PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Professional and Technical Services, Real Property Services Branch, Pacific Region

Km 355.5 – 359.5 Bougie Creek Cut Slope and Highway Embankment Stabilization — Addendum #001

Project No. R.119901.002 — 2020-11-26

The following changes in the tender documents are effective immediately. This addendum will form part of the Contract documents.

Questions from Bidders and Responses

Question 1: Regarding Section 01 11 10 – Part 3 – 3.1.2 there is reference made to a mandatory onsite pre-tender meeting for this tender (Page 4 of 144).

Looking through the tender documents I'm unable to find any other information for this meeting. Could you please confirm the date and details of this meeting, or direct me to where I can find that information

Response 1: A pre-tender meeting is not occurring for this project.

Question 2: This project is to be completed by March 31, 2021. When are we able to commence this project?

Response 2: The project can commence once the Contract is awarded. It is anticipated that the Contract will be awarded within 2 weeks of closing. Construction can commence once all of the required pre-construction submittals have been submitted to, reviewed, and approved by the Departmental Representative.

Question 3: Is a geotechnical report available?

Response 3: No, a geotechnical report is not available for this project. However, eight boreholes logs have been provided as part of Addendum 001 for the Contractor's reference. The logs are provided for reference only and PSPC makes no assurances the material encountered at these boreholes are representative of the geotechnical conditions of the area between the boreholes. Furthermore, construction work may have occurred in the areas of these boreholes since the drilling was undertaken. For additional information, refer to the "Limitation of Use" included with the borehole logs.

Question 4: When we excavate/haul/stockpile, topsoil & other types of soil (i.e Clay) should be separated?

Response 4: No, excavated material does not need to be separated. The excavated material will need to be stockpiled in accordance with Section 31 23 33 – Excavation and Backfill, sub-section 3.4 Stockpiling of Excavation Materials of the contract specifications.

Question 5: Drawing C102, C103 & C104 show estimated quantities for reference. The total amount of riprap is 560m3 according to the table, however the amount seems small if I measure the swale area and multiply by 0.45m (Riprap Thickness). Could you please clarify the riprap thickness is 0.45m?

Response 5: The reference quantities have been updated as part of the revised drawings included in this Addendum (Addendum 001). The riprap thickness is 0.45 m as shown on the Contract Drawings.

Question 6: Are you anticipated with any load limit restrictions between the jobsite to PSPC's Adsette Pit?

Response 6: Yes, legal highway load limit restrictions apply (including, if applicable, seasonal restrictions). Legal highway load limit restrictions also apply to the Bougie Creek River Bridge.

Explanation of Addendum Presentation: Changes to the Specifications and Changes to the Contract Drawings sections of this Addendum have been presented as follows:

- *New text has been underlined for ease of identification.*
- *Removed text has a "strikethrough" and is to be deleted from the text.*

Changes to the Specifications:

1. Section – Table of Contents

Insert:

Appendices

K Gravel Pit Location

Km 355.5 – 359.5 Bougie Creek Cut Slope and Highway Embankment Stabilization — Addendum #001

Project No. R.119901.002 — 2020-11-26

Delete:

List of Contract Drawings, Sheet No. 1 – 25

Insert:

List of Contract Drawings:

LIST OF CONTRACT DRAWINGS

Sheet No.	Title	Drawing Number	Revision Number
1	Cover Page	C000	
2	Project Location Plan, Key Plan, Drawing Index, Legend and Control Monuments	C001	B
3	Plan - Profile Offtake Ditch Regrading and Tree Clearing Sta. 355+220 - 355+900	C101	B
4	Plan - Profile Cut Slope Regrading Sta. 355+900 - 356+500	C102	B
5	Plan - Profile Cut Slope Regrading Sta. 356+500 - 357+100	C103	B
6	Plan - Profile Cut Slope Regrading Sta. 357+700 - 358+300	C104	B
7	Plan - Profile Interceptor Ditch and Lateral Swale Sta. 355+900 - 356+500	C201	B
8	Plan - Profile Interceptor Ditch and Lateral Swale Sta. 356+500 - 357+100	C202	B
9	Plan - Profile Interceptor Ditch and Lateral Swale Sta. 357+700 - 358+300	C203	B
10	Plan - Profile Lateral Swales Sta. 358+551 - 357+100	C204	B
11	Plan - Profile Interceptor Ditch and Lateral Swale Sta. 357+700 - 358+300	C205	B
12	Typical Sections - Cut Slope Regrading (Sheet 1 of 2)	C301	B
13	Typical Sections - Cut Slope Regrading and Telegraph Pole Details (Sheet 2 of 2)	C302	B
14	Interceptor Ditch and Lateral Swale Details	C401	B
15 – 27	Cross-Sections	C501 – C513	B

2. Section 01 11 10 – Summary of Work

Delete:

1.1 – Order of Precedence, Item .2

Insert:

1.1 – Order of Precedence, Item .2:

.2 If conflict arises between an item in the main body of these Specifications (Division 1 – Division ~~35~~ 32) and an item found in one of the Appendices (Reference Documents), the main body of the Specifications (Division 1 – Division 35) shall govern.

Delete:

1.2 – Work Covered by Contract Documents, Item .2.7

Insert:

1.2 – Work Covered by Contract Documents, Item .2.7:

.7 Excavation of natural ground, and offsite disposal / stockpiling of excavated material. Removal of snow and ice prior to excavation of the natural ground.

Delete:

1.5 – Owner Supplied Materials, Item .1

Insert:

1.5 – Owner Supplied Materials, Item .1

.1 Not used. This sub-section has been intentionally omitted.

Delete:

3.1 – Site Inspection, Item .2:

Insert:

3.1 – Site Inspection, Item .2:

.2 Not used. This sub-section has been intentionally omitted.

3. Section 01 35 43 – Environmental Protection

Insert:

1.2 – Definitions, Item .8:

.8 Heritage material: are objects, sites or locations of a traditional societal practice that is of historical, cultural or archaeological significance to British Columbia, a community or an aboriginal people as determined by the Archaeological Monitor.

Delete:

3.16 – Site Clearing, Plant Protection, and Nesting Bird Protection, Item .1

Insert:

3.16 – Site Clearing, Plant Protection, and Nesting Bird Protection, Item .1:

.1 Prior to Tree Clearing during the breeding bird nesting period (April 24 to August 29), the Contractor shall complete a Breeding Bird and Bird Nest survey per the requirements of Item ~~1.6~~ 1.8 Breeding Bird and Bird Nest Survey. No surveys are required if clearing is performed outside of the nesting period.

4. Section 01 52 00 – Construction Facilities and Equipment

Delete:

1.9 – Construction Laydown Area, Construction Parking, and Site Office, Item .1.2

Insert:

1.9 – Construction Laydown Area, Construction Parking, and Site Office, Item .1.2

.2 The gravel pit as identified in the figure attached to Appendix K.

Delete:

1.14 – Construction Equipment, Item .2

Insert:

1.14 – Construction Equipment, Item .2:

.2 The Departmental Representative has the right to request additional equipment and/or qualified operators be brought to site should the work appear to be delayed due to lack of equipment or qualified operators.

5. Section 31 23 33 – Excavation and Backfill

Delete:

1.1 – Measurement and Payment Procedures, Item .1, .2 and .3.

Insert:

1.1 – Measurement and Payment Procedures, Item .1, .2 and .3:

.1 Payment for Excavation will be made on the basis of the Price per Unit Bid for Excavation in the Bid and Acceptance Form. The Price per Unit Bid shall include all costs for excavation of natural ground as shown on the Contract Drawings (including stumps and roots located within the limits of excavation), snow and ice removal prior to excavation of natural ground (if required), dewatering (if required), loading, transport (including any maintenance required to gain access) and stockpiling of excavated material at ~~PSPC's Adsette Pit~~ the gravel pit identified in Appendix K (turn-off from the highway at Km 366.3 of the Alaska Highway) or at an alternative stockpile location selected by the Contractor outside of PSPC's ROW, and all other items necessary for successful completion of the work.

