within SCR D	Site Coordinates
Redrooffs Road	Kenyon Creek	Sechelt, BC	Lat: 49.4803320
			Long: -123.8554920
Margaret Road	Flume Creek	Robert's Creek, BC	Lat: 49.4314860
			Long: -123.6693050
Beach Avenue	Flume Creek	Robert's Creek, BC	Lat: 49.4314860
			Long: -123.6693050

Permanent instream works were initially scheduled for the 2023 least-risk window but have been postponed until 2024. Urban Systems Ltd. (Urban) conducted site inspections on June 5, 2023, for the MOTI to assess current instream and infrastructure conditions at each crossing location and determine whether additional works would be required to reduce the risk of additional damage to infrastructure or wash-out during the winter and spring of 2023/2024 prior to the completion of permanent repair works in the fall of 2024. If the inspection found there were vulnerabilities, Urban determined the nature of "Phase 1" works to be required. Urban's findings are summarized in the following memos and included in Appendix 1:

- Urban Systems Ltd. July 24, 2023. *Memorandum: Project 14009 - Sunshine Coast DFAA – Kenyon Creek – Phase 1 Work*; and
- Urban Systems Ltd. July 24, 2023. *Memorandum: Project 14005 - Sunshine Coast DFAA – Flume Creek – Phase 1 Work*.

Urban identified risks and vulnerabilities to roadway and drainage components of the sites which require interim measures to be completed in the 2023 least-risk window (Appendix 1).

Phase 1 works will occur within the project footprint of the previously submitted Change Approval application (Appendix 2) except for the proposed riprap spillway located on the eastern edge of the project area on Redrooffs Road. Both proposed spillways will be constructed above the high-water mark on the existing gravel shoulder and will not require any vegetation removal.

Works have been summarized in Phase 1 (2023) and Phase 2 (2024) for each crossing for your reference.

1.1 Redrooffs Road Scope of Work

1.1.1 Redrooffs Phase 1 (2023)

Phase 1 Redrooffs Road design includes the following scope of work:

- Install 10kg riprap spillway underlain with geotextile in the location of the existing localized erosion. Exact extents to be determined while in the field.

1.1.2 Redrooffs Phase 2 (2024)

The permanent Redrooffs Road design includes the following scope of work:

- Removing the five temporary culverts installed under emergency works during the flooding event;
- Installing two, 35m-long, concrete, square box culverts side-by-side (two-barrel culvert crossing) – one 2.4m width x 2.4m height, the other 2.1m width x 2.1m height complete with fish baffle design (refer to appended civil engineering drawings);
- Installing one, 13m-long, 0.90m-diameter HDPE culvert;
- Installing 50kg Class (550mm thickness) riprap aprons (armoring) at the culvert inlets and outlets (6m length riprap armoring at inlets, and 12m-long armoring at outlets) on top of 150mm-thickness, medium-weight, non-woven geotextile fabric (keyed into ground);
- Regrading embankments and repaving Redrooffs Road according to finalized civil engineering drawings;
- Removing trees determined likely to fail, as described in the Arborist Summary Report; and
- Seeding and/or planting any disturbed vegetated areas from construction works and restoration areas.

1.2 Margaret Road Scope of Work

1.2.1 Margaret Road Phase 1 (2023)

Interim Margaret Road design includes the following scope of work:

- Cleaning out the existing culvert at Margaret Road intersection, which is plugged with granular material.

1.2.2 Margaret Road Phase 2 (2024)

The proposed permanent design scope of work at Margaret Road includes:

- Removing accumulated debris and gravel/sand substrate that may have accumulated at the culvert inlets/outlets during the atmospheric river event;
- Removing the three temporary CSP culverts at Margaret Road, which were installed under emergency works;
- Installing two side-by-side (double-barrel) concrete box culverts (both culverts 12.5m-long, one barrel 2.7m wide and 1.5m high, the other barrel 2.1m wide and 1.2m high), complete with a concrete headwall, and fish baffles (spacing of fish baffles is TBD);
- Clearing and grubbing (minor vegetation removal) at culvert inlets/outlets and along the road edges to accommodate the riprap armoring and road/driveway rebuilding;

- Stripping surface material and installing non-woven geotextile fabric to be covered by 450mm-thick class 25kg riprap armouring at the inlet and outlet (67m² of riprap at the inlet, and 95m² at the outlet);
- Excavating, stripping, rebuilding, grading, and paving an approximately 90m-long section of Margaret Road;
- Minor regrading of a residential driveway off Margaret Road; and
- Seeding and/or planting any disturbed vegetated areas from construction works and restoration areas.

1.3 Beach Avenue Scope of Work

1.3.1 Beach Avenue Phase 1 (2023)

The proposed design scope of work at Beach Avenue includes:

- Cleaning out the existing culvert at Beach Avenue intersection;
- Removing the gravel bar and realigning thalweg of Flume Creek to align with the center of the culvert crossings. This includes retaining and reusing existing channel gravels to restore the creek bed upon removal of the gravel bar;
- Trimming the existing most westerly culvert back to match other culverts, approximately 1.0–1.5m. Riprap may need to be adjusted because of this;
- Installing a bentonite clay cut-off wall below Beach Avenue culvert crossings to minimize the waterflow that bypasses the culverts. This involves excavating below the culvert and up to halfway up the side of the culverts, and then placing a blended bentonite clay in sandbags below the culvert inlets to seal water flow; and
- Backfilling the excavation with bedding material that was removed. If clay and sandbags are exposed with the potential to be damaged by debris, placing riprap to protect the bags is recommended.

1.3.2 Beach Avenue Phase 2 (2024)

The proposed permanent design scope of work at Beach Avenue includes:

- Removing accumulated debris and gravel/sand substrate that may have accumulated at the culvert inlets/outlets during the atmospheric river event;
- Removing the four temporary CSP culverts, which were installed under emergency works;
- Installing two side-by-side (double-barrel) concrete box culverts (both 13m-long, one barrel 2.1m wide and 1.2m wide, the second barrel with a width of 2.7m and height of 1.5m), complete with a concrete headwall and fish baffles (spacing of fish baffles is TBD);
- Clearing and grubbing (minor vegetation removal) at culvert inlets/outlets and along the road edges to accommodate the riprap armouring and road rebuilding;
- Stripping surface material and installing non-woven geotextile fabric to be covered by 450mm-thick class 25kg riprap armouring at the inlet and outlet;
- Excavating, stripping, rebuilding, grading, and paving an approximately 60m-long section of Beach Avenue; and
- Seeding and/or planting any disturbed vegetated areas from construction works.

1.4 FISH AND FISH HABITAT PROTECTION MEASURES AND BEST MANAGEMENT PRACTICES FOR INSTREAM WORKS

Phase 1 works will be subject to the same environmental mitigation measures as already provided as part of the original application package to the Ministry of Forests detailed in PGL's March 17, 2023, *Supplementary Information to Support Change Approval Application Number 100403050 for Kenyon Creek and Flume Creek Culvert and Bank Stabilization Works* and summarized below for Phase 1 instream works to avoid contravention of the *Fisheries Act*.

Environmental Mitigation Measure Required for Phase 1 Works	Document Section Reference (where the relevant mitigation has already been provided in previous application package)
Erosion and Sediment Control	<ul style="list-style-type: none"> • Appendix 5 of March 17, 2023, Supplementary Information document (MOTI's Sunshine Coast Construction Environmental Management Plan) • Section 5 of March 17, 2023, Supplementary Information document
Protection of Riparian Zone	<ul style="list-style-type: none"> • Section 5 of March 17, 2023, Supplementary Information document
Instream Work Area Isolation	<ul style="list-style-type: none"> • DFO Code of practice for temp diversion channel • Section 5 of March 17, 2023, Supplementary Information document
Spill Response	<ul style="list-style-type: none"> • Emergency Spill Response Plan provided within the Construction Environmental Management Plan of March 17, 2023, Supplementary Information document (MOTI's Sunshine Coast Construction Environmental Management Plan) • Section 5 of March 17, 2023, Supplementary Information document

STATEMENT OF LIMITATIONS AND CONDITIONS FOR REPORT

Complete Report

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

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

Basis of Report

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

Use of the Report

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

CLOSING

We trust that this meets your needs. If you have any questions or require clarification, please contact Stewart Brown or Bruce Nidle at 604-895-7612 and 604-895-7609, respectively.

Attachments: Appendix 1 – Phase 1 Work Memos (Urban Systems Ltd.)
Appendix 2 – Environmental Permit Submissions

Appendix 1

Phase 1 Work Memos (Urban Systems Ltd.)

MEMORANDUM

DATE July 20, 2023 FROM Cody Bagg, P.Eng.
TO Stacie Crane FILE 1961.0480.15
CC Michael Braun SUBJECT Project 14009 - Sunshine Coast DFAA – Kenyon
Gundula Brigl Creek – Phase 1 Work

1.0 BACKGROUND

On June 5th, 2023, Urban Systems Ltd. (Urban), conducted a site inspection for the BC Ministry of Transportation and Infrastructure (MOTI) on the Sunshine Coast DFAA – Kenyon Creek project which is located where Kenyon Creek crosses Redrooffs Road. The purpose of the site inspection was to assess the risks and vulnerabilities of roadway design as well as the drainage components of the site relating to postponement of the permanent replacement of the temporary culverts which had been installed in response to the atmospheric river events in November 2021. In addition to the site inspection, Urban was requested to provide recommendations to mitigate the risks and vulnerabilities that were identified on site. While there is overlap, the recommendations have been broken down into three categories: Roadway, Drainage, and Maintenance.

2.0 SITE OBSERVATIONS

Attendance: Cody Bagg (Urban), Sam Roosma (Urban), Tim Barnes (MOTI), Eric Corrigan (Stantec)

Site Photos:



Figure 1: Kenyon Creek - Inlet



Figure 2: Kenyon Creek – Upstream



Figure 3: Kenyon Creek – Outlet



Figure 4: Kenyon Creek – Downstream



Figure 5: Redrooffs Rd – Looking west from culvert crossing



Figure 6: - Redrooffs Rd – Looking east from culvert crossing

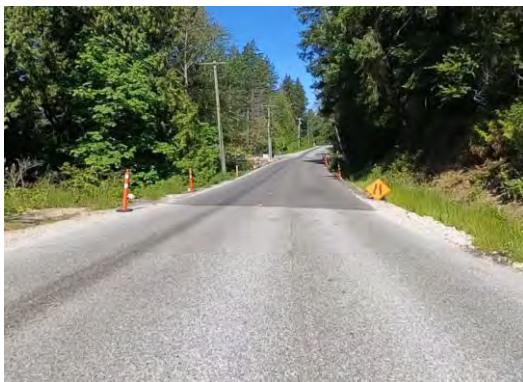


Figure 7: Redrooffs Rd – Looking west towards culvert crossing



Figure 8: Redrooffs Rd – Looking east towards culvert crossing

Site Notes:

- Site appeared to be in similar condition as previous site visit.
- Temporary traffic pylons were in place on both sides of the roadway.
- Temporary paint markings were in place. Slight offset at the eastern tie in.
- Existing paint markings outside of project limits are worn out and faded.
- Small amounts of shoulder erosion due to pavement runoff.
- No visible changes to drainage conditions within Kenyon Creek.
- Small amount of small diameter woody debris blocking culvert inlet. Removed by hand.
- Vehicle traffic was witnessed to be consistently exceeding the posted speed limit within the project zone.

3.0 RECOMMENDATIONS

Below are the recommendations to minimize risk and address vulnerabilities with the existing roadway, drainage, and maintenance practices.

3.1 ROADWAY

- To assist in the delineation of the shoulder, install flexible delineator posts on both sides of Redrooffs Road. Delineator posts to have white reflectors to drivers' right side and yellow reflectors to the left side.
- Install additional signage to notify motorists of the reduced lane width and/or speed limit. As per direction from the MOTI Traffic Representative, a W-026 sign is to be temporarily installed in each direction as motorists approach the project site.

3.2 DRAINAGE

- Install 10kg riprap spillway underlain with geotextile at location of existing localized erosion. Exact extents to be determined in field. Location identified on attached schematic design drawings.

3.3 MAINTAINENCE

- Increase the frequency of routine site inspections. Determining a specific frequency is difficult so a practical approach should be taken to determine the appropriate frequency. After prolonged rainfalls or high intensity storms, site inspections should be completed. Visual inspection of the inlet and outlet of the culvert should be completed. Ensure no debris is blocking or has the potential to block the culverts.

4.0 CONCLUSION

I trust that the content of this memorandum satisfies your expectations and requirements. Please notify the undersigned of plans to implement these recommendations and if any issues are experienced at these sites until the permanent replacement can occur.

DATE July 20, 2023
FILE 1961.0480.15
SUBJECT Project 14009 - Sunshine Coast DFAA – Kenyon Creek – Phase 1 Work
PAGE 4 of 5



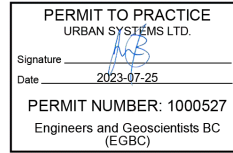
Sincerely,

URBAN SYSTEMS LTD



2023-07-24

Cody Bagg, P.Eng.
Transportation Design Engineer



/cb
Enclosure
Appendix A – Schematic Design Drawings

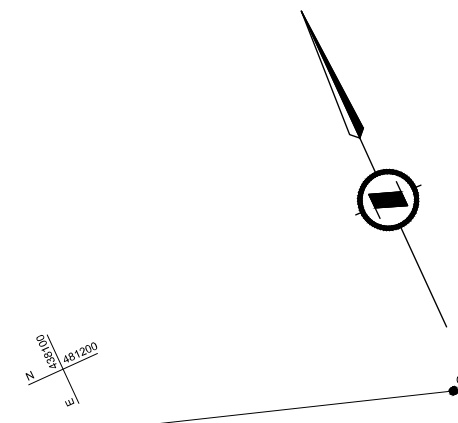
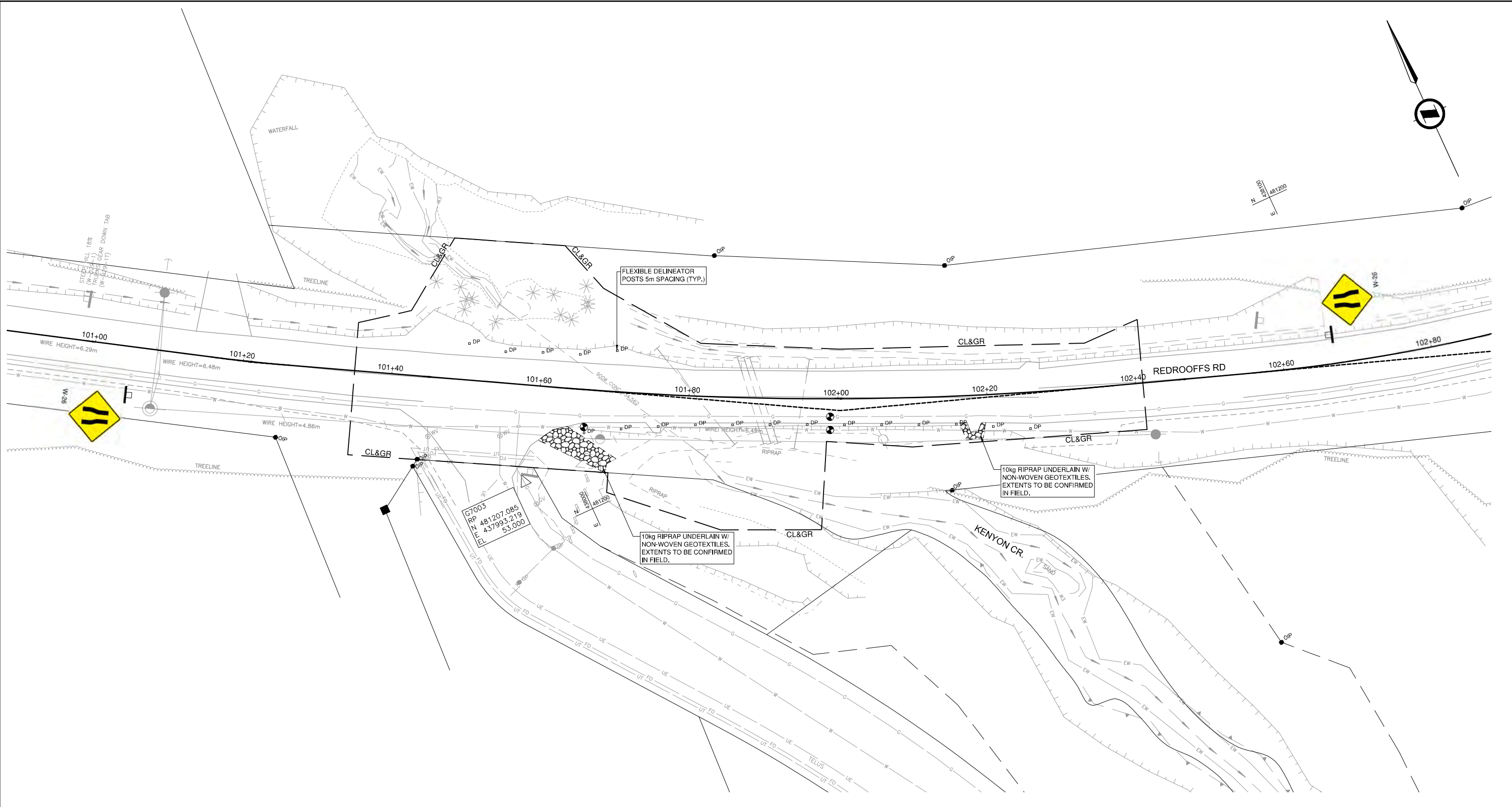
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DATE July 20, 2023
FILE 1961.0480.15
SUBJECT Project 14009 - Sunshine Coast DFAA – Kenyon Creek – Phase 1 Work
PAGE 5 of 5



APPENDIX A – SCHEMATIC DESIGN DRAWINGS

PLOT DATE: 2023/07/20 U:\Projects_SUR\1961\0480\15\0-Design\CAD\30_WORKING_SKETCHES\2023-07-19 Memo for Temp Work - Phase 1\Kenyon Creek - Phase 1 - Temp Work - Planning



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

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



SCALE 0 2 1:250 12m

CAD FILE NAME: KENYON CREEK - PHASE 1 TEMP. WORK PLAN
 PLOT DATE: 2023-07-20

REV	DATE	REVISIONS	NAME

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

DESIGNED: C.BAGG DATE: 2023-07-20
 QUALITY CONTROL: S.CAVASINNI DATE: 2023-07-20
 QUALITY ASSURANCE: C.BAGG DATE: 2023-07-20
 DRAWN: C.LUSSIER DATE: 2023-07-20

CODY BAGG, P.ENG.
 SENIOR DESIGNER
 DATE: _____

ISSUED FOR INFORMATION
 2023-07-20
 urbansystems.ca

PHASE 1 - TEMP WORK
 KENYON CREEK
 DFAA FLOOD DAMAGE

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

MEMORANDUM

DATE	July 24, 2023	FROM	Cody Bagg, P.Eng.
TO	Stacie Crane	FILE	1961.0480.14
CC	Michael Braun Gundula Brigl	SUBJECT	Project 14005 - Sunshine Coast DFAA – Flume Creek – Phase 1 Work

1.0 BACKGROUND

On June 5th, 2023, Urban Systems Ltd. (Urban), conducted a site inspection for the BC Ministry of Transportation and Infrastructure (MOTI) on the Sunshine Coast DFAA – Flume Creek project located at the Flume Creek crossings of Margaret Road and Beach Avenue. The purpose of the site inspection was to assess the risks and vulnerabilities of roadway design as well as the drainage components of the site relating to postponement of the permanent replacement of the temporary culverts which had been installed in response to the atmospheric river events in November 2021. In addition to the site inspection, Urban was requested to provide recommendations to mitigate the risks and vulnerabilities that were identified on site. While there is overlap, the recommendations have been broken down into three categories: Roadway, Drainage, and Maintenance.

