



# Geotechnical Data Report Highway 7 over Nicomen Slough Dewdney Bridge 00596 Replacement Project Dewdney, BC



### PRESENTED TO British Columbia Ministry of Transportation and Infrastructure

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> Tetra Tech Canada Inc. Suite 1000 – 10th Floor, 885 Dunsmuir Street Vancouver, BC V6C 1N5 CANADA Tel 604.685.0275 Fax 604.684.6241



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### LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of British Columbia Ministry of Transportation and Infrastructure and their agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than BC Ministry of Transportation and Infrastructure, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in the Appendix or Contractual Terms and Conditions executed by both parties.





## **1.0 INTRODUCTION**

Tetra Tech Canada Inc. (Tetra Tech) was retained by the British Columbia Ministry of Transportation and Infrastructure (BC MoTI) under Contract No. 860-CS-0955 to provide geotechnical engineering services for the Highway 7 over Nicomen Slough Dewdney Bridge No. 00596 Replacement Project. The site is located along Highway 7 in Dewdney, BC, approximately 12 km east of Mission, BC.

This report presents the findings of our geotechnical exploration program conducted in September 2019.

The Limitations on the Use of this Document, attached in Appendix A, forms an integral part of this report.

## 2.0 PROJECT DESCRIPTION

This project involves the replacement of the existing Dewdney Bridge with a two-lane bridge. The three conceptual options include a five-span prestressed I-girder option, a long span truss, or a shorter span option which allows for top down construction (approximately 11 spans).

We understand that the existing bridge was constructed in the late 1950s comprising a 19.8 m main steel I-girder span and 15 "inverted bathtub" concrete spans approximately 8.5 m each, founded on timber piles. Available drawings for the bridge suggest that the timber piles extend to approximately 15 m below mudline, however pile installation or driving logs were not made available. We understand that the existing bridge has required numerous repairs in recent years and is in poor condition.

At this time, the five-span prestressed concrete I-girder option is the most likely replacement for the existing bridge. This bridge will be supported on piles at each abutment; with four in-slough piers. The bridge will be supported on piles at each abutment. The proposed bridge will likely require additional fills to raise the road grade along Highway 7 as well as the approaches. The bridge approaches may tie into the existing dikes or span overtop of the existing dikes.

The objective of our geotechnical subsurface exploration was to obtain information along the alignment of the existing bridge abutments, approach fills and within the Nicomen Slough at possible pier locations, for the purposes of conceptual design. The contents of this report therefore include the following:

- A description of the scope of work;
- A description of the methodology and equipment used;
- Results and factual data collected during the geotechnical site investigation; and
- A site plan figure showing the testhole locations.

## 3.0 INFORMATION REVIEWED

The following information sources were reviewed as part of a desktop study completed early in the project:

- Information provided by BC MoTI, including existing structural drawings and site photos;
- Published water well logs from the BC Water Resources Atlas (<u>http://maps.gov.bc.ca/ess/hm/wrbc</u>);
- Fraser Valley Regional District Geographical Information System data; and
- Relevant geological maps and papers published by the Geological Survey of Canada, BC Geological Survey and other information sources.





## 4.0 GEOTECHNICAL SITE EXPLORATION

## 4.1 General

The geotechnical site exploration was completed between September 3 and 27, 2019 and consisted of the following:

- Sixteen (16) Solid Stem Auger testholes located along Highway 7 and the dikes;
- Two (2) Sonic testholes located at the north and south bridge approaches;
- Three (3) Sonic testholes located within the slough, drilled atop the bridge deck;
- Two (2) Seismic Cone Penetration Test (SCPT) soundings located at the north and south bridge approaches; and
- Two (2) Cone Penetration Test (CPT) soundings located within the slough, drilled from the bridge deck through sonic casing.

A site plan and testhole locations plan are shown on Figures 1 and 2, respectively.

Testholes in the slough were advanced through the bridge deck from a truck mount sonic rig positioned on the bridge. The testholes were located with structural input from McElhanney and out of the wheelpaths.

Prior to coring through the bridge deck the concrete was removed down to the deck rebar by chipping out the deck concrete in an area approximately 305 mm (12") square at each testhole location. This area was sufficient to expose two bars in the bridge girder. The core hole was then positioned such that the core hole cut through only one of the bars. A larger, shallower area 356 by 356 mm (14" by 14") was sawcut to a depth adequate to allow a similar sized road plate to be bolted to the deck. The road plate surfaces were roughly flush with the road surface and with the road plates bolted in place when drilling was not occurring. Finally, 229 mm (9") diameter holes were cored through the bridge deck by SureCore Concrete Coring. The drill casing diameter for the testholes on the bridge was 178 mm (7") diameter.

The testhole logs and a summary report containing CPT data are provided in Appendix B.

## 4.2 Solid Stem Auger

The Solid Stem Auger testholes were carried out by Downrite Drilling Ltd. Four (4) testholes were completed in the Dewdney Area Improvement District dike, to depths of 6.1 m to 7.6 m. Four (4) testholes were completed in the Nicomen Island Improvement District dike, to depths of 9.1 m. Eight (8) testholes were completed on Highway 7, with practical refusal at approximately 1 m, and three (3) reaching target depths of 6.1 m. Upon completion, testholes in the dikes were backfilled to surface with grout in accordance with the *Dike Maintenance Act*. Testholes located on the roadway were backfilled to surface with auger cuttings and bentonite chips in accordance with the BC *Water Sustainability Act*.

## 4.3 Sonic Drilling

The sonic testholes were carried out by Mud Bay Drilling Co. Ltd. One (1) testhole was completed on the approach on each side of the bridge (for a total of two (2) testholes), at the intersection of the dikes and the roadway. Three (3) testholes were completed in the slough, from the bridge deck.





The testholes in the dikes (on the approaches) were advanced 102 mm (4") core followed by 152 mm (6") casing. Testholes were backfilled to surface with grout in accordance with the *Dike Maintenance Act*.

Testholes in the slough were cased with 178 mm (7") casing from the rectangular hole in the bridge deck to approximately 1.5 m below mudline and cleaned out. Then 152 mm (6") casing was lowered, and advanced following drilling with 102 mm (4") core. Testholes in the slough were backfilled to surface with bentonite chip plugs and slough in accordance with the BC *Water Sustainability Act.* Core was photographed after logging.

## 4.4 Cone Penetration Testing and Seismic Cone Penetration Testing

The Cone Penetration Testing (CPT) / Seismic Cone Penetration Testing (SCPT) soundings were carried out by Conetec Investigations Ltd. Two (2) SCPT's were completed adjacent to the sonic testholes on the bridge approaches. Two (2) CPT's were completed at two of the three sonic testhole locations in the slough, and were advanced through the casing prior to sonic drilling. The CPT and SCPT soundings were completed using a 15 cm<sup>2</sup> seismic piezocone for detailed stratigraphic profiling and measurement of in situ soil properties. The testing was carried out in general accordance with ASTM D5778. SCPT19-01 and SCPT19-02 were pre-drilled to depths of approximately 4 m and 3 m (respectively) below ground surface due to the widespread occurrence of gravels and cobbles in the upper part of the soil profile. Measurements of the shear wave velocity (V<sub>s</sub>) of the soil were obtained using a manual surface hammer shear wave source. Seismic testing was not performed at CPT19-03 and CPT19-04 on the bridge deck. A series of pore pressure dissipation (PPD) tests were also carried out to measure static groundwater levels and to estimate the permeability of the soil layers. Further details of the CPT / SCPT testing, including the cone dimensions, load cell specifications and data plots can be found in the attached report in Appendix B.

## 4.5 Logging and Sampling

A Tetra Tech field engineer was on site during advancement of the testholes to log and sample the material encountered, as well as to direct the in-situ testing, termination depths and backfilling. During the drilling, Tetra Tech's field engineer also monitored the drill advancement rates, soil recovery, bit wear, etc. and periodically sampled the soil cuttings to document the subsurface conditions. Soil samples recovered from both auger and sonic testholes were retained for geotechnical index laboratory testing.

## 4.6 Laboratory Testing

Soil samples recovered from the testholes were sent to Tetra Tech's laboratory for geotechnical index classification. The following tests were conducted on selected samples:

- Water Content (ASTM D2216);
- Atterberg Limits (ASTM D4318);
- Particle Size Distribution (ASTM D7928);
- Grain Size Analysis of material finer than 75 μm (ASTM D1140 and ASTM C117);
- Soluble Sulphate Ion Content of Soil (CSA A23.2-3B); and
- Water Soluble Chloride Ion Content (CSA A23.2-4B)

Laboratory test results are presented on the testhole logs and in Appendix C.





## 5.0 SUBSURFACE CONDITIONS

### 5.1 Surficial Geology

Based on Geological Survey of Canada (GSC) surficial geology Map 1485A (Armstrong 1976), subsurface soils within the slough are likely to consist of normally consolidated Fraser River Sediments comprising silts and sands, with potential for clay layers based on a review of water well logs. The Fraser River Sediments are underlain by glaciomarine sediments, glacial till and bedrock. Glacial till and bedrock are expected to be on the order of 100 m depth or more in this area.

## 5.2 Soil Stratigraphy

The results of the geotechnical site exploration are generally consistent with the soil conditions anticipated from the published surficial geology mapping. The interpreted soil stratigraphy is described below.

- Asphalt Concrete: Testholes conducted along Highway 7 (SH19-01, SH19-02, and BH19-09 to BH19-16) encountered approximately 130 mm to 150 mm of asphalt concrete at the north approach, and 150 mm to 260 mm of asphalt concrete at the south approach. BH19-01 conducted on River Road South encountered 80 mm of asphalt concrete.
- Granular Fill (Road Base): Along Highway 7 north of the existing bridge, the asphalt concrete was underlain by granular fill generally comprising gravel, some sand, some cobbles, between approximately 1.05 m and 2.85 m thick. Along Highway 7 south of the bridge, granular fill generally comprised sandy gravel, trace to some silt, between approximately 0.75 m and 2.52 m thick. Granular fill thickness increased towards the bridge deck approaches at both ends along Highway 7.
- Fill (Dike): Dike fill at the north side of the bridge (BH19-01 to BH19-04) generally comprised compact gravel and sand, some cobbles, some boulders, with traces of silt up to 3.5 m thick. Dike fill at the south side of the bridge (BH19-05 to BH19-08) generally comprised compact / firm, silty sand to sandy silt, up to 4.6 m thick.
- Interbedded Sand and Silt: Below the dike fill, as observed within testholes conducted at the approaches and dikes north and south of the bridge, as well as below the mudline, as observed within testholes conducted along the existing bridge, interbedded sand and silt was encountered down to approximately 64.3 m below existing road grade. Intermittent wood layers, wood inclusions and debris, as well as organic silt layers about 0.4 m thick were also encountered within the top 10 m below mudline. Based on the CPT data, the measured cone tip resistance (qt) generally ranged between 10 to 20 MPa (100 to 200 bar).

Neither glacial till nor bedrock were encountered during drilling. The depth to bedrock recorded at a water well approximately 200 m to the south of the existing bridge was 118 m. This has been used as the depth to firm ground for the purposes of this report.

## 5.3 Groundwater

Based on porewater pressure readings and dissipation data obtained at SCPT19-01 and SCPT19-02 at either approach, groundwater levels were measured at approximately 7.8 m and 9.7 m below existing road grade, respectively on the existing bridge approach fills. After completion of the bridge deck coreholes, water level and mudline measurements were also obtained with respect to the top of the bridge deck; this information is summarized in the table below.



### Table 5-1: Summary of Water Level and Depth Measurements Within the Slough

Date	Testhole Location	Location on Bridge	Depth to Water Level Below Bridge Deck Surface (m)	Depth to Mudline (m)
September 16, 2019	SH19-03	Centre	10.6	11.6
September 16, 2019	SH19-04	North Side	9.3	10.5
September 16, 2019	SH19-05	South Side	10.9	12.8

This information indicates that the depth of water in the slough was 1.0 m to 1.9 m at the three testhole locations advanced through the existing bridge deck. We anticipate that seasonal fluctuations in the Fraser River, seasonal runoff from Dewdney Peak and Nicomen Mountain, as well as periods of wet weather, will have an influence on groundwater levels and water levels within the slough.





## 6.0 CLOSURE

We trust this data report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted, Tetra Tech Canada Inc.



Prepared by: Julie Kostecki, P.Eng. Geotechnical Engineer Engineering Practice Direct Line: 778.945.5753 Julie.Kostecki@tetratech.com

/cy/sy



Reviewed by: Kim Johnston, M.Sc., P.Eng., PE Principal Specialist, Pacific Region Engineering Practice Direct Line: 778.945.5885 Kim.Johnston@tetratech.com



## REFERENCES

Armstrong, J E; Geological Survey of Canada, "A" Series Map 1485A, 1980, 1 sheet, https://doi.org/10.4095/108875 (Open Access)



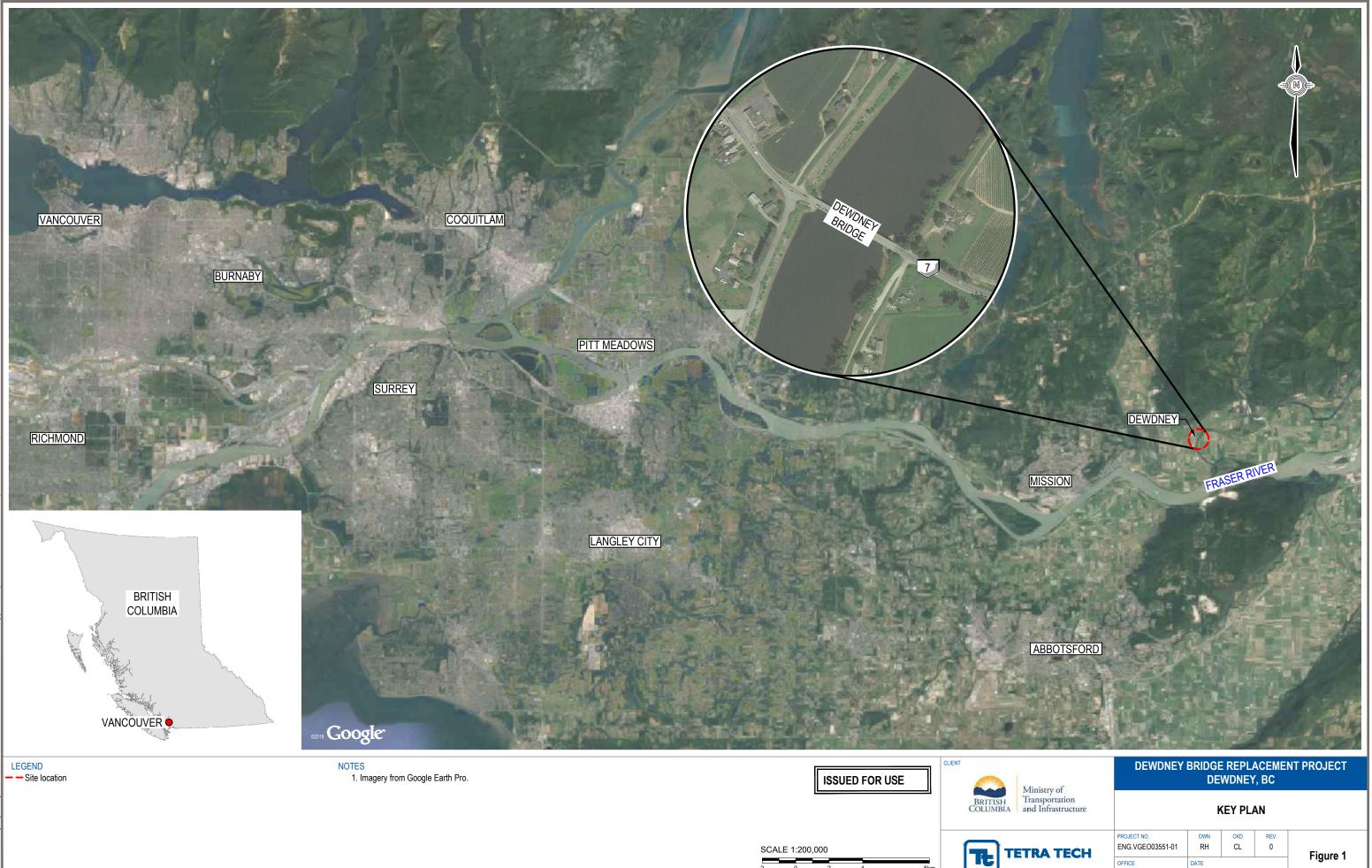




## FIGURES

- Figure 1 Site Plan
- Figure 2 Testhole Location Plan



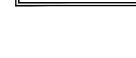


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OFFICE VANC	DATE November	14, 2019		Figure 1





 Water Line based on BC One Call figure.
 Dike alignments based on BC Lower Mainland Dike Inventory Maps for Dewdney Area Improvement District/Norrish Creek (Map 24) and Nicomen Island Improvement District; North Nicomen Dyking District (Map 27)



SCALE 1:1500



ETRA	TECH

PROJECT NO.	DWN	CKD	REV	
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OFFICE	DATE			Figure 2
VANC	November	14, 2019		



# APPENDIX A

## TETRA TECH'S LIMITATIONS ON THE USE OF THIS DOCUMENT



## GEOTECHNICAL

### 1.1 USE OF DOCUMENT AND OWNERSHIP

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If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of TETRA TECH.

### 1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Contract, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

### **1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS**

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by third parties other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

### **1.6 GENERAL LIMITATIONS OF DOCUMENT**

This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this document, at or on the development proposed as of the date of the Professional Document requires a supplementary exploration, investigation, and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.



#### **1.7 ENVIRONMENTAL AND REGULATORY ISSUES**

Unless stipulated in the report, TETRA TECH has not been retained to explore, address or consider and has not explored, addressed or considered any environmental or regulatory issues associated with development on the subject site.

#### 1.8 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems, methods and standards employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. TETRA TECH does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

### **1.9 LOGS OF TESTHOLES**

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

### **1.10 STRATIGRAPHIC AND GEOLOGICAL INFORMATION**

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historical environment. TETRA TECH does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional exploration and review may be necessary.

### 1.11 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

#### 1.12 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

### 1.13 INFLUENCE OF CONSTRUCTION ACTIVITY

Construction activity can impact structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques, and construction sequence are known.

### 1.14 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, and the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

### 1.15 DRAINAGE SYSTEMS

Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function. Where temporary or permanent drainage systems are installed within or around a structure, these systems must protect the structure from loss of ground due to mechanisms such as internal erosion and must be designed so as to assure continued satisfactory performance of the drains. Specific design details regarding the geotechnical aspects of such systems (e.g. bedding material, surrounding soil, soil cover, geotextile type) should be reviewed by the geotechnical engineer to confirm the performance of the system is consistent with the conditions used in the geotechnical design.

### **1.16 DESIGN PARAMETERS**

Bearing capacities for Limit States or Allowable Stress Design, strength/stiffness properties and similar geotechnical design parameters quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition used in this report. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions considered in this report in fact exist at the site.

### 1.17 SAMPLES

TETRA TECH will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

## 1.18 APPLICABLE CODES, STANDARDS, GUIDELINES & BEST PRACTICE

This document has been prepared based on the applicable codes, standards, guidelines or best practice as identified in the report. Some mandated codes, standards and guidelines (such as ASTM, AASHTO Bridge Design/Construction Codes, Canadian Highway Bridge Design Code, National/Provincial Building Codes) are routinely updated and corrections made. TETRA TECH cannot predict nor be held liable for any such future changes, amendments, errors or omissions in these documents that may have a bearing on the assessment, design or analyses included in this report.



# APPENDIX B

## **TESTHOLE LOGS AND CPT DATA**





## **TESTHOLE LOGS**



BR	ITTISH	Ministry of Transportation	Project: Bridge	e R	epla		JMMARY LOG	Drill Hole #: BH19-( Date(s) Drilled: September 3, 2019						
COL	UMBIA		Location: River Roa Datum: WGS 1984		6, NE	-bound	lane Alignment:	-	Company: Downrite Drilling Driller: Jonathan Goode					
, iop	Te	704-ENG.VGEO03551-01 tra Tech	Northing/Easting: 5	5445		, 55869	C C	Drill	I Make/Model:					
Logg	ed by: CL	Reviewed by: DR	Elevation: X Shear Strength (kPa)	ш		(9)		+	Drilling Method: Auger					
DEPTH (m)	DRILLING	- Reviewed by: DR XPocket Penetrometer 100 200 ▲ SPT "N" (BLC Wp% W 20 40		SAMPLE TYP	SAMPLE NO	RECOVERY (%)	DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION				
0					SA-01		brown, FILL, compact	GP	i	a				
2					SA-02		ML, SILT (non-plastic), some sand, brown, moist, compact/firm			a a				
		361			SA-03		CL, CLAY (low plasticity), some silt, olive 2.4r brown, moist, firm	CL	FTV = 39 KPa	р о 8 о				
3	Auger				SA-04		CI, CLAY (intermediate plasticity), some silt, olive brown, orange mottling, moist, firm	n — — CI		0 0 0 0				
4		33.3			SA-05		ML, SILT (non-plastic), trace clay, trace 3.7r sand (fine), brown, orange mottling, moist, firm -medium bedded with SILT, trace to some sand (fine)	n		a a a a a a				
5		29.3			SA-06			ML		0 0 9 0				
6	5.5m				SA-07		-water at 5.5 m			o o				
7	Ť						End of Testhole at 6.1 m (target depth achieved). - Water level was observed at 5.5 m. - Upon completion, testhole was backfilled to surface with grout in accordance with the Dike Maintenance Act.	n		<u>. 'a . 'a</u>	-			
8							<ul> <li>Soil description is based on visual assessment and laboratory test data where available.</li> <li>Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered</li> </ul>							
9							samples. These estimates are based on engineering judgement. - FTV refers to Field Torvane, an approximate value for shear strength obtained in the field with a Torvane Shear Device.							
-							- UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.							
10 Leger		Auger 🗍 <b>B</b> -Becker 🚺	C-Core G-Grat	b		<b>V</b> -Vane	Legend Installation: Sand Grout Cement Bento	nite	Final Depth of					
Samp Type:	le L#-		O-Odex W-Was (air rotary) (mud re		·	•	installation.	motor	Depth to Top	of Rock: Page 1	: N			

Γ								SU	MMARY LOG		Drill Hole #:	BH19	9-02
	BRI	TISH	Ministry of Transportation	Project: Bridge	e R	epla	ace	men	ıt	Date	e(s) Drilled: Septembe	er 3, 2019	1
			and Infrastructure	Location: Dewdney		ea Im	ipro\	/eme		1	npany: Downrite Drillir	g	
	Piepa	Tetr	04-ENG.VGEO03551-01 ra Tech	Datum: WGS 1984 Northing/Easting: 5		5950	, 55	8723	Alignment: Station/Offset:		er: Jonathan Goode Make/Model:		
	Logg	ed by: CL	Reviewed by: DR	Elevation:						Drill	ing Method: Auger		
	DEPTH (m)	DRILLING DETAILS	Wp%, W	300 400 DWS/300 mm) ▲	SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate	BACKFILL INFORMATION	DEPTH (m)
MOTI-SOIL-REV3 ENG-VGE003551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE_REV3.GDT 11/20/19	1 1 2 3 4 5 6 7 8 9 -9 10	Auger Auger	20 40 40 25.7 33.7 33.7			SA-01 SA-02 SA-03 SA-04 SA-05 SA-06	2		GP, GRAVEL (fine, angular to rounded) and SAND (fine to coarse), trace silt, brown, rootlet inclusions, FILL, brown, (GP, GRAVEL (fine, angular to rounded) and SAND (fine to coarse), trace silt, grey, FILL, compact       0.6m         GP, GRAVEL (fine to coarse, angular to rounded) and SAND (fine to coarse), some cobbles, some boulders, trace silt, brown, FILL, compact       0.5m         ML, SILT (non-plastic), trace sand (fine), trace clay, brown, moist, firm -layers some sand (fine)       3.5m         CL, CLAY (low plasticity), some silt, olive brown, moist, firm       4.6m         CL, CLAY (low plasticity), trace to some silt, brown, orange mottling, moist, firm       6.2m         SM3, SAND (fine), silty, brown, mottled, compact       6.9m         SP, SAND (fine to medium), grey-brown, dry, compact       6.9m         SP, SAND (fine to medium), grey-brown, dry, compact       7.6m         End of Testhole at 7.6 m (target depth achieved).       7.6m         • Water level was not encountered.       0.9m completion, testhole was backfilled to surface with grout in accordance with the Dike Maintenance Act.       7.6m         • Soil description is based on visual assessment and laboratory test data where available.       7.6m         • Estimates of soil consistency were determined from drill rig performance, in situ test data, and visual classification of recovered samples. These estimates are based on engineering judgement.	GP GP ML CL CH SM3	{G % S % F %} FTV = 40 KPa FTV = 59 KPa		- 1 2 3 4 5 6 7 8 8
I-SOIL-	Legen Sample			C-Core G-Grab		LY	<b>V</b> -Va		Legend Installation:		Final Depth of Depth to Top o		
MOT	Type:	Sam	ab Spoon	O-Odex (air rotary) W-Was	eturn	ı) Ш	Tub	e	Drill Slotted Slough Nezon	neter		age 1	