.2 Measurement for Payment for completion of Excavation will be made on the in-situ volume of material surveyed in cubic metres (i.e. volume prior to excavation), excavated from the limits of the work, transported offsite, and accepted by the Departmental Representative. Any areas within the excavation limits with existing ground below bottom of proposed excavation shall be filled with material excavated from other areas of the excavation. This excavated material used as fill and remaining onsite shall not be measured for payment. The surveyed quantity shall include material excavated ~~to~~ for the Offtake Ditch. The surveyed quantity shall exclude material excavated for the Interceptor Ditches, Lateral Swales, ~~and~~ Telegraph Pole excavations, and snow removed from the cut slopes to facilitate the work. No separate measurement or payment for hauling the material will be made.

.3 Payment for Lateral Swale and Interceptor Ditch will be made on the basis of the Price per Unit Bid for Lateral Swale and Interceptor Ditch in the Bid and Acceptance Form. The Price per Unit Bid shall include all costs for excavation of natural ground as shown on the Contract Drawings (including stumps and roots located within limits excavation limits), dewatering (if required), loading, transport and stockpiling of excavated material at ~~PSPC's Adsette Pit~~ the gravel pit identified in Appendix K (turn-off from the highway at Km 366.3 of the Alaska Highway) or at an alternative offsite stockpile location selected by the Contractor outside of PSPC's ROW, and all other items necessary for successful completion of the work. The price per unit bid of Lateral Swale shall further include the supply, transport, and placement of nonwoven geotextile and riprap in the locations, grades, and thicknesses shown on the Contract Drawings.

Delete:

3.4 – Stockpiling of Excavation Materials, Item .1 and .2

Insert:

3.4 – Stockpiling of Excavation Materials, Item .1 and .2:

.1 Stockpile excavated material at ~~PSPC's Adsette Pit~~ the gravel pit identified in Appendix K (turn-off from the highway at Km 366.3 of the Alaska Highway) as directed by the Departmental Representative, or at an alternative stockpile location outside of PSPC's ROW selected by the Contractor, permitted to accept the excavated material, and acceptable to the Departmental Representative.

.2 Should the Contractor elect to dispose of the excavated material at ~~PSPC's Adsette Pit~~ the gravel pit identified in Appendix K, the Contractor shall ensure the following is achieved:

.1 Stockpile excavated material in uniform layers no greater than 1 m in thickness. Ensure excavated material is not placed in ditches or interferes with the established drainage patterns. During stockpiling operations, prevent snow and ice from becoming intermixed with excavated material.

.2 Ensure ready run-off of surface water following stockpiling of excavated material, to the satisfaction of the Departmental Representative.

6. Section 31 37 00 – Riprap

Delete:

2.1 – Riprap, Item .1

Insert:

2.1 – Riprap, Item .1

.1 The Contractor shall be solely responsible to choose a source(s) of riprap for the project from a source outside of the highway Right-of-Way.

Km 355.5 – 359.5 Bougie Creek Cut Slope and Highway Embankment Stabilization — Addendum #001

Project No. R.119901.002 — 2020-11-26

Changes to the Contract Drawings

Delete:

Sheet C001 – Project Location Plan, Key Plan, Drawing Index, Legend and Control Monuments – Rev. A – Issued for Tender – Dated: 20/09/28

Sheet C101 – Plan - Profile Offtake Ditch Regrading and Tree Clearing Sta. 355+220 - 355+900– Rev. A – Issued for Tender – Dated: 20/09/28

Sheet C102 – Plan - Profile Cut Slope Regrading Sta. 355+900 - 356+500– Rev. A – Issued for Tender – Dated: 20/09/28