2.0 SITE OBSERVATIONS

Attendance: Cody Bagg (Urban), Sam Roosma (Urban), Tim Barnes (MOTI), Eric Corrigan (Stantec)



Figure 1: Margaret Rd Crossing – Inlet



Figure 2: Margaret Rd – Flume Creek Upstream



Figure 3: Margaret Rd Crossing – Outlet



Figure 4: Margaret Rd – Flume Creek Downstream



Figure 5: Margaret Rd – Looking north



Figure 6: - Margaret Rd – Looking south



Figure 7: Beach Ave Crossing - Inlet



Figure 8: Beach Ave – Flume Creek Upstream



Figure 9: Beach Ave Crossing - Outlet

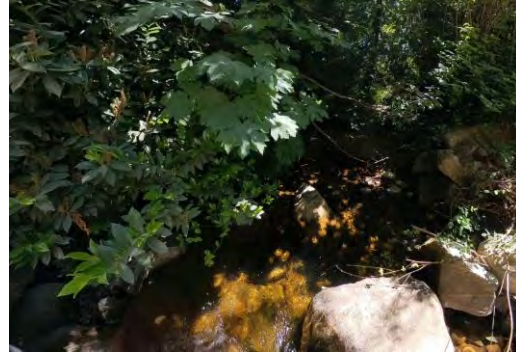


Figure 10: Beach Ave – Flume Creek Downstream



Figure 11: Beach Ave – Culvert crossing



Figure 12: Margaret Rd – Northern driveway Inlet



Figure 13: Margaret Rd – Southern driveway outlet



Figure 14: Beach Ave and Margaret Rd Intersection
– Plugged culvert inlet

Margaret Road Culvert Crossing:

- Appeared to be in similar condition as previous site visits.
- Minor potholes in gravel surface.
- No signs of erosion or instability in either road structure or drainage channel.

- Riprap appeared stable and operating as intended.
- Ditch along Margaret Rd was slightly incised but appeared stable.

Beach Ave Culvert Crossing:

- Culvert at intersection of Beach Avenue and Margaret Road is still plugged with granular material.
- Shoulder erosion in locations where size and placement of riprap created large voids.
- Water was seen piping under and between the eastern two culverts. A visible void all the way through the length of the two culverts. NOTE: It is difficult to determine if this has been the case since the installation of the temporary culverts. The culverts are side by side and are touching for the majority of the length. This would have made bedding and compaction impossible during construction.

3.0 RECOMMENDATIONS

Below are the recommendations to minimize risk and address vulnerabilities with the existing roadway, drainage, and maintenance practices.

3.1 ROADWAY

- Temporarily pave existing gravel section of Beach Avenue and Margaret Road. An extensive number of complaints have been received by MOTI District staff regarding the condition of the roadways. A temporary asphalt patch will essentially eliminate the complaints that the MOTI District staff must respond too. This temporary asphalt patch will be kept in place until the construction of the permanent works are initiated.
(COMPLETED)

3.2 DRAINAGE

- Clean out existing culvert at Margaret Road and Beach Avenue intersection. Culvert is plugged with granular material and is required to be flushed out. See Figure 14.
- Remove gravel bar and realign thalweg of Flume Creek to align with the center of the culvert crossings. Retain and stockpile removed gravels to be reused to restore the creek bed upon removal of gravel bar.



- Trim existing most westerly culvert back to match other culverts, approximately 1.0 - 1.5m. Riprap may need to be adjusted because of this.



- Install bentonite clay cut off wall below Beach Avenue culvert crossings to minimize the waterflow that bypasses the culverts. Excavate below the culvert and up to halfway up the side of the culverts. Place a blended bentonite clay in sandbags below the culvert inlets to seal water flow. Careful and deliberate placement of the bags ensure a good seal with the culverts. Backfill excavation with bedding material that was removed. If clay and sandbags are exposed with the potential to be damaged by debris, placing riprap to protect the bags is recommended.



3.3 MAINTAINENCE

- Increase the frequency of routine site inspections. Determining a specific frequency is difficult so a practical approach should be taken to determine the appropriate frequency. After prolonged rainfalls or high intensity storms, site inspections should be completed. Visual inspection of the inlet and outlet of each culvert should be completed. Ensure no debris is blocking or has the potential to block the culverts.
- Periodically inspect the proposed clay plug/cut off wall for signs of erosion and/or piping. Ensure complete seal around culverts.
- Repair roadway shoulders if erosion occurs. Minor patching of the shoulders may be required to ensure the roadway width is maximized.

4.0 CONCLUSION

I trust that the content of this memorandum satisfies your expectations and requirements. Please notify the undersigned of plans to implement these recommendations and if any issues are experienced at these sites until the permanent replacement can occur.

Sincerely,

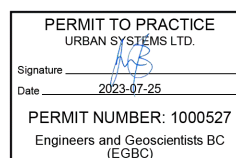
URBAN SYSTEMS LTD.



2023-07-24

Cody Bagg, P.Eng.
Transportation Design Engineer

/cb
Enclosure
Appendix A: Schematic Design Drawings



DATE July 24, 2023
FILE 1961.0480.14
SUBJECT Project 14005 - Sunshine Coast DFAA – Flume Creek – Phase 1 Work
PAGE 7 of 7

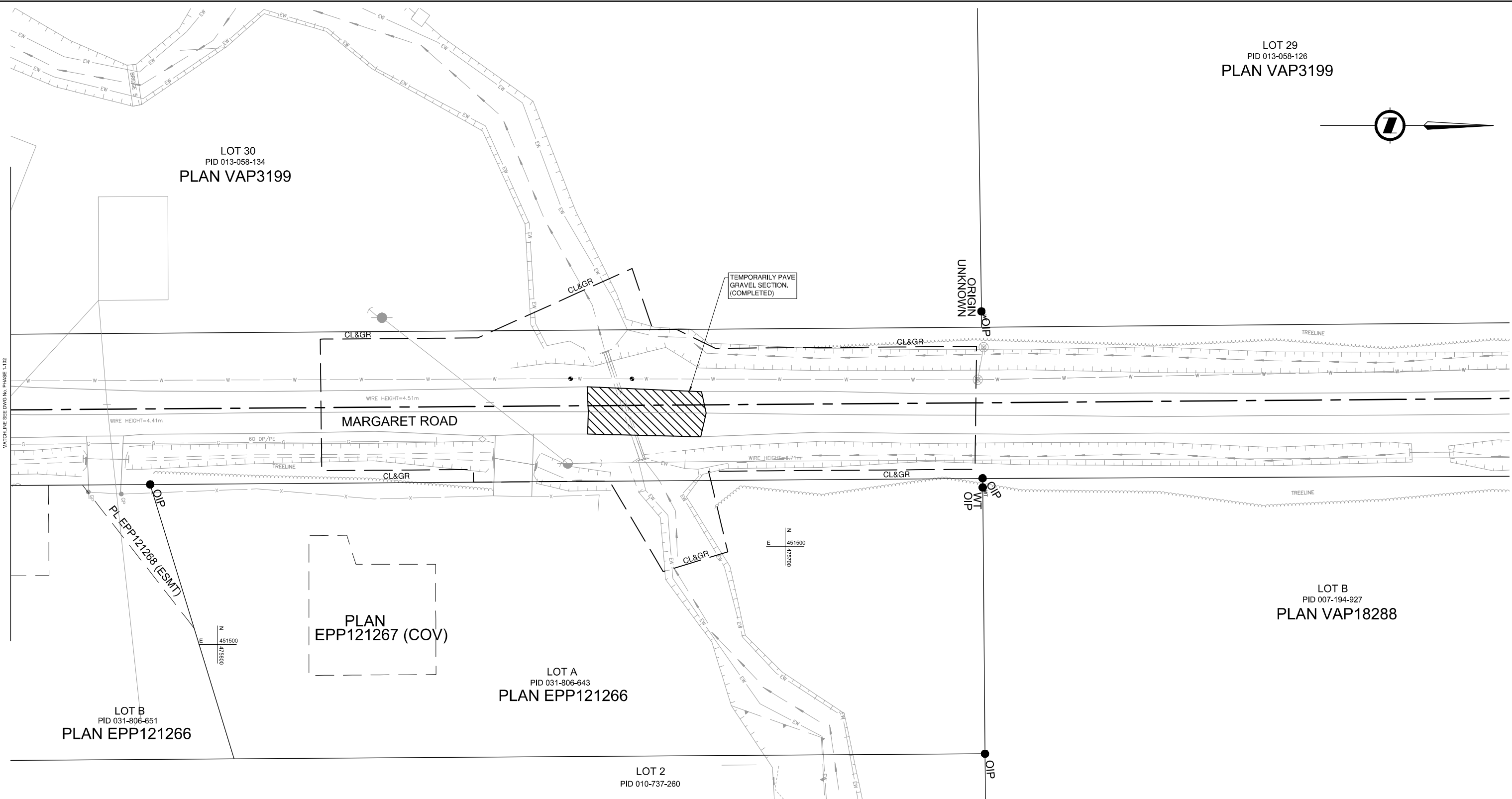


APPENDIX A – SCHEMATIC DESIGN DRAWINGS

LOT 29
PID 013-058-126
PLAN VAP3199



LOT 30
PID 013-058-134
PLAN VAP3199



PLAN EPP121267 (COV)

LOT A
PID 031-806-643
PLAN EPP121266

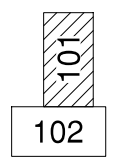
LOT B
PID 031-806-651
PLAN EPP121266

LOT B
PID 007-194-927
PLAN VAP18288

LOT 2
PID 010-737-260

SURVEY NOTE:
COORDINATES ARE AT GROUND LEVEL AND BASED ON THE FOLLOWING CONVERSION FACTORS FROM UTM Z10 NAD 83 (CSRS), CGVD28 (HT2.0):
-TACK POINT: 08H2546
-ADJUSTED COORDINATES WERE DIVIDED BY GIVEN SCALE FACTOR OF : 0.9996343
-ROTATION: NOT APPLIED
-TRANSLATION: SHIFT NORTH (-5000000.000), SHIFT EAST (0.000)

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



URBAN SYSTEMS

SCALE 0 2 1:250 12m

CAD FILENAME: FLUME CREEK - PHASE 1 TEMP. WORK PLAN
PLOT DATE: 2023-07-21

REV	DATE	REVISIONS	NAME

BRITISH COLUMBIA

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

DESIGNED: C.BAGG DATE: 2023-07-21
QUALITY CONTROL: S.CAVASINNI DATE: 2023-07-21
QUALITY ASSURANCE: C.BAGG DATE: 2023-07-21
DRAWN: E.PROULX DATE: 2023-07-21

CODY BAGG, P.ENG.
SENIOR DESIGNER

ISSUED FOR INFORMATION
2023-07-21
urbansystems.ca

PHASE 1 - TEMP WORK
FLUME CREEK
DFAA FLOOD DAMAGE

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
872CS1714	14005	1	PHASE 1 - 101	

PLOT DATE: 2023/07/21 U:\Projects_SUR\1961\0480\14\0-Design_SUR\1961\0480\14\0-Design_CAD\30_WORKING_SKETCHES\2023-07-19 Memo for Temp Work - Phase 1\Flume Creek - Phase 1 Temp Working

LOT 31
PID 013-058-142
PLAN VAP3199

LOT 30
PID 013-058-134
PLAN VAP3199

PLAN
EPP121267
(COV)

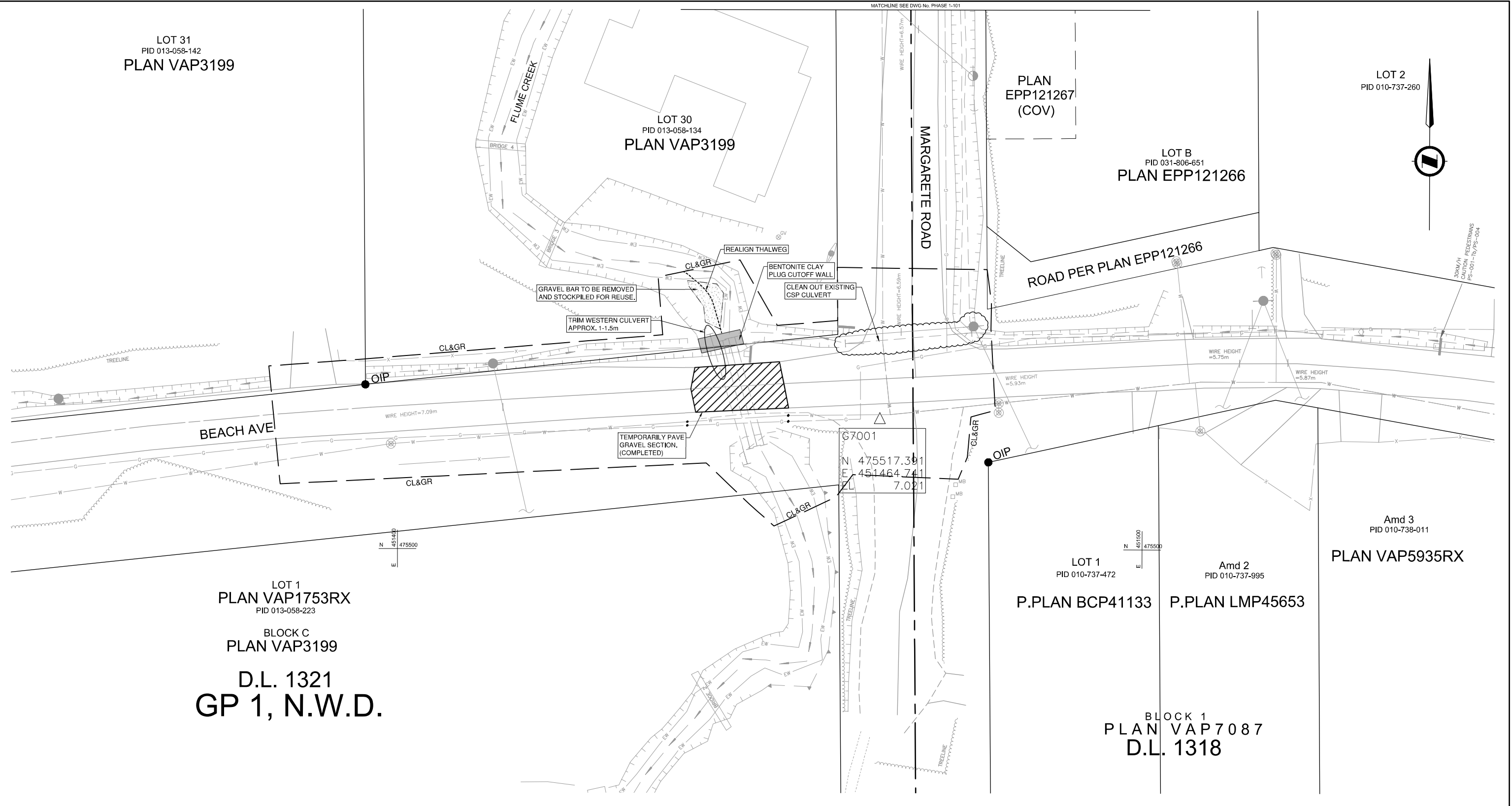
LOT B
PID 031-806-651
PLAN EPP121266

LOT 2
PID 010-737-260



30KM/H
CAUTION PEDESTRIANS
PS-001-TB/PS-004

PLOT DATE: 2023/07/21 U:\Projects_SUR\1961\0480\14\0-Design\CAD\30_WORKING_SKETCHES\2023-07-19 Memo for Temp Work - Phase 1\Flume Creek - Phase 1 - Temp Working



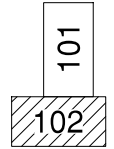
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PLAN VAP1753RX
PID 013-058-223
BLOCK C
PLAN VAP3199
D.L. 1321
GP 1, N.W.D.

LOT 1
PID 010-737-472
P.PLAN BCP41133
P.PLAN LMP45653

Amd 3
PID 010-738-011
PLAN VAP5935RX
Amd 2
PID 010-737-995
BLOCK 1
PLAN VAP7087
D.L. 1318

SURVEY NOTE:
COORDINATES ARE AT GROUND LEVEL AND BASED ON THE FOLLOWING CONVERSION FACTORS FROM UTM Z10 NAD 83 (GSRs), CGVD28 (HT2.0):
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-ADJUSTED COORDINATES WERE DIVIDED BY GIVEN SCALE FACTOR OF : 0.9996343
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REV	DATE	REVISIONS	NAME

CAD FILENAME: FLUME CREEK PHASE 1 TEMP WORK
PLOT DATE: 2023-07-21

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

DESIGNED: C.BAGG DATE: 2023-07-21
QUALITY CONTROL: S.CAVASINNI DATE: 2023-07-21
QUALITY ASSURANCE: C.BAGG DATE: 2023-07-21
DRAWN: E.PROULX DATE: 2023-07-21