	SHI						รเ	JMMARY LOG	Drill Hole #: BH19-02						
	BRI	TISH	Ministry of Transportation	Project: Bridge	-					Date(s) Drilled: September 3, 2019					
	COLU	JMBIA	and Infrastructure	Location: Dewdney Datum: WGS 1984	Area	Impro	ovem	ent District dike Alignment:	-	npany: Downrite Drillir er: Jonathan Goode	g				
	гтера	Tetr	4-ENG.VGEO03551-01 a Tech	Northing/Easting: 54	44595	50,5	5872	-		Make/Model:					
	Logge	ed by: CL	Reviewed by: DR						Drilli	ing Method: Auger					
	Ê	() (0	X Pocket Penetrometer 100 200	r X Shear Strength (kPa) 300 400	TYPE	0	୍ରି <mark>ଅ</mark>		NO		NO (c				
	DEPTH (m)	DRILLING DETAILS			с f	BECOVERV (%)		SOIL	CLASSIFICATION	COMMENTS TESTING	BACKFILL INFORMATION DEPTH (m)				
	EPT	DET	▲ SPT "N" (BLC	OWS/300 mm) ▲	SAMPLE		S L	DESCRIPTION	ASSIF		EPT BAC				
			▲ SPT *N* (BLC Wp% W 20 40	<sup>₩</sup> 60 <sup>₩</sup> 80	SAI	δ Δ	S		CLA	Drillers Estimate {G % S % F %}					
	10							- FTV refers to Field Torvane, an approximate value for shear strength				-			
	-							obtained in the field with a Torvane Shear				-			
	-							Device. - UTM coordinates and contour				-			
	-11							information as obtained from XXXX and the FVRD Regional Information Map			11	- 1-			
	-							(RIM) online website, respectively.				-			
	-											-			
	-											-			
	12										12	2-			
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	-13										13	}—			
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19	-											-			
11/20/	-15										15	5-			
, TŬ	-											-			
EV3.0	-											-			
E E	-											-			
APLA											16	)-			
ATEN	-											-			
DAT	-											-			
MOTI											17	-			
GPJ	- 17										17	-			
DGE	-											-			
Y BR	-											-			
VDNE											18	3-			
DEV	-											-			
MOT	-											-			
51-01	-											-			
0035	19										19	}			
-VGE	_											-			
ĖNĊ ENĊ															
RV3	- 20											-			
MOTI-SOIL-REV3 ENG-VGE003551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI DATATEMPLATE REV3.GDT 11/20/19	Legeno Sample	<u>d</u> <b>[] A</b> -Al	uger 🔲 <b>B</b> -Becker	<b>C</b> -Core <b>G</b> -Grab			Vane	Legend Installation:	nite	Final Depth of					
OTI-S	Type:	<b>L#</b> -L Sam		O-Odex (air rotary)	h hturn\[	T-	Shelby		meter	Depth to Top o	of Rock: N/A age 2 of 2				
Σ		Jalli			iuni) L	10	50			F	ugo 2 01 2	_			

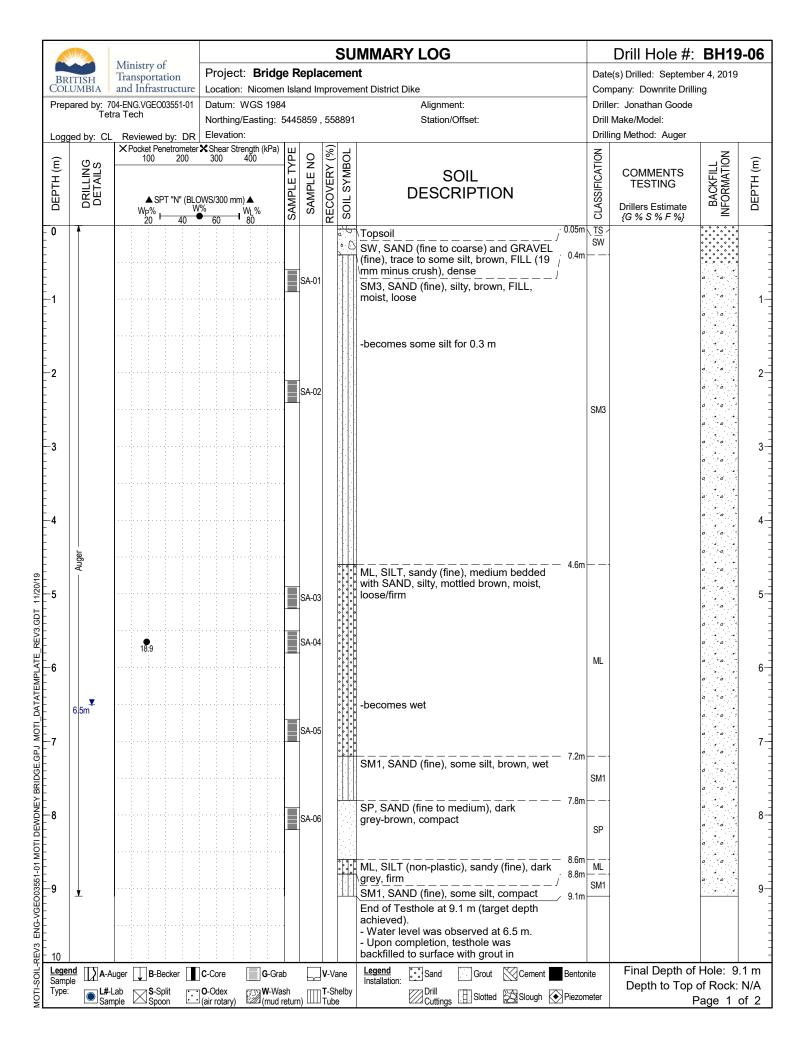
ſ	S.							รบ	MMARY LOG		Drill Hole #:	BH19	<b>)-03</b>
	BRI	TISH	Ministry of Transportation	Project: Bridge		-					e(s) Drilled: Septembe		
		JMBIA	and Infrastructure	Location: Dewdney Datum: WGS 1984		ea Im	ıpro	/eme	nt District dike Alignment:		npany: Downrite Drillir er: Jonathan Goode	ıg	
		Teti	04-ENG.VGE003551-01 ra Tech	Northing/Easting: 5		5966	, 558	8735	Station/Offset:		Make/Model:		
	Logg	ed by: CL	Reviewed by: DR	Elevation:						Drill	ing Method: Auger	,	1
	DEPTH (m)	DRILLING DETAILS	× Pocket Penetrometer 100 200 ▲ SPT "N" (BLC Wp% ₩ 20 ₩ 40 ₩	300 400	SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
	0	•						000	GP, GRAVEL (fine, angular to rounded) and SAND (fine to coarse), trace silt, brown, rootlet inclusions, FILL, compact	GP			-
MOTI-SOIL-REV3 ENG-VGE003551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE_REV3.GDT 11/20/19		Auger				SA-01	2	Ь	and SAND (fine to coarse), trace silt, brown, rootlet inclusions, FILL, compact       0.5m         GP, GRAVEL (fine to coarse, angular to rounded) and SAND (fine to coarse), some cobbles, some boulders, trace silt, brown, FILL, compact       0.5m         ML, SILT (low plasticity), trace to some sand (fine), trace clay, brown, firm, moist -occasional sandy SILT and silty SAND lenses       3.5m         CH, CLAY (medium-high plasticity), some silt, light brown, orange/dark grey mottling, moist, firm       4.9m         End of Testhole at 6.1 m (target depth achieved).       6.1m         Water level was not observed.       0.5m         Upon completion, testhole was backfilled to surface with grout in accordance with the Dike Maintenance Act.       6.1m		FTV = 44 KPa		1 2 3 4 5 6 7
10TI DEWDNEY BRIDGE.GF	-8								<ul> <li>Soil description is based on visual assessment and laboratory test data where available.</li> <li>Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement.</li> <li>FTV refers to Field Torvane, an</li> </ul>				8-
REV3 ENG-VGEO03551-01 M	- <b>9</b> 10								<ul> <li>approximate value for shear strength obtained in the field with a Torvane Shear Device.</li> <li>UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.</li> </ul>				9-
30IL-	Legen Sampl		uger 🔔 <b>B</b> -Becker	C-Core G-Grat	)		<b>V</b> -Va	ane	Legend Installation: Sand Grout Cement Bentor	ite	Final Depth of		
OTI-S	Sample Type:	L#-L	.ab 🖂 <b>S</b> -Split	O-Odex (air rotary) W-Was	sh	<u>,</u> Ш	T-Sh	helby	Drill Slotted Slough Piezon	neter	Depth to Top o		
ž		Sarr	iple 🖾 Spoon 🕒	(air rotary) 🖾 (mud re	eturr	1) பப	1 UDe	e			ן P	age 1	

		Ministry of						MMARY LOG		Drill Hole #:	BH19	9-0			
	TISH	Transportation	Project: Bridge		•					e(s) Drilled: Septembe		)			
	UMBIA	and Infrastructure	-	ation: Dewdney Area Improvement District dike						Company: Downrite Drilling Driller: Jonathan Goode					
riep	areu by: 7 Te	704-ENG.VGEO03551-01 tra Tech	Datum: WGS 1984 Northing/Easting: 5		5990	, 55	8754	Alignment: Station/Offset:		ier: Jonathan Goode					
Logg	ed by: Cl	_ Reviewed by: DR						Drilling Method: Auger							
	(P	Reviewed by: DR X Pocket Penetrometer 100 200	Shear Strength (kPa) 300 400	ЫШ	0	(%)	OL		N		Z				
DEPTH (m)	DRILLING DETAILS			≽	SAMPLE NO	R	SYMBOL	SOIL	CATI	COMMENTS	ATIC				
Η Η			MC(200 mm) <b>A</b>	РГЕ	MPL	NO NE	S	DESCRIPTION	SIFI	TESTING	ACK				
۳		▲ SPT "N" (BLC Wp% ₩ 20 40	WS/300 mm) ▲ % WL% 60 80	SAMPLE	SA	RECOVERY (%)	SOIL		CLASSIFICATION	Drillers Estimate {G % S % F %}	BACKFILL INFORMATION				
0	1	20 40	60 80				0.0	GP, GRAVEL (fine, angular to rounded)							
								and SAND (fine to coarse), trace silt, grey, rootlet inclusions, FILL, compact	GP						
							0	g. c, ,	GF						
					-			GP, GRAVEL (fine to coarse, angular to		-	0 0				
.1					SA-01	1	0.0	rounded) and SAND (fine to coarse),			a				
							0	some cobbles, some boulders, trace silt, brown, FILL, compact			0 0				
							0.0	· · · · · · · · · · · · · · · · · · ·			р <u>о</u>				
2		<b>_</b>					0				0 0	:			
-							0.0		GP		0 0				
							0				o 'o '				
							0				0 0				
3							0				0 0	1			
							0				a . o				
								ML, SILT (non-plastic), some sand (fine),		1	o o .	:			
	Auger							brown, moist, firm			0 0				
4	Ì				SA-02	,			ML		0				
											0 0				
							$\mathbb{H}$	CH, CLAY (high plasticity), some silt, light	$\vdash -$	-	0 0				
E					-			brown, orange/dark grey mottling, moist,			a a				
5		37.6			SA-03	3		firm	CH		o o				
								5.5m	L_		o o				
					SA-04	1		ML, SILT, trace to some sand (fine), trace clay, brown, rust/orange mottling, moist,			o o	•			
6					-			firm	ML		o o				
								SP, SAND (fine to medium), trace silt,		1	0 0				
								brown, dry, compact			o o				
					SA-05	5			SP		0. 0				
7			· · · · · · · · · · · · · · · · · · ·		-						0 0				
											0 0				
	¥							7.6m		-					
								End of Testhole at 7.6 m (target depth achieved).							
8				1				- Water lével was not encountered. - Upon completion, testhole was							
								backfilled to surface with grout in accordance with the Dike Maintenance							
				1				Act.							
9								- Soil description is based on visual assessment and laboratory test data							
J								where available. - Estimates of soil consistency were							
								determined from drill rig performance,							
								and visual classification of recovered samples. These estimates are based on							
10	1		· · · · ·					engineering judgement.							
<b>Leger</b> Samp			C-Core G-Gra			<b>V</b> -∨		Legend Installation: Sand Grout Cement Bento		Final Depth of Depth to Top of					
Type:	L#-	Lab Spoon :	O-Odex (air rotary)	sh	, IIII	T-S	helby	Drill Cuttings 🖽 Slotted 🔀 Slough 💽 Piezo	meter		age 1				

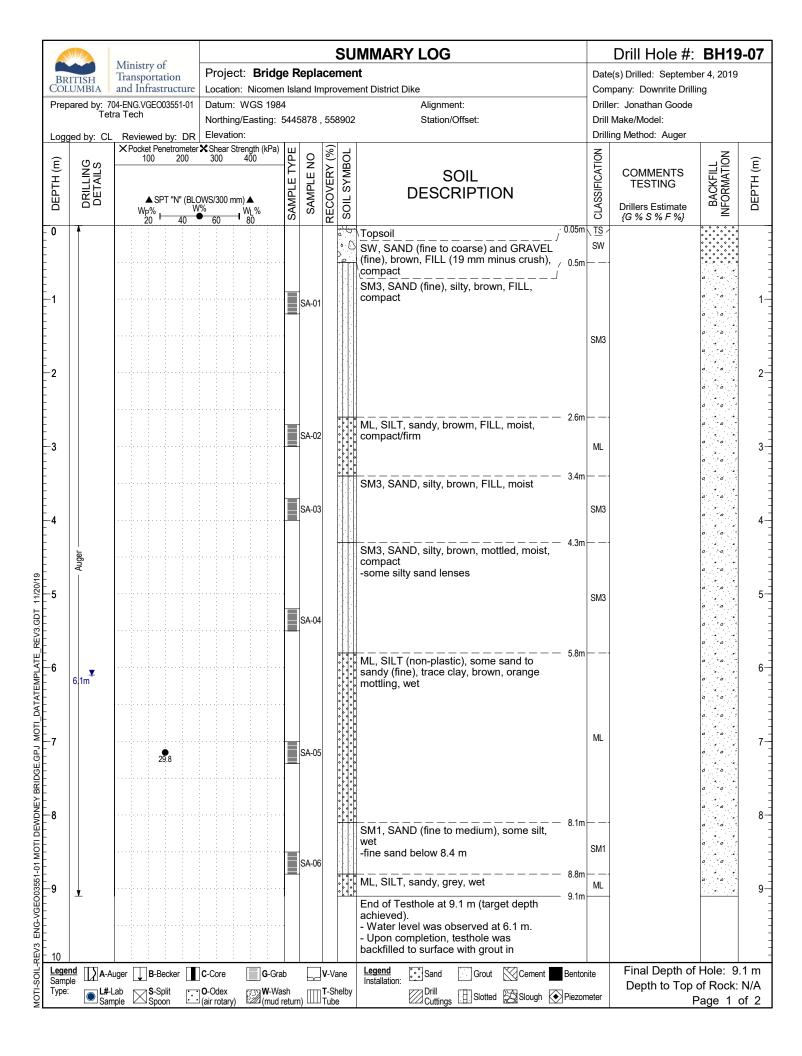
	SHIM							S	SU	MMARY LOG		Drill Hole #:	BH19	<del>)</del> -04		
	BRITIS	SH Tr	inistry of ansportation	-	t: Bridg		-	cem	nen	t	Date(s) Drilled: September 3, 2019					
	OLUM		d Infrastructur		: Dewdne WGS 198	-	ea Imp	rove	emer	nt District dike Alignment:	-	npany: Downrite Drillir er: Jonathan Goode	ng			
	ropurot	Tetra T	NG.VGE003551-0 ech	Northing	/Easting:		5990, 8	5587	754	Station/Offset:	1	Make/Model:				
L	ogged I		Reviewed by: D									ing Method: Auger				
000011 (m)			Pocket Penetrome 100 200 ▲ SPT "N" (E Wp% 20 40	300 300 8LOWS/300 mr W% 60		SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)		
MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE_REV3.GDT 11/20/19	0 1 2 3 4 5 6 7 8									<ul> <li>UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.</li> </ul>	5			11- 12- 13- 14- 15- 16- 17- 18- 19-		
-REV3 - 5												East D. H. C				
10S-I	ampic	A-Auger		C-Core	G-Gra			/-Van		Legend Sand Grout Cement Bento		Final Depth of Depth to Top o				
TOM T	/pe:	L#-Lab Sample	Spoon S	<b>O</b> -Odex (air rotary)	W-Wa (mud)	ash returr	ו) Ш <b>⊺</b>	-She Tube	lby	Cuttings Slotted Slough Piezor	neter		age 2			

COLU	TISH JMBIA	Ministry of Transportation and Infrastructure 704-ENG VGE003551-01	Project: <b>Bridg</b> Location: Mcintyre Datum: WGS 1984	Roa	-			IMMARY LOG Int Alignment:	Con	Drill Hole #: e(s) Drilled: September npany: Downrite Drillin ler: Jonathan Goode	er 4, 2019	
		704-ENG.VGEO03551-01 tra Tech	Northing/Easting: {	5445		, 558	849	C C	Drill	Make/Model:		
DEPTH (m)	DETAILS	■ Reviewed by: DR × Pocket Penetrometer 100 200 ▲ SPT "N" (BLC Wp% W 20 40		SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	
0 -1 -2					SA-01		a a	GP, GRAVEL (fine, angular to sub-rounded), sandy (fine to coarse), 0.3m grey-brown, FILL (19 mm minus crush), dry, compact SM3, SAND (fine), silty, brown, FILL, moist, compact -some gravel at 1.5 m	GP SM3			
3					SA-02	2		ML, SILT (non-plastic), some sand (fine), trace clay, dark greyish-brown, moist, firm -some SILT, sandy pockets		- FTV = 30 KPa	a a a a a a	
4	- Auger				SA-03	3		SM3, SAND (fine), silty, brown, moist,	ML		0 0 0 0	
5					SA-04			compact -some SILT, sandy layers -becomes wet	SM3		0 0 0 0 0 0	-
7	6.1m				SA-05	5		SM1, SAND (fine), some silt, brown, wet, 6.1m compact	SM1		o o o o	
								SM3, SAND (fine), silty, wet 7.2m	SM3	-	0 0 0 0	
-8					SA-06	<b>)</b>		ML, SILT, some sand, some clay, grey, orange oxidization, firm	SP		a	
10	¥.							End of Testhole at 9.1 m (target depth achieved). - Water level was observed at 6.1 m. - Upon completion, testhole was backfilled to surface with grout in				
<u>Legen</u> Sampl Type:	e LZI'''	Lab 🖂 <b>S</b> -Split 📑	C-Core G-Gral O-Odex (air rotary) W-Was (mud r			<b>V</b> -Vai		Legend Installation: Sand Grout Cement Bento Drill Cuttings Stotted Slough Piezo		Final Depth of Depth to Top o		: N

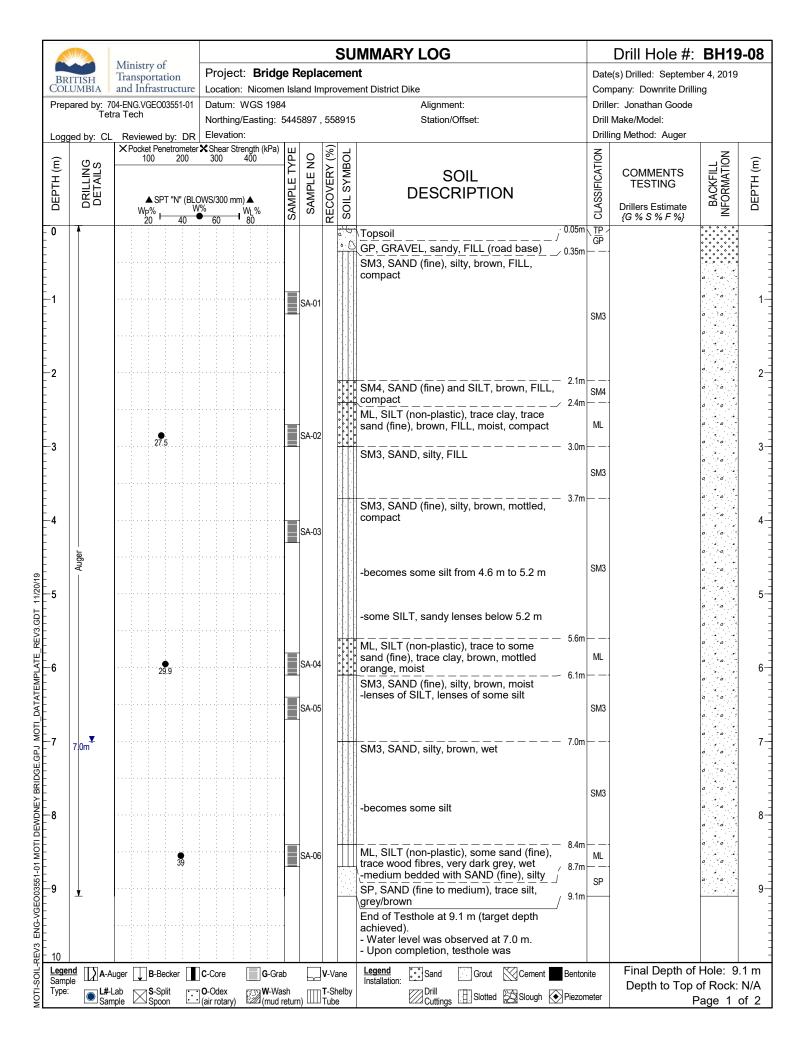
ſ	ALC: NO						ç	SU	MMARY LOG		Drill Hole #:	BH19	9-05
		LICH	Ministry of Transportation	Project: Bri	-	-					e(s) Drilled: Septembe	er 4, 2019	
╞	COLU	JMBIA	and Infrastructure	-		ad				1	npany: Downrite Drillin	g	
	Prepa	rea by: 70 Tetr	4-ENG.VGEO03551-01 a Tech	Datum: WGS 1 Northing/Easting		5802	. 558	849	Alignment: Station/Offset:		er: Jonathan Goode Make/Model:		
	Logge	ed by:_CL	Reviewed by: DR	Elevation:			,				ing Method: Auger		
	DEPTH (m)	DRILLING DETAILS	× Pocket Penetromete 100 200 ▲ SPT "N" (BL Wp% 20 1 40	300 400 OWS/300 mm) ▲	SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
MOTI-SOIL-REV3 ENG-VGE003551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE_REV3.GDT 11/20/19	-11 				Ο 		<u>ē</u>		accordance with the Dike Maintenance Act. - Soil description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement. - FTV refers to Field Torvane, an approximate value for shear strength obtained in the field with a Torvane Shear Device. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.		Final Depth of I	Hole: 9	
S-ITC	Type:	<b>L#</b> -L Sam		O-Odex (air rotary)	Wash ud retur	<u>,</u> Ш	T-Sh	elby	Drill Cuttings	neter	Depth to Top o		
ž		Sam 🗹	ple 🖂 Spoon 🕒	⊐ (air rotary) 🖾 (m	ud retur	n) Ш	Tube				P	age 2	ot 2



	SI						Ś	SU	MMARY LOG		Drill Hole #:	BH19	9-06
	BRIT	ISH	Ministry of Transportation	Project: Bridg		-	cen	nen	nt		e(s) Drilled: Septembe	er 4, 2019	-
	COLU	MBIA a	and Infrastructure	Location: Nicomer Datum: WGS 198		and Im	prov	/em		1	npany: Downrite Drillin er: Jonathan Goode	g	
	Prepa	Tetra	I-ENG.VGE003551-01 a Tech	Northing/Easting:		5859,	558	891	Alignment: Station/Offset:		Make/Model:		
	Logge		Reviewed by: DR							Drill	ng Method: Auger		
	DEPTH (m)	DRILLING DETAILS	100 200	Shear Strength (kPa) 300 400 20WS/300 mm) ▲ <sup>1%</sup> 60 ₩L% 80	SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
MOTI-SOIL-REV3 ENG-VGE003551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE_REV3.GDT 11/20/19		! <b>∏}A</b> -Aug		00 - 80			LL /		accordance with the Dike Maintenance Act. - Soil description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, in situ test data, and visual classification of recovered samples. These estimates are based on engineering judgement. - FTV refers to Field Torvane, an approximate value for shear strength obtained in the field with a Torvane Shear Device. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.		Final Depth of		11– 12– 13– 14– 15– 16– 17– 18– 19–
DTI-SC	Sample Type:	L#-La		O-Odex (air rotary) W-Wa					Installation: Drill Cuttings Slotted Slough Piezor		Depth to Top o	of Rock:	N/A
ĕ		🖃 Samp	ie i⊆⊐ Spoon i⊑i•	air rotary)	returr	1) עעדן	ube				P	age 2 o	01.2



	SHI						Ś	SU	MMARY LOG		Drill Hole #:	BH19	9-07
	BRIT	ISH	Ministry of Transportation and Infrastructure	Project: Bridg		-				1	e(s) Drilled: Septembe		
	COLU		4-ENG.VGE003551-01 a Tech	Location: Nicomer Datum: WGS 198		ana Im	ipro\	/eme	ent District Dike Alignment:	+	npany: Downrite Drillin er: Jonathan Goode	ıy	
				Northing/Easting:	544	5878,	558	902	-	1	Make/Model:		
	Logge		Reviewed by: DR XPocket Penetrometer	Elevation: T Shear Strength (kPa) 300 400	ш		()				ing Method: Auger	_	
	DEPTH (m)	DRILLING DETAILS		300 4Ŏ0 ( , , DWS/300 mm) ▲ <sup>V%</sup> WL% 80	SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
MOTI-SOIL-REV3 ENG-VGE003551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE_REV3.GDT 11/20/19									accordance with the Dike Maintenance Act. - Soil description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.				11 12 13 14 15 16 17 18
-SOIL	Legend Sample			C-Core G-Gra			V-Va		Legend Installation: Sand Grout Cement Bentor		Final Depth of I Depth to Top c		
MOTI	Type:	Samp	ab Spoon Solit	O-Odex (air rotary)	ash returi	n) 🎹	T-She Tube	elby	Drill Slotted Slough 🕥 Piezor	neter		age 2 (	



	SMILL							SI	JMMARY LOG		Drill Hole #:	BH19	9-08
	BRITIS	SH	Ministry of Transportation	Project: E	-		-	eme	nt	1	e(s) Drilled: Septembe	er 4, 2019	
_	COLUM	IBIA	and Infrastructure	Location: Ni Datum: WG		Islan	d Imp	rover	nent District Dike Alignment:	-	npany: Downrite Drillir er: Jonathan Goode	ng	
	Fiepare	Tetr	4-ENG.VGEO03551-01 a Tech	Northing/Eas		4458	97,5	5891	5	1	Make/Model:		
	Logged	by: CL	Reviewed by: DR						1	Drill	ing Method: Auger		
	DEPTH (m)	DETAILS	× Pocket Penetrometer 100 200 A SPT "N" (BLC Wp% 40 20	Shear Strengtl 300 400 DWS/300 mm) ▲ /% ₩L 9 60 80		SAMPLE TYPE	SAMPLE NO	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
-	10								backfilled to surface with grout in accordance with the Dike Maintenance Act.				
	-11								<ul> <li>Soil description is based on visual assessment and laboratory test data where available.</li> <li>Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement.</li> <li>UTM coordinates and contour information as obtained from XXXX and</li> </ul>				11-
	13								the FVRD Regional Information Map (RIM) online website, respectively.				13-
-	14												14-
ATE_REV3.GDT 11/20/	15												15-
AOTI_DATATEMPL													
EY BRIDGE.GPJ I	17												17-
51-01 MOTI DEW	18 19												18– 19–
-SOIL-REV3 ENG-VC	Sample	<b>A</b> -Au		J L	] <b>G</b> -Grab			Vane	Legend Installation:	nite	Final Depth of Depth to Top of		
MOTI	Туре:	Sam	ab ⊠ <mark>S</mark> -Split ⊡ ple Spoon	O-Odex (air rotary)	W-Wasl (mud re	h turn)	Ш <b>Т</b> .	Shelby	Drill Cuttings	neter		age 2	

ſ	SIL						S	SU	MMARY LOG	Drill Hole #:	BH19	-09
	BRIT	TISH	Ministry of Transportation	Project: Bridge		-				Date(s) Drilled: Septembe		
-	COLU	JMBIA	and Infrastructure	Location: Highway		B, 1.3	3 m f	from		Company: Downrite Drillin	ıg	
	Prepa	red by: 70 Tetr	04-ENG.VGEO03551-01 ra Tech	Datum: WGS 1984 Northing/Easting: 5		137	558	609	Alignment: Station/Offset:	Driller: Jonathan Goode Drill Make/Model:		
	Logge	ed by: CL	Reviewed by: DR		51100	, ,	0000	000		Drilling Method: Auger		
	(m) H	ING		Shear Strength (kPa) 300 400	: TYPE	E NO	ERY (%)	SYMBOL	SOIL	COMMENTS	FILL ATION	(m) F
	DEPTH (m)	DRILLING DETAILS	▲ SPT "N" (BLC W <sub>P</sub> % ₩ 20 40	OWS/300 mm) ▲ /% WL % ●60 I %0	SAMPLE	SAMPLE NO	RECOVERY (%)	SOIL S	DESCRIPTION	NOLLY COMMENTS TESTING Drillers Estimate G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
		⊢ – Auger –							Asphalt (150 mm thick)0.15m SP, SAND (fine to coarse), gravelly (fine to coarse, sub-rounded to rounded, FILL (road base)	SP		23
MOTI-SOIL-REV3 ENG-VGE003551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE_REV3.GDT 11/20/19	-5 -6 -7 -9											4- 5- 7- 8- 9-
SOIL-RE	10 Legeno Sample		uger 🔲 <b>B</b> -Becker 🚺	<b>C</b> -Core <b>G</b> -Gral	b		V-Var	ne	Legend Installation:	ite Final Depth of I		
IOTI-S	Type:	, L#-L Sam		O-Odex (air rotary) W-Was	sh eturn)		<b>T</b> -She Tube		Drill Cuttings	Depth to Top o	of Rock: N age 1 o	
≥L		0	- opoon	(mdd 1								

	Milles -	Miniature of				S	U	MMARY LOG		Drill Hole #:	BH19	9-1
	ITISH	Ministry of Transportation	Project: Bridg		-					e(s) Drilled: Septembe		)
COL	UMBIA	and Infrastructure	Location: Highway		VB, 1.	65 m f	from		-	mpany: Downrite Drilli	ng	
rep	ared by: 7 Tei	704-ENG.VGEO03551-01 tra Tech	Datum: WGS 1984		2000	FEOO	26	Alignment:		ler: Jonathan Goode		
1.000			Northing/Easting: =	J440	, 000	5586	30	Station/Offset:		I Make/Model: ling Method: Auger		
Logg	ed by. CL	Reviewed by: DR XPocket Penetrometer		ш	_	9-					-	
Ê	ეა	100 200	300 400	TYPE	SAMPLE NO	6) X	SYIMBUL		CLASSIFICATION		BACKFILL INFORMATION	
Ξ	DRILLING DETAILS			μ	Ц	Π N	ž	SOIL	FICA	COMMENTS TESTING	MAI	
DEPTH (m)	IN E	▲ SPT "N" (BLC	WS/300 mm) 🔺	SAMPLE	MF	S =		DESCRIPTION	SSI		NOR OR	
		▲ SPT "N" (BLC Wp% ₩ 20 40	% WL%	SAI	\$	RECOVERY (%)	2 N		CLA	Drillers Estimate {G % S % F %}	L L	6
0	1			t				Asphalt (150 mm thick)0.15m	ASPH			
						.◀	L. ]	SP, SAND (fine to coarse), gravelly (fine				•
						•		to coarse, sub-rounded to rounded, FILL (road base)			1//////////////////////////////////////	
					SA-01		· •		SP		\/////	
1					]							
					SA-02	Π		MI, SILT (intermediate plasticity), some 1.2m		1	\//////	
		25.9			UN-02		11	clay, occasional coarse sand, brown,			<u> </u>	
							$\ \ $	moist, stiff	MI			
2												
								CL, CLAY (low plasticity), silty, brown, 2.1m		1		
					SA-03		$\langle \rangle$	moist, firm				
					54-03	V	$\langle \rangle$		CL			
3	ger –											
-	- Auger						-	-mottling at 3 m 3.2m	<u> </u>	-	\/////	
								SM3, SAND (fine), silty, orangey-brown,	SM3		\/////	
					SA-04			-occasional black organic seams			\/////	
,								SAND (fine), trace silt, grey-brown 3.8m	$\vdash$ –	-	\//////	
4					SA-05			-			\/////	
					1							
				1							\//////	
									SP		\/////	
5									54			
											\//////	
	5.6m			1				hannen für de nichten in de			\/////	
	0.011							-becomes fine to medium sand, wet			\/////	
6	¥.				SA-06			6.1m		_	<i>\//////</i>	
								End of Testhole at 6.1 m (target depth achieved).				
							.	- Water lével was observed at 5.6 m.				
								- Upon completion, testhole was backfilled to surface with auger cuttings				
7								and bentonite chips in accordance with				
								the BC Water Sustainability Act. - Soil description is based on visual				
							;	assessment and laboratory test data				
								where available. - Estimates of soil consistency were				
8								determined from drill rig performance, and visual classification of recovered				
								samples. These estimates are based on				
								engineering judgement. - UTM coordinates and contour				
							i	information as obtained from XXXX and				
9								the FVRD Regional Information Map (RIM) online website, respectively.				
								,				
				1								
10												
eger		Auger <b>B</b> -Becker	C-Core G-Gra	ıb		V-Vane		Legend Installation: Sand Grout Cement Benton	hite	Final Depth of	Hole: 6	5.1
Sampl Type:						T-Shelt		nistaliation.		Depth to Top of	of Rock:	: N
	Sar	mple Spoon	O-Odex (air rotary)	returi	ŋШ	Tube	1	Drill Cuttings	neter	F	age 1	of

							IMMARY LOG		Drill Hole #:	0	<b>3</b> -
	TISH	Ministry of Transportation	Project: Bridge						e(s) Drilled: Septemb		9
	UMBIA	and Infrastructure	Location: Highway 7	WB	, 1.3	3 m fror		-	npany: Downrite Drilli	ng	
Prepa	ared by: 7 Tet	04-ENG.VGEO03551-01 tra Tech	Datum: WGS 1984 Northing/Easting: 54	4507	76	558650	Alignment: Station/Offset:		er: Jonathan Goode Make/Model:		
١٥٩٩	ed bv <sup>.</sup> CI	Reviewed by: DR			υ,	000002			ing Method: Auger		
20996	ou by. OL	XPocket Penetrometer	Elevation: Shear Strength (kPa) 300 400	ц		(%) 			<u> </u>	~	
(E	ပိုလ	100 200	300 400	2	SAMPLE NU	RECOVERY (%) SOIL SYMBOL	2011	CLASSIFICATION	COMMENTS	BACKFILL INFORMATION	
DEPTH (m)	DRILLING DETAILS		u u	۲ 2   ۲	1	VER SYN	SOIL	IFIC/	TESTING	SKFI	
Щ Ц	DRI	▲ SPT "N" (BLC Wp% W 20 40	0WS/300 mm) ▲		AM	SOIL (	DESCRIPTION	ASS	Drillers Estimate	FOF	
	_	W <sub>P</sub> % W 20 40	% ₩L%	AN C	מ	SC			{G % S % F %}	≥	
0	T					0. V.	Asphalt (130 mm thick) 0.13m	ASPH	-		
						0	SP, SAND (fine to coarse) and GRAVEL (fine to coarse, angular to rounded), trace				•
						0	silt, brown-grey, FILL				
						٥. اه (:	-becoming coarser with depth	SP			
1				SA	<b>\-01</b>						
						0.					
							(transition) CL, CLAY, silty, some sand	CL	1	<u> </u>	
								<b>—</b> —			
2							CI, CLAY (intermediate plasticity), some silt, grevish brown, orange mottling, some				
							dark grey laminations, moist, soft				
								СІ			
		<b>   </b>		SA	-02			СІ	Atterberg (Sa#SA-02):		l
3	Auger	35.9						.	PL:24% LL:38%	///////////////////////////////////////	
	4									\/////	
							ML, SILT (non-plastic), some sand (fine,	<u> </u>	1	\/////	
				C A	N-03		trace medium), brown, orange mottling, moist, soft	ML		\//////	
4		32.7			-00		•			\/////	
							• 	L	4		
							SM3, SAND (fine), silty to some silt, brown, lensed with clean grey fine sand4.6m	0.40		¥//////	
							SP, SAND (fine), trace silt, brown	<u> </u>		\/////	
5										<i>\\\\\\\</i>	
										\//////	
				SA	<b>\-04</b>			SP		\/////	
										\/////	
6	ļ						1			\/////	
	<u>¥</u>						End of Testhole at 6.1 m (target depth 6.1m				1
							achieved). - Water level was not encountered.				
							- Upon completion, testhole was				
7							backfilled to surface with auger cuttings and bentonite chips in accordance with				
•							the BC Water Sustainability Act. - Soil description is based on visual				
							assessment and laboratory test data				
							where available. - Estimates of soil consistency were				
8							determined from drill rig performance,				
-							and visual classification of recovered samples. These estimates are based on				
							engineering judgement. - UTM coordinates and contour				
							information as obtained from XXXX and				
9							the FVRD Regional Information Map (RIM) online website, respectively.				
3											
10											
Legen		Auger 🔲 <b>B</b> -Becker	C-Core G-Grab	 [	ות	<b>V</b> -Vane	Legend Installation	nite	Final Depth of		
Sample Type:	e LEL Sar	Lab 🔽 <b>S</b> -Split 📑	O-Odex (air rotary)	Г	_	<b>T</b> -Shelby Tube	Installation.	notor	Depth to Top	of Rock: Page 1	

ſ	S.M.M		N/: -	C						SU	MMARY LOG		Drill Hole #:	BH19	<u>)-12</u>
	BRIT	ISH	Ministry Transpor	rtation	-	et: Bridg	-	-					e(s) Drilled: Septembe		_
	COLU			astructure	-	n: Highwa WGS 198		VB, 1.	35 n	n froi			npany: Downrite Drillir	ng	
	Prepar	Tetr	a Tech	EO03551-01		g/Easting:		5953 .	. 558	3672	Alignment: Station/Offset:		er: Jonathan Goode Make/Model:		
	Logge	d by: CL	Review	ed by: DR	·			,	,				ing Method: Auger		
	DEPTH (m)	DRILLING DETAILS	100	SPT "N" (BLC	300 OWS/300 m	400 m)▲	SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	IL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING	BACKFILL INFORMATION	DEPTH (m)
			W <sub>P</sub> % 20	6. W	₩ ● 60	⊣ <sup>′WL%</sup>	SAI	S/	REO	SOIL		CLA	Drillers Estimate {G % S % F %}	INF	
MOTI-SOIL-REV3 ENG-VGE003551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE_REV3.GDT 11/20/19	-1							SA-01			Asphalt (130 mm thick) 0.13m GP, SAND and GRAVEL, some cobbles, max size 15 cm, FILL	<u>ASPH</u> GP			2- 3 3 4 5- 6 7- 8 8 9
OIL-F	Legend	<b>A</b> -Au	uger 🔲 B	B-Becker	C-Core	G-Gr	ab		<b>V</b> -Va	ine	Legend Installation: Sand Grout Cement Benton	nite	Final Depth of		
OTI-S	Sample Type:	L#-L Sam			<b>0</b> -Odex (air rotary)	<b>W</b> -W (mud	ash		T-Sh Tube		Drill Slotted Slough Piezon	neter	Depth to Top o		
Σ		u Sam	iµie ∟⊐S		⊸ (an rotary)	mud) في السل	return	ரயய	UDE	;			۲ P	age 1	

ſ	SIL							รบ	MMARY LOG	Г	Drill Hole #:	BH19	9-13
	BRI	TISH	Ministry of Transportation	Project: Bridge		-	ace	mer	ıt	Date(s	) Drilled: Septembe	r 5, 2019	
	COLU	JMBIA	and Infrastructure	<b>0</b> ,		VB, 1	.3 m	from	-	1	any: Downrite Drillin	g	
	Prepa	red by: 70 Tetr	04-ENG.VGE003551-01 ra Tech	Datum: WGS 1984 Northing/Easting: 5		5812	559	8010	Alignment: Station/Offset:		Jonathan Goode ake/Model:		
	l ogge	ed by: Cl	Reviewed by: DR		J++C	5012	, 556	5910	Station/Onset.		g Method: Auger		
			× Pocket Penetrometer	rXShear Strength (kPa)	ш		(%	7			55	z	
	DEPTH (m)	DRILLING DETAILS	100 200	300 400	TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL	CLASSIFICATION	COMMENTS	BACKFILL INFORMATION	DEPTH (m)
	TH	ILLI			ЦШ	IPLE	Ň	SΥΙ	DESCRIPTION	SIFIC	TESTING	RMP RMP	ТН
	DE	DE	▲ SPT "N" (BLC	OWS/300 mm) ▲ V% Wi %	SAMPLE	SAN		Ы	DESCRIPTION	TASS	Drillers Estimate	NFO	DEF
	- 0	<b>T</b>	Wp% W 20 40	₩L% 60 ₩L%	Ś	•,	R	S			{G % S % F %}	=	
	-	T 5						o. ()	Asphalt (180 mm thick)0.18m GP, SAND and GRAVEL (rounded to	ASPH			-
	-	Auger		· · · · · · · · · · · · · · · · · · ·				• ()	sub-rounded), some cobbles, grey-brown,	GP			
	-	¥						0	FILL, moist				
ł	1								End of Testhole at 0.8 m (auger refusal). - Water level was not encountered.				1-
	-								- Upon completion, testhole was				
	-								backfilled to surface with auger cuttings and bentonite chips in accordance with				
	-								the BC Water Sustainability Act.				
þ	-2								- Soil description is based on visual assessment and laboratory test data				2-
Ē	-								where available - Estimates of soil consistency were				-
þ	-								determined from drill rig performance, and visual classification of recovered				-
	-								samples. These estimates are based on				
ŀ	-3								engineering judgement. - UTM coordinates and contour				3-
Ē	-								information as obtained from XXXX and				-
	-								the FVRD Regional Information Map (RIM) online website, respectively.				
	-												-
	-4												4-
	-												-
	-												-
19													
11/20	-5												5-
L.													-
C3.G	-		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·									
ШШ	-												
PLAT	-6												6-
TEM													-
ATAC	-												-
E E	-												-
Σ	-7												7-
SE.GF													-
RIDG	-												-
Έ													-
MDM	-8												8-
													-
MO	.												-
51-0													-
0035	-9												9-
VGE													-
ENG	-												-
EV3	10												-
MOTI-SOIL-REV3 ENG-VGE003551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI DATATEMPLATE REV3.GDT 11/20/19	Legend		uger <b>J B</b> -Becker	C-Core G-Grat	b	[	<b>v</b> -Va	ane	Legend Installation: Sand Grout Cement Bentor	nite	Final Depth of I	Hole: 0	.8 m
TI-SC	Sample Type:	,					-		installation.		Depth to Top c	f Rock:	N/A
ОМ		Sam	ab Spoon :	O-Odex (air rotary)	eturr	ŋШ	Tub	nelby e	Drill Cuttings I Slotted Slough Nezon	ieteľ	P	age 1	of 1

	SIL						S	SU	MMARY LOG		Drill Hole #:	BH19	)-14
	BRI	TISH	Ministry of Transportation	Project: Bridge		•					e(s) Drilled: Septembe		
			and Infrastructure	Location: Highway Datum: WGS 1984		'B, 1.:	3 m f	from		•	npany: Downrite Drillin er: Jonathan Goode	g	
	Ртера	Tetr	04-ENG.VGEO03551-01 ra Tech	Northing/Easting: 5		793.	5589	945	Alignment: Station/Offset:		Make/Model:		
	Logge	ed by: CL	Reviewed by: DR	Elevation:		,					ng Method: Auger		
	DEPTH (m)	DRILLING DETAILS	× Pocket Penetrometer 100 200 ▲ SPT "N" (BLC Wp% 20 40	X Shear Strength (kPa)           300         400           0WS/300 mm) ▲           0%         WL%           60         80	SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
MOTI-SOIL-REV3 ENG-VGE003551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE_REV3.GDT 11/20/19									Asphalt (180 mm thick)0.18m GP, SAND and GRAVEL (rounded to sub-rounded), some cobbles, grey-brown, FILL, moist0.9m end of Testhole at 0.9 m (auger refusal). - Water level was not encountered. - Upon completion, testhole was backfilled to surface with auger cuttings and bentonite chips in accordance with the BC Water Sustainability Act. - Soil description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.	GP	Final Depth of	Hole: 0	
MOTI-6	Type:	, Sam	.ab ⊠ <mark>S</mark> -Split ⊡	O-Odex (air rotary) W-Was	sh return	) [[[]]	<b>T</b> -She Tube	elby	Drill Slotted Slough Piezon	neter	Depth to Top o	of Rock: age 1 o	

ſ	A.M.						SL	IMMARY LOG		Drill Hole #:	BH19	<b>}</b> -15
	BRI	TISH	Ministry of Transportation	Project: Bridge						e(s) Drilled: Septembe		
	COLL	JMBIA	and Infrastructure	°,	WB	, 1.4	m fror	-	-	pany: Downrite Drillin	ıg	
	Prepa	red by: 70 Tetr	04-ENG.VGE003551-01 ra Tech	Datum: WGS 1984 Northing/Easting: 54	1/57	77 5	58070	Alignment: Station/Offset:	1	er: Jonathan Goode Make/Model:		
	l ogge	ed by: Cl	Reviewed by: DR		437	<i>, , , , , , , , , , , , , , , , , , , </i>	50973	Station/Onset.		ng Method: Auger		
			×Pocket Penetrometer		ш		с Г			0 0	z	
	DEPTH (m)	DRILLING DETAILS	100 200	<u>300 400 </u>		SAMPLE NU		801	CLASSIFICATION	COMMENTS	BACKFILL INFORMATION	DEPTH (m)
	TH	ILLI					s/	SOIL DESCRIPTION	IFIC	TESTING	CKF RMA	TH
	Ш	DE		OWS/300 mm) ▲ V% Wi %	SAMPLE		3 3	DESCRIPTION	ASS	Drillers Estimate	LEOI	DEF
	_	<b>T</b>	W <sub>P</sub> % ₩ 20 40	₩L% 60 80	\$		Š		Ö	{G % S % F %}	≤	
	0	Î						Asphalt (260 mm thick)	ASPH			
	-	 					0	GP, SAND and GRAVEL (rounded to sub-rounded), some cobbles, grey-brown,				
		Auger					20	FILL moist	GP			-
	1						00					
	-	¥.			SA	-01		1.2m				
	-							End of Testhole at 1.2 m (auger refusal). - Water level was not encountered.				
Ē								- Upon completion, testhole was				
F								backfilled to surface with auger cuttings and bentonite chips in accordance with				
F	-2							the BC Water Sustainability Act.				2-
Ē								- Soil description is based on visual assessment and laboratory test data				-
F	:							where available.				-
Ē								- Estimates of soil consistency were determined from drill rig performance,				-
	-3							and visual classification of recovered				3-
	-							samples. These estimates are based on engineering judgement.				
	-		· · · · · · · · · · · · · · · · · · ·					- UTM coordinates and contour information as obtained from XXXX and				
								the FVRD Regional Information Map				
	-4							(RIM) online website, respectively.				4-
	-											
61	-											
1/20/-	5											5-
1 T	-											
3.GL	-											-
ЯR С												-
ATE	-6											6-
MPL												
TATE												-
PA												
MOT	-											7-
L de	-7											
GE.C												
BRID												
Ъ												
EWD.	-8											8-
IDI	-											-
M												
51-0												
2035	-9											9-
VGEC												
5 NG												-
73 E												-
MOTI-SOIL-REV3 ENG-VGE003551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE_REV3.GDT 11/20/19	10 Legen	• <b>[</b> ] • • <b>[</b> ]						Legend Sand Concut Coment Bento	-14-	Final Depth of	Hole 1	2 m
I-SOI	Sample	, ш <i>а</i> л		<b>C</b> -Core <b>G</b> -Grab	ł		Vane	Installation:		Depth to Top c		
MOT	Туре:	Sam	ab Spoon	O-Odex (air rotary)	urn) [	Шт	Shelby ıbe	Cuttings Slotted Slough Piezon	neter		age 1	

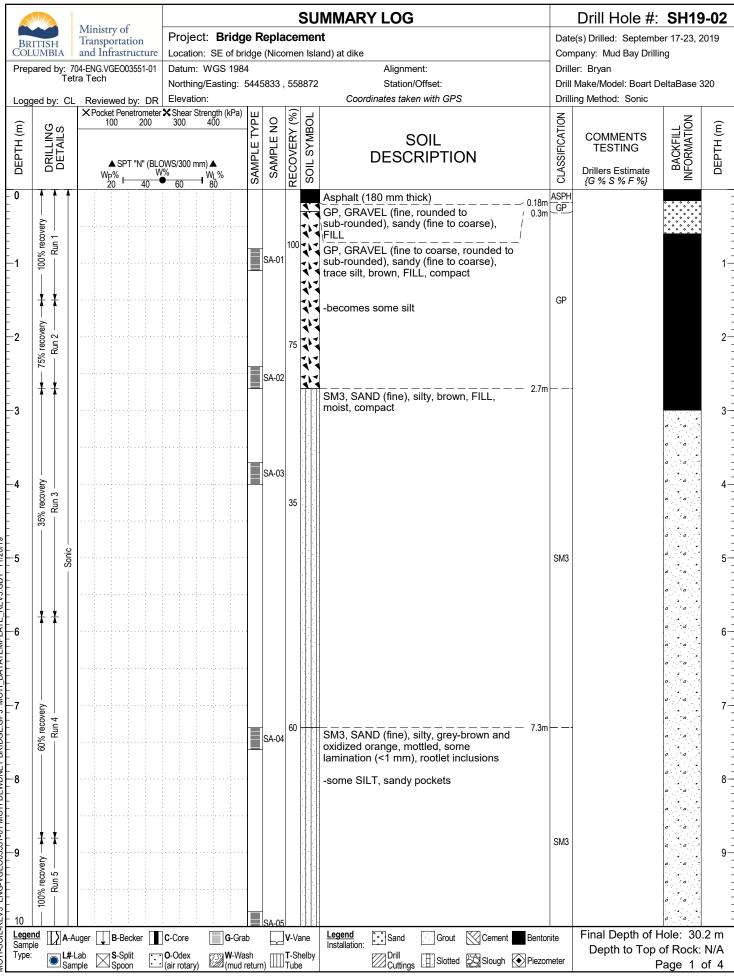
		Ministry of						IMARY LOG		Drill Hole #:		
	TISH	Transportation	Project: Bridg		-					e(s) Drilled: Septemb		)
	JMBIA		Location: Highway Datum: WGS 198		۷В, О.	.9 m fro	om t	og line Alignment:	-	npany: Downrite Drilli er: Jonathan Goode	ng	
<b>.</b>	Te	704-ENG.VGEO03551-01 tra Tech	Northing/Easting:		5767	, 5590 <sup>-</sup>	)15	Station/Offset:		Make/Model:		
Logg	ed by: CL	Reviewed by: DR	Elevation:	-					Drill	ing Method: Auger	1	1
<del>_</del>	(") (a	Reviewed by: DR XPocket Penetrometer 100 200	Shear Strength (kPa) 300 400	ЪE	Q	RECOVERY (%)			NO		_NO	-
H (m)	DRILLING DETAILS			Ē	SAMPLE NO	VERY (%)	E AB	SOIL	CLASSIFICATION	COMMENTS TESTING	BACKFILL INFORMATION	
DEPTH	ET.	▲ SPT "N" (BLC	)WS/300 mm) ▲	<b>APLI</b>	MPI		ا د ا	DESCRIPTION	SSIF		ORN	
ā		W <sub>P</sub> % W	0WS/300 mm) ▲ %WL% 6080	SAMPLE	SA		SOIL		CLA	Drillers Estimate {G % S % F %}		
0	1	20 40		+				Asphalt (150 mm thick) 0.15m	ASPH			
					SA-01	0. 0	DS	SP, SAND (fine to coarse) and GRAVEL fine to coarse, rounded, trace angular),				
					57-01	0		prown-grey, FILL (max size 5 cm), moist	SP			
							- T	0.9m	<u> </u>	1		
1							S	SM2, SAND (fine), some silt, brown, FILL				
					SA-02				SM2			
					]							
2								20m	L_			
۲					SA-03			CH, CLAY (high plasticity), some silt, dark greyish-brown, mottled orange, moist,	СН			
		36.4		-	0/100		fi	irm / 2.4m		-		
							S	SM2, SAND (fine), some silt, brown, nottled, moist, compact	SM2			
3	Auger –	1			SA-04		1.11	•	L	1	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
	– Au						S  n	SP, SAND (fine), trace silt, grey-brown, a.0m noist, compact				
					SA-05				SP			
								becomes some silt, mottled				
4								10m	<u> </u>	-		
							s	ML, SILT (non-plastic), trace to some sand (fine), trace clay, olive brown,	ML			
		29.6			SA-06			prange mottling, wet, soft to firm				
								SP, SAND (fine to medium), trace silt, grey-brown, wet, compact				
5							9	, cy stown, wet, compact				
					SA-07				SP			
				-	-				.			
												>
6	¥							6.1m		1	· · · · · · · · ·	
							a	End of Testhole at 6.1 m (target depth achieved).				
			· · · · · · · · · · · · · · · · · · ·				-	Water lével was not encountered. Upon completion, testhole was				
							b	backfilled to surface with auger cuttings				
7				1			t	and bentonite chips in accordance with he BC Water Sustainability Act.				
								Soil description is based on visual assessment and laboratory test data				
				1			v	where available. Estimates of soil consistency were				
8							d	letermined from drill rig performance,				
5							s	and visual classification of recovered camples. These estimates are based on				
							e	engineering judgement. UTM coordinates and contour				
							ii 📃	nformation as obtained from XXXX and				
9								he FVRD Regional Information Map RIM) online website, respectively.				
-								• •				
10												
Legen Sampl	רעע ק		C-Core G-Gra			V-Vane		Legend Installation: Sand Grout Cement Benton	nite	Final Depth of Depth to Top		
Type:	👝 L#-	Lab Spoon	O-Odex (air rotary) W-Wa	ash	, III	T-Shelb	by	Drill Cuttings	neter		Page 1	