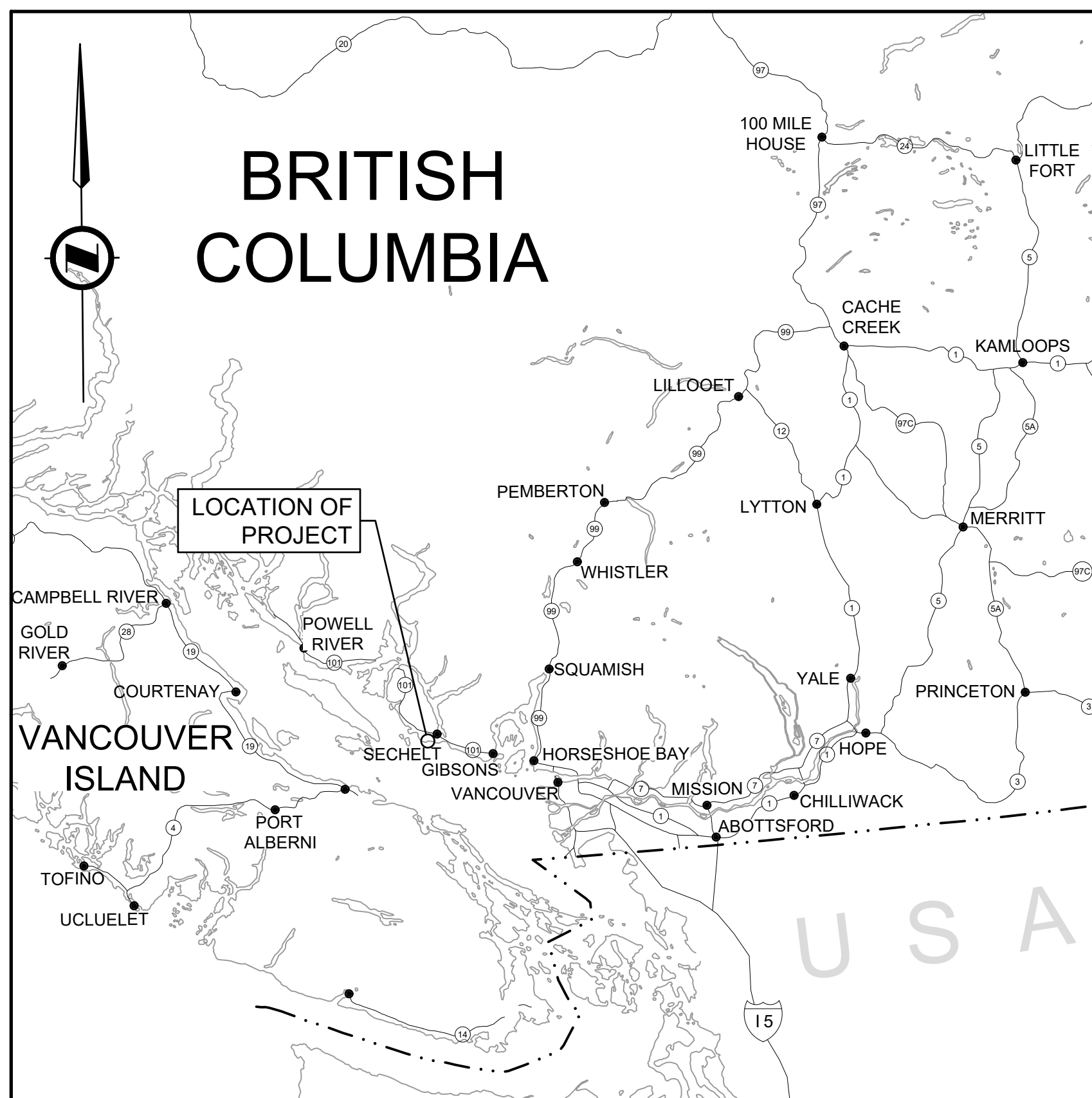
CODY BAGG, P.ENG.
SENIOR DESIGNER

ISSUED FOR INFORMATION
2023-07-21
urbansystems.ca

PHASE 1 - TEMP WORK
FLUME CREEK
DFAA FLOOD DAMAGE

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
872CS1714	14005	1	PHASE 1 - 102	

Appendix 2
Environmental Permit Submissions



LOCATION MAP
N.T.S



Ministry of
Transportation
and Infrastructure

PROJECT NO. 14009

**KENYON CREEK
DFAA FLOOD DAMAGE
ENVIRONMENTAL PERMITS**

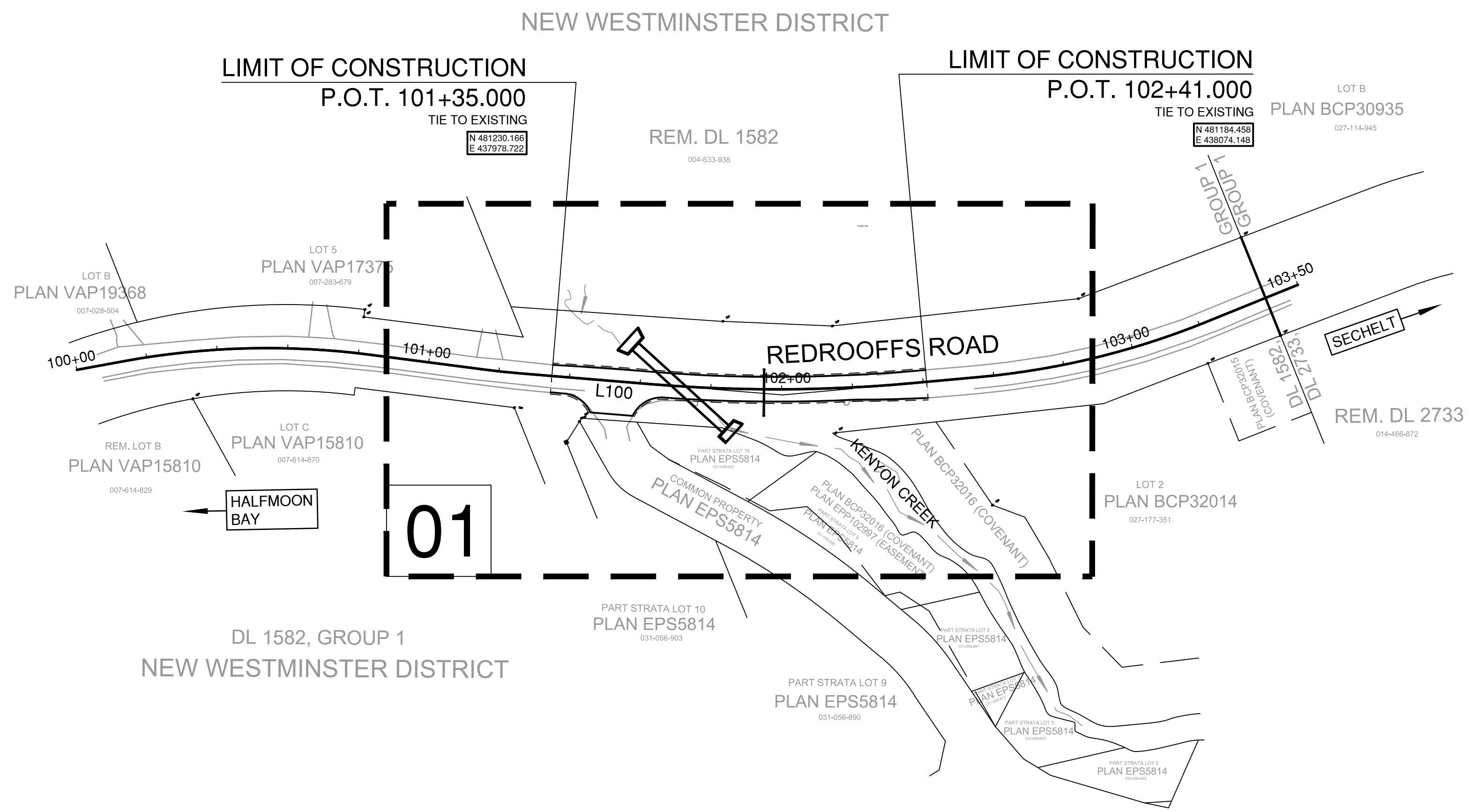
STA. 101+35.000 - STA. 102+41.000

0.106 km

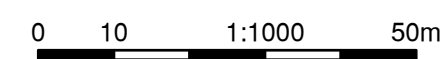
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GRADING AND DRAINAGE CONTRACT

DRAWING INDEX	
R1-1028-001	KEY PLAN
R1-1028-002	LEGEND
R1-1028-101	PLAN
R1-1028-701	DRAINAGE AND DETAILS



KEY PLAN



PLOT DATE: 2023/03/01 U:\Projects_SUR\1961\0480\15\0-Design\CAD\DrawingProduction\EnvironmentalDrawings\R1-1028-000-Enviro.dwg



DRAWING NUMBER REV
R1-1028-001-ENVIRO

LEGEND

SYMBOLS (EXISTING)

AERIAL UTILITIES	DRAINAGE & UTILITIES
POWER POLE	CULVERT OUTLET
POWER POLE WITH TRANSFORMER	SANITARY MANHOLE
POWER / TELEPHONE POLE WITH TRANSFORMER	UTILITY MANHOLE
POWER GUY POLE	WATER MANHOLE
POWER / TELEPHONE POLE	MANHOLE UNKNOWN
POWER / TELEPHONE GUY POLE	
ANCHOR OR GUY WIRE	
DEADMAN	
TELEPHONE POLE	
TELEPHONE GUY POLE	
HIGH TENSION POLE	
HIGH TENSION TOWER	
UTILITY POLE	
	ELECTRICAL
	JUNCTION BOX
	UTILITY VAULT
	LAMP STANDARD
	UTILITY KIOSK
	UTILITY PEDESTAL
	TRAFFIC COUNTER
	TRAFFIC SIGNAL
	TRAFFIC SIGNAL CONTROLLER
	METERS
	VALVE
	WATER VALVE
	WATER METER
	FIRE HYDRANT
	WELL
	STANDPIPE / WATER BLOW OFF
	AIR VALVE
	GAS VALVE
	SERVICE METER
	UNDERGROUND
	VENT/BREATHER PIPE
	FILLER CAP
	FUEL / GAS PUMP
	FUEL TANK
	SEPTIC TANK
	UNDERGROUND MARKER (MISC)
	ROAD SIGNS
	STANDARD SIGN
	COMMERCIAL SIGN
	SIGN BRIDGE STRUCTURE
	DETAIL
	GATE POST
	MAILBOX
	OLD POST
	DELINEATOR POST
	FLAGPOLE
	DECORATIVE TREE
	TREE
	PILING
	WELL
	SWAMP
	DIRECTIONAL ARROW
	DRAINAGE & UTILITIES
	STORM MANHOLE
	STANDARD CATCH BASIN
	ROUND CATCH BASIN
	DRYWELL
	CB MANHOLE
	CULVERT INLET

LINE TYPES (EXISTING)

MAN-MADE FEATURES
RAILWAY TRACKS
RAILWAY BALLAST
ROAD MARKING - YELLOW
ROAD MARKING - WHITE
ROAD MARKING - BROKEN
CROSSWALK
STOP LINE
EDGE OF ROAD - PAVED
EDGE OF ROAD GRAVEL
GRAVEL SHOULDER
DIRT ROAD
GRAVEL ROAD
EDGE OF GRAVEL
SIDEWALK
CONCRETE PAD
FENCE
TOP OF CURB
CL OF GUTTER
CONCRETE ROAD BARRIER
TOP OF FILL
RIP RAP
BUILDING
TREE LINE
LAWN LINE
HYDRAULIC
CULVERT
DITCH CENTER
DITCH EDGE
CENTER OF CREEK
HIGH WATER
EDGE OF WATER
HIGH WATER MARK (EXTREME)
SEEPAGE LINE
TOPOGRAPHY
BASE OF SLOPE
MARSH
TOP OF ROCK
SLIDE
TALUS
TRAIL
TOP OF SLOPE
UTILITIES
OVERHEAD UTILITY
PIPELINE (GAS)
UG ELECTRIC
UG COMMUNICATION
STORM SEWER
SANITARY SEWER
WATER MAIN
MISCELLANEOUS UNDERGROUND

SYMBOLS (PROPOSED)

AERIAL UTILITIES	METERS
POWER POLE	VALVE
POWER POLE WITH TRANSFORMER	WATER VALVE
POWER / TELEPHONE POLE WITH TRANSFORMER	WATER METER
POWER GUY POLE	FIRE HYDRANT
POWER / TELEPHONE POLE	STANDPIPE / WATER BLOW OFF
POWER / TELEPHONE GUY POLE	AIR VALVE
ANCHOR OR GUY WIRE	GAS VALVE
DEADMAN	SERVICE METER
TELEPHONE POLE	
TELEPHONE GUY POLE	
HIGH TENSION POLE	
HIGH TENSION TOWER	
	UNDERGROUND
	VENT/BREATHER PIPE
	FILLER CAP
	FUEL / GAS PUMP
	FUEL TANK
	SEPTIC TANK
	UNDERGROUND MARKER (MISC)
	ROAD SIGNS
	STANDARD SIGN
	BARRIER MOUNTED DELINEATOR
	RELOCATED OVERHEAD SIGN
	TWO POST SIGN
	TWO POST SIGN (BREAKAWAY)
	STANDARD DAVIT POLE - TYPE 3
	STANDARD COMBINATION POLE - TYPE 1
	HEAVY DUTY DAVIT POLE - TYPE 6
	HEAVY DUTY COMBINATION POLE - TYPE 7
	HEAVY POLE - TYPE H
	HEAVY COMBINATION POLE - TYPE H
	CANTILEVER STRUCTURE
	SIGN BRIDGE STRUCTURE
	PATTERNS
	PAVEMENT REMOVAL
	RIPRAP
	RIGID INSULATION FOAM
	REMOVALS / RELOCATES
	POWER POLE
	TELEPHONE POLE
	HIGHWAY SIGNS
	APPROXIMATE HYDROVAC UTILITY LOCATE
	DETAIL
	GATE POST
	MAILBOX
	POST
	POST MOUNTED DELINEATOR
	FLAGPOLE
	DIRECTIONAL ARROW
	DRAINAGE & UTILITIES
	MANHOLE
	STORM MANHOLE
	STANDARD CATCH BASIN
	VARIABLE DEPTH CATCH BASIN
	SPILLWAY
	HEADWALL
	DRYWELL
	TELEPHONE MANHOLE
	POWER MANHOLE
	SANITARY MANHOLE
	UTILITY MANHOLE
	WATER MANHOLE
	MANHOLE UNKNOWN
	ELECTRICAL
	JUNCTION BOX
	UTILITY VAULT
	LAMP STANDARD
	UTILITY KIOSK
	UTILITY PEDESTAL
	TRAFFIC SIGNAL
	TRAFFIC SIGNAL CONTROLLER
	UNDERGROUND ELECTRICAL TRANSFORMER

LINE TYPES (PROPOSED)

FEATURES
HIGHWAY CONTROL LINE
MINOR CONTROL LINE
CLEARING AND GRUBBING
PAVEMENT EDGE
SHOULDER EDGE
CURB AND GUTTER
RAISED ISLAND
SAWCUT
RUMBLE STRIP
RETAINING WALL
FENCE
TOP OF CUT / BOTTOM OF FILL (TOES)
100mm - YELLOW PAINT LINE (SOLID)
100mm - WHITE PAINT LINE (SOLID)
100mm - CONTINUITY PAINT LINE (BROKEN)
100mm - LANE PAINT LINE (BROKEN)
CONCRETE BARRIER
DITCH CENTER / ADDITIONAL DITCHING
DITCH EDGE
BOUNDARIES
RIGHT OF WAY
TEMPORARY LICENCE TO CONSTRUCT
UTILITIES
OVERHEAD UTILITY
PIPELINE (GAS)
SERVICE LINE (GAS)
UG ELECTRIC
UG COMMUNICATION
STORM SEWER
SUB DRAIN
CULVERT
SANITARY SEWER
WATER MAIN
MISCELLANEOUS UNDERGROUND

LINE TYPES (EXISTING)

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

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

FOR ENVIRONMENTAL PERMITTING

URBAN SYSTEMS

REV	DATE	REVISIONS	NAME

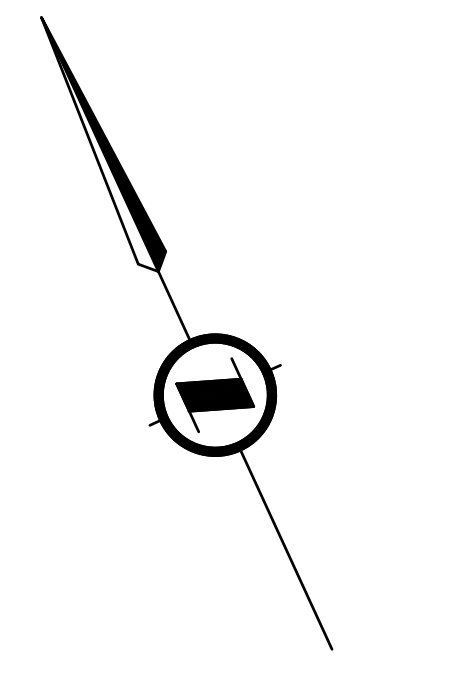
<p>BRITISH COLUMBIA</p>	<p>MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE</p> <p>SOUTH COAST REGION</p> <p>HIGHWAY ENGINEERING AND GEOMATICS</p>
<p>CAD FILENAME: R1-1028-000-ENVIRQ</p> <p>PLOT DATE: 2023-03-01</p>	<p>DESIGNED: S.CAVASINNI DATE: 2023-02-10</p> <p>QUALITY CONTROL: C.BAGG DATE: 2023-02-10</p> <p>QUALITY ASSURANCE: J.BORCH DATE: 2023-02-10</p> <p>DRAWN: S.CAVASINNI DATE: 2023-02-10</p>
<p>CODY BAGG, P.ENG.</p> <p>SENIOR DESIGNER</p>	<p>FILE NUMBER: 872CS1714</p> <p>PROJECT NUMBER: 14009</p> <p>REG: 1</p> <p>DRAWING NUMBER: R1-1028-002-ENVIRQ</p>

PLAN				
KENYON CREEK DFAA FLOOD DAMAGE				
SCALE				

PLOT DATE: 2023/03/01 U:\Projects_SUR\1961\0480\15\0-Design\CAD\DrawingProduction\EnvironmentalDrawings\R1-1028-000-Enviro.dwg

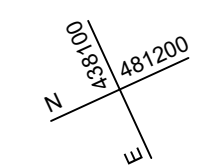
NEW WESTMINSTER DISTRICT

REM. DL 1582
004-633-938



Culvert inlet

Kenyon Creek - Looking upstream from the culvert inlet.
Photo captured: 2022-10-18



LIMIT OF CONSTRUCTION
P.O.T. 102+41.000
TIE TO EXISTING
R-1028-701

CULVERT 2 - HIGH FLOW CULVERT
35.0m W2100xH2100 CONC
STA. 101+68.796
N. INV. 49.41
S. INV. 47.66

CULVERT 1 - LOW FLOW CULVERT
35.0m W2400xH2400 CONC
STA. 101+73.071
N. INV. 49.08
S. INV. 47.33
c/w FISH BAFFLES, DESIGN TBD