		Ministry of		_					Drill Hole #:		
BRI	ITISH	Transportation	Project: Bridge		•			1	e(s) Drilled: Septemb	,	2019
	UMBIA	and Infrastructure	Location: NW of brid Datum: WGS 1984	age :	at di	Ke inter	section Alignment:	-	npany: Mud Bay Drilli ler: Bryan	ing	
, iep	Te	704-ENG.VGEO03551-01 tra Tech	Northing/Easting: 54	4459	926 .	558706	C C	1	Make/Model: Boart D	)eltaBase	320
Logg	ed by: Cl	L Reviewed by: DR			,		Coordinates taken with GPS		ling Method: Sonic		
DEPTH (m)	LING	X Pocket Penetrometer 100 200	300 400 (	E TYPE	E NO	VERY (%) SYMBOL	SOIL	CLASSIFICATION	COMMENTS TESTING	BACKFILL	
DEPT	DRILLING DETAILS	▲ SPT "N" (BLC W <sub>P</sub> % ↓ W 20 ↓ 40	WS/300 mm) ▲ <sup>%</sup> WL % 60 ■ 80	SAMPLE	SAMPLE NO	RECOVERY (%) SOIL SYMBOL	DESCRIPTION	CLASSIF	Drillers Estimate {G % S % F %}	BACK	
0						24 24 24	Asphalt (150 mm thick)	ASPH	-	° ° ° ° ° ° °	•
1	70% recovery 					70 PD	coarse), some cobbles, trace silt, FILL	GP			
2				S	A-01						
3					A-02		ML, SILT (non-plastic), some sand (fine), trace clay, greyish-brown, grey/orange mottling, moist	 ML		0 0	
4	100% recovery 	28,5			A-02	100	ML, SILT (non-plastic), some clay, mottled, olive brown, moist			a o o o	
-							4 Qm	ML	-	a a a a	1
5	Sonic				A-04		CH, CLAY (high plasticity), some silt, grey-brown, orange/grey mottling, moist	СН	<b>Atterberg</b> (Sa#SA-05): PL:30% LL:56%	0 0	
6	**	38.3			A-06		CL, CLAY (non-plastic), silty, moist	CL	PL:30% LL:56%	a o o o	•
_					A-00		And the send contact at 6.4 m 6.4n ML, SILT, trace sand (fine), moist 6.7n SAND (fine), trace silt, grey-brown 6.7n	ML	-	a a a a	
7	- 100% recovery Run 3			S	A-08	100	-becomes more grey with depth	SP		o o	
8										0 0 0 0	
9				S	A-09		SP, SAND (fine to medium), trace silt,8.5n grey-brown		-	0 0	
	- 100% recovery Run 4			S	A-10					0 0 0	
10 egen								<u> </u>	Final Depth of I		
<b>.eger</b> Sampl	<u>1d</u> ∐∑A-/	Auger 🕌 <b>B</b> -Becker	C-Core G-Grab			<b>V</b> -Vane <b>T</b> -Shelby Tube	Installation:	nite	Depth to Top		

-		Ministry of				50	MMARY LOG	_	Drill Hole #:	2115	9-0
BRI	ITISH UMBIA	Transportation	Project: Bridge	-					e(s) Drilled: Septemb		201
		and Infrastructure	Location: NW of brid Datum: WGS 1984	lge at c	like i	nters	ection Alignment:	-	npany: Mud Bay Drillii ler: Bryan	ng	
riep	Tet	04-ENG.VGEO03551-01 ra Tech	Northing/Easting: 54	45926	, 558	8706			ler: Bryan   Make/Model: Boart D	eltaBase 3	320
Logg	ed by: CL		Elevation:				Coordinates taken with GPS		ing Method: Sonic		
DEPTH (m)	DRILLING DETAILS	100 200	rXShear Strength (kPa) L 300 400 € L	SAMPLE NO	RECOVERY (%)	SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING	BACKFILL INFORMATION	
D	ΗG	▲ SPT "N" (BLC WP% 20 40	OWS/300 mm) ▲ V% WL% ● 60 80	SAM	RCC	SOIL		CLAS	Drillers Estimate {G % S % F %}	B/ INFC	
10	^i	40			100		SP, SAND (fine to medium), trace silt, grey-brown <i>(continued)</i>			0 0	
11	100% recovery Run 4	•		SA-1'	1				Since /0-#04.44)	a a a a a a	
12	* *	27.1							Sieve (Sa#SA-11) G:0% S:98% F:2%	0 0 0 0	
13	ery									a a a a	
14	100% recovery 				100			SP		a a a a	
15	ić 🕇 🗍			SA-12	2					0 0 0 0	
15	Sonic									o o	
16	100% recovery 				100					a a a a a a	
17	10			SA-1:	3					0.0	
18	* *									a	
19	80% recovery 	·····	· · · · · · · · · · · · · · · · · · ·				SP. SAND (fine to medium) and 19.2r	n — —	-	0.0.	
20				SA-14	TI		SP, SAND (fine to medium), grey (distinct colour change at 19.2 m)			0 0	
<b>eger</b> Samp	<u>nd</u> ∭A-A le ∭A-A San		G-Grab G-Odex (air rotary) G-Grab (mud ret		<b>V</b> -Va	ane	Legend Installation: Sand Grout Cement Bento	onite	Final Depth of F Depth to Top		

			Ministry of									MMARY LOG				Drill Hole #:	SH19	9-0
BR	ITISH UMBI		Transportation		Proje		-		-							e(s) Drilled: Septemb		2019
			and Infrastructu		Locatio				e at di	ike i	inter					npany: Mud Bay Drilli	ng	
rep	bared b	Tet	04-ENG.VGE003551- ra Tech	-01	Datum: Northin				026	559	8706	Alignme Station/				er: Bryan Make/Model: Boart D	oltoBaso	320
.00	aed hv	CI	Reviewed by: [		Elevati		. ig. 0	+J	.520,	, 556	0100	Coordinates take				ing Method: Sonic		020
			×Pocket Penetrom	neter >	K Shear S	Strength (	kPa)	ш	<u> </u>	(%	Ļ					-	z	
	U Z	Ŋ	100 20	0	300	4ŎO `		Ϋ́	ž	2	BO				ATIC	COMMENTS		1
ием I н (m)		A						Щ	PLE	ΥĒ,	SYMBOL		SOIL RIPTIO		IFIC,	TESTING	3MA	עשיין אין
Ц	DRILLING	С	▲ SPT "N" ( W <sub>P</sub> %,	(BLOV	WS/300 m	nm)▲		SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL S	DESC	RIPHU	NN	CLASSIFICATION	Drillers Estimate	BACKFILL INFORMATION	
			<sup>₩</sup> ₽ <sup>%</sup> ⊢ 40	0	60	⊣ <sup>WL%</sup> 80			Ø	RE	ŭ				CL	{G % S % F %}	Ξ	
20	<u>ح</u>						-	=				SP, SAND (fine to r (distinct colour char	nedium), g	(rey 2 m)				
	6 recove Run 7 -											(continued)	ige at 10.2	,			0 0	
	80% recovery					-	:										a	
94																	0 0	
21	¥¥																0 0	
																	0 0	
50				į													a	1
2																		
	overy 8																0 0	
	70% recovery — Run 8 —								OA 1-	70								
<b>.</b>	- 70,								SA-15								0 0	
23																	0.0	
																	0 0	
																	0.0	
							-										0 0	
4	╡╅╅			····ċ.														
																	o o	
				•••••			· · · · · ·								SP			
		 0				-											a	
25		- Sonic		· · · · · . :													0 0	
	∋ry –					-											0 0	
	0% recovery — Run 9 —			<u>.</u> .		·····;·····				0							0 0	
	0% r R					-											0 0	
26																	0.0	
				-													0 0	
							· · · · · ·											
							-										o o	
7	XX					•••••••••••••••••••••••••••••••••••••••												
	[ ]					-												
						· · · · · · · · · · · · · · · · · · ·											0 0	
							-										0 0	
8				· · · ·			· · · · · ·										0 0	
	very					-	-										0 0	
	% recovi Run 10						· · · · ·			100							0 0	
	100% recovery Run 10					-				100							0 0	
9				···· :			 											
							:											
				···· }		· · · · · ·			SA-16								0 0	
						-	-										0 0	
0				:		:	-								– 29.9m – –		°°	
ege amp	na ble	<b>A</b> -A			C-Core		<b>G</b> -Grab			<b>V</b> -Va		Legend Installation:		Cement	Bentonite	Final Depth of F Depth to Top		
ype		] <b>L#</b> -L Sarr	_ab ⊠ <mark>S</mark> -Split nple Spoon	$[\cdot ]$	<b>0</b> -Odex (air rotary	(7.57)	N-Was	sh	, mi	T-Sł	helby e	Drill Cuttings	Slotted	Slough 🤇	Piezometer		Page 3	

								;	SU	MMARY LOG		Drill Hole	e #: SH	19-01
	BRI	LISH	Ministry of Transportation		ect: Bridg	e R	epla				1	Date(s) Drilled: Se	otember 26-2	7, 2019
	COLU	MBIA	and Infrastructu		on: NW of b	ridge	e at d	ike i	nters		(	Company: Mud Ba	y Drilling	
	Prepa	red by: 70 Tetr	4-ENG.VGEO03551 a Tech	01 Datum	: WGS 1984					Alignment:		Driller: Bryan		
				Norum	ng/Easting:	5443	5926	, 558	3706	Station/Offset: Coordinates taken with GPS		Drill Make/Model: B Drilling Method: Sc		se 320
	Logge	a by: CL	Reviewed by: XPocket Penetrom			ш		()				-		-
	DEPTH (m)	DRILLING DETAILS	100 20 ▲ SPT "N" W <sub>P</sub> %	0 300 (BLOWS/300 r W%	400	SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION		COMMEN TESTINO Drillers Estin (G % S % F	BACKE	DEPTH (m)
	- 30	* * *	20 4	0 60	- 80		SA-17		<b>~</b>	GP, GRAVEL (fine to coarse, rounded), trace to some sand (fine to coarse)	- (	GP		
MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI_DATATEMPLATE_REV3.GDT 11/20/19						· · ·				End of Testhole at 30.2 m (target depth achieved). - Upon completion, testhole was backfilled to surface with grout in accordance with the Dike Maintenance Act. - Soil description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.				31– 32– 33– 33– 35– 36–
Y BRIDGE.GPJ MO														37-
-VGEO03551-01 MOTI DEWDNEY														38-
/3 ENG	-					-								-
-RE	- 40	4 (77)										Einal Darit		
-SOIL	Legeno Sample	. u//^~		C-Core	<b>G</b> -Gra			V-Va			ntonite	e Final Deptl	1 of Hole: Top of Ro	
NOTI	Type:	E L#-L Sam	ab ple	: <b>0</b> -Odex (air rotary	y) W-Wa (mud r	sh returr	n) IIII	Tube	nelby e	Drill Cuttings Slotted Slough 💽 Pie	zomet	ter		4 of 4
<				,,	· · · · ·		,			· ·			J -	

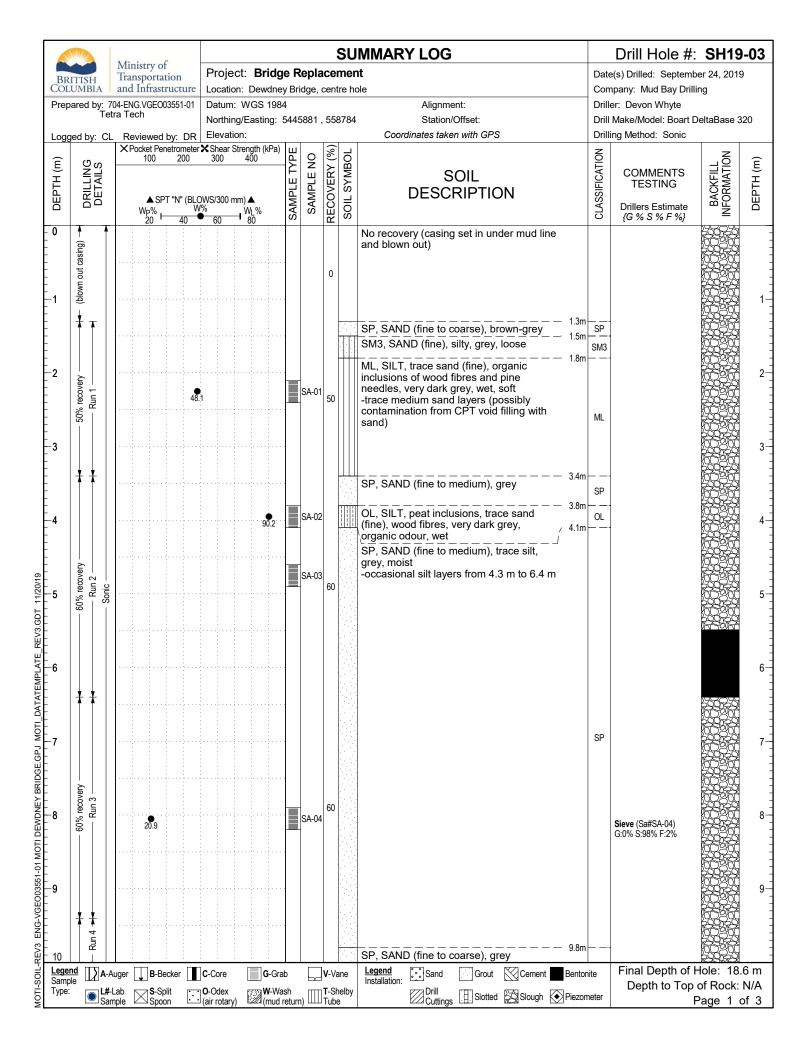


MOTI-SOIL-REV3 ENG-VGEO03551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI\_DATATEMPLATE\_REV3.GDT 11/20/19

		N	Ainistry of						MMARY LOG		Drill Hole #:	SHIS	9-0
BRI	ITISH	Т	Ainistry of Transportation	Project: Bridg		-					e(s) Drilled: Septembe		2019
	UMBIA		nd Infrastructure	Location: SE of b		(Nico	omer	n Isla	-	-	npany: Mud Bay Drillir	ng	
riep	areu by: T	l 704- Tetra	-ENG.VGE003551-01 Tech	Datum: WGS 198 Northing/Easting:		5833	, 558	3872	Alignment: Station/Offset:		er: Bryan Make/Model: Boart D	eltaBase 3	320
Logg	ed by:	CL	Reviewed by: DR					_	Coordinates taken with GPS		ing Method: Sonic		
DEPTH (m)	DRILLING		X Pocket Penetrometer 100 200	Shear Strength (kPa) 300 400	-YP	SAMPLE NO	RECOVERY (%)	SYMBOL	SOIL	CLASSIFICATION	COMMENTS	BACKFILL INFORMATION	
PTH	ETA				SAMPLE	1PL	N	SΥI	DESCRIPTION	SIFIC	TESTING	RM/	
	ЦĞ		▲ SPT "N" (BLC WP%		AMF	SAN	С Ш	SOIL		LAS	Drillers Estimate	NFO	
10			Wp% W 20 40	% ₩L%	S		R	0) 		0	{G % S % F %}		
							100					0.0	
						0.4.00			SP, SAND (fine to medium), brown	n — — -		0 0	
	5					SA-06				SP		a	
11	100% recovery — Run 5 —								oxidization, then becomes dark grey	n – –	-	0 0	
	- 100								sand to 11.1 m/			0 0	
									ML/SM1, SILT (non-plastic), trace sand (fine), very dark grey; medium bedded			00	
	¥ ¥		28.5			SA-07			with SAND (fine), trace silt; wet, firm to			00	
12	11				•							00	
												000	
						SA-08						0 0	
					F							0 0	
13	very -				• •							0 0	
	100% recovery — Run 6 —						100					0 0	
	100% — R											0.0	
14	i		<b>3</b> 6.7			SA-09						0 0	
14						]						0 0	
												o o	
										ML/SM	1	0 0	
15	**	Sonic -										0 0	
		ഗ്   							4			0 0	
												a a	
												0 0	
16												00	
	very					CA 40						0.0	
	90% recovery — Run 7 —		27.6			SA-10	90					0 0	
	- 60%											0 0	
17												00	
						SA-11						a	
					f	1						a a	
18	ŦŦ							1.11		n	-	0 0	
									Likely continues as above, layered SILT and SAND			0 0	
					• •							0 0	
	overy 8 —											0 0	
19	0% recovery — Run 8 —											0 0	
	0											0 0	
					• •		0					0 0	
20												0 0	
Leger Samp		A-Aug	er 🕁 <b>B</b> -Becker	C-Core G-Gr	ab		V-Va	ine	Legend Installation: Sand Grout Cement Bent	onite	Final Depth of H		
Samp Type:	······	_#-Lab Sample		O-Odex (air rotary)			T-Sh Tube	elhv	Drill Cuttings Slotted Slough Pieze		Depth to Top	of Rock:	: N

	11/100	N	Ainistry of						MMARY LOG		Drill Hole #:	SH19	)-02
BRI	TISH	Т	ransportation	Project: Bridg		-					e(s) Drilled: Septemb		019
	UMBIA		nd Infrastructure	Location: SE of b Datum: WGS 198		e (Nico	ome	n Isla	and) at dike Alignment:	-	npany: Mud Bay Drilli ler: Bryan	ng	
. iep	a ou by. 1	Tetra	ENG.VGEO03551-01 Tech	Northing/Easting:		5833	, 558	3872	5		l Make/Model: Boart D	eltaBase 3	320
Logg	ed by:		Reviewed by: DR	Elevation:	_				Coordinates taken with GPS		ing Method: Sonic	-	
DEPTH (m)	DRILLING		100 200	Shear Strength (kPa)           300         400           OWS/300 mm) ▲           Image: WL %           60         80	SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	
	<ul> <li>▲ 0% recovery —</li> <li>▲ Run 8 —</li> </ul>								-No recovery (3 attempts) Likely continues as above, layered SILT and SAND <i>(continued)</i>			a a . a . a	
-21	TT								ML, SILT, some sand, dark grey, moist	n — — ML	-	0 0	
-22									SP, SAND (fine to medium), trace silt, dark grey, 3 cm decayed wood inclusion, moist	n — —		o o o o o o	
-23	75% recovery		17.7			SA-12	75				<b>Sieve</b> (Sa#SA-12) G:0% S:92% F:8%	a a a a a a	
-24	* *											0 0 0 0 0	
25	ery –	Sonic –										0 0 0 0	
26	40% recov					SA-13	40		-15 cm wood piece	SP		a a a a a a	
27	* *											0 0 0 0	
28	ivery											0 0 0 0	
-29	40% recovery					SA-14	40					0 0	
30 Legen Sampl									Legend Installation: Sand Grout Cement Bent		Final Depth of F		<u></u>
	na IIV.	<b>A</b> -Auge	er 👃 <b>B</b> -Becker	C-Core G-Gr			V-Va		Legend Sand Grout Cement Bent		- Final Denth of F	1010 3()	

	STATE OF STATE					S	SU	MMARY LOG		Drill Hole #:	SH19	)-02
	BRITISH	Ministry of Transportation	Project: Bridge		-					e(s) Drilled: Septembe		2019
	OLUMBIA	and Infrastructure	Location: SE of brid Datum: WGS 1984		(Nicc	omen	Isla	and) at dike Alignment:	4	npany: Mud Bay Drillin er: Bryan	ıg	
	Te	04-ENG.VGEO03551-01 tra Tech	Northing/Easting: 5		, 833	, 5588	872	-		Make/Model: Boart De	eltaBase 3	320
Lo	gged by: CL	Reviewed by: DR		,,		1 - 1		Coordinates taken with GPS	Drill	ing Method: Sonic		
DEPTH (m)	DRILLING DETAILS		Shear Strength (kPa) 300 400 20WS/300 mm) ▲ 1% 60 ₩L% 80	SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
MOTI-SOLL-REV3 ENG-VGED033551-01 MOTI DEWDNEY BRIDGE.GPJ MOTI DATATEMPLATE REV3.GDT 11/2019 人協同力 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1								<sup>30.2m</sup> End of Testhole at 30.2 m (target depth achieved). - Upon completion, testhole was backfilled to surface with grout in accordance with the Dike Maintenance Act. - Soll description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.				31– 32– 33– 34– 35– 36– 37– 38– 38– 39–
- 40 - 40 - 10S-12 -	gend A-A		C-Core G-Grat			<b>V</b> -Van		Legend Installation:		Final Depth of H Depth to Top c		
ω W	pe: <b>I</b> #- Sar	Lab Spoon .	O-Odex (air rotary)	eturn	) Ш	Tube	~ j	Drill Slotted Slough Nezon	neter	P	age 4	of 4