POTENTIAL BYPASS PUMP LOCATION

CLASS 25kg RIPRAP
14.0m 750 DIA HDPE
STA. 101+95.000
N. INV. 51.52
S. INV. 49.74

CLASS 50 kg RIPRAP CHANNEL BOTTOM TO BE TOP DRESSED WITH FISHERIES GRAVELS

INLET HIGHWATER MARK ELEVATION 51.3m

CL&GR

EDGE OF GRAVEL
PAVEMENT EDGE

REDROOFS ROAD

POTENTIAL CRANE PAD LOCATION

CONCRETE HEAD WALL SEE DWG. R1-1028-701 FOR DETAILS

LIMIT OF CONSTRUCTION
P.O.T. 101+35.000
TIE TO EXISTING
R-1028-701

LOT C
PLAN VAP15810
007-614-870

PART STRATA LOT 10
PLAN EPS5814
031-056-903

PART STRATA LOT 9
PLAN EPS5814
031-056-890

PART STRATA LOT 10
PLAN EPS5814
031-056-903

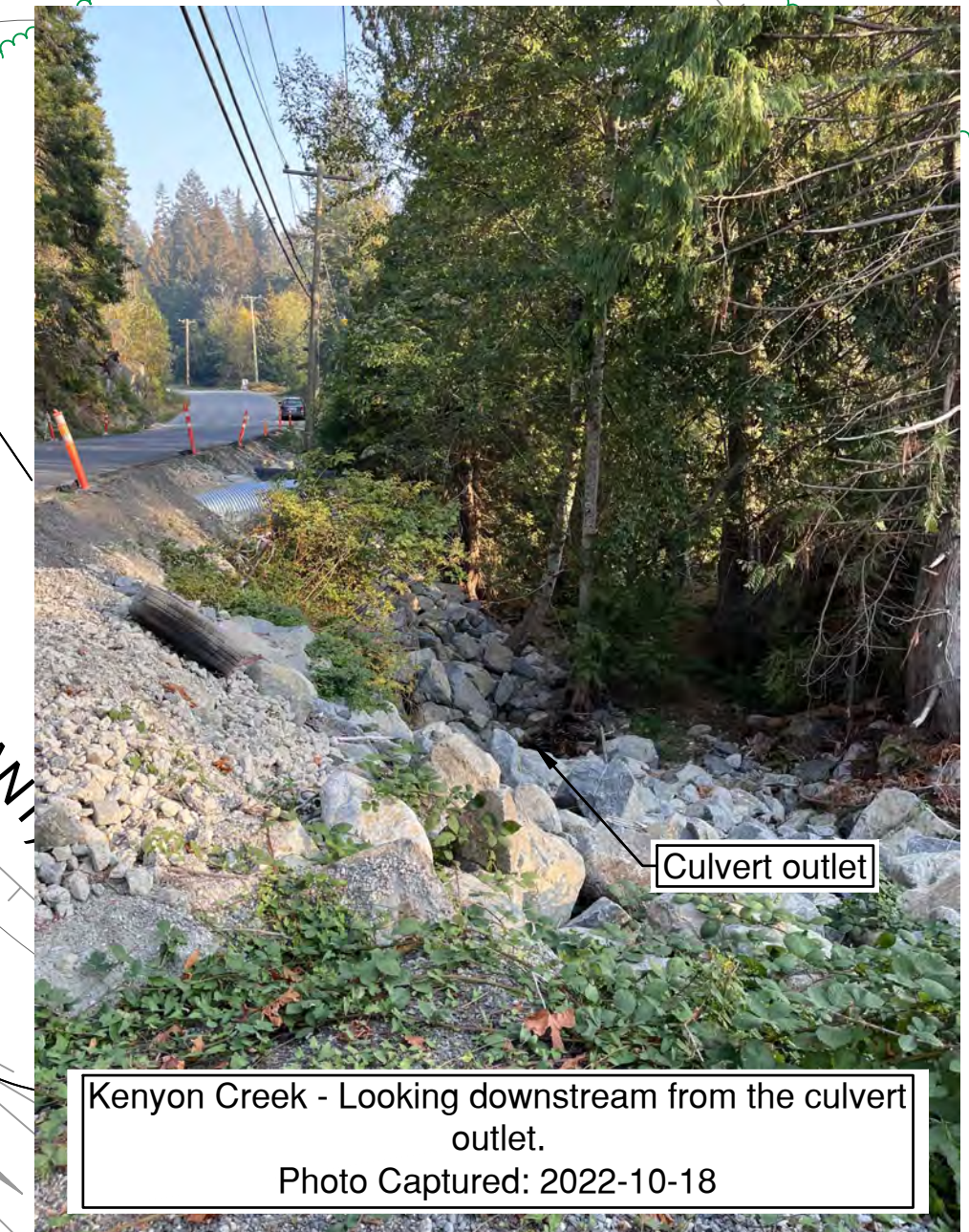
PART STRATA LOT 9
PLAN EPS5814
031-056-890

PLAN EPS5814

PLAN BCP32016 (COVENANT)
PLAN EPP102997 (EASEMENT)

PLAN BCP32016 (COVENANT)

KENYON CREEK



Culvert outlet

Kenyon Creek - Looking downstream from the culvert outlet.
Photo Captured: 2022-10-18

- RETAINED AND ENHANCED INSTREAM AREA = 58 m²
- WORK BELOW HWM = 311m²
- PERMANENT RIPARIAN DISTURBANCE = 10 m²
- TEMPORARY RIPARIAN DISTURBANCE = 699 m²
- TOTAL PROJECT AREA = 3189 m²
- CL & GR TOTAL THIS DWG = 1984 m²

FOR DRAINAGE AND UTILITIES SEE DWG R1-1028-701

LEGEND

RIPRAP	
CHANNEL BOTTOM - RIPRAP TOP DRESSED WITH FISHERIES GRAVELS	
HIGH WATERMARK	



SCALE 0 2 1:250 12m

CAD FILENAME R1-1028-100-ENVIRQ
PLOT DATE 2023-03-01

REV	DATE	REVISIONS	NAME



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

CODY BAGG, P.ENG.
SENIOR DESIGNER
DATE

PERMIT TO PRACTICE
C.D.W. BAGG
48107
2023-08-09
PERMIT NUMBER: 1000527
Engineers and Geoscientists BC (EGBC)



2023-03-02

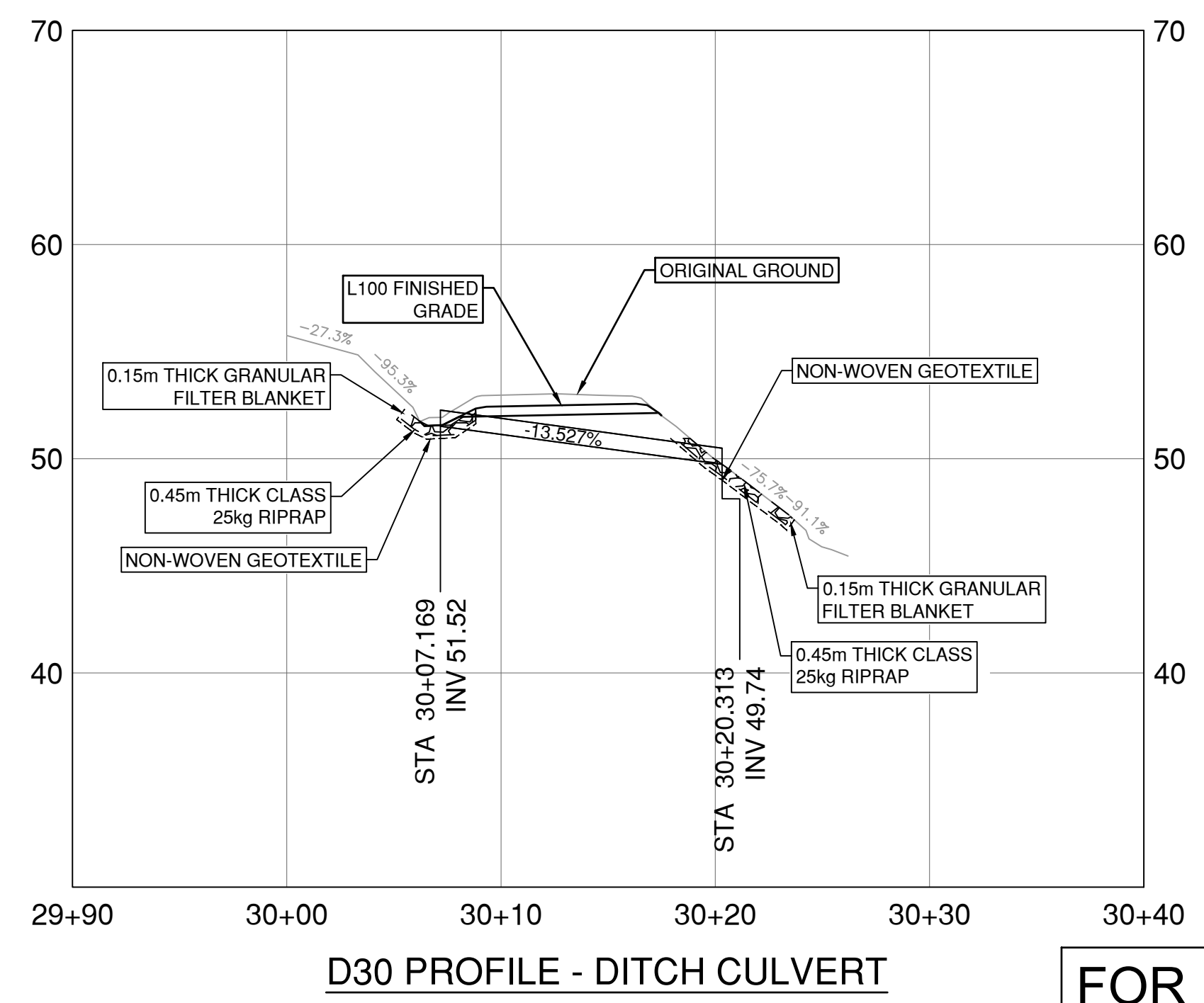
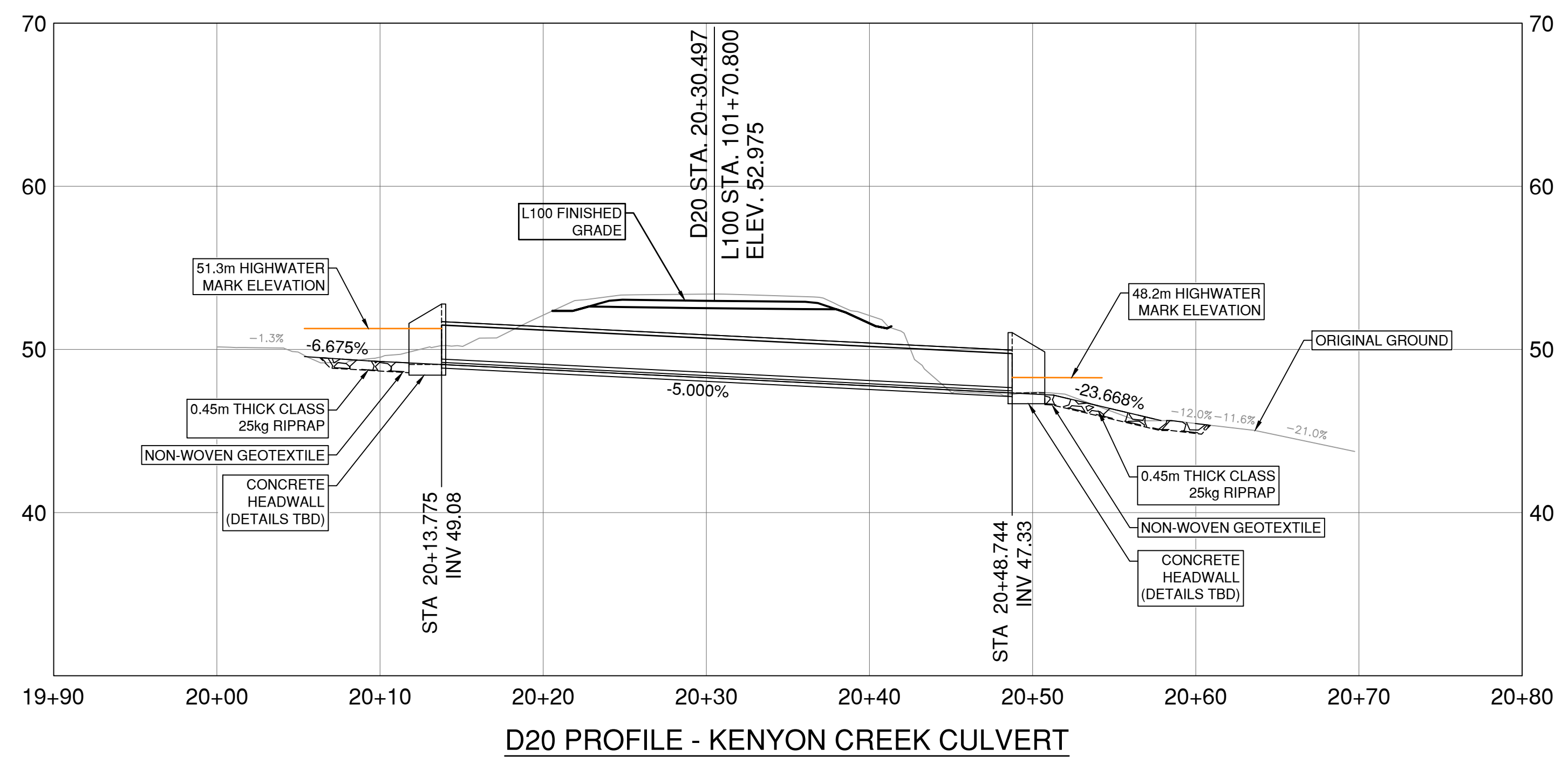
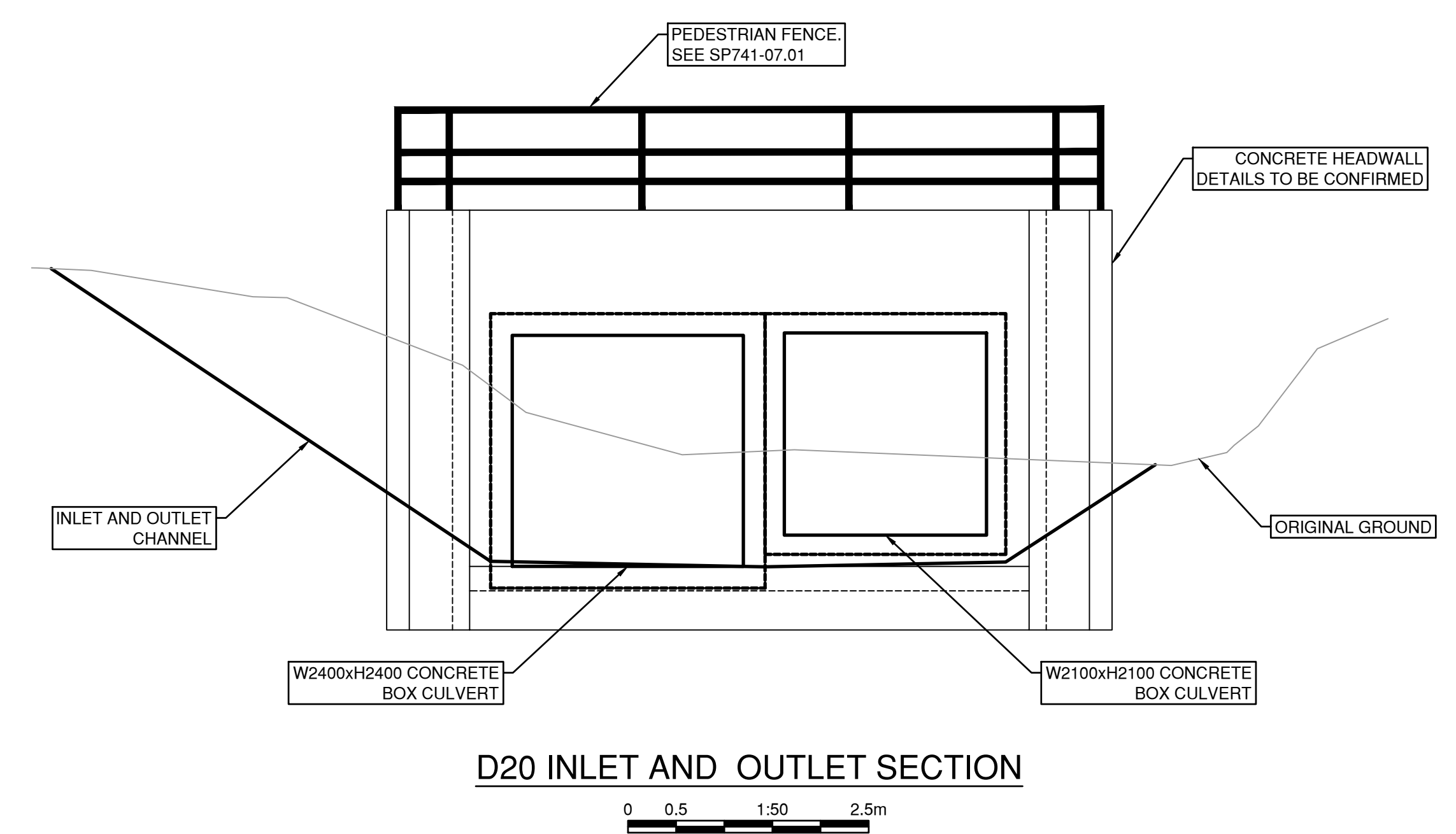
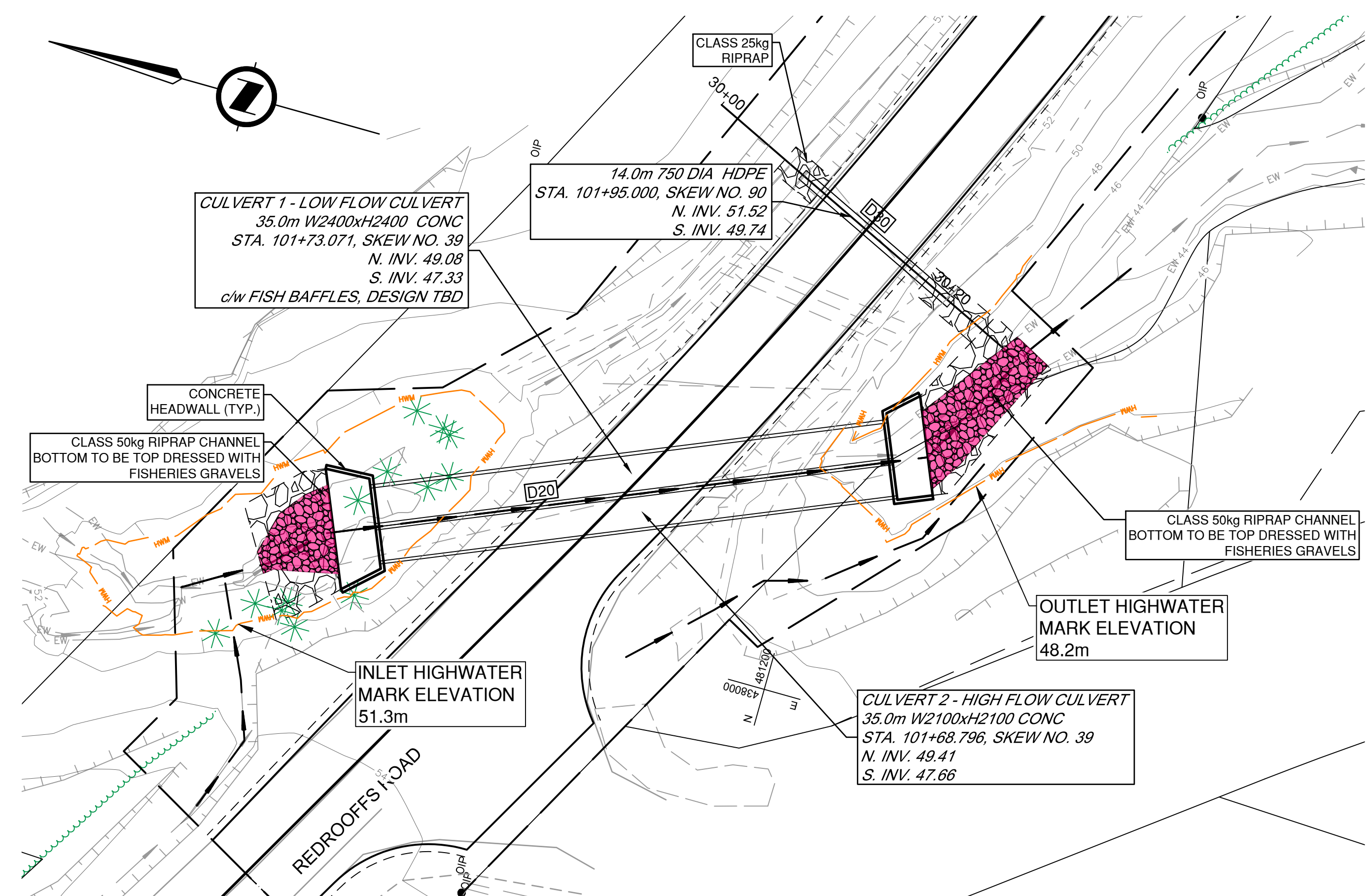
FOR ENVIRONMENTAL PERMITTING

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

DESIGNED S.CAVASINNI	DATE 2023-02-10
QUALITY CONTROL C.BAGG	DATE 2023-02-10
QUALITY ASSURANCE J.BORCH	DATE 2023-02-10
DRAWN E.PROULX	DATE 2023-02-10

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

PLOT DATE: 2023/03/01 U:\Projects_SUR\1961\0480\15\0-Design\CAD\DrawingProduction\EnvironmentalDrawings\R1-1028-700-Enviro.dwg



LEGEND

RIPRAP	
CHANNEL BOTTOM - RIPRAP TOP DRESSED WITH FISHERIES GRAVELS	
HIGH WATERMARK	



SCALE 0 2 1:250 12m

CAD FILENAME R1-1028-700-ENVIRO
 PLOT DATE 2023-03-01

REV	DATE	REVISIONS	NAME

BRITISH COLUMBIA

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

CODY BAGG, P.ENG.
 SENIOR DESIGNER

DESIGNED S.CAVASINNI DATE 2023-02-10
 QUALITY CONTROL C.BAGG DATE 2023-02-10
 QUALITY ASSURANCE J.BORCH DATE 2023-02-10
 DRAWN E.PROULX DATE 2023-02-10

FOR ENVIRONMENTAL PERMITTING

PERMIT TO PRACTICE
 URBAN SYSTEMS LTD.
 Signature: [Signature]
 Date: 2023-03-01
 PERMIT NUMBER: 1000527
 Engineers and Geoscientists BC
 (ESBC)

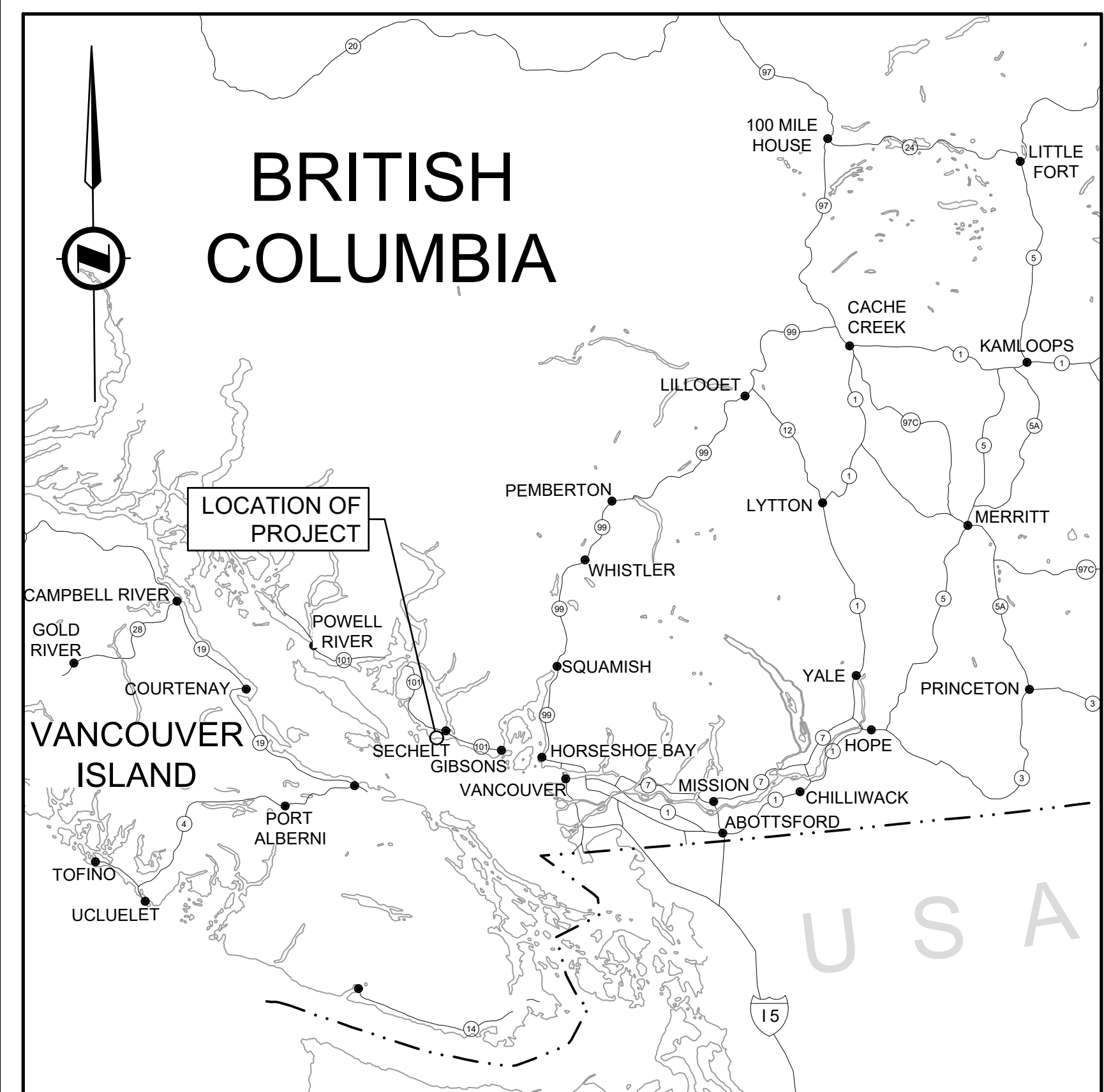


2023-03-02

DRAINAGE AND DETAILS
 KENYON CREEK
 DFAA FLOOD DAMAGE

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

PLOT DATE: 2023/03/02 U:\Projects_SUR\1961\0480\14\0-Design\CAD\DrawingProduction\EnvironmentalDrawings\R1-1027-000-Enviro.dwg



LOCATION MAP
N.T.S



Ministry of
Transportation
and Infrastructure

PROJECT NO. 14005

FLUME CREEK DFAA FLOOD DAMAGE ENVIRONMENTAL PERMITS

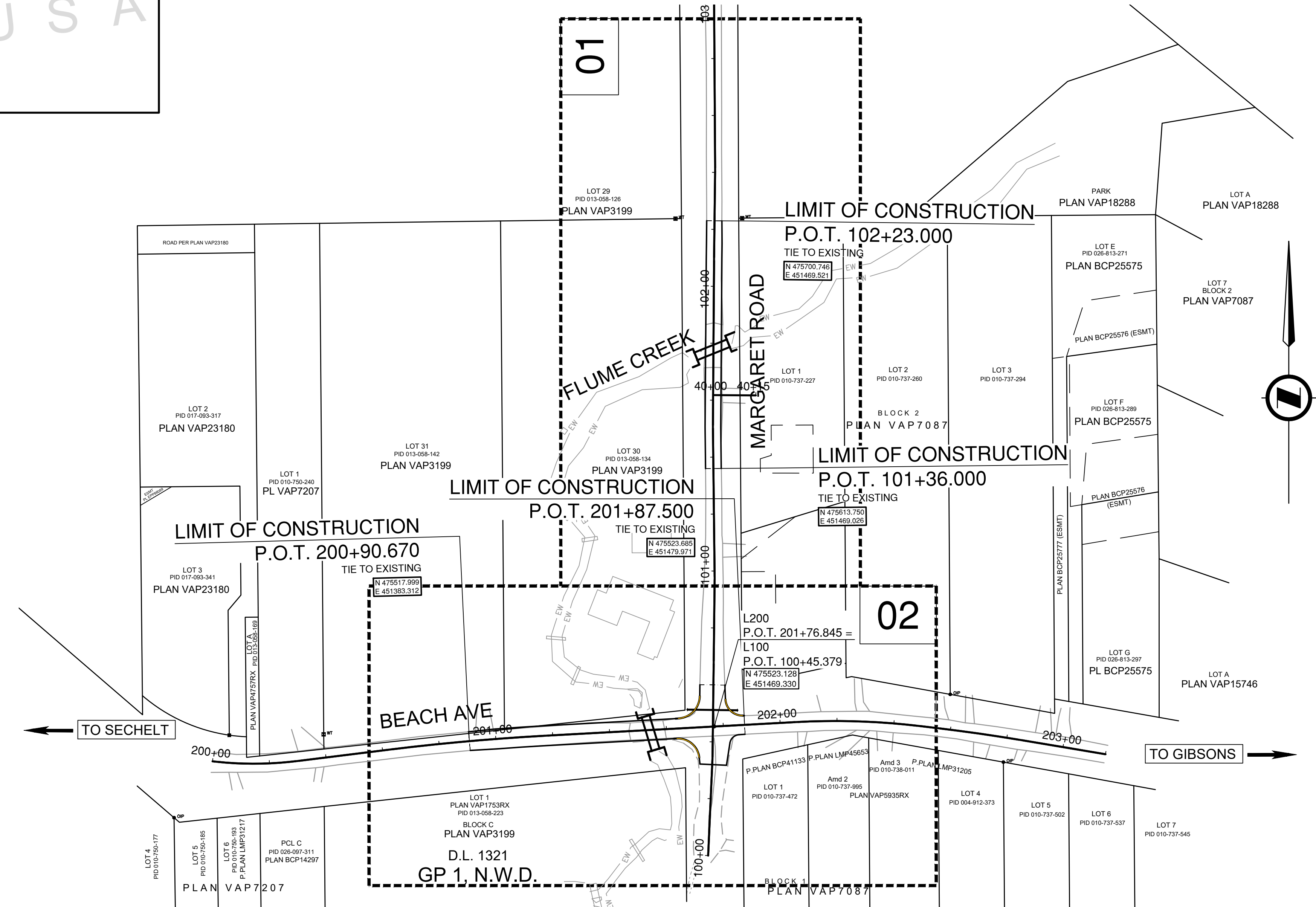
MARGARET RD: STA. 101+36.000 - STA. 102+25.000 (0.89 km)

BEACH AVE: STA. 201+11.539 - STA. 201+70.693 (0.59 km)

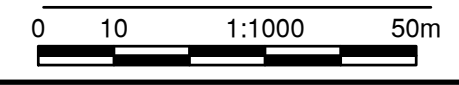
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GRADING AND DRAINAGE CONTRACT

DRAWING INDEX	
R1-1027-001	KEY PLAN
R1-1027-002	LEGEND
R1-1027-101 to 102	PLAN
R1-1027-701 to 703	DRAINAGE AND DETAILS



KEY PLAN



DRAWING NUMBER REV
R1-1027-001-ENVIRQ

LEGEND

SYMBOLS (EXISTING)

AERIAL UTILITIES	DRAINAGE & UTILITIES	ELECTRICAL
POWER POLE	CULVERT OUTLET	JUNCTION BOX
POWER POLE WITH TRANSFORMER	SANITARY MANHOLE	UTILITY VAULT
POWER / TELEPHONE POLE WITH TRANSFORMER	UTILITY MANHOLE	LAMP STANDARD
POWER GUY POLE	WATER MANHOLE	UTILITY KIOSK
POWER / TELEPHONE POLE	MANHOLE UNKNOWN	UTILITY PEDESTAL
POWER / TELEPHONE GUY POLE		TRAFFIC COUNTER
ANCHOR OR GUY WIRE		TRAFFIC SIGNAL
DEADMAN		TRAFFIC SIGNAL CONTROLLER
TELEPHONE POLE		
TELEPHONE GUY POLE		
HIGH TENSION POLE		
HIGH TENSION TOWER		
UTILITY POLE		
SURVEY		
CONTROL POINT		
CONTROL MONUMENT		
LEGAL MONUMENT		
STANDARD IRON PIN FOUND		
CAPPED IRON PIN		
LEAD PLUG		
BENCHMARK		
SPOT ELEVATION		
GEOTECHNICAL		
TESTPIT		
TESTHOLE		
OBSERVATION WELL		
DETAIL		
GATE POST		
MAILBOX		
OLD POST		
DELINEATOR POST		
FLAGPOLE		
DECORATIVE TREE		
TREE		
PILING		
CONCRETE PILLAR		
WELL		
SWAMP		
DIRECTIONAL ARROW		
DRAINAGE & UTILITIES		
STORM MANHOLE		
STANDARD CATCH BASIN		
ROUND CATCH BASIN		
DRYWELL		
CB MANHOLE		
CULVERT INLET		

LINE TYPES (EXISTING)

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

LINE TYPES (EXISTING)

MAN-MADE FEATURES	HYDRAULIC	TOPOGRAPHY	UTILITIES
RAILWAY TRACKS	CULVERT	BASE OF SLOPE	OVERHEAD UTILITY
RAILWAY BALLAST	DITCH CENTER	MARSH	PIPELINE (GAS)
ROAD MARKING - YELLOW	DITCH EDGE	SLIDE	UG ELECTRIC
ROAD MARKING - WHITE	CENTER OF CREEK	TALUS	UG COMMUNICATION
ROAD MARKING - BROKEN	HIGH WATER	TRAIL	STORM SEWER
CROSSWALK	EDGE OF WATER		SANITARY SEWER
STOP LINE	HIGH WATER MARK (EXTREME)		WATER MAIN
EDGE OF ROAD - PAVED			MISCELLANEOUS UNDERGROUND
EDGE OF ROAD GRAVEL			
GRAVEL SHOULDER			
DIRT ROAD			
GRAVEL ROAD			
EDGE OF GRAVEL			
SIDEWALK			
CONCRETE PAD			
FENCE			
TOP OF CURB			
CL OF GUTTER			
CONCRETE ROAD BARRIER			
TOP OF FILL			
RIP RAP			
BUILDING			
TREE LINE			
LAWN LINE			



SYMBOLS (PROPOSED)

AERIAL UTILITIES	METERS	UNDERGROUND	ROAD SIGNS	DRAINAGE & UTILITIES	PATTERNS	REMOVALS / RELOCATES	ELECTRICAL
POWER POLE	VALVE	VENT/BREATHING PIPE	STANDARD SIGN	MANHOLE	LEVELLING COURSE	POWER POLE	JUNCTION BOX
POWER POLE WITH TRANSFORMER	WATER VALVE	FILLER CAP	BARRIER MOUNTED DELINEATOR	STORM MANHOLE	PAVEMENT REMOVAL	TELEPHONE POLE	UTILITY VAULT
POWER / TELEPHONE POLE WITH TRANSFORMER	WATER METER	FUEL / GAS PUMP	RELOCATED OVERHEAD SIGN	STANDARD CATCH BASIN		HIGHWAY SIGNS	LAMP STANDARD
POWER GUY POLE	FIRE HYDRANT	FUEL TANK	TWO POST SIGN	VARIABLE DEPTH CATCH BASIN			UTILITY KIOSK
POWER / TELEPHONE POLE	STANDPIPE / WATER BLOW OFF	SEPTIC TANK	TWO POST SIGN (BREAKAWAY)	SPILLWAY			UTILITY PEDESTAL
POWER / TELEPHONE GUY POLE	AIR VALVE	UNDERGROUND MARKER (MISC)	STANDARD DAVIT POLE - TYPE 3	HEADWALL			TRAFFIC SIGNAL
ANCHOR OR GUY WIRE	GAS VALVE		STANDARD COMBINATION POLE - TYPE 1	DRYWELL			TRAFFIC SIGNAL CONTROLLER
DEADMAN	SERVICE METER		HEAVY DUTY DAVIT POLE - TYPE 6	TELEPHONE MANHOLE			UNDERGROUND ELECTRICAL TRANSFORMER
TELEPHONE POLE			HEAVY DUTY COMBINATION POLE - TYPE 7	POWER MANHOLE			
TELEPHONE GUY POLE			HEAVY POLE - TYPE H	SANITARY MANHOLE			
HIGH TENSION POLE			HEAVY COMBINATION POLE - TYPE H	UTILITY MANHOLE			
HIGH TENSION TOWER			CANTILEVER STRUCTURE	WATER MANHOLE			
			SIGN BRIDGE STRUCTURE	MANHOLE UNKNOWN			

LINE TYPES (PROPOSED)

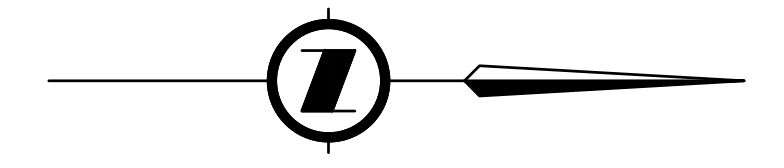
FEATURES	BOUNDARIES	UTILITIES
HIGHWAY CONTROL LINE	RIGHT OF WAY	OVERHEAD UTILITY
MINOR CONTROL LINE	TEMPORARY LICENCE TO CONSTRUCT	PIPELINE (GAS)
CLEARING AND GRUBBING		SERVICE LINE (GAS)
PAVEMENT EDGE		UG ELECTRIC
SHOULDER EDGE		UG COMMUNICATION
CURB AND GUTTER		STORM SEWER
RAISED ISLAND		SUB DRAIN
SAWCUT		CULVERT
RUMBLE STRIP		SANITARY SEWER
RETAINING WALL		WATER MAIN
FENCE		MISCELLANEOUS UNDERGROUND
TOP OF CUT / BOTTOM OF FILL (TOES)		
100mm - YELLOW PAINT LINE (SOLID)		
100mm - WHITE PAINT LINE (SOLID)		
100mm - CONTINUITY PAINT LINE (BROKEN)		
100mm - LANE PAINT LINE (BROKEN)		
CONCRETE BARRIER		
DITCH CENTER / ADDITIONAL DITCHING		
DITCH EDGE		

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

FOR ENVIRONMENTAL PERMITTING

PLOT DATE: 2023/03/02 U:\Projects_SUR\1961\0480\14\0-Design\CAD\DrawingProduction\EnvironmentalDrawings\R1-1027-000-Enviro.dwg

SCALE		CAD FILENAME: R1-1027-000-ENVIRQ PLOT DATE: 2023-03-02		MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE SOUTH COAST REGION HIGHWAY ENGINEERING AND GEOMATICS	PLAN FLUME CREEK DFAA FLOOD DAMAGE	
REV	DATE	REVISIONS	NAME		DESIGNED: S.CAVASINNI DATE: 2023-03-02	FILE NUMBER: 872CS1714
				QUALITY CONTROL: C.BAGG DATE: 2023-03-02	PROJECT NUMBER: 14005	
				QUALITY ASSURANCE: J.BORCH DATE: 2023-03-02	REG: 1	
				DRAWN: E.PROULX DATE: 2023-03-02	DRAWING NUMBER: R1-1027-002-ENVIRQ	
				CODY BAGG, P.ENG. SENIOR DESIGNER	REV	



Flume Creek - Margaret Road culvert Outlet - Looking downstream.
Photo captured: 2023-01-11

Culvert outlet

MARGARET ROAD

LIMIT OF CONSTRUCTION
P.O.T. 101+36.000
TIE TO EXISTING

LIMIT OF CONSTRUCTION
P.O.T. 102+23.000
TIE TO EXISTING

CULVERT 1 - LOW FLOW CULVERT
12.5m W2700xH1800 CONC
STA. 101+76.529
E. INV. 8.797
W. INV. 8.957

CULVERT 2 - HIGH FLOW CULVERT
12.5m W2100xH1500 CONC
STA. 101+79.615
E. INV. 9.097
W. INV. 9.407

POTENTIAL INSTREAM WORKS DUE TO
TEMPORARY DITCH INFILL AND CULVERT
INSTALLATION FOR CRANE PAD

POTENTIAL CRANE
PAD LOCATION

POTENTIAL DITCH CULVERT
UNDER CRANE PAD

REMOVE TREES

OUTLET HIGHWATER
MARK ELEVATION
9.4m

INLET HIGHWATER
MARK ELEVATION
10.5m

CONCRETE HEADWALL
SEE DWG. R1-1027-701
FOR DETAILS (TYP.)