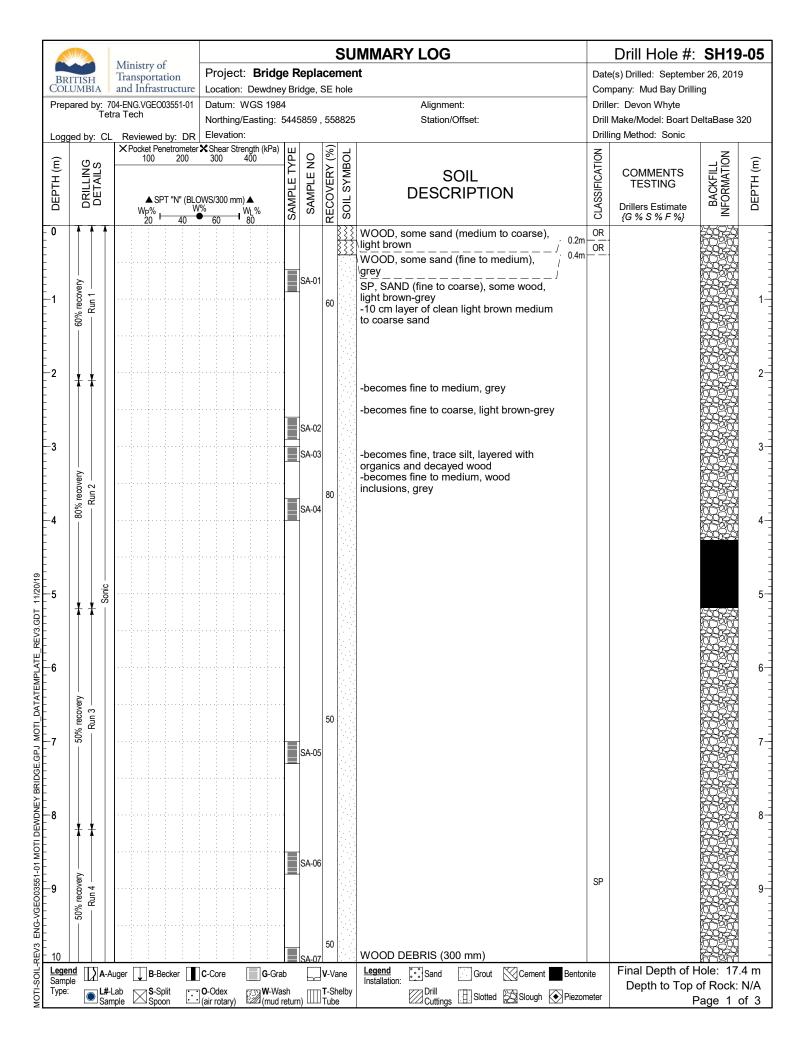


	MIRE	Ministerraf				S	<b>SU</b>	MMARY LOG		Drill Hole #:	SH19	9-0
BR	ITISH	Ministry of Transportation	Project: Bridge		-					e(s) Drilled: Septembe		9
COL	UMBIA	and Infrastructure	Location: Dewdney		lge, o	centr	e ho		1	pany: Mud Bay Drillin	g	
Prep	ared by: 7 Te	704-ENG.VGEO03551-01 tra Tech	Datum: WGS 1984		001	550	704	Alignment:		er: Devon Whyte	ltoPo (	200
1.00			Northing/Easting: 54 Elevation:	4458	581,	558	184	Station/Offset: Coordinates taken with GPS		Make/Model: Boart De	alabase (	320
LUYC	ed by: CL	X Pocket Penetromete		ш	~	(%)						
Ê	ეკ	100 200	300 400	TYPE	SAMPLE NO	RECOVERY (%)	SYMBOL		CLASSIFICATION		BACKFILL INFORMATION	
Ē			i	щ	ĽE	Ĩ,	Σ	SOIL	FICA	COMMENTS TESTING	MAT	
DEPTH (m)	DRILLING DETAILS	▲ SPT "N" (BL	0WS/300 mm) ▲	SAMPLE	AMF	õ	2	DESCRIPTION	SSII		3AC	
			<sup>1%</sup> WL%	SA	S/	Ш	SOIL		CLA	Drillers Estimate {G % S % F %}	E R	
10								SP, SAND (fine to coarse), grey				
								(continued)				
		····;····;····;····							SP			
			Ι	ļ	SA-05							
11	very					80						
	80% recovery — Run 4 —							-100 mm thick lense of SILT, sandy, firm,			<u>zerze</u>	
	80% F							wood inclusions at 11.3 m depth				
								SP, SAND (fine to medium), grey				
12					SA-06							
-					0070							
	¥¥					:						
	<b>† †</b>										885A	
13											68269	
IJ											66568	
											66366	
											6656	
	100% recovery 										6596	
14	1% recov Run 5					100					6636	
	- 100% Sonic										6636	
											EE SE	
				S	SA-07							
15			· · · · · · · · · · · · · · · · · · ·						SP			
	+											
16												
17	90% recovery — Run 6 —											
• '	)% recove - Run 6					90						
	06							-100 mm thick lense of SAND (fine), eithe				
				s	SA-08	:		-100 mm thick lense of SAND (fine), silty, woody organic inclusions at 17.4 m			4024	
40												
18												
					SA-09							
	¥ ¥ ¥				om-U9			End of Tootholo at 18.6 m (target depth				
								End of Testhole at 18.6 m (target depth achieved).				
19								- Upon completion, testhole was				
								backfilled to surface with bentonite chip plugs and sluff in accordance with the BC				
								Water Sustainability Act.				
								- Soil description is based on visual assessment and laboratory test data				
20								where available.		Final Danth of L	olo: 40	
Lege Samp	na ∐∑A-A Ile		C-Core G-Grab			<b>V</b> -Var		Legend Installation: Sand Grout Cement Bentor	nite	Final Depth of H Depth to Top o		
Type:	● L#- Sar	Lab Spoon	O-Odex (air rotary) W-Wash (mud rei	h	I	T-She Tube	elby	Drill Cuttings []] Slotted 🔀 Slough 💽 Piezon	antor		age 2	

	SWIM			-									SU	IMMARY LOG		Drill Hole #:	SH19	<b>3-03</b>
	RITISH	Mini Trans	sport	ation			-		Brid	-	-	ace	mei	nt		e(s) Drilled: Septembe	er 24, 201	
	LUMBIA			tructu	-				ewdn iS 19	-	idge,	cen	tre h	ole Alignment:	-	npany: Mud Bay Drillir er: Devon Whyte	ng	
	pared by: 7 Te	tra Tec	:h	JUJJJ I	-01				sting:		5881	, 55	8784			Make/Model: Boart De	eltaBase	320
Log	ged by: Cl					Elev					1			Coordinates taken with GPS	Drill	ing Method: Sonic	1	1
DEPTH (m)	DRILLING DETAILS		100	enetrom 20 PT "N"	(BLO)	300 WS/30	) )0 mi	400	)	SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
22 22 23 24 24 25 26 27 26 27 26 27 26 27 28 27 28 27 28 27 28 27 28 27 28 27 28 29 20 27 28 29 20 27 28 29 20 29 20 20 20 20 20 20 20 20 20 20														<ul> <li>Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement.</li> <li>UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.</li> </ul>				21 22 23 24 25 26 27 28 28 29
∑ - 30																<b></b>		
Lege Sam	iple 🖽		-	Becker		C-Cor			<b>G</b> -G		<b>-</b>	<b>V</b> -V		Installation: Sand Grout Cement Bento		Final Depth of H Depth to Top o		
to Type	: Sa	Lab	⊠Sp	Split oon	$\vdots$	<b>O</b> -Ode (air rot	ex tary)		<b>W</b> -W	lash I retur	n) [[[	T-S	helby ie	Drill Cuttings	meter		age 3	

			Ministry of						MMARY LOG		Drill Hole #:	SH19	9-0
BR	ITISH		Transportation	Project: Bride	-	-				1	e(s) Drilled: Septembe		9
-	UMBL		and Infrastructure	Location: Dewdne	-	idge,	NW	hole		-	npany: Mud Bay Drillir	ng	
Prep	ared b	y: 70 Tetr	04-ENG.VGE003551-01 ra Tech	Datum: WGS 198 Northing/Easting:		5902	559	37⊿0	Alignment: Station/Offset:	1	er: Devon Whyte Make/Model: Boart D	eltaRase ?	320
	ied bv:	CI	Reviewed by: DR	Elevation:			, 000	5743	Coordinates taken with GPS		ing Method: Sonic		020
	-		×Pocket Penetromete	r X Shear Strength (kPa)	ш		(%	_			5	z	
(E	β	'n	× Pocket Penetromete 100 200 ▲ SPT "N" (BL Wp% V 20 40	300 400	Ľ	SAMPLE NO	RECOVERY (%)	SYMBOL	2011	CLASSIFICATION	COMMENTS	BACKFILL INFORMATION	
DEPTH (m)		IAI			Ш	Ч	ЧЩ.	SΥΝ	SOIL	IFIC,	TESTING	SKFI	
Ē	E E	UΕ	▲ SPT "N" (BL	OWS/300 mm) ▲	MP	AMI	8	SOIL S	DESCRIPTION	ASSI	Drillers Estimate	FOR	
	_		<sup>₩</sup> P <sup>%</sup> - 40	OWS/300 mm) ▲ V% ₩L % ● 60 80	SA	Ś	ЯЩ	SC		5	{G % S % F %}	Z	
0	1								No recovery (casing set in under mud line				
	- (buj								and blown out)				
	t cas												9
	(blown out casing)						0						
1	(blow											RESERVE	
												REAR	
	¥ ∓	·							SP, SAND (fine to medium), wood	SP	-	6856	
										- <sup></sup>	1	RSA63	
2						SA-01			SP, SAND (fine to coarse), grey	SP		ESSE	
								গ্ৰাত	2.3m	<u> </u>	1	10000	
									ML/SP, SILT, sandy (fine), thinly bedded 2.3m with SP, SAND (fine to medium), and	ML/SP			
	overy					SA-02			SILT trace sand (fine) grey				ç
3	60% recovery — Run 1 —					SA-03	60	<u>ווווון</u>	OL, ORGANIC SILT, woody organics, / 3.0m		1		
	60%								(brown-grey				
									SP, SAND (fine)			100360	
										SP			
4													
	₩₩								SP, SAND (fine to medium), trace silt,	SP	-	2002-0	
									Agrey/ 4.6m	- <u>-</u> -	-		
5		Sonic -							SP, SAND (medium to coarse), grey, some wood inclusions				
J		– Sc											
	ery -					SA-04				SP			
6	80% recovery — Run 2 —				F	54-04	80						
U	30% r – Ru												
									-WOOD DEBRIS (400 mm) at 6.2 m (CPT refusal)				
									SM1, SAND (fine to medium), some silt,		-	ASSA	
_									grey 6.9m	SM	1		
7			4	8		SA-05			ML, SILT (non-plastic), trace sand (fine to	ML		18558	
									medium), very dark grey, wet / 7.2m WOOD DEBRIS (200 mm) /			6896	
	ŦŦ								SP, SAND (fine to medium), grey			66563	
8												6536	
	very												
	50% recovery — Run 3 —												
9	50%						50						ļ
						SA-06							
												199390	
10													Ļ
L <b>ege</b> i Samp	10			C-Core G-Gr			V-Va		Legend Installation: Grout Cement Bento		Final Depth of H Depth to Top of		
Type:		] <b>L#</b> -L Sam	ab ⊠ <mark>S</mark> -Split ⊡	<b>0</b> -Odex (air rotary)	ash	ПП	T-Sh	elby	Drill Slotted Slough Piezo	motor		age 1	

	STAR A	_				ļ	รบ	MMARY LOG		Drill Hole #:	SH19	)-04
	BRITISH	Ministry of Transportation	Project: Bridge							e(s) Drilled: Septembe		9
	COLUMBIA	and Infrastructure	Location: Dewdney Datum: WGS 1984		dge,	NW	hole	Alignment:	-	npany: Mud Bay Drillir er: Devon Whyte	ng	
'	Te	704-ENG.VGEO03551-01 tra Tech	Northing/Easting: 5		5902 ,	, 558	8749	Station/Offset:		Make/Model: Boart De	eltaBase 3	320
L	ogged by: Cl	Reviewed by: DR	Elevation:					Coordinates taken with GPS	Drill	ing Method: Sonic		
	DEPTH (m) DRILLING DETAILS	× Pocket Penetrometer 100 200 ▲ SPT "N" (BLC Wp% W 20 40     40	300 400	SAMPLE TYPE	SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)
51-01 MOTI DEWDNEY BRIDGE.GPJ MOTI. DATATEMPLATE. REV3.GDT 11/20/19	$10 \qquad - \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$				SA-07	60		SP, SAND (fine to medium), grey (continued) -single coarse gravel inclusion (3 cm) End of Testhole at 16.6 m (target depth achieved). - Upon completion, testhole was backfilled to surface with bentonite chip plugs and sluff in accordance with the BC Water Sustainability Act. - Soil description is based on visual assessment and laboratory test data where available. - Estimates of soil consistency were determined from drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgement. - UTM coordinates and contour information as obtained from XXXX and the FVRD Regional Information Map (RIM) online website, respectively.	SP	{G % S % F %}		11 12 13 14 14 15 16 16 17 17 18
REV.	20											
SOIL	sample		C-Core G-Grat		ĽĽ	<b>V</b> -Va		Legend Installation: Sand Grout Cement Bento		Final Depth of H Depth to Top o		
TOM		-Lab Spoon 🖸	O-Odex (air rotary)	sh eturn	ı) Ш	T-Sh Tube	nelby e	Drill Slotted Slough Piezo	meter		age 2	



		Ministry of					JMMARY LOG	_	Drill Hole #:	JIII	9-0				
BRI	TISH	Transportation	Project: Bridge	-					e(s) Drilled: September	,	9				
	JMBIA	and Infrastructure	Location: Dewdney I Datum: WGS 1984	Bridge	e, S	E hol	Alianment:	-	Company: Mud Bay Drilling Driller: Devon Whyte						
гера	areu by: To	704-ENG.VGE003551-01 etra Tech	Northing/Easting: 54	4585	9.F	55882	Ū		Driller: Devon Whyte Drill Make/Model: Boart DeltaBase 320						
Logge	ed by: C	CL Reviewed by: DR							ling Method: Sonic		-				
_ [	(")	×Pocket Penetrometer 100 200	Elevation: X Shear Strength (kPa) 300 400	۲ ۲	1.0	<u>چ</u>		NO		_NO	1				
DEPTH (m)	DRILLING DETAILS		F	SAMPLE LYP		VERY (% SYMROI	SOIL	CLASSIFICATION	COMMENTS	BACKFILL INFORMATION					
L L	RILI	▲ SPT "N" (BI (	0WS/300 mm) ▲	שא			DESCRIPTION	SSIFI	TESTING	ACK ORV					
ā			0WS/300 mm) ▲ /% WL % ● 60 80	SAMPLE SAMPLE		SOIL SYMBOL		CLA	Drillers Estimate {G % S % F %}	В Ē L	2				
10						-	SP, SAND (fine to coarse), some wood,								
	ery -						light brown-grey (continued)								
	50% recovery — Run 4 —														
11	50%    F														
"	$\downarrow\downarrow$														
										ASSA	5				
				SA-	08					REAR CONTRACT					
12															
	ery –						-becomes fine								
	80% recovery — Run 5 —				8	30				1888					
13	- 80%														
				SA-	09										
		8													
14										ASSA					
	* *														
15															
							· ] ·								
	<u> </u>														
	60% recovery — Run 6 —				F	50				in the second					
16	50% r — Ru									ESSE					
	Ĩ														
										a the the test to					
_															
17					10										
	* * *			SA-	IU	-	End of Testhole at 17.4 m (target depth	m	-						
							achieved).								
18							- Upon completion, testhole was backfilled to surface with bentonite chip								
							plugs and sluff in accordance with the BC Water Sustainability Act.								
							- Soil description is based on visual assessment and laboratory test data								
							where available.								
19							- Estimates of soil consistency were determined from drill rig performance,								
							and visual classification of recovered samples. These estimates are based on								
							engineering judgement.								
20							- UTM coordinates and contour information as obtained from XXXX and								
Legen	d TJA	-Auger <b>B</b> -Becker	C-Core G-Grab		٦v	-Vane	Legend Sand Grout Cement Ben	tonite	Final Depth of F	lole: 17	.4				
Sample Type:			O-Odex (air rotary)			-Shelb ube			Depth to Top						

	SNIM.						(	SU	MMARY LOG		Drill Hole #:	SH19	9-05			
	BRITI	ISH TI	linistry of ransportation	Project:	-	-	acer	nen		Date(s) Drilled: September 26, 2019						
_	COLUN	MBIA ar	nd Infrastructure			Bridge,	SE	nole	Alignment:	-	npany: Mud Bay Drillin er: Devon Whyte	g				
	Tepare	Tetra	ENG.VGEO03551-01 Tech	Northing/E		45859	, 558	825	-		Make/Model: Boart De	eltaBase 3	320			
L	.ogged		Reviewed by: DR							-	ng Method: Sonic		1			
	UEPIH (m)		KPocket Penetrometer 100 200 ▲ SPT "N" (BL Wp% 40	_OWS/300 mm) /		SAMPLE NO	RECOVERY (%)	SOIL SYMBOL	SOIL DESCRIPTION	CLASSIFICATION	COMMENTS TESTING Drillers Estimate {G % S % F %}	BACKFILL INFORMATION	DEPTH (m)			
- 2	20								the FVRD Regional Information Map (RIM) online website, respectively.							
LEY BRIDGE.GPJ MOTL DATATEMPLATE REV3.GDT 11/20/19	21 22 23 23 24 24 25 26 26 27 27								(KIW) online website, respectively.				21- 22- 23- 24- 25- 26- 27- 28-			
REV3 ENG-VGEO035	2 <b>9</b> 30												29-			
	egend ample	A-Auge	r 📕 <b>B</b> -Becker	C-Core	G-Grab		<b>V</b> -Va	ine	Legend Installation: Sand Grout Cement Bento	nite	Final Depth of H					
S-ITOM	ype:	L#-Lab Sample			W-Wash (mud retu	ım) Ш	T-Sh Tube	elby	Drill Slotted Slough Piezor	neter	Depth to Top o	of Rock: age 3				

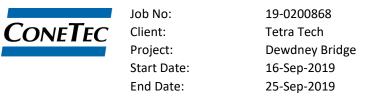


## **CPT DATA**



## Cone Penetration Test Summary and Standard Cone Penetration Test Plots





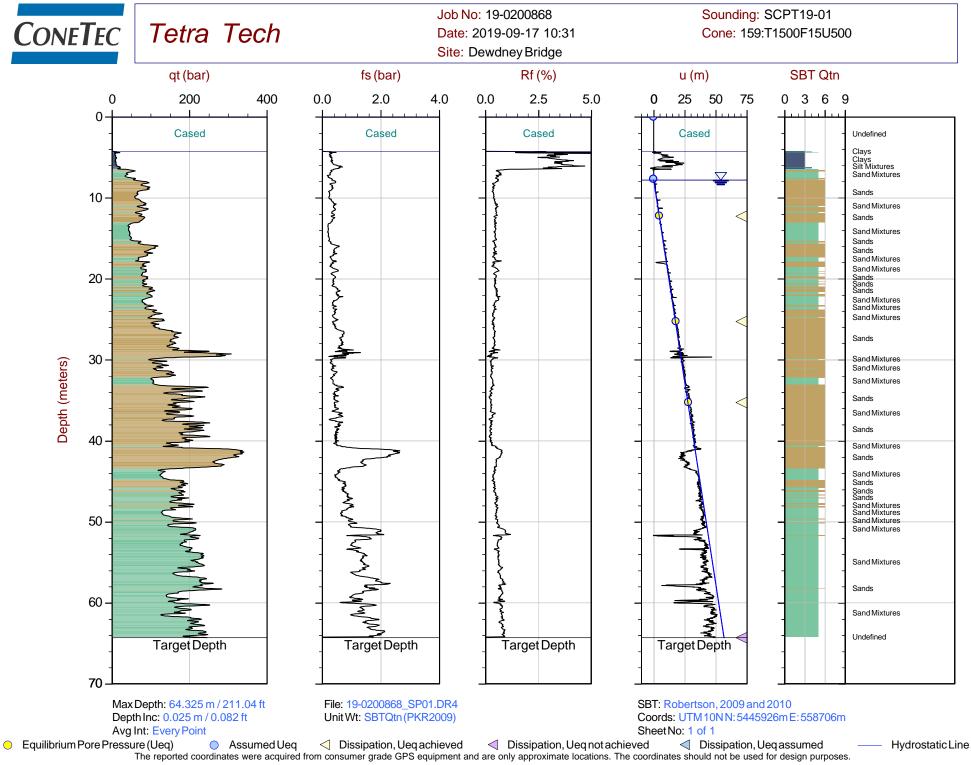
		CONE	PENETRATION TE	ST SUMMARY				
Sounding ID	nding ID File Name Date			Assumed Phreatic Surface <sup>1</sup> (m)	Mudline Depth <sup>2</sup> (m)	Final Depth <sup>3</sup> (m)	Northing <sup>4</sup> (m)	Easting <sup>4</sup> (m)
19-0200868_SP01	SCPT19-01	17-Sep-2019	159:T1500F15U500	7.8		64.325	5445926	558706
19-0200868_SP02	SCPT19-02	16-Sep-2019	519:T1500F15U500 159:T1500F15U500	9.7		60.000	5445833	558872
19-0200868_CP03	CPT19-03	24-Sep-2019	630:T1500F15U500	10.5	13.0	43.150	5445881	558784
19-0200868_CP04	CPT19-04	25-Sep-2019	630:T1500F15U500	9.2	10.5	42.125	5445902	558749

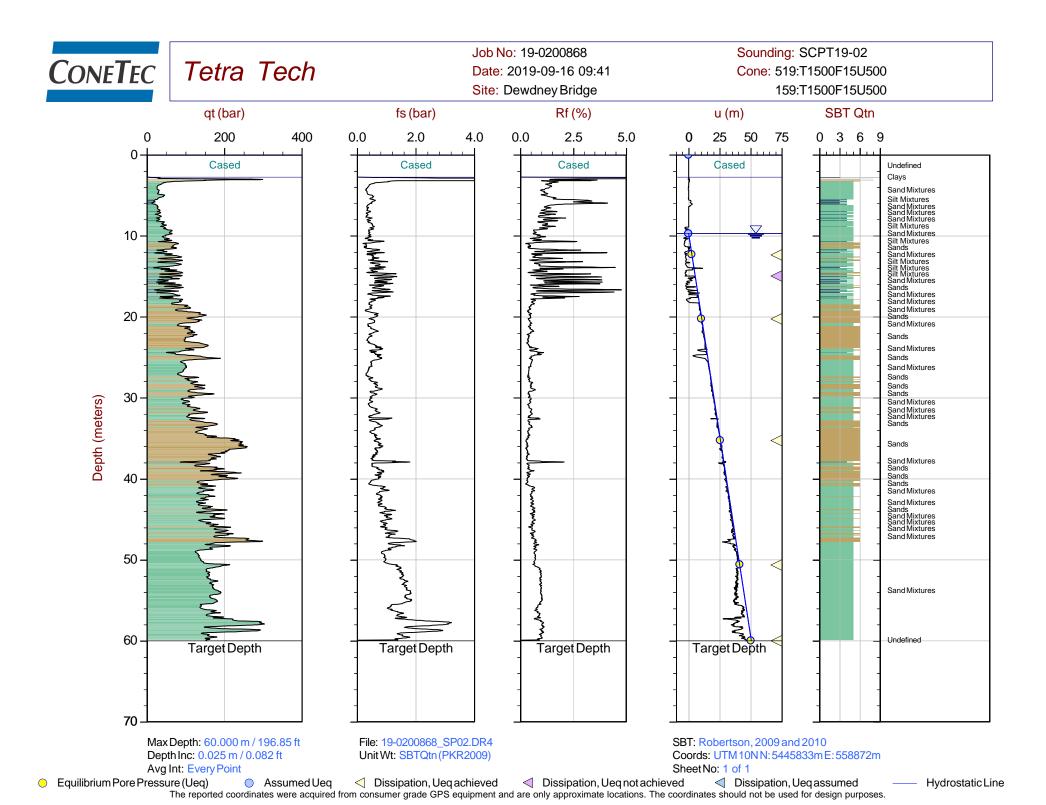
1. Thew assumed phreatic surface was based on pore pressure dissipations test. Hydrostatic conditions were assumed for the calculated parameters.

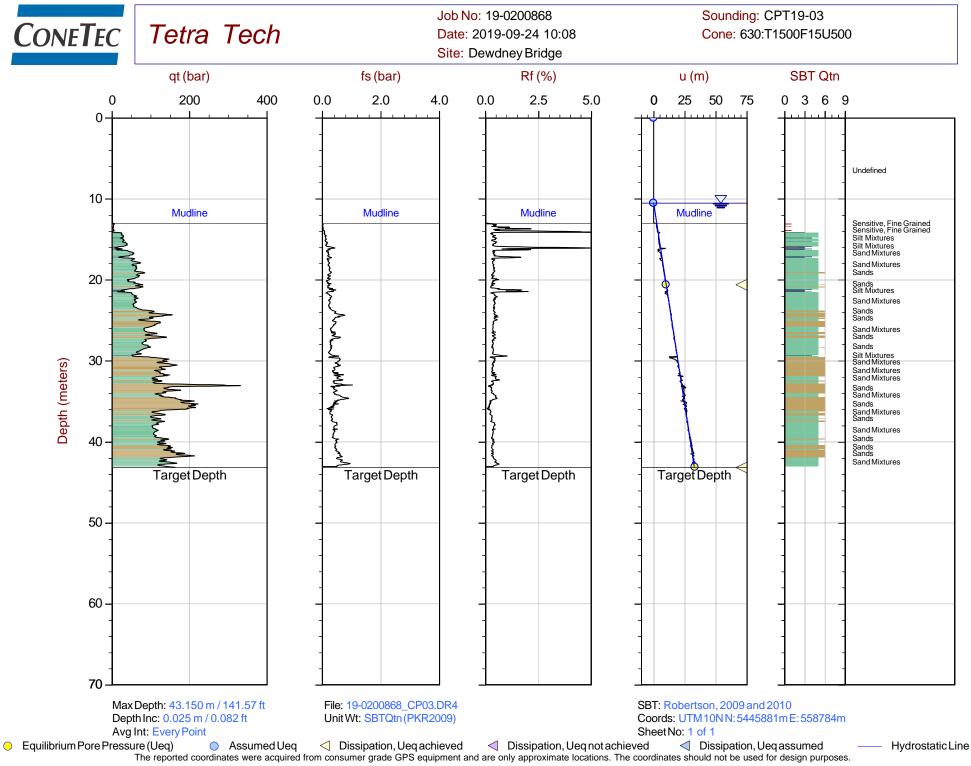
2. The mudline depth was measured from the bridge deck.