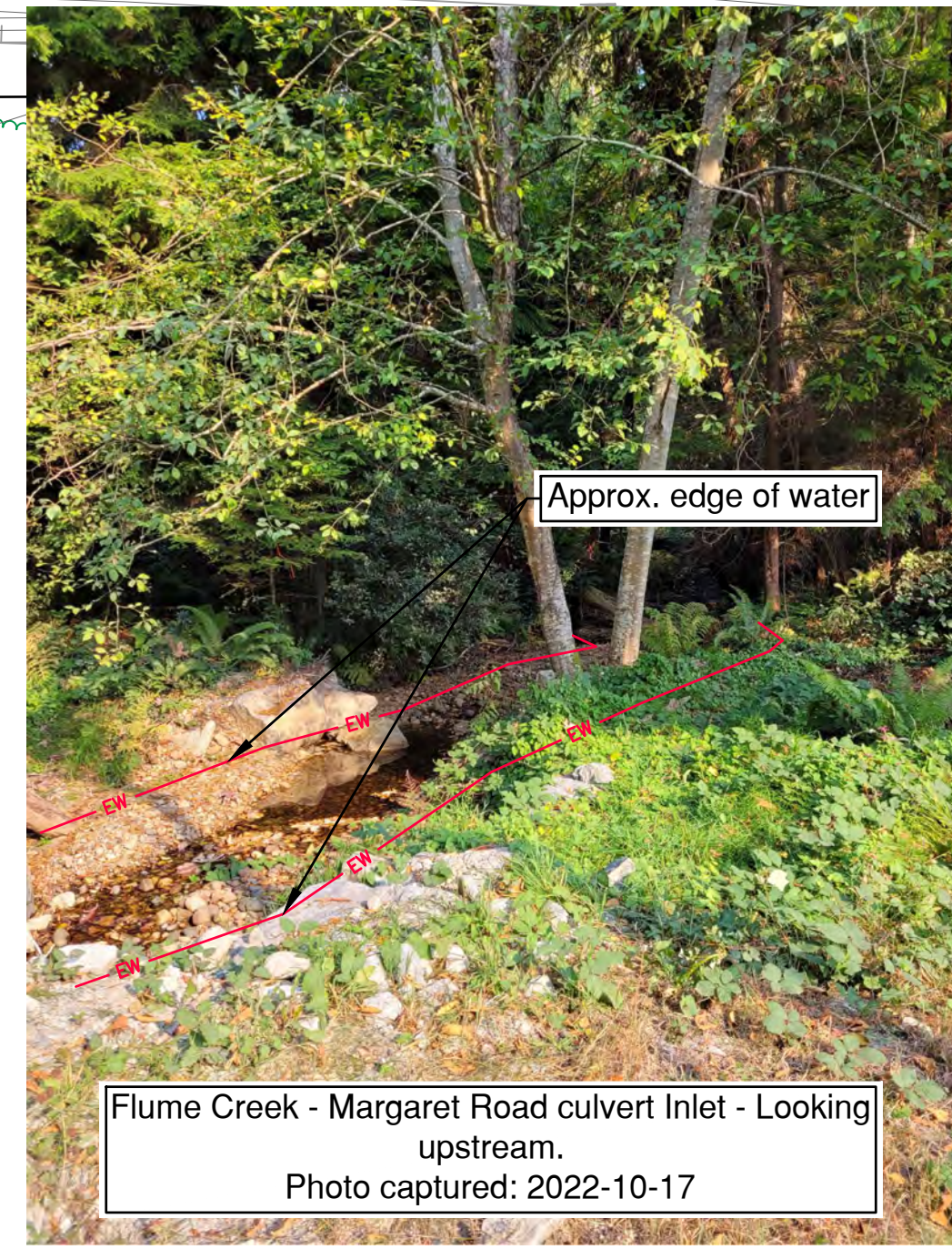
450mm THICK CLASS 25kg RIP RAP
SEE DWG. R1-1027-701 FOR DETAILS (TYP.)

PLAN
EPP121267 (COV)

LOT A
PID 031-806-643
PLAN EPP121266

LOT B
PID 031-806-651
PLAN EPP121266

LOT 2
PID 010-737-260



Flume Creek - Margaret Road culvert Inlet - Looking upstream.
Photo captured: 2022-10-17

Approx. edge of water

LOT B
PID 007-194-927
PLAN VAP18288

D.L. 1318
GP 1, N.W.D.

- RETAINED AND ENHANCED
INSTREAM AREA = 72 m²
- WORK BELOW HWM = 239m²
- PERMANENT RIPARIAN
DISTURBANCE = 9 m²
- TEMPORARY RIPARIAN
DISTURBANCE = 746 m²
- TOTAL PROJECT AREA = 2160 m²
- CL & GR TOTAL THIS DWG = 1447 m²

FOR DRAINAGE AND UTILITIES
SEE DWG R1-1027-701 to R1-1027-702

LEGEND

RIPRAP

CHANNEL BOTTOM -
RIPRAP TOP DRESSED WITH
FISHERIES GRAVELS

HIGH WATERMARK

SCALE 0 2 1:250 12m

CAD FILENAME R1-1027-100-ENVIRQ
PLOT DATE 2023-03-02

REV	DATE	REVISIONS	NAME

BRITISH COLUMBIA

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

CODY BAGG, P.ENG.
SENIOR DESIGNER

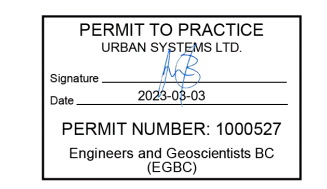
DESIGNED S.CAVASINNI DATE 2023-03-02
QUALITY CONTROL C.BAGG DATE 2023-03-02
QUALITY ASSURANCE J.BORCH DATE 2023-03-02
DRAWN E.PROULX DATE 2023-03-02

FOR ENVIRONMENTAL PERMITTING

PLAN
FLUME CREEK
DFAA FLOOD DAMAGE
STA. 100+36.000 TO 102+23.000

FILE NUMBER 872CS1714	PROJECT NUMBER 14005	REG 1	DRAWING NUMBER R1-1027-101-ENVIRQ
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PLOT DATE: 2023/03/02 U:\Projects_SUR\1961\0480\14\0-Design\CAD\DrawingProduction\EnvironmentalDrawings\R1-1027-100-Enviro.dwg





Flume Creek - Beach Ave culvert Inlet - Looking upstream.
Photo captured: 2023-02-08

Culvert inlet

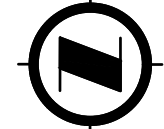


Flume Creek - Beach Ave culvert Outlet - Looking downstream.
Photo captured: 2022-10-17

Culvert outlet



LOT 2
PID 010-737-260



LOT B
PID 031-806-651
PLAN EPP121266

PLAN
EPP121267
(COV)

LIMIT OF CONSTRUCTION
P.O.T. 201+87.500
TIE TO EXISTING

LOT 30
PID 013-058-134
PLAN VAP3199

18.0m 900 DIA HDPE w/
300mm EMBEDMENT
STA. 201+76.756
E. INV. 6.29
W. INV. 5.99

INLET HIGHWATER
MARK ELEVATION
6.3m

LIMIT OF CONSTRUCTION
P.O.T. 200+90.670
TIE TO EXISTING

BEACH AVE

MARGARET ROAD

ROAD PER PLAN EPP121266

P.PLAN LMP45653

LOT 1
PLAN VAP1753RX
PID 013-058-223

BLOCK C
PLAN VAP3199

D.L. 1321
GP 1, N.W.D.

CULVERT 2 - HIGH FLOW CULVERT
13.0m W2100xH1500 CONG
STA. 201+52.667
N. INV. 5.155
S. INV. 4.693

CULVERT 1 - LOW FLOW CULVERT
13.0m W2700xH1800 CONG
STA. 201+55.602
N. INV. 4.705
S. INV. 4.393

CONCRETE HEADWALL
SEE DWG. R1-1027-702
FOR DETAILS (TYP.)

450mm THICK CLASS 25kg RIP RAP
SEE DWG. R1-1027-702
FOR DETAILS (TYP.)

POTENTIAL TEMPORARY
DIVERSION LOCATION

REMOVE TREES

OUTLET HIGHWATER
MARK ELEVATION
5.3m

201+00

202+00

100+00

N 451400
E 475500

- RETAINED AND ENHANCED
INSTREAM AREA = 40 m²
- WORK BELOW HWM = 202 m²
- PERMANENT DISTURBANCE ON
WASHED OUT AREAS = 22 m²
- PERMANENT RIPARIAN
DISTURBANCE = 21 m²
- TEMPORARY RIPARIAN
DISTURBANCE = 583 m²
- TOTAL PROJECT AREA = 2219 m²
- CL & GR TOTAL THIS DWG 1399 m²

FOR DRAINAGE AND UTILITIES
SEE DWG R1-1027-701 to R1-1027-702

LEGEND

RIPRAP	
CHANNEL BOTTOM - RIPRAP TOP DRESSED WITH FISHERIES GRAVELS	
HIGH WATERMARK	



SCALE 0 2 1:250 12m

CAD FILENAME R1-1027-100-ENVIRQ
PLOT DATE 2023-03-02

REV	DATE	REVISIONS	NAME

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

CODY BAGG, P.ENG.
SENIOR DESIGNER

DESIGNED S.CAVASINNI DATE 2023-03-02
QUALITY CONTROL C.BAGG DATE 2023-03-02
QUALITY ASSURANCE J.BORCH DATE 2023-03-02
DRAWN E.PROULX DATE 2023-03-02

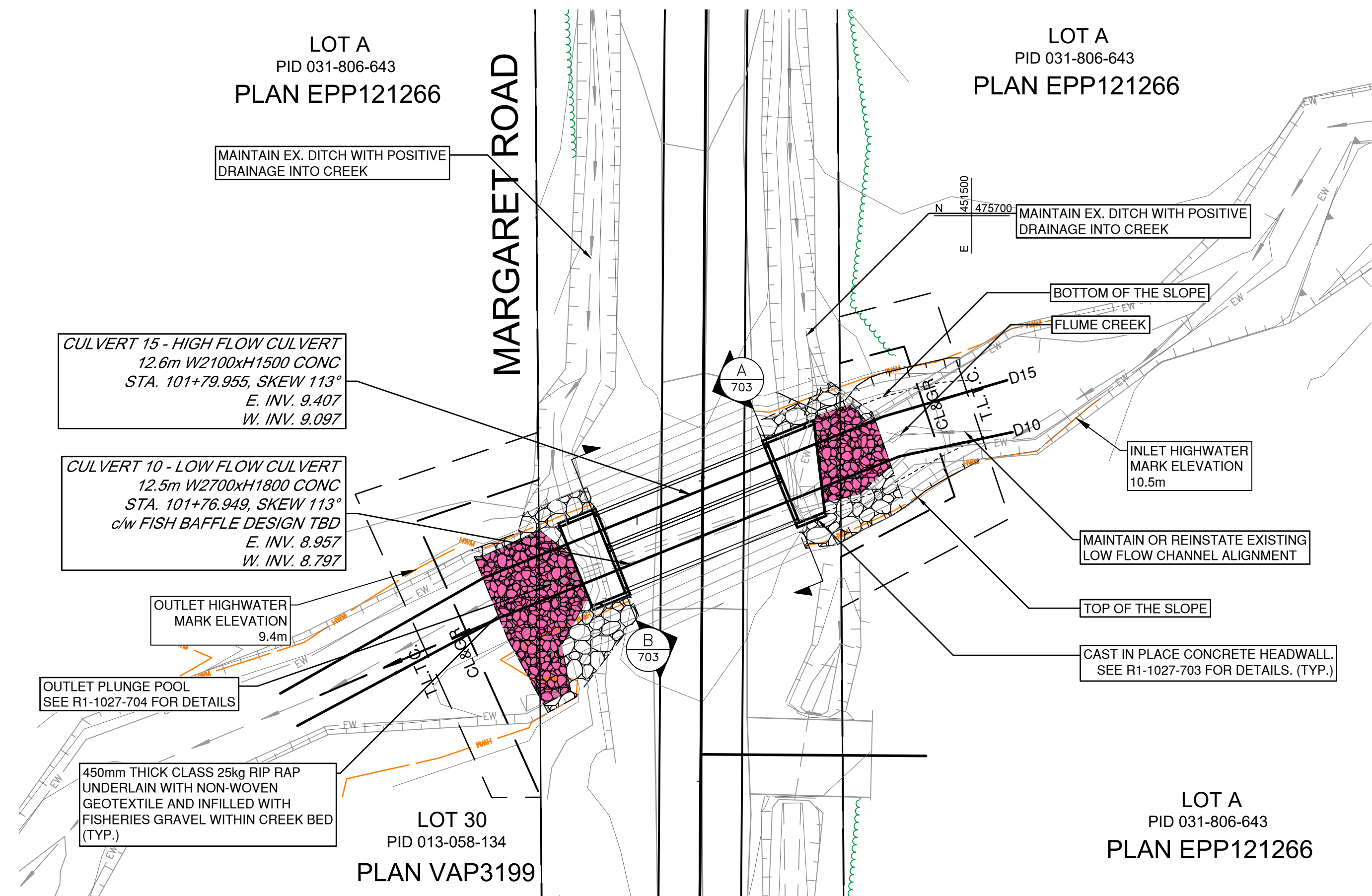
FOR ENVIRONMENTAL PERMITTING

PLAN
FLUME CREEK
DFAA FLOOD DAMAGE
STA. 200+90.670 TO 201+87.500

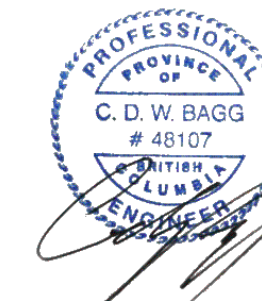
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872CS1714	14005	1	R1-1027-102-ENVIRQ	

PLOT DATE: 2023/03/02 U:\Projects_SUR\1961\0480\14\0-Design\CAD\DrawingProduction\EnvironmentalDrawings\R1-1027-100-Enviro.dwg

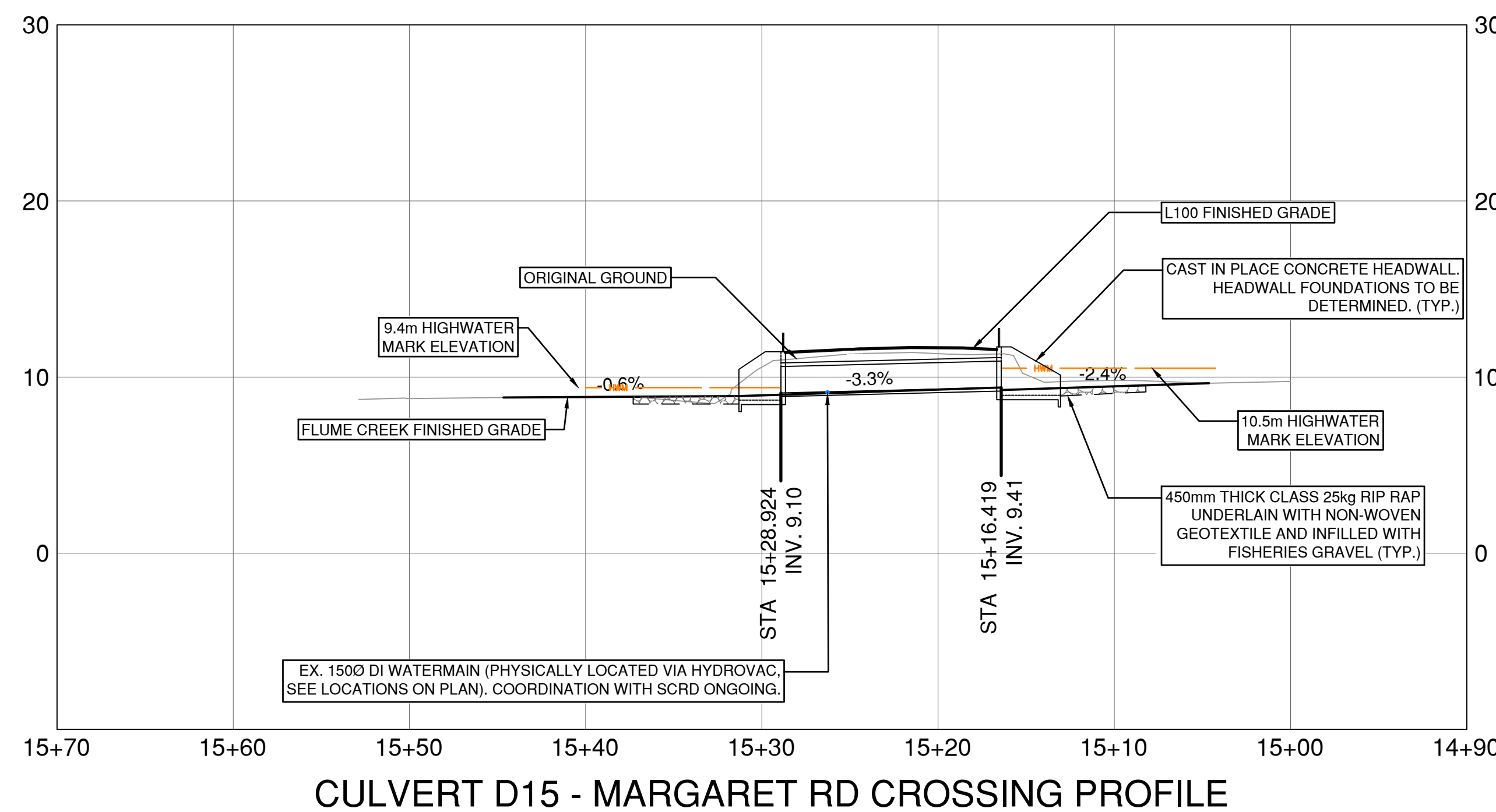
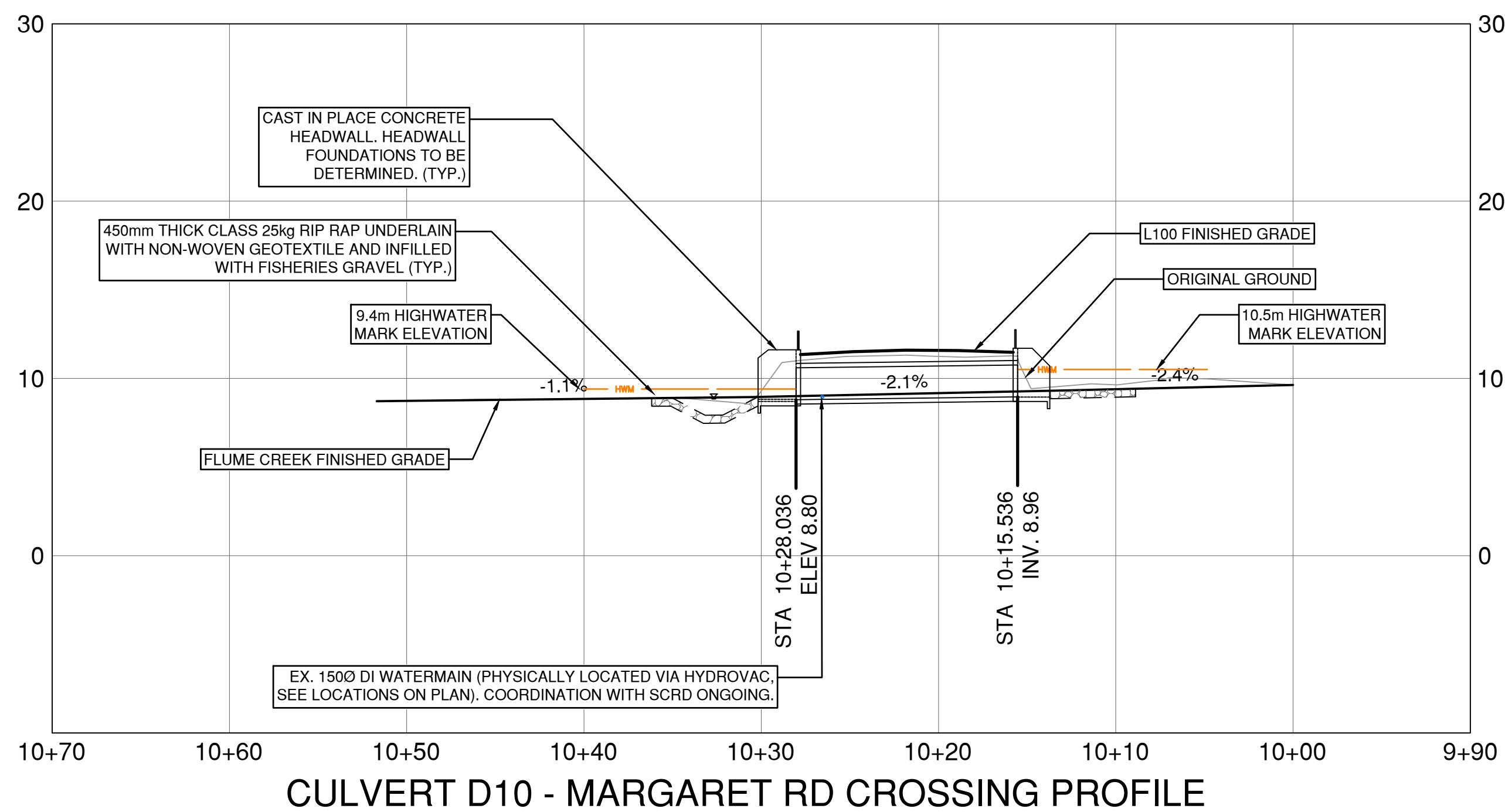
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PERMIT TO PRACTICE
URBAN SYSTEMS LTD.
Signature: [Signature]
Date: 2023-03-02
PERMIT NUMBER: 1000527
Engineers and Geoscientists BC (EGCBC)