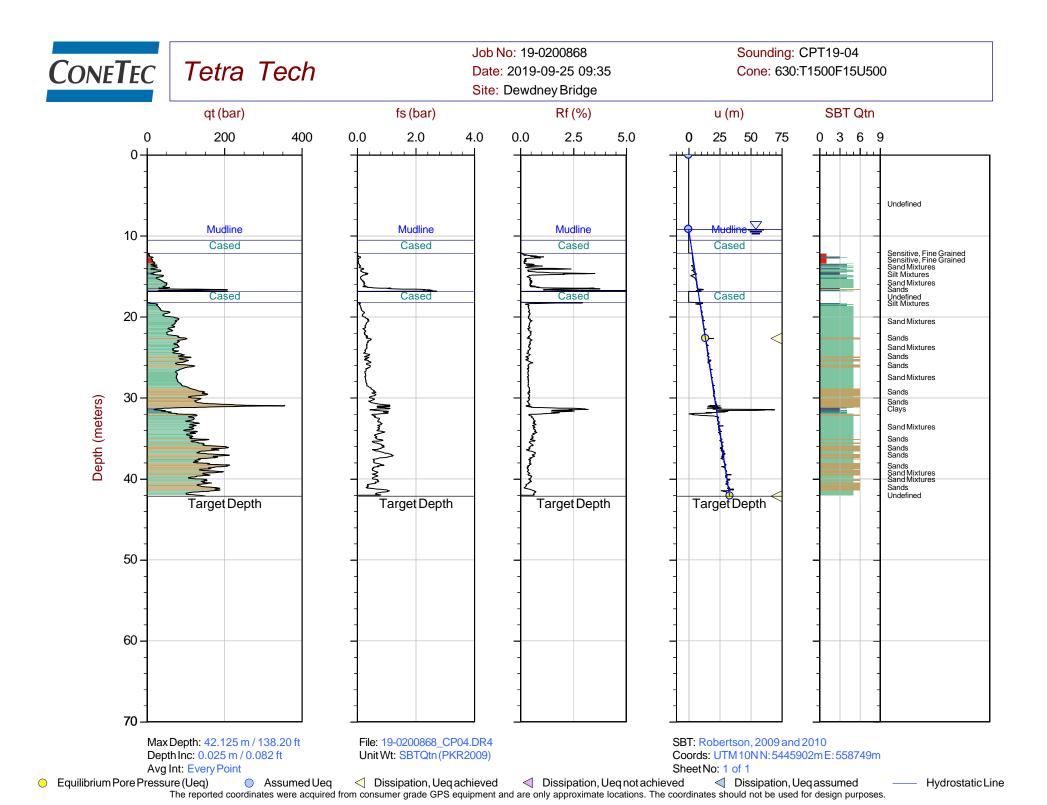
3. The penetration depths are referenced to the existing bridge deck at the time of sounding.

4. Coordinates were acquired using a consumer grade GPS. Datum: WGS 1984 / UTM Zone 10 North



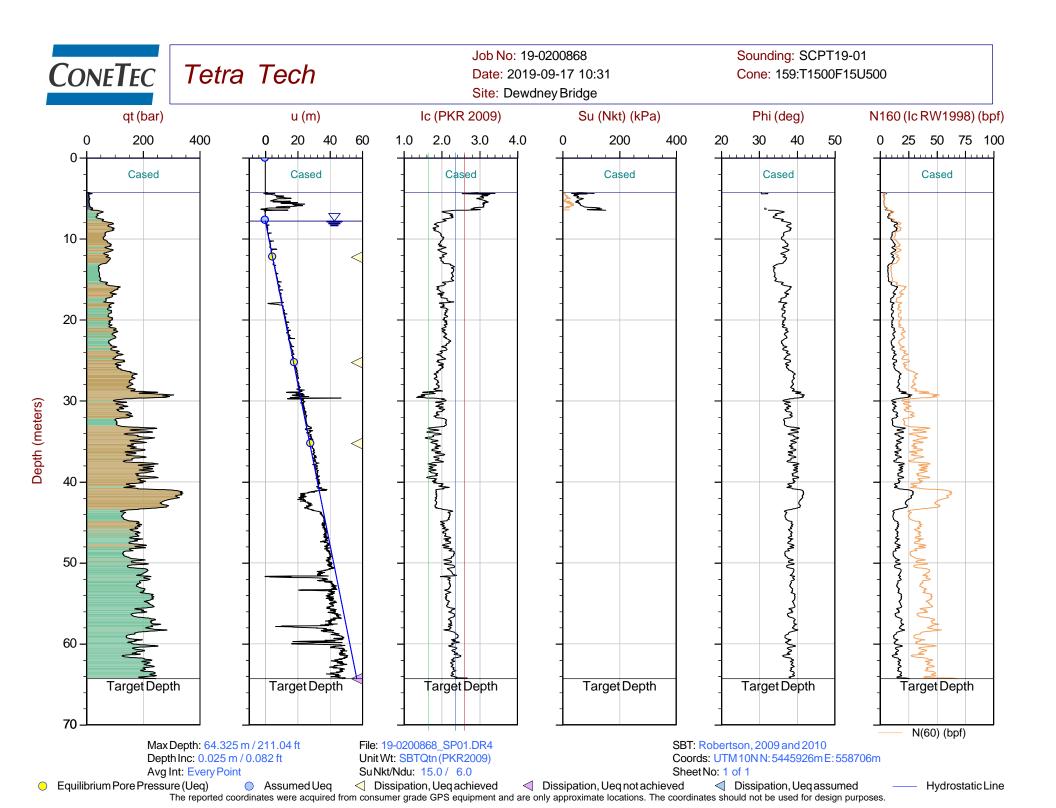


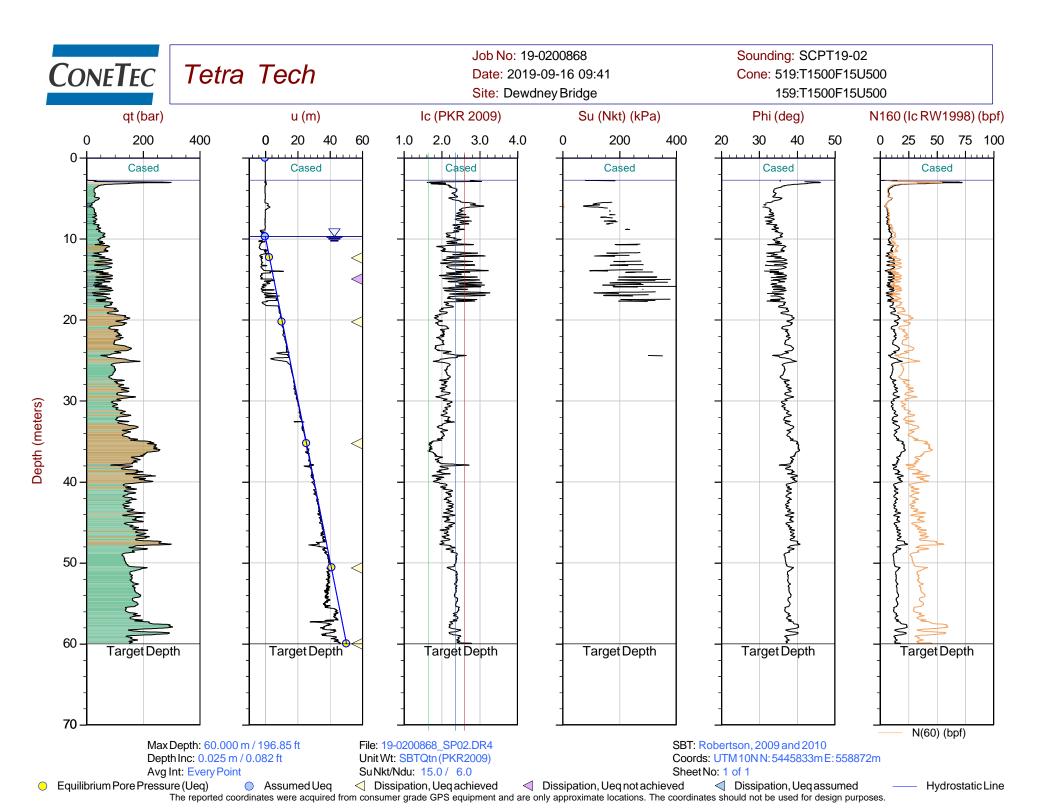


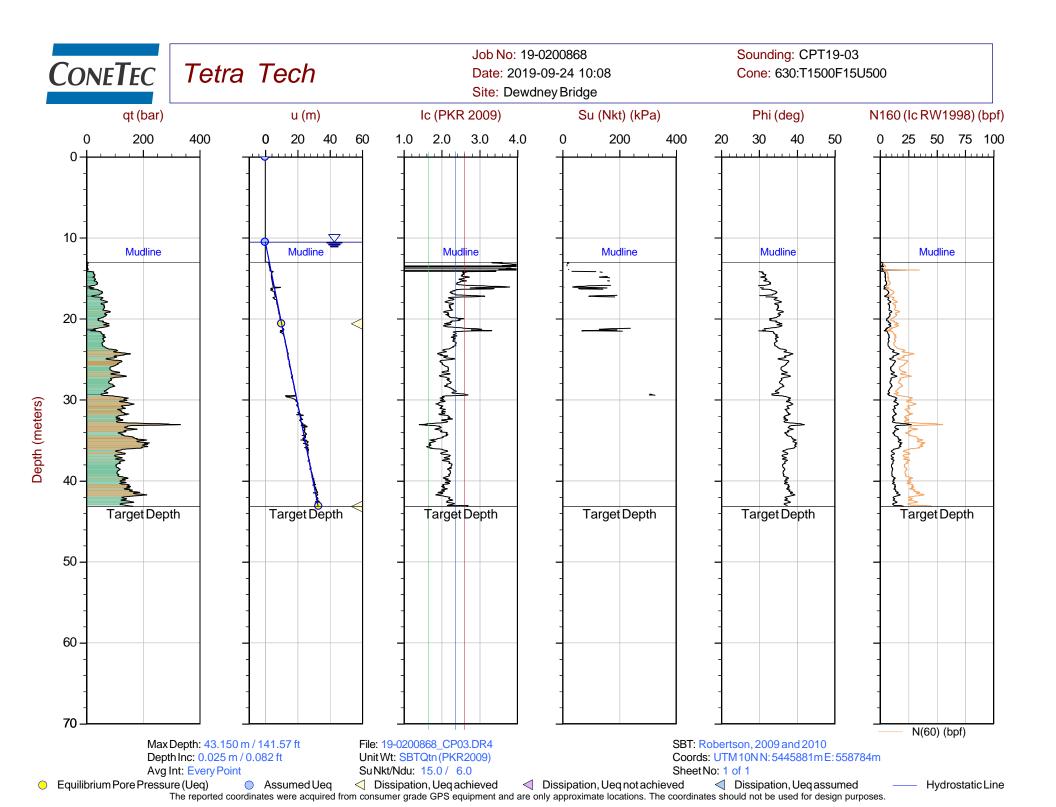


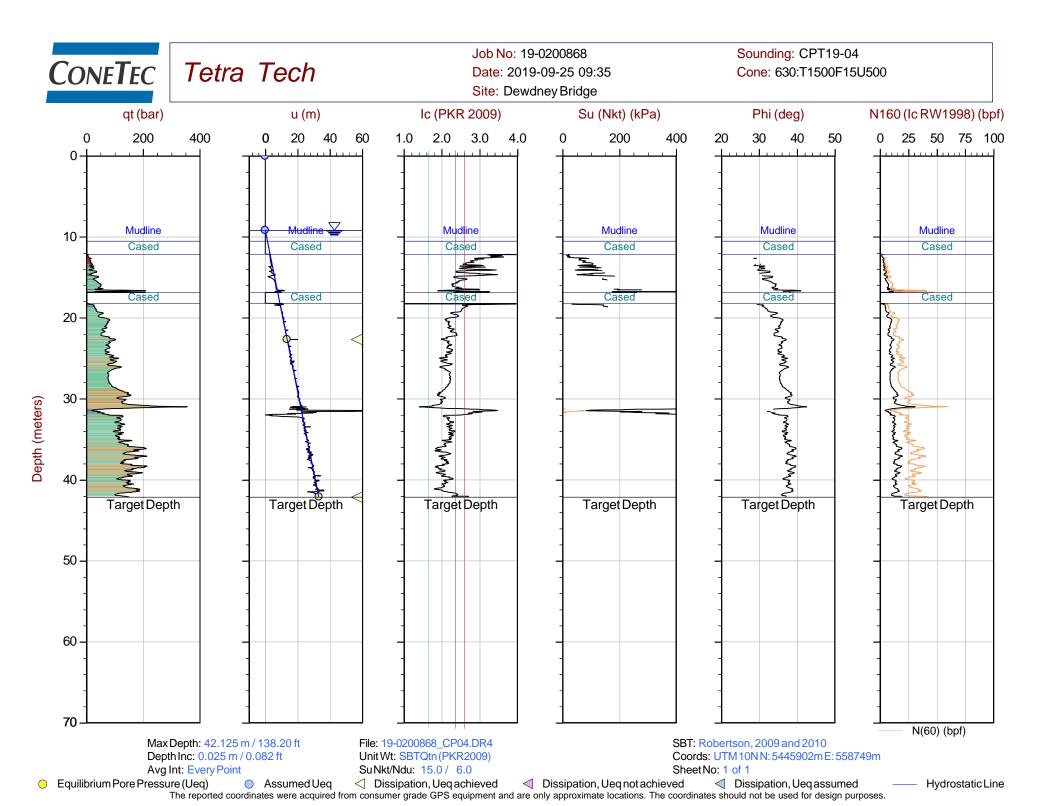
Advanced Cone Penetration Plots with Ic, Su(Nkt), Phi and N1(60)lc





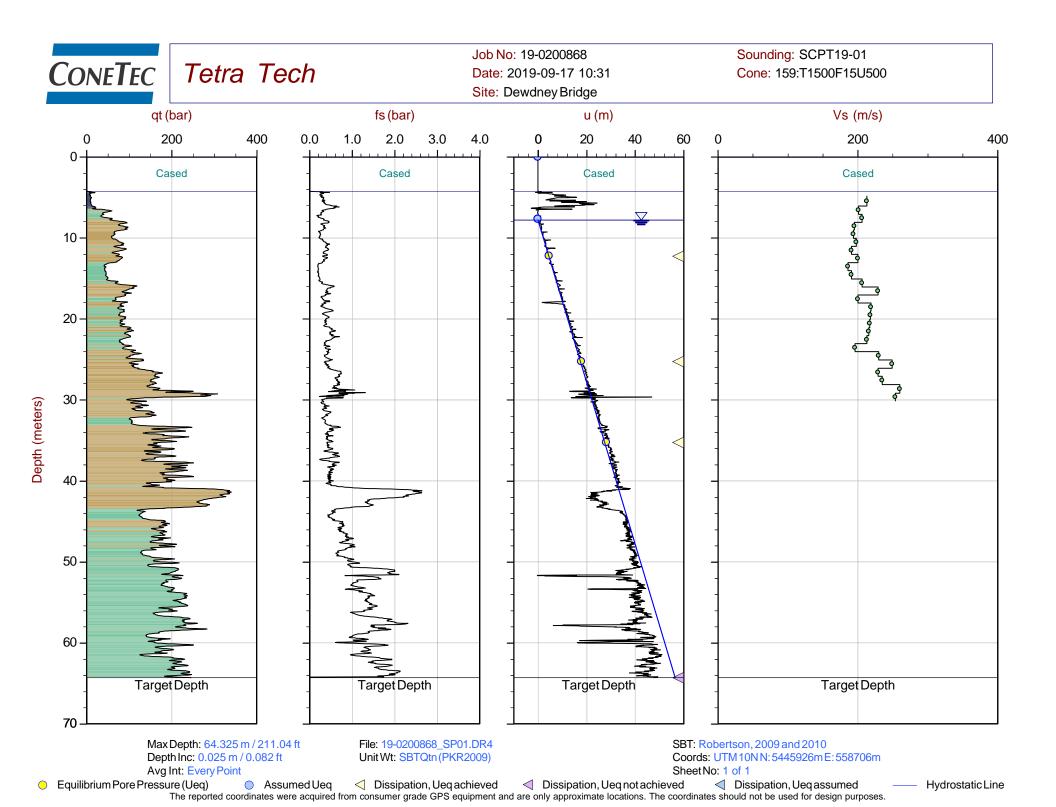


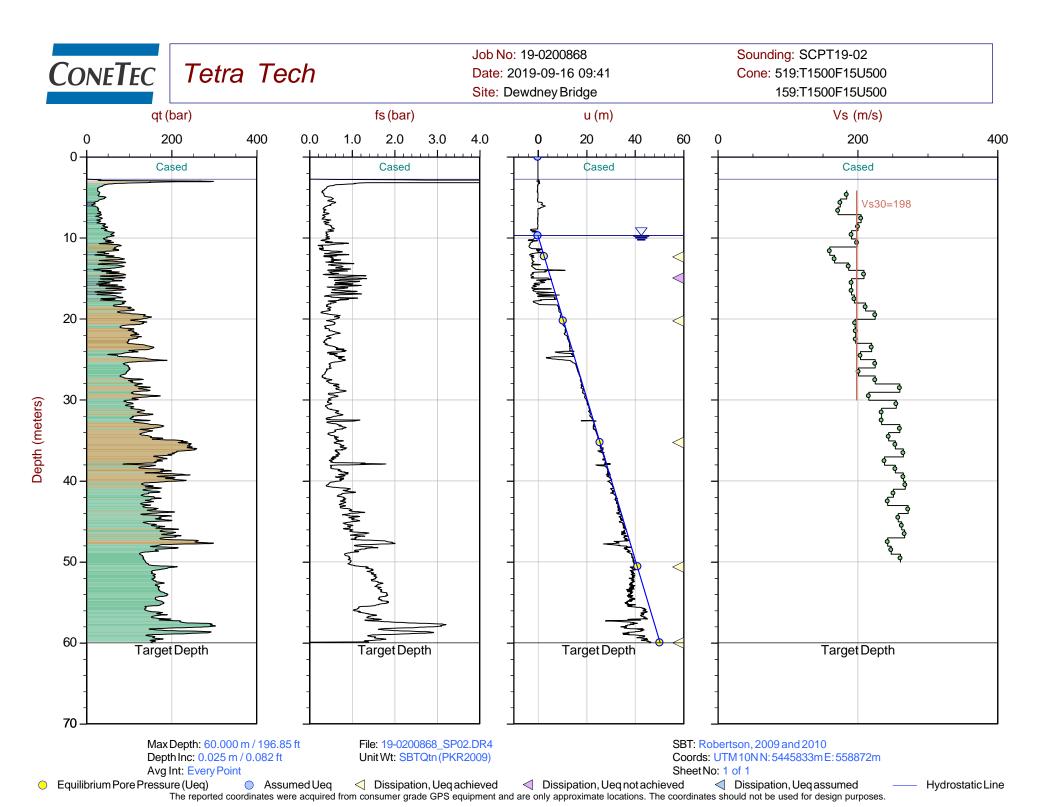




Seismic Cone Penetration Test Plots







Seismic Cone Penetration Test Tabular Results





Job No: 19-0200868 Client: Tetra Tech Project: Dewdney Bridge Sounding ID: SCPT19-01 Date: 17-Sep-2019 Seismic Source: Beam Source Offset (m): 0.40

Source Depth (m): 0.00 Geophone Offset (m): 0.20

	SCPTu SHE	AR WAVE VEL	OCITY TEST RES	ULTS - Vs	
Tip Depth (m)	Geophone Depth (m)	Ray Path (m)	Ray Path Difference (m)	Travel Time Interval (ms)	Interval Velocity (m/s)
5.05	4.85	4.87			
6.28	6.08	6.09	1.23	5.68	216
7.28	7.08	7.09	1.00	4.91	203
8.28	8.08	8.09	1.00	4.82	207
9.25	9.05	9.06	0.97	4.95	196
10.25	10.05	10.06	1.00	5.12	195
11.25	11.05	11.06	1.00	5.04	198
12.25	12.05	12.06	1.00	5.21	192
13.25	13.05	13.06	1.00	4.99	200
14.25	14.05	14.06	1.00	5.37	186
15.28	15.08	15.09	1.03	5.37	192
16.27	16.07	16.07	0.99	4.80	206
17.27	17.07	17.07	1.00	4.36	229
18.25	18.05	18.05	0.98	4.90	200
19.23	19.03	19.03	0.98	4.46	220
20.27	20.07	20.07	1.04	4.77	218
21.27	21.07	21.07	1.00	4.61	217
22.27	22.07	22.07	1.00	4.63	216
23.27	23.07	23.07	1.00	4.70	213
24.27	24.07	24.07	1.00	5.11	196
25.27	25.07	25.07	1.00	4.35	230
26.32	26.12	26.12	1.05	4.21	249
27.30	27.10	27.10	0.98	4.28	229
28.32	28.12	28.12	1.02	4.34	235
29.40	29.20	29.20	1.08	4.15	260
30.32	30.12	30.12	0.92	3.62	254



Job No: 19-0200868 Client: Tetra Tech Project: Dewdney Bridge Sounding ID: SCPT19-02 Date: 16-Sep-2019 Seismic Source: Beam Source Offset (m): 0.40

Source Depth (m): 0.00 Geophone Offset (m): 0.20

	SCPTu SHE	AR WAVE VELC	OCITY TEST RES	ULTS - Vs	
Tip Depth (m)	Geophone Depth (m)	Ray Path (m)	Ray Path Difference (m)	Travel Time Interval (ms)	Interval Velocity (m/s)
4.38	4.18	4.20			
5.38	5.18	5.20	1.00	5.30	188
6.38	6.18	6.19	1.00	5.64	177
7.33	7.13	7.14	0.95	5.47	173
8.32	8.12	8.13	0.99	4.79	207
9.32	9.12	9.13	1.00	4.96	201
10.32	10.12	10.13	1.00	5.21	192
11.32	11.12	11.13	1.00	5.00	200
12.35	12.15	12.16	1.03	6.41	160
13.30	13.10	13.11	0.95	5.68	167
14.20	14.00	14.01	0.90	4.79	188
15.22	15.02	15.03	1.02	4.87	209
16.25	16.05	16.05	1.03	5.39	191
17.25	17.05	17.05	1.00	5.21	192
18.25	18.05	18.05	1.00	5.13	195
19.23	19.03	19.03	0.98	4.64	211
20.25	20.05	20.05	1.02	4.54	225
21.23	21.03	21.03	0.98	4.98	197
22.23	22.03	22.03	1.00	5.07	197
23.23	23.03	23.03	1.00	5.07	197
24.25	24.05	24.05	1.02	4.63	220
25.25	25.05	25.05	1.00	4.89	204
26.25	26.05	26.05	1.00	4.45	225
27.25	27.05	27.05	1.00	4.98	201
28.25	28.05	28.05	1.00	4.45	225
29.27	29.07	29.07	1.02	3.91	261
30.25	30.05	30.05	0.98	4.54	216
31.25	31.05	31.05	1.00	3.91	255
32.25	32.05	32.05	1.00	4.27	234
33.25	33.05	33.05	1.00	4.27	234



Job No: 19-0200868 Client: Tetra Tech Project: Dewdney Bridge Sounding ID: SCPT19-02 Date: 16-Sep-2019 Seismic Source: Beam Source Offset (m): 0.40

Source Depth (m): 0.00 Geophone Offset (m): 0.20

	SCPTu SHE	AR WAVE VEL	OCITY TEST RES	ULTS - Vs	
Tip Depth (m)	Geophone Depth (m)	Ray Path (m)	Ray Path Difference (m)	Travel Time Interval (ms)	Interval Velocity (m/s)
34.27	34.07	34.07	1.02	3.91	261
35.27	35.07	35.07	1.00	4.09	244
36.27	36.07	36.07	1.00	3.94	254
37.27	37.07	37.07	1.00	3.77	265
38.27	38.07	38.07	1.00	4.20	238
39.25	39.05	39.05	0.98	3.86	254
40.25	40.05	40.05	1.00	3.77	265
41.25	41.05	41.05	1.00	3.73	268
42.25	42.05	42.05	1.00	3.98	251
43.25	43.05	43.05	1.00	4.11	243
44.25	44.05	44.05	1.00	3.68	272
45.27	45.07	45.07	1.02	3.95	258
46.27	46.07	46.07	1.00	3.80	263
47.27	47.07	47.07	1.00	3.75	267
48.27	48.07	48.07	1.00	4.11	243
49.27	49.07	49.07	1.00	4.03	248
50.27	50.07	50.07	1.00	3.83	261

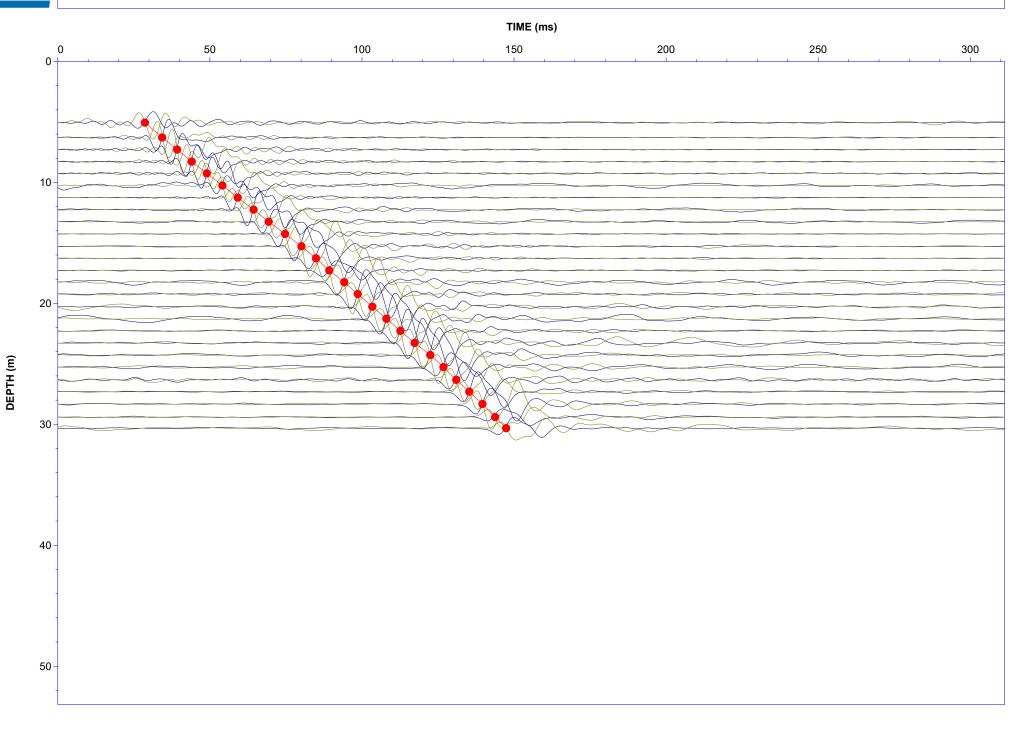
Seismic Cone Penetration Test Shear Wave (Vs) Traces