2023-03-02



FOR ENVIRONMENTAL PERMITTING

LEGEND

RIPRAP	
CHANNEL BOTTOM - RIPRAP TOP DRESSED WITH FISHERIES GRAVELS	
HIGH WATERMARK	

URBAN SYSTEMS

SCALE 0 2 1:250 12m

CAD FILENAME: R1-1027-700-ENVIRO
PLOT DATE: 2023-03-02

REV	DATE	REVISIONS	NAME

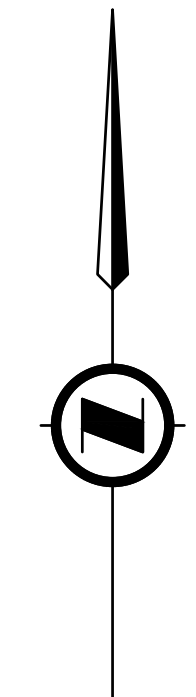
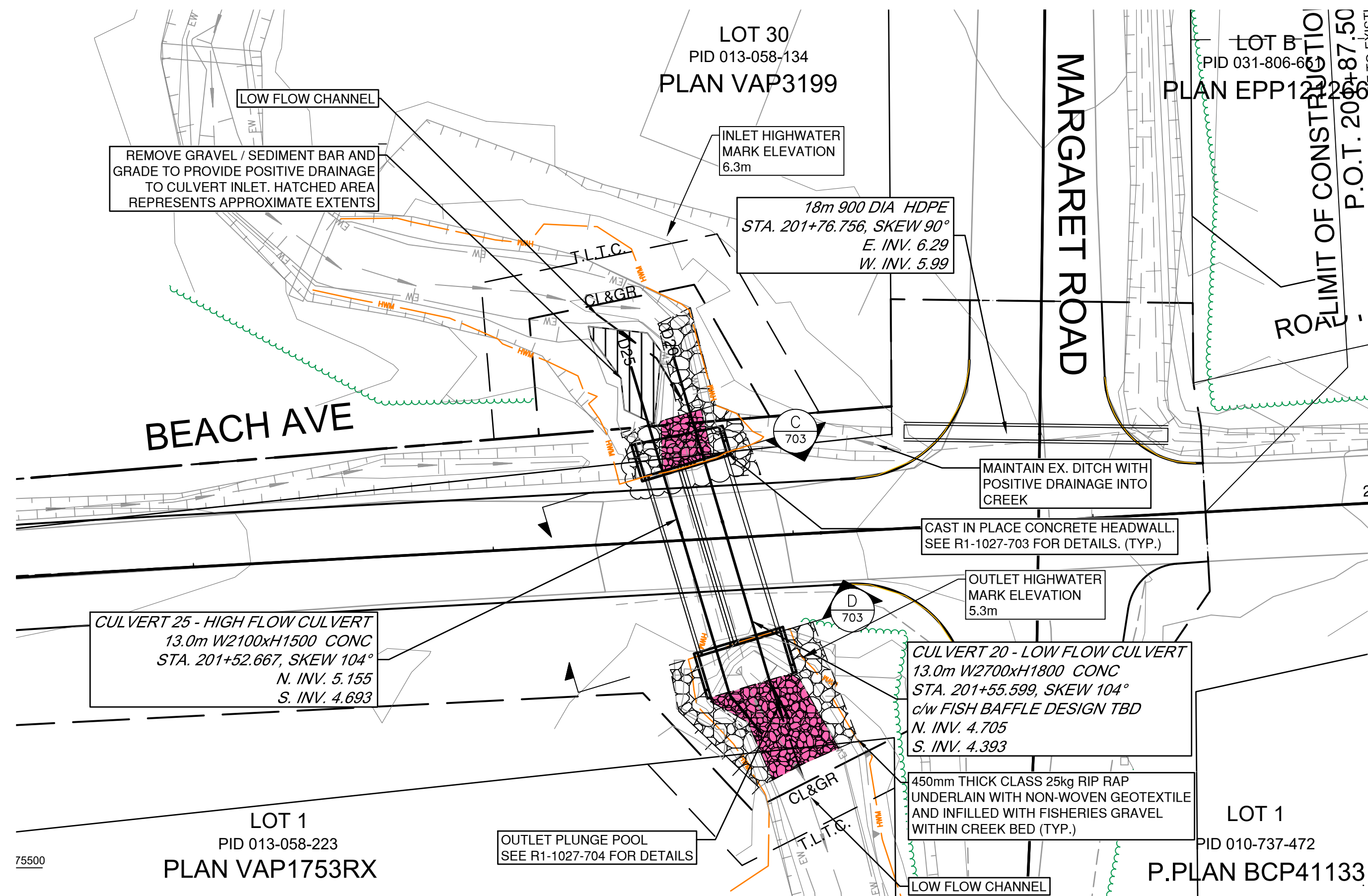
BRITISH COLUMBIA MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE
SOUTH COAST REGION
HIGHWAY ENGINEERING AND GEOMATICS

CODY BAGG, P.ENG.
SENIOR DESIGNER

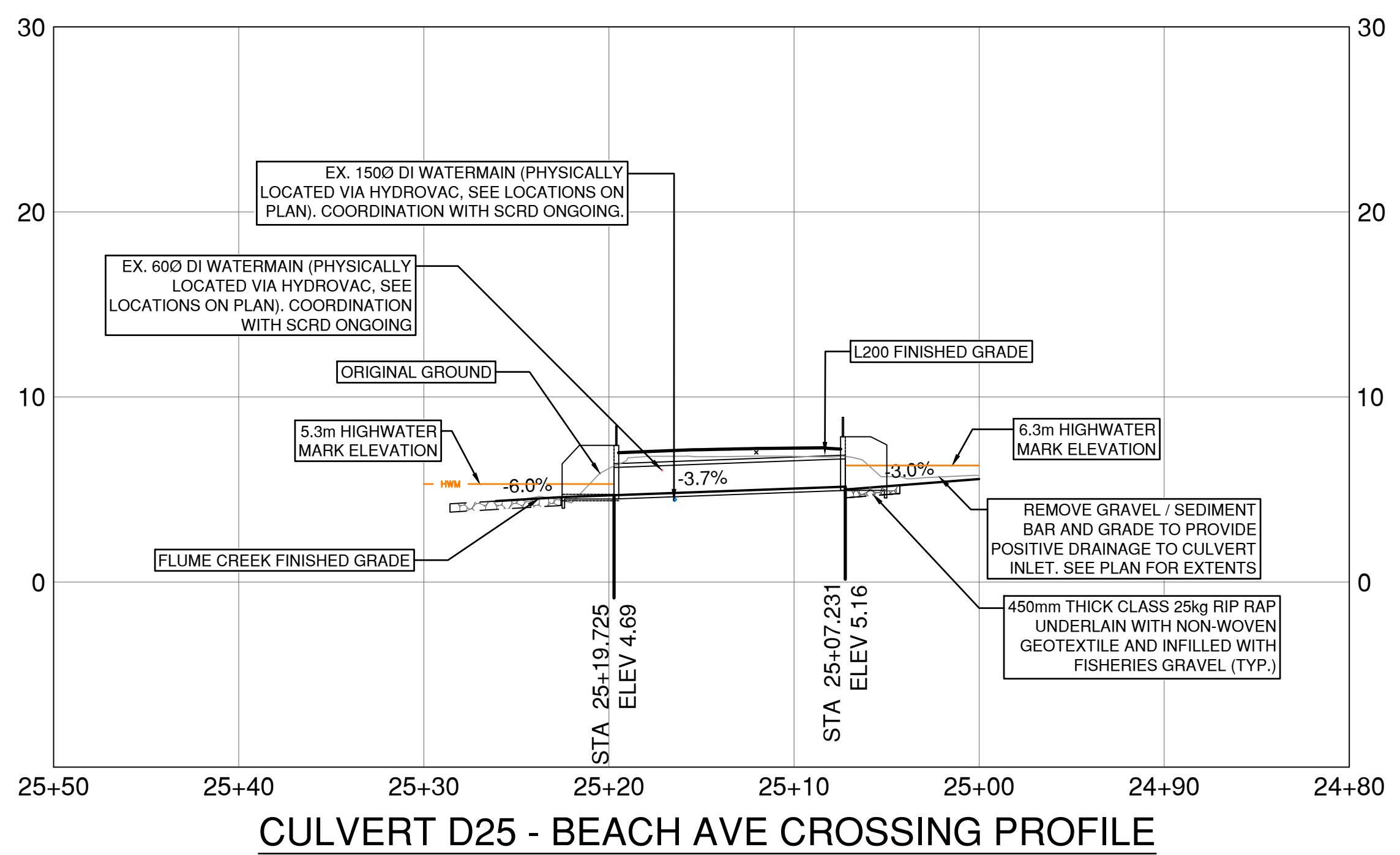
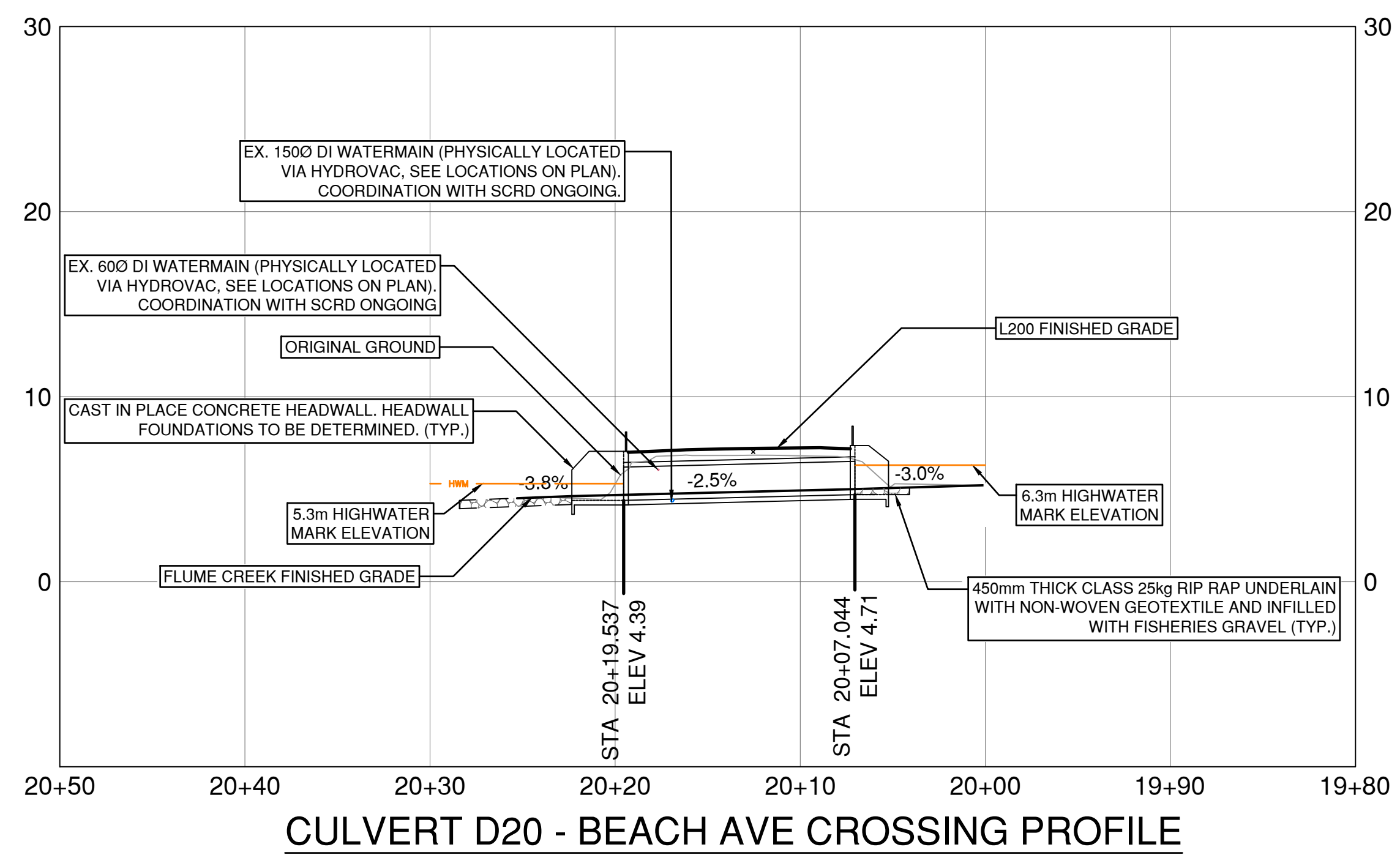
DESIGNED: S.CAVASINI DATE: 2023-03-02
QUALITY CONTROL: C.BAGG DATE: 2023-03-02
QUALITY ASSURANCE: J.BORCH DATE: 2023-03-02
DRAWN: E.PROULX DATE: 2023-03-02

MARGARET ROAD CULVERT CROSSING
FLUME CREEK
DFAA FLOOD DAMAGE

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
872CS1714	14005	1	R1-1027-701-ENVIRO	



2023-03-02



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PERMIT NUMBER: 1000527
Engineers and Geoscientists BC (EGBC)

LEGEND

<p>RIPRAP</p> <p>CHANNEL BOTTOM - RIPRAP TOP DRESSED WITH FISHERIES GRAVELS</p> <p>HIGH WATERMARK</p>	
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SCALE 0 2 1:250 12m

CAD FILENAME R1-1027-700-ENVIRQ
PLOT DATE 2023-03-02

REV	DATE	REVISIONS	NAME

BRITISH COLUMBIA

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

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SENIOR DESIGNER

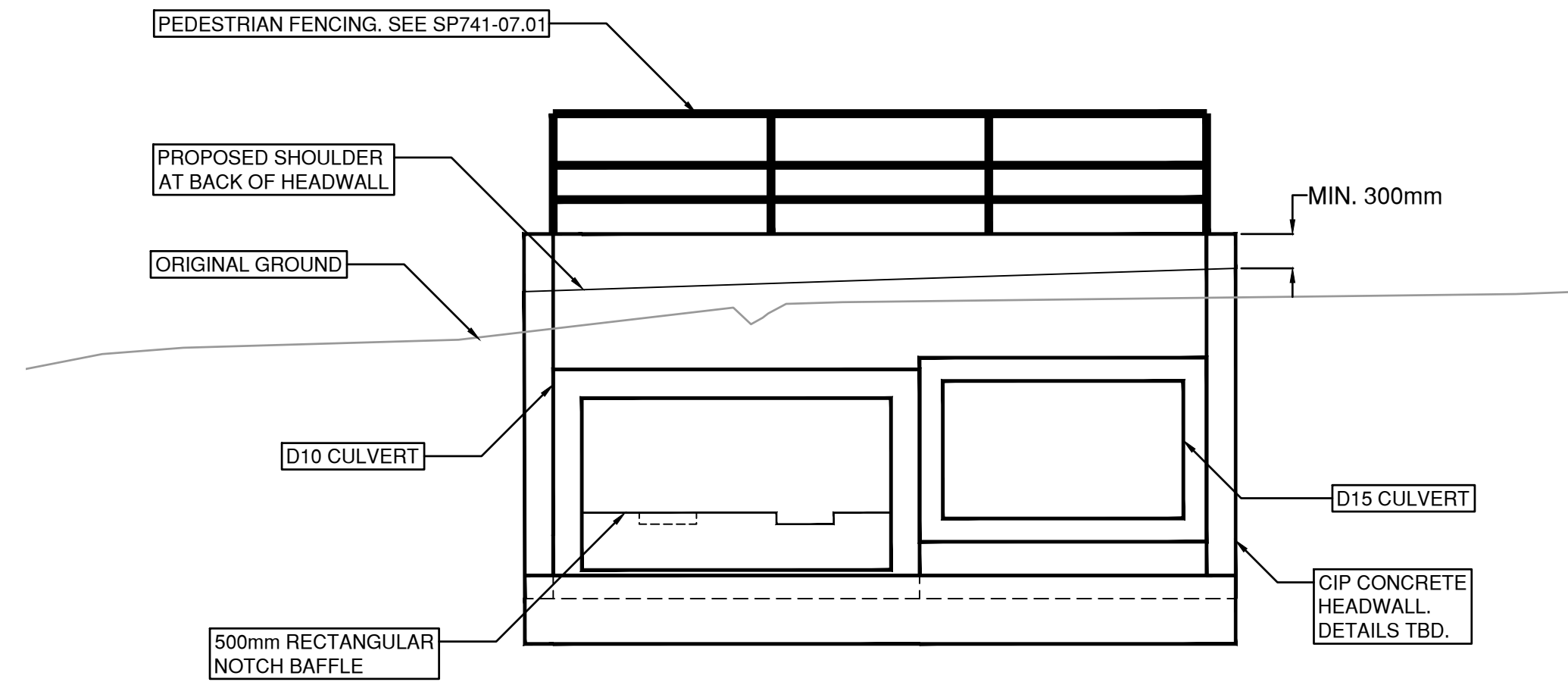
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QUALITY CONTROL: C.BAGG DATE: 2023-03-02
QUALITY ASSURANCE: J.BORCH DATE: 2023-03-02
DRAWN: E.PROULX DATE: 2023-03-02

FOR ENVIRONMENTAL PERMITTING

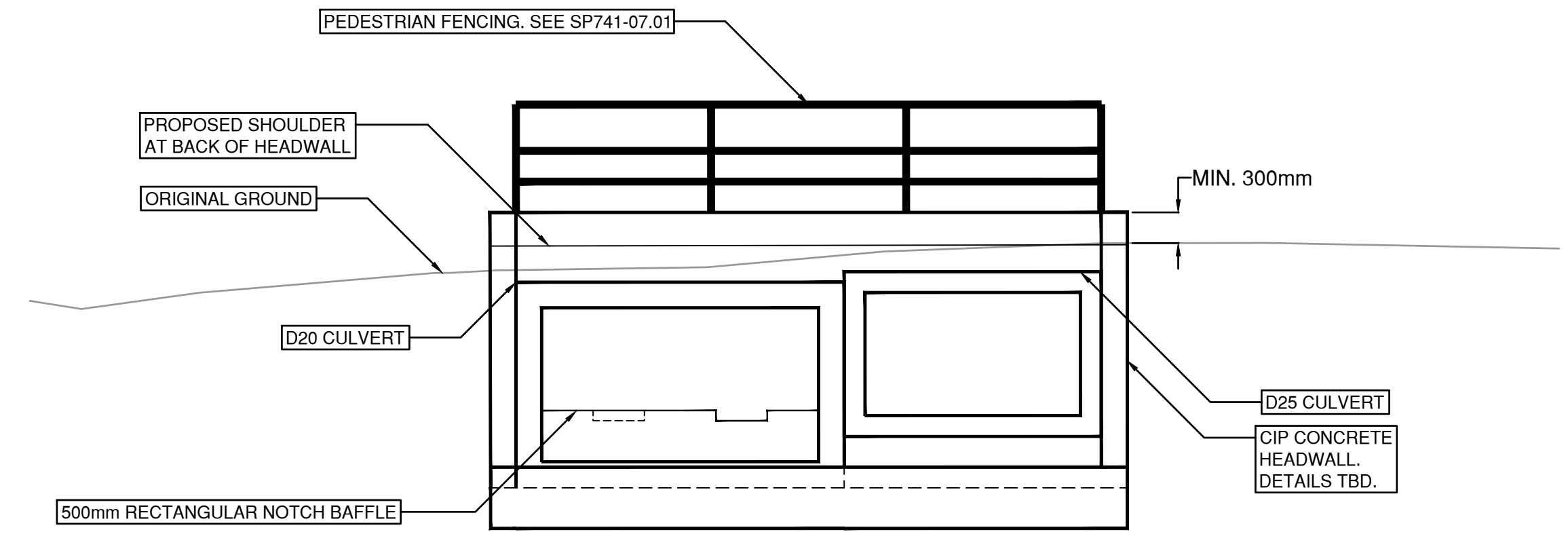
BEACH AVENUE CULVERT CROSSING FLUME CREEK DFAA FLOOD DAMAGE

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
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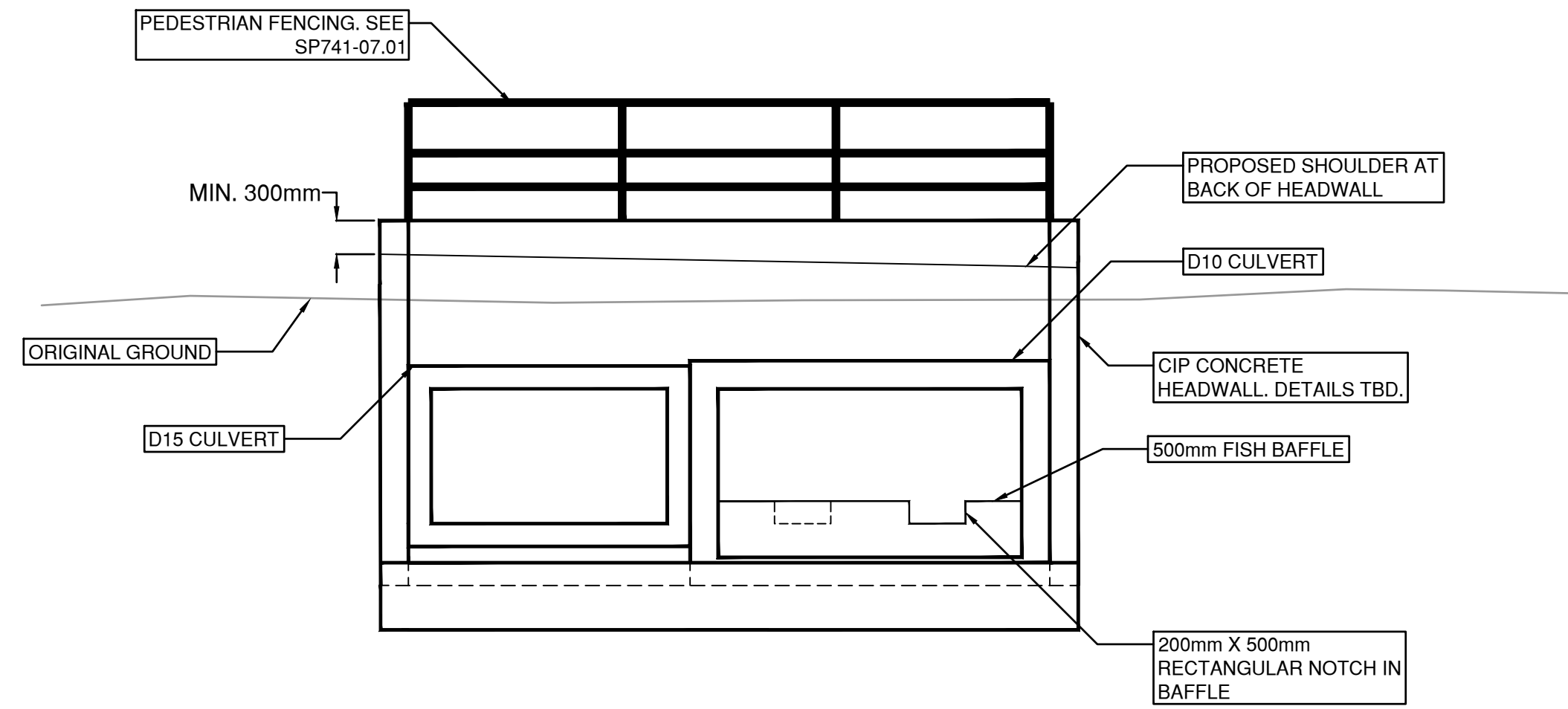
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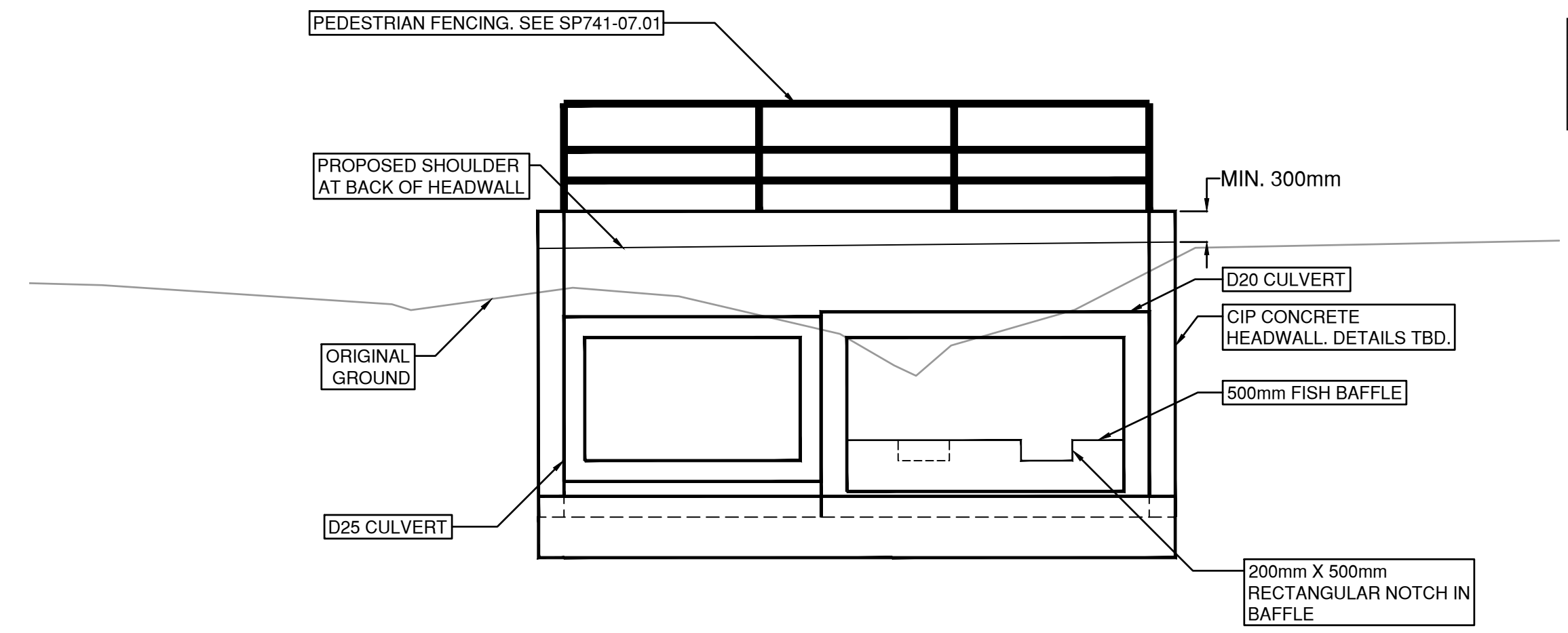
A MARGARET RD CROSSING
701 D10 & D15 INLET SECTION



C BEACH AVE CROSSING
702 D20 & D25 INLET SECTION



B MARGARET RD CROSSING
701 D10 & D15 OUTLET SECTION



D BEACH AVE CROSSING
702 D20 & D25 OUTLET SECTION



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URBAN ENGINEERING
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Date: 2023-03-02
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Engineers and Geoscientists BC
(EGBC)

FOR ENVIRONMENTAL PERMITTING

PLOT DATE: 2023/03/02 U:\Projects_SUR\1961\0480\14\0-Design\CAD\DrawingProduction\EnvironmentalDrawings\R1-1027-700-Enviro.dwg

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		PLOT DATE 2023-03-02	
REV	DATE	REVISIONS	NAME

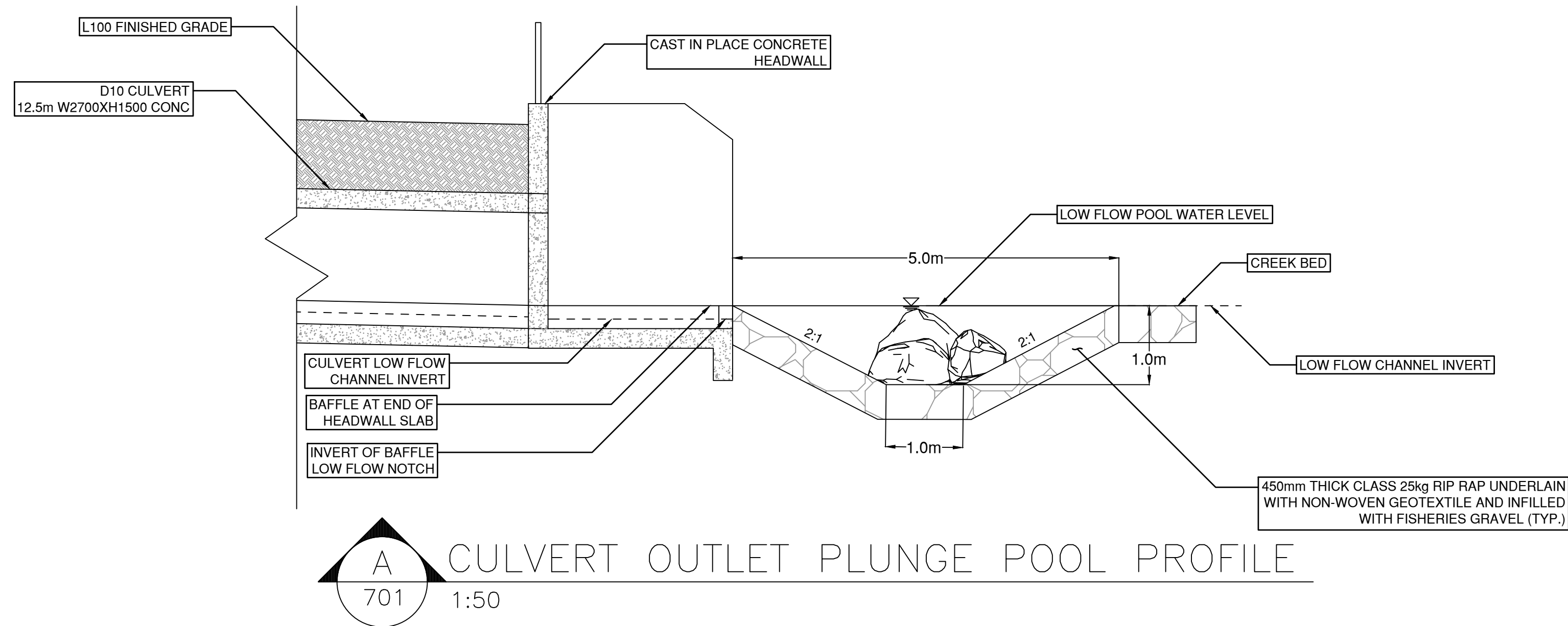
BRITISH COLUMBIA MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE
SOUTH COAST REGION
HIGHWAY ENGINEERING AND GEOMATICS

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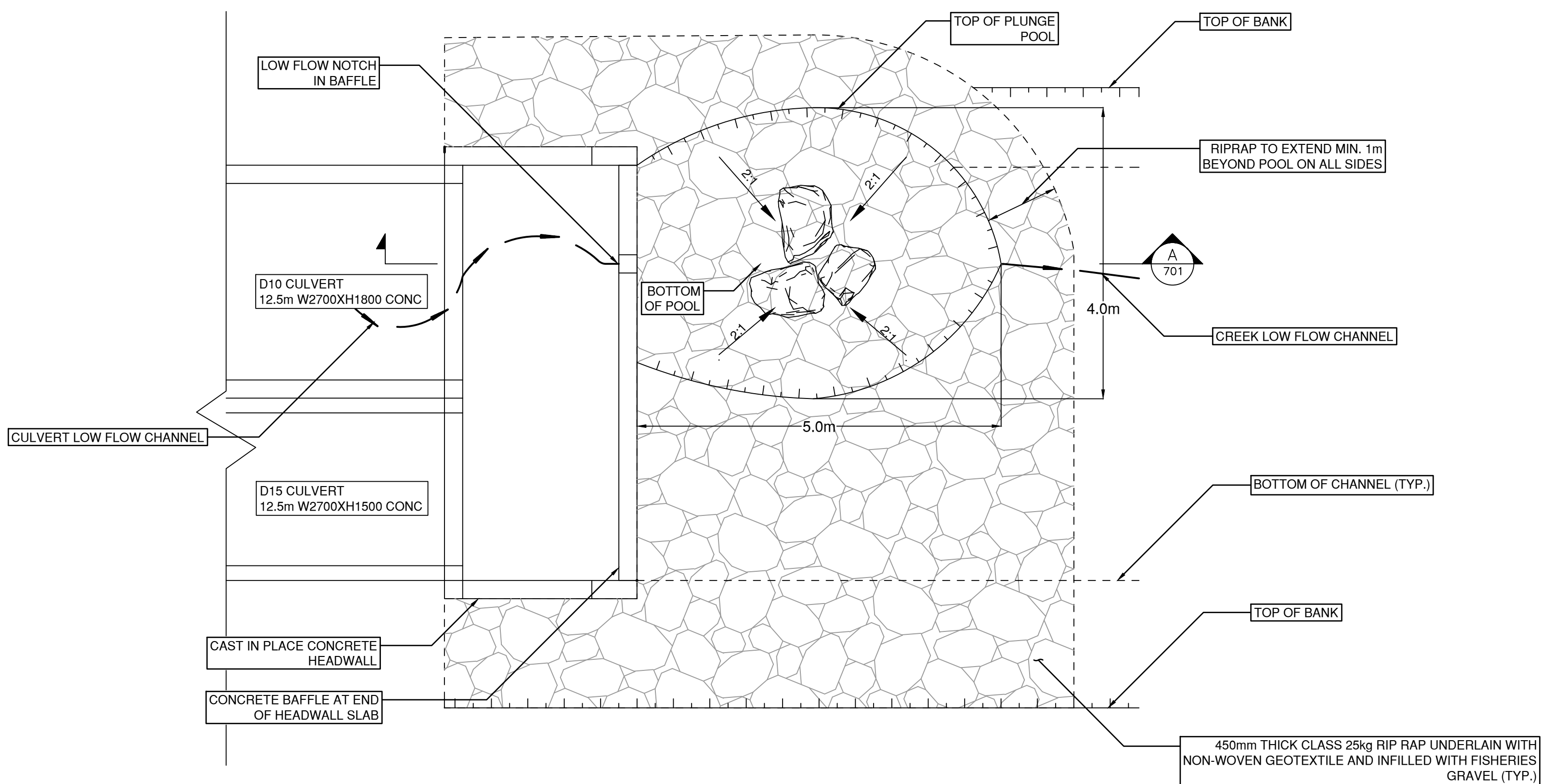
CODY BAGG, P.ENG.
SENIOR DESIGNER
DATE

SECTIONS			
FLUME CREEK DFAA FLOOD DAMAGE			
FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER
872CS1714	14005	1	R1-1027-703-ENVIRQ





A
701
1:50
CULVERT OUTLET PLUNGE POOL PROFILE



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Date: 2023-03-02
PERMIT NUMBER: 1000527
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(EGBC)

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PLOT DATE: 2023/03/02 U:\Projects_SUR\1961\0480\14\0-Design\CAD\DrawingProduction\EnvironmentalDrawings\R1-1027-700-Enviro.dwg



SCALE 0 0.5 1.50 2.5m		CAD FILENAME R1-1027-700-ENVIRQ	
		PLOT DATE 2023-03-02	
REV	DATE	REVISIONS	NAME

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SENIOR DESIGNER

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QUALITY ASSURANCE: J.BORCH DATE: 2023-03-02
DRAWN: E.PROULX DATE: 2023-03-02

MARGARET ROAD PLUNGE POOL			
FLUME CREEK DFAA FLOOD DAMAGE			
FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER
872CS1714	14005	1	R1-1027-704-ENVIRQ