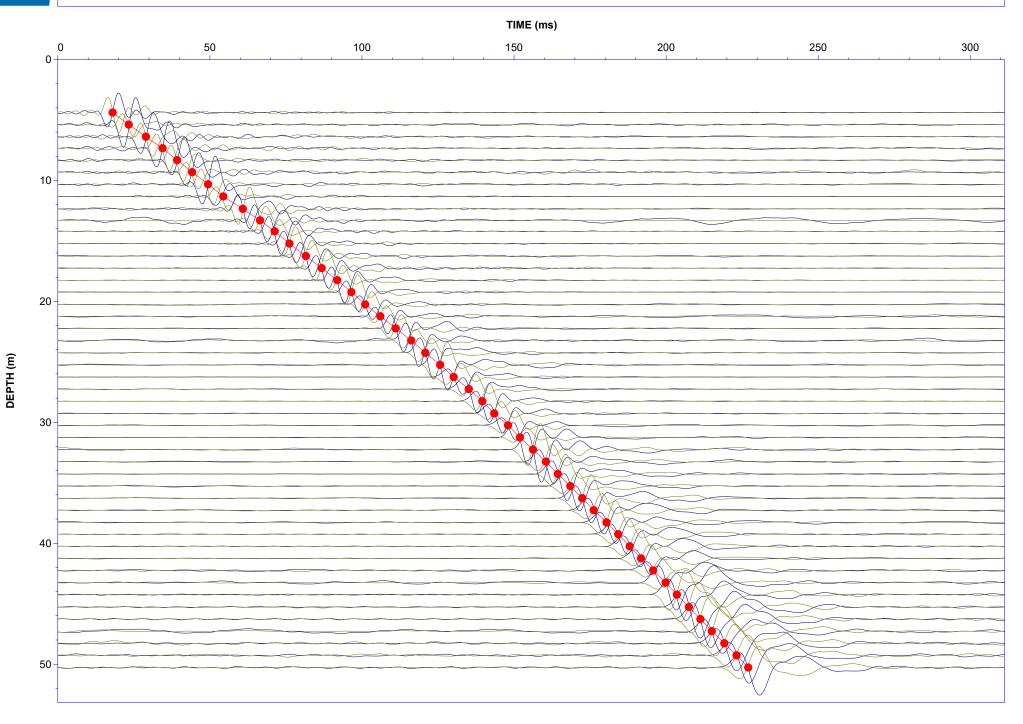
Hole: SCPT19-01

Date: 09:17:19 10:31





Date: 09:16:19 09:41

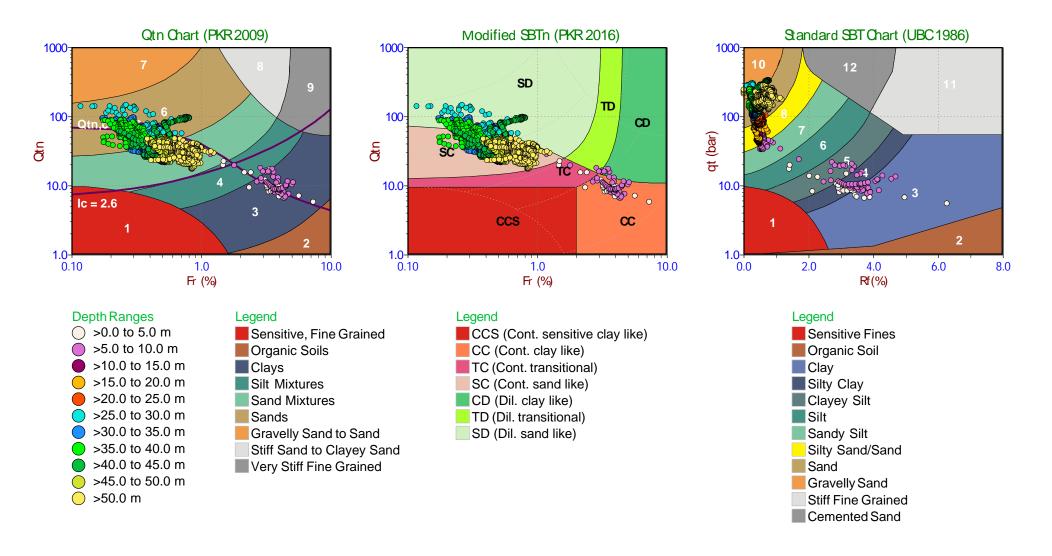


Soil Behaviour Type (SBT) Scatter Plots



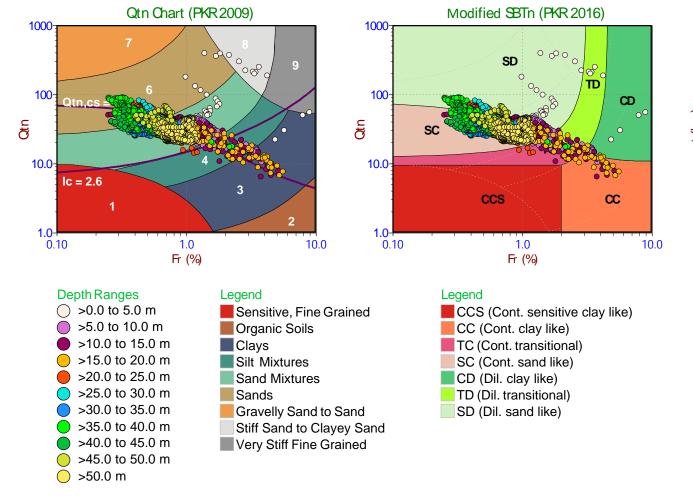
Job No: 19-0200868 Date: 2019-09-17 10:31 Site: Dewdney Bridge

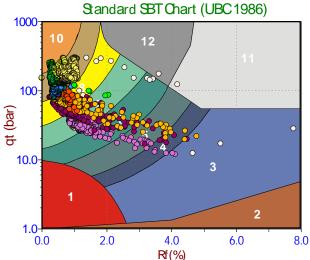
#### Sounding: SCPT19-01 Cone: 159:T1500F15U500



Job No: 19-0200868 Date: 2019-09-16 09:41 Site: Dewdney Bridge

#### Sounding: SCPT19-02 Cone: 519:T1500F15U500

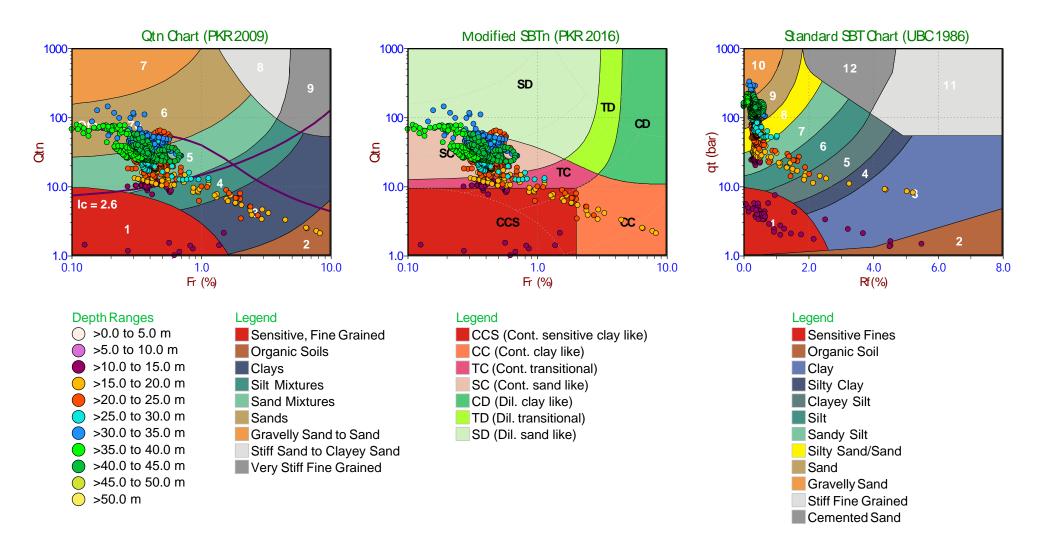




Legend Sensitive Fines Organic Soil Clay Silty Clay Clayey Silt Silt Sandy Silt Silty Sand/Sand Sand Gravelly Sand Stiff Fine Grained Cemented Sand

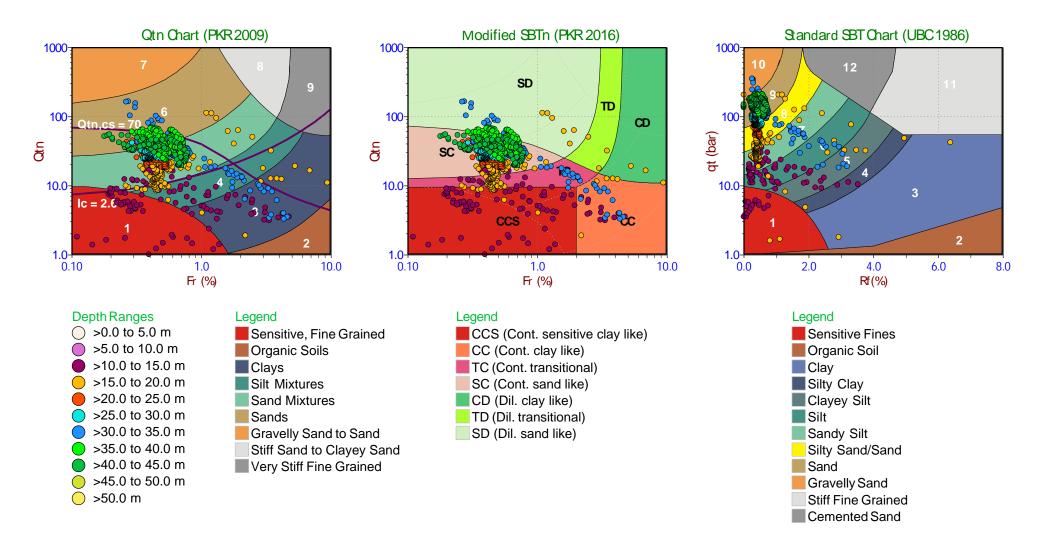
Job No: 19-0200868 Date: 2019-09-24 10:08 Site: Dewdney Bridge

#### Sounding: CPT19-03 Cone: 630:T1500F15U500



Job No: 19-0200868 Date: 2019-09-25 09:35 Site: Dewdney Bridge

#### Sounding: CPT19-04 Cone: 630:T1500F15U500



Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

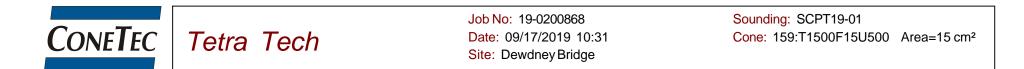


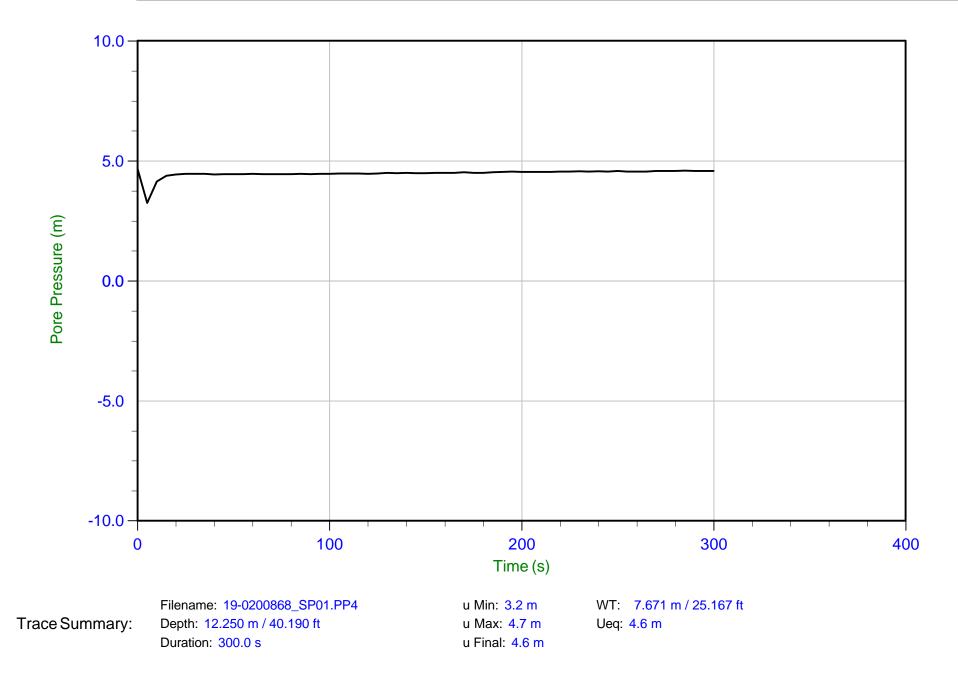


		CPTu Po	ORE PRE	SSURE	DISSIPATION	SUMMARY	•			
Sounding ID	File Name	Cone Area (cm²)	Duration (s)	Test Depth (m)	Estimated Equilibrium Pore Pressure U <sub>eq</sub> (m)	Calculated Phreatic Surface (m)	Estimated Phreatic Surface (m)	t <sub>50</sub> ª (s)	Assumed Rigidity Index (I <sub>r</sub> )	c <sub>h</sub> <sup>b</sup> (cm²/min)
SCPT19-01	19-0200868_SP01	15	300	12.250	4.6	7.7				
SCPT19-01	19-0200868_SP01	15	600	25.275	17.9	7.3				
SCPT19-01	19-0200868_SP01	15	605	35.275	28.1	7.2				
SCPT19-01	19-0200868_SP01	15	300	64.325	Not Achieved					
SCPT19-02	19-0200868_SP02	15	600	12.325	2.6	9.7				
SCPT19-02	19-0200868_SP02	15	540	14.950	Not Achieved					
SCPT19-02	19-0200868_SP02	15	300	20.250	10.3	9.9				
SCPT19-02	19-0200868_SP02	15	500	35.275	25.5	9.7				
SCPT19-02	19-0200868_SP02	15	600	50.625	41.1	9.5				
SCPT19-02	19-0200868_SP02	15	300	60.000	50.2	9.8				
CPT19-03	19-0200868_CP03	15	500	20.600	10.1	10.5				
CPT19-03	19-0200868_CP03	15	600	43.150	33.1	10.4				
CPT19-04	19-0200868_CP04	15	350	22.650	13.5	9.2				
CPT19-04	19-0200868_CP04	15	500	42.125	33.3	8.9				

a. Time is relative to where umax occurred.

b. Houlsby and Teh, 1991.

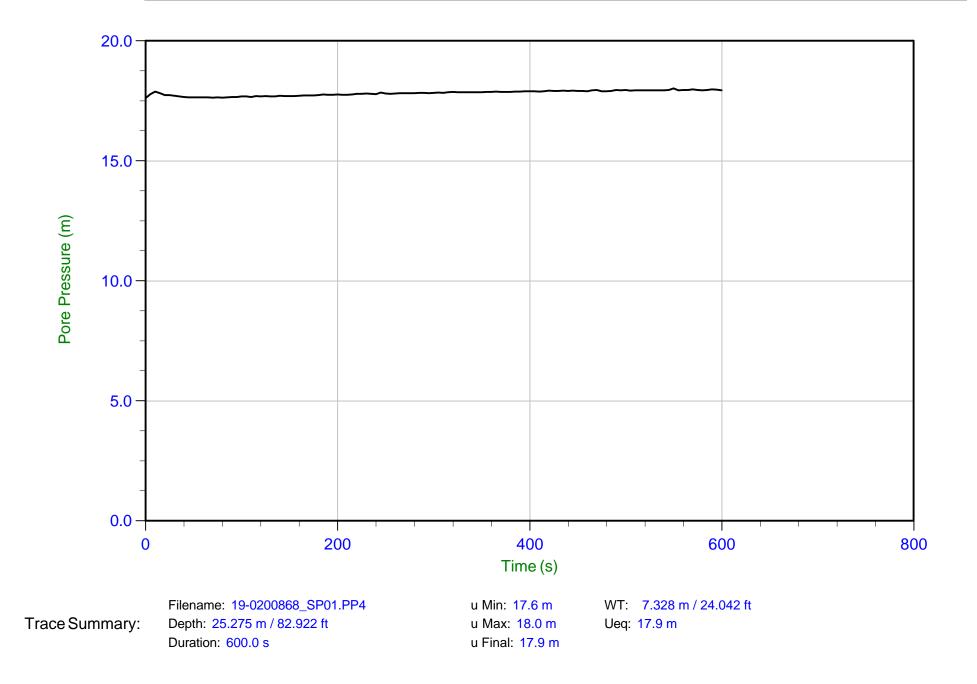


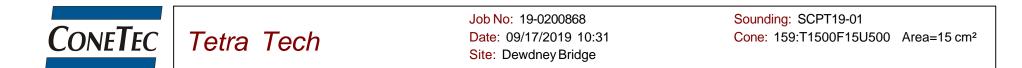


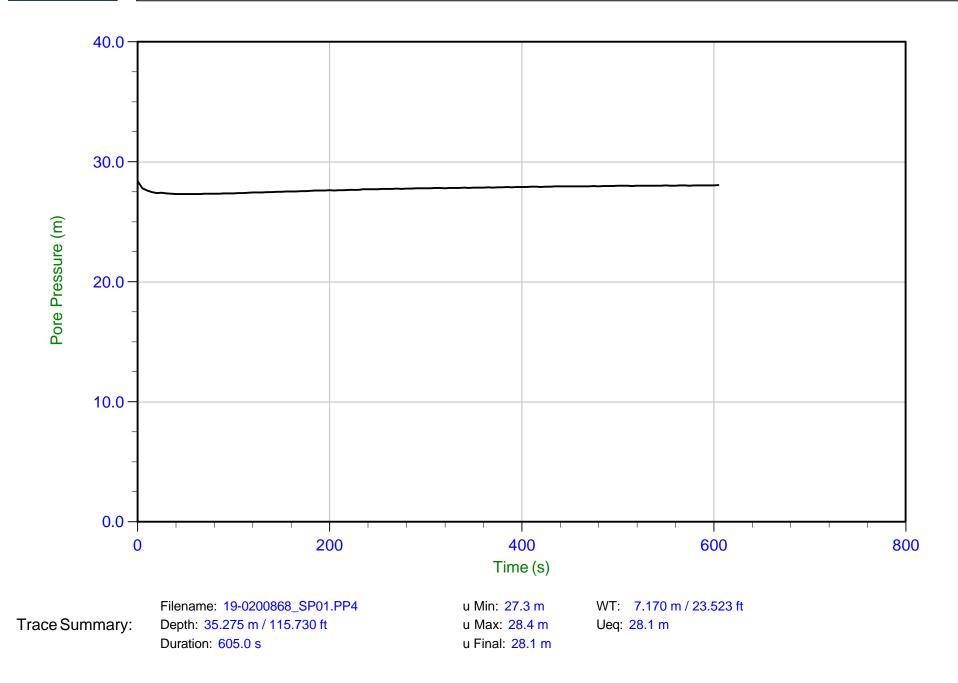


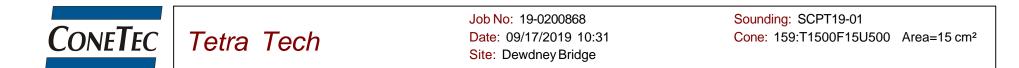
 Sounding:
 SCPT19-01

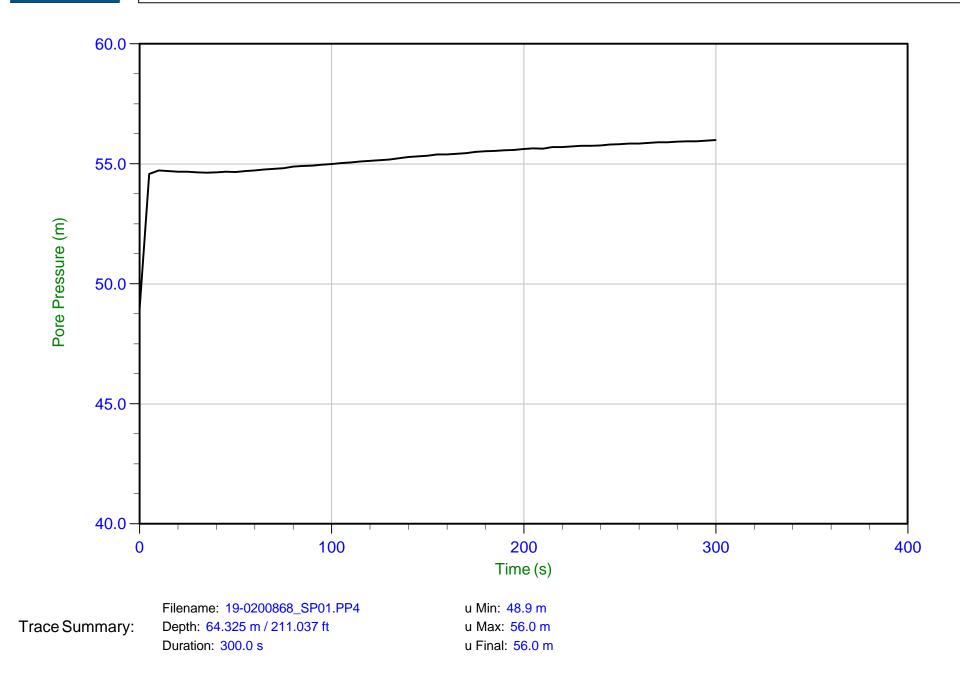
 Cone:
 159:T1500F15U500
 Area=15 cm<sup>2</sup>



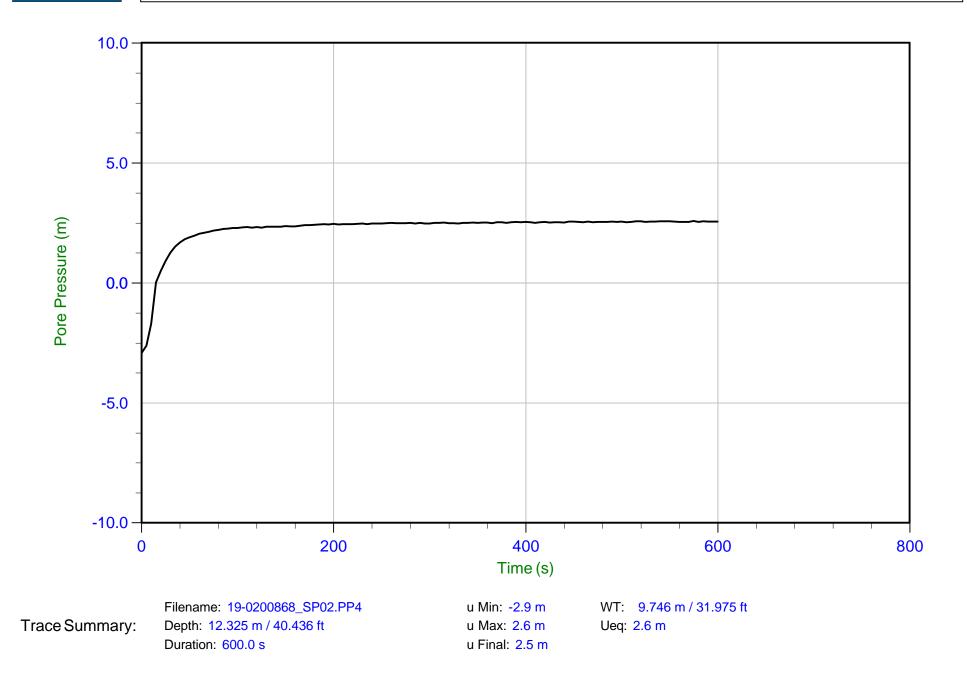


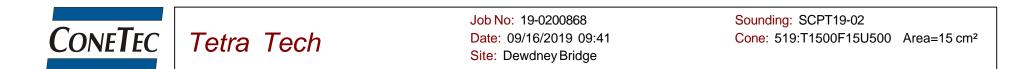


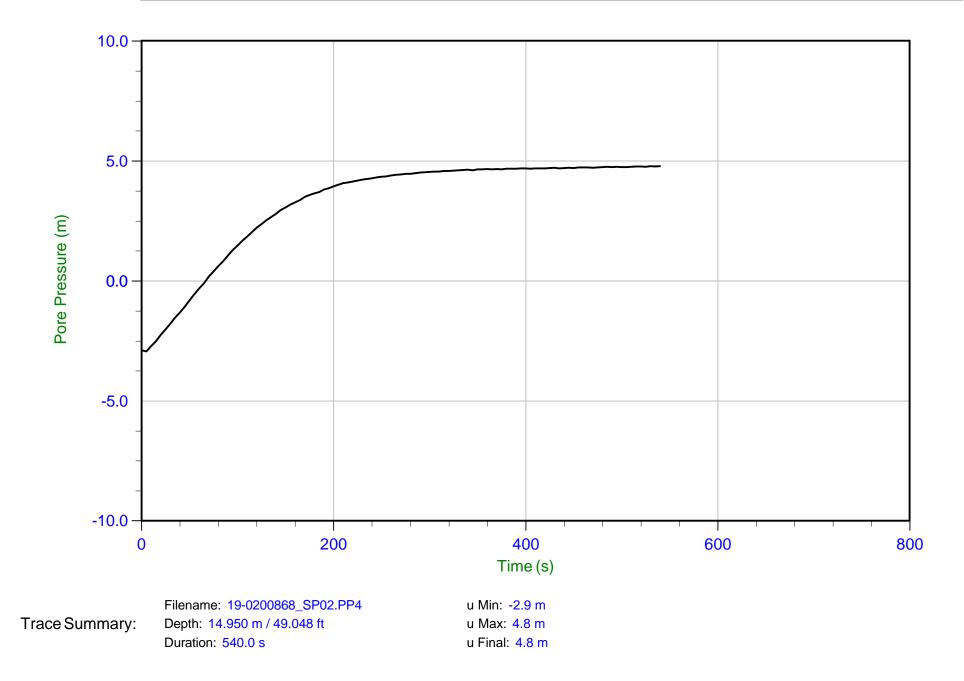




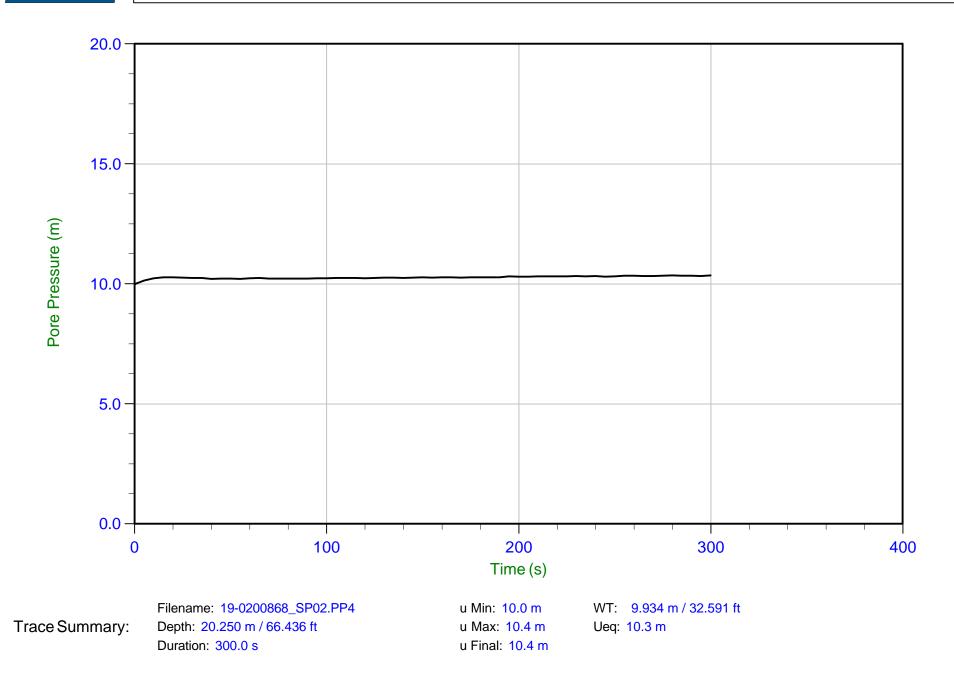






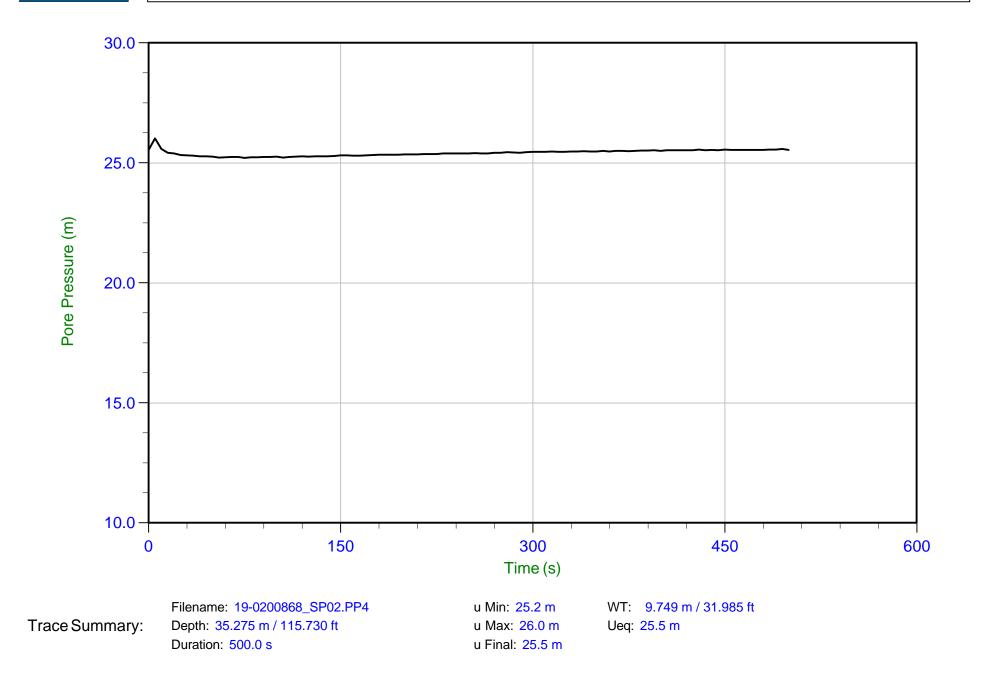




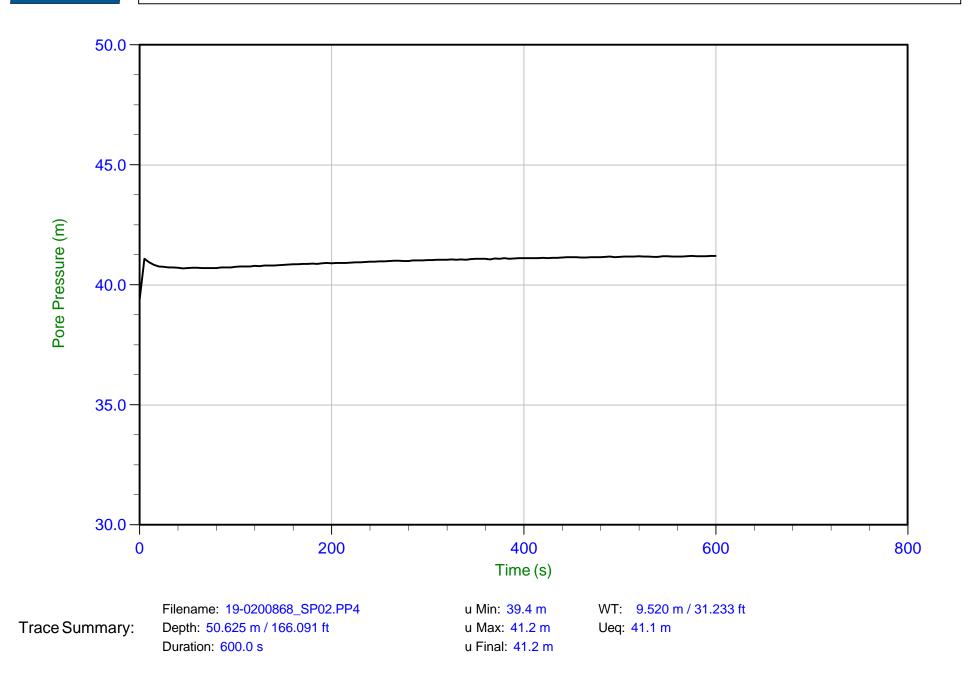




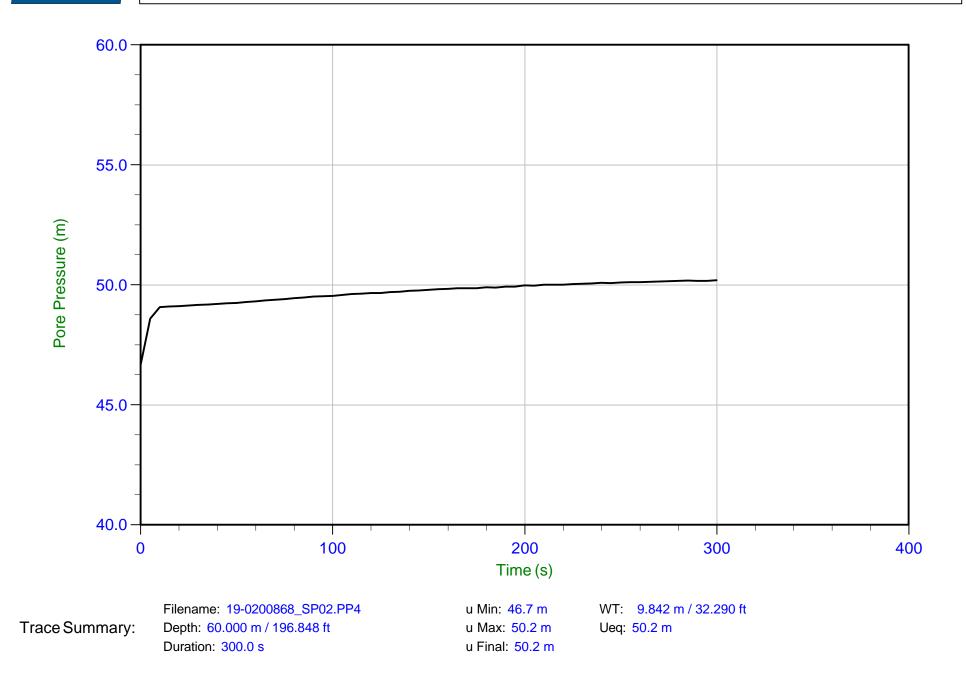
Sounding: SCPT19-02 Cone: 519:T1500F15U500 Area=15 cm<sup>2</sup>



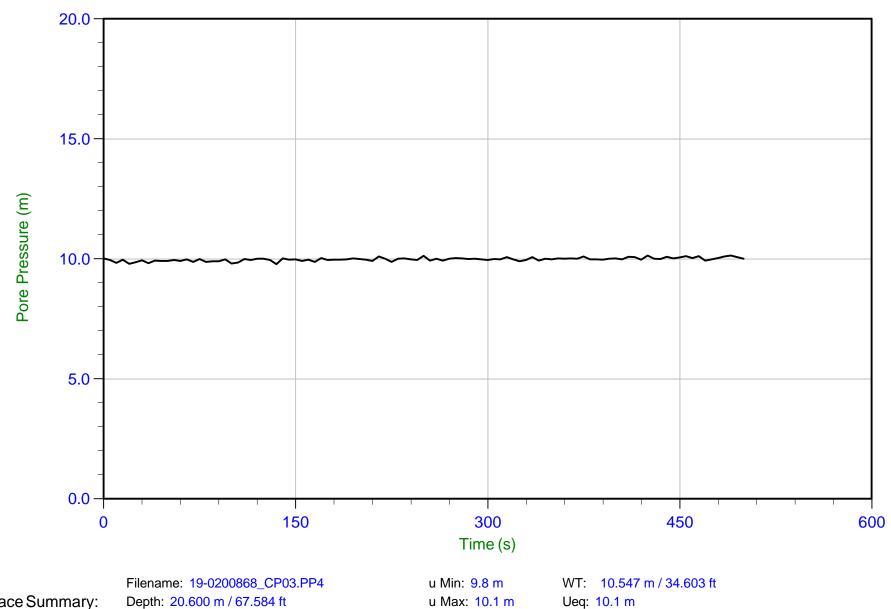












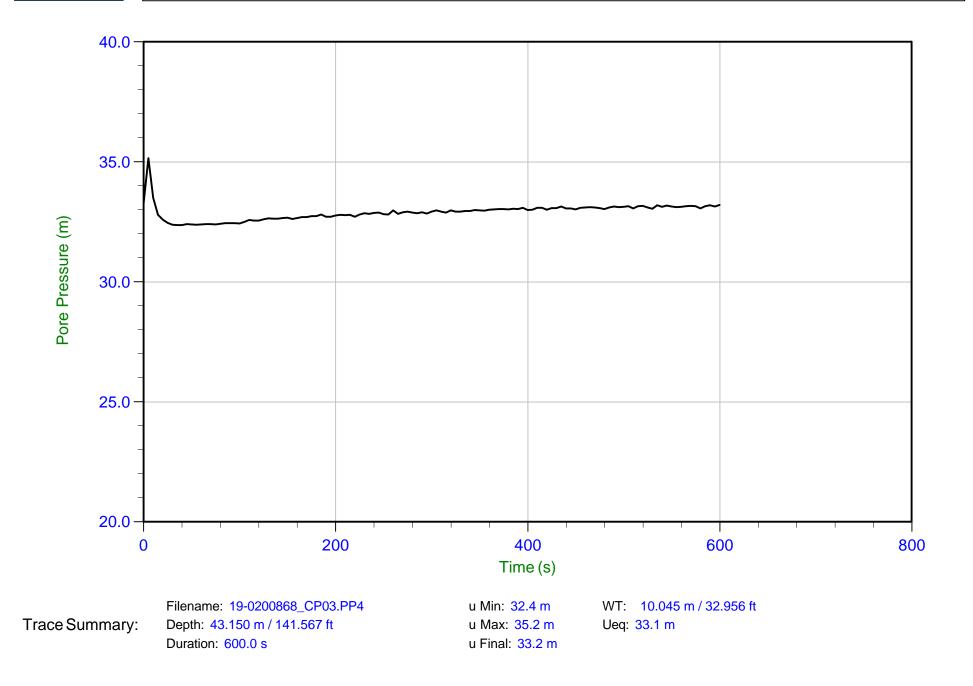
Trace Summary:

Duration: 500.0 s

u Final: 10.0 m

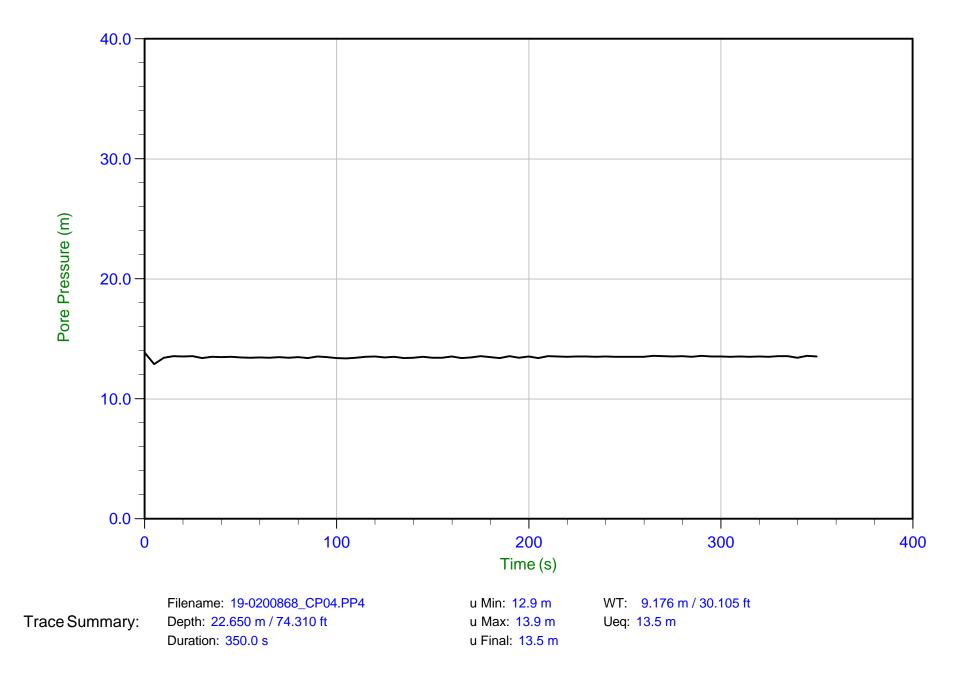


Job No: 19-0200868 Date: 09/24/2019 10:08 Site: Dewdney Bridge Sounding: CPT19-03 Cone: 630:T1500F15U500 Area=15 cm<sup>2</sup>



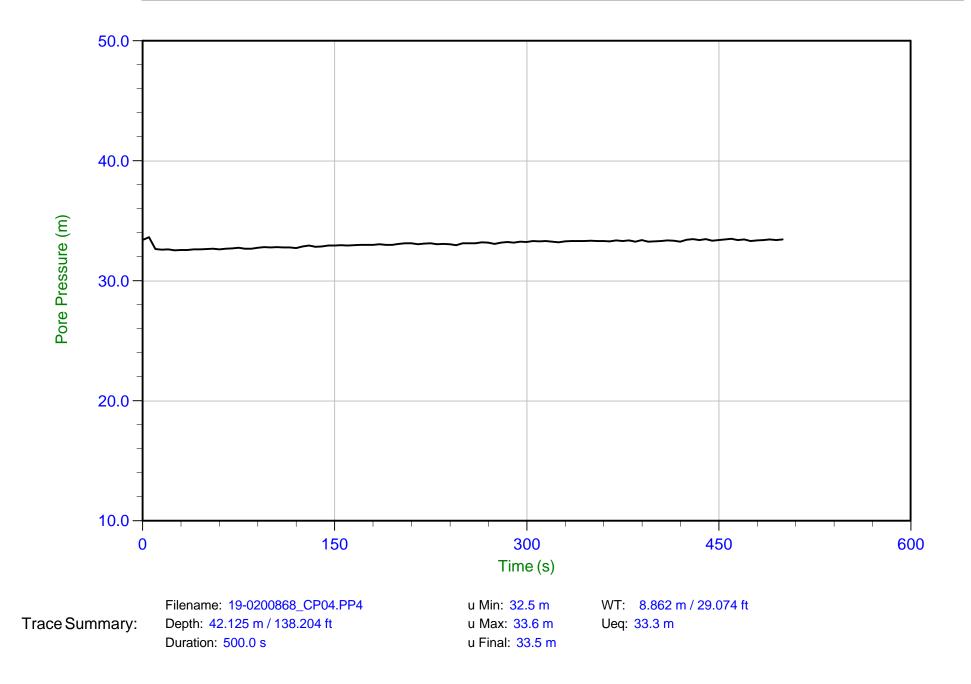


Job No: 19-0200868 Date: 09/25/2019 09:35 Site: Dewdney Bridge Sounding: CPT19-04 Cone: 630:T1500F15U500 Area=15 cm<sup>2</sup>





Job No: 19-0200868 Date: 09/25/2019 09:35 Site: Dewdney Bridge Sounding: CPT19-04 Cone: 630:T1500F15U500 Area=15 cm<sup>2</sup>





### APPENDIX C

### LABORATORY TEST RESULTS



		SIEVE ANALYSIS	REPORT		
		Washed Sieve: ASTM C1	36 and C117		
Project No.:	Dewdney Bridge Replace	ment	Sample No.:	S11	
Project:	704-ENG.VGEO03551-01		Date Received:		
Client:	BC MOTI		Sampled by:	CL	
Attention:			Date Tested:	October 12	, 2019
Email:			Tested by: CL	/BG Offic	e: Nanaimo
Description:	SAND, trace silt, moist, br	rown.	Moisture Content No. Crushed Fac		
Source:	SH19-01		By Particle Mass:		-,
Supplier:					
Sample Loca	tion:				
Specification					
Sieve F	Percent				100
[ -··· - ] -·	assing				
					90
					80
					70
	PAL				
					60
		/			50
1-11-1 - 1-1-1 - 1-1-1-1-1-1-1-1-1-1-1-					
	/				40
					30
1.18	100				
0.600	99				20
0.300	60				
0.150	15				10
0.075	1.8				
	0.075 0.150	0.300 0.600 1.18 Siev	2.36 4.75 10 ve Size (mm)	) 19 12.5 25	38 6375 0 50
		0164	6 0126 (mm)		
Remarks:					
				6 -	
		Pavia	wed By:		DEre
		nevier			P.Eng.



			(	SIEVE /		IS REF	PORT							
			w	ashed Sie	ve: ASTN	1 C136 a	nd C117							
Project No.:	Dewdney	Bridge Re	eplacem	ent			Sample	No.:	S1:	2				
Project:	704-ENG.						Date Re							
Client:	BC MOTI						Sample	i by:	CL					
Attention:							Date Te	_			12, 2	019		
Email:							Tested t		L/BG		ffice:		anair	no
Description:	SAND, tra	ice silt, m	oist, grey	y-brown			Moisture	Conter	nt (as r	eceive	d):	1	7.7%	6
Source:	SH19-02	111-1					No. Crus			T W	0 (2)	or	i nre	e (a
Supplier:	01119-02						By Partie	Je Mas	5.					
Sample Loca	tion: 22.9	23.2												
Specification		- 20.2												
specification	1													
Sieve F	Percent													10
Size F	Passing													
					/									90
					<b> </b>									80
					/									
				+	-		_		+-+-	_			++	70
			-			1							┼╫	60
														50
														30
9.5	100			∦			_					$\square$	+-#	40
4.75	100	3		/										
2.36	100				_									30
1.18	99													
0.600	86												1#	20
0.300	32		1											10
0.150	14													10
0.075	7.7	0.075 0	).150 O.	300		.18 ;	2.36 4.	75		10				0
?emarks:		0.075	.130 0.	.500 0.	000		ize (mm)	75	10 12.5	19 2	25 38	50	6375	
4					Re	viewed	By: _	2	j¢		_		P.En	g.



				SIE	/E ANA	LYSIS R	EPORT						
							6 and C117						
Project: Client: Attention: Email: Description: Source: Supplier: Sample Loca		G.VGEC N race silt	003551-	ement 01	d Sieve: /		Sample Date R Sample Date Te Tested Moistur No. Cru	eceived: ed by: ested: by: <u>(</u> e Conte	CL Oc CL/BG nt (as i ices:	itober i O	ffice: d):	Na 2	anaimo 20.9% Three (3)
Size P 4.75 2.00 0.85 0.425 0.250 0.150 0.075	2 Percent Passing 100 100 99 72 6 3 1.8	0.075	0.150	0.250 0.	425	D.85	2.00 ¢	.75	10 <sub>12.5</sub>	19 2	25	3 50	100 90 80 70 60 50 40 30 20 10 6375
Remarks:						Review	ed By: 🖉	1_	-0	-			P.Eng.



#### SOLUBLE SULPHATE ION CONTENT OF SOIL

(CSA Designation A23.2-2B & A23.2-3B)

Project:	Dewdney Bridge	Replacement		Date Tested:	Octo	ober 16	6, 2019	
Project No.:	704-ENG.VGEOC Ministry of Transp			Tested By:	EM			
Client:	Infrastructure			Sample Sour	rce:	SH19-	01, SH19-0	)2
Location:	Highway 7, Dewd	ney, BC		Laboratory:		Calga	ŷ	
Sample Nun	nber	SA-07	SA-04					
Borehole Nu	ımber	SH19-01	SH19-02					
Depth (m)		6.4-6.7	7.3-7.6					
Sulphate Co	ontent %	0.07	0.07					
Degree of E	xposure (Class)	Negligible	Negligible					

Class of exposure	Degree of exposure	Water-soluble sulphate (SO <sub>4</sub> )† in soil sample, %	Sulphate (SO <sub>4</sub> ) in groundwater samples, mg/L‡	Water soluble sulphate (SO <sub>4</sub> ) in recycled aggregate sample, %	Cementing materials to be used§
S-1	Very severe	> 2.0	> 10 000	> 2.0	HS or HSb
S-2	Severe	0.20-2.0	1500-10 000	0.60-2.0	HS or HSb
S-3	Moderate	0.10-0.20	150-1500	0.20-0.60	MS, MSb, LH, HS, or HSb

\*For sea water exposure, see Clause 4.1.1.5.

†In accordance with CSA A23.2-3B.

‡In accordance with CSA A23.2-2B.

§Cementing material combinations with equivalent performance may be used (see Clauses 4.2.1.2, 4.2.1.3, and 4.2.1.4). Type HS cement shall not be used in reinforced concrete exposed to both chlorides and sulphates. Refer to Clause 4.1.1.6.3.

#### Limitations:

i) The degree of exposure class included herein are valid only if drainage and weeping systems

meet the requirements of the site conditions.

ii) The degree exposure class should be re-verified if backfill soils for foundation walls originate

from an unknown source.

#### **Remarks:**

**Reviewed By:** 

Manuelue P.Eng.



		<b>WA</b>	TER SO	LUBLE	CHLOR	DE ION CONTENT IN	CONCR	ETE		
				(C:	SA Desig	nation A23.2-4B)				
Project:	Dewdne	ey Bridg	e Replac	ement		Date Received:	11-C	oct-19	By:	EM
Project No.:	704-EN	IG.VGE	O03551-(	01		Date Tested:	16-C	)ct-19	By:	EM
Client:	Ministry Infrastru		nsportatio	n and		Laboratory:	Calg	ary		
Borehole Nur	mber		SH1	9-01		Borehole Number		SH	19-02	
Sample Num			SA	-08		Sample Number		S	<b>A-</b> 05	
Sample Loca		Hia	hway 7, [		BC	Sample Location	Hie	hway 7.	Dewdney	. BC
Depth: (m)		7.3-7.6			,	Depth: (m)	9.8-10.1	,, ., .,		
Chloride Conten Mass of Sample	it by	0.014				Chloride Content by Mass of Sample, %	0.006			
Borehole Nu						Borehole Number				
Sample Num	her					Sample Number				
Sample Loca						Sample Location				2
Depth: (m)						Depth: (m)				
Chloride Conter Mass of Sample						Chloride Content by Mass of Sample, %				
Borehole Nu	mber	2				Borehole Number				
						Borehole Number Sample Number				
Sample Num	nber									
Borehole Nu Sample Num Sample Loca Depth: (m) Chloride Conter	nber ation					Sample Number				