Sheet C103 – Plan - Profile Cut Slope Regrading Sta. 356+500 - 357+100– Rev. A – Issued for Tender – Dated: 20/09/28

Sheet C104 – Plan - Profile Cut Slope Regrading Sta. 357+700 - 358+300 – Rev. A – Issued for Tender – Dated: 20/09/28

Sheet C201 – Plan - Profile Interceptor Ditch and Lateral Swale Sta. 355+900 - 356+500 – Rev. A – Issued for Tender – Dated: 20/09/28

Sheet C202 – Plan - Profile Interceptor Ditch and Lateral Swale Sta. 356+500 - 357+100 – Rev. A – Issued for Tender – Dated: 20/09/28

Sheet C203 – Plan - Profile Interceptor Ditch and Lateral Swale Sta. 357+700 - 358+300 – Rev. A – Issued for Tender – Dated: 20/09/28

Sheet C301 – Typical Sections - Cut Slope Regrading (Sheet 1 of 2) – Rev. A – Issued for Tender – Dated: 20/09/28

Sheet C302 – Typical Sections - Cut Slope Regrading and Telegraph Pole Details (Sheet 2 of 2) – Rev. A – Issued for Tender – Dated: 20/09/28

Sheet C401 – Interceptor Ditch and Lateral Swale Details – Rev. A – Issued for Tender – Dated: 20/09/28

Sheet C501 to C513 – Cross-Sections – Rev. A – Issued for Tender – Dated: 20/09/28

Insert:

Sheet C001 – Project Location Plan, Key Plan, Drawing Index, Legend and Control Monuments – Rev. B – Issued for Amendment – Dated: 20/11/26

Sheet C101 – Plan - Profile Offtake Ditch Regrading and Tree Clearing Sta. 355+220 - 355+900– Rev. B – Issued for Amendment – Dated: 20/11/26

Sheet C102 – Plan - Profile Cut Slope Regrading Sta. 355+900 - 356+500– Rev. B – Issued for Amendment – Dated: 20/11/26

Sheet C103 – Plan - Profile Cut Slope Regrading Sta. 356+500 - 357+100– Rev. B – Issued for Amendment – Dated: 20/11/26

Sheet C104 – Plan - Profile Cut Slope Regrading Sta. 357+700 - 358+300 – Rev. B – Issued for Amendment – Dated: 20/11/26

Sheet C201 – Plan - Profile Interceptor Ditch and Lateral Swale Sta. 355+900 - 356+500 – Rev. B – Issued for Amendment – Dated: 20/11/26

Sheet C202 – Plan - Profile Interceptor Ditch and Lateral Swale Sta. 356+500 - 357+100 – Rev. B – Issued for Amendment – Dated: 20/11/26

Sheet C203 – Plan - Profile Interceptor Ditch and Lateral Swale Sta. 357+700 - 358+300 – Rev. B – Issued for Amendment – Dated: 20/11/26

Sheet C204 – Plan - Profile Lateral Swales Sta. 358+551 - 357+100 – Rev. B – Issued for Amendment – Dated: 20/11/26

Sheet C205 – Plan - Profile Interceptor Ditch and Lateral Swale Sta. 357+700 - 358+300 – Rev. B – Issued for Amendment – Dated: 20/11/26

Sheet C301 – Typical Sections - Cut Slope Regrading (Sheet 1 of 2) – Rev. B – Issued for Amendment – Dated: 20/11/26

Sheet C302 – Typical Sections - Cut Slope Regrading and Telegraph Pole Details (Sheet 2 of 2) – Rev. B – Issued for Amendment – Dated: 20/11/26

Sheet C401 – Interceptor Ditch and Lateral Swale Details – Rev. B – Issued for Amendment – Dated: 20/11/26

Sheet C501 to C513 – Cross-Sections – Rev. B – Issued for Amendment – Dated: 20/11/26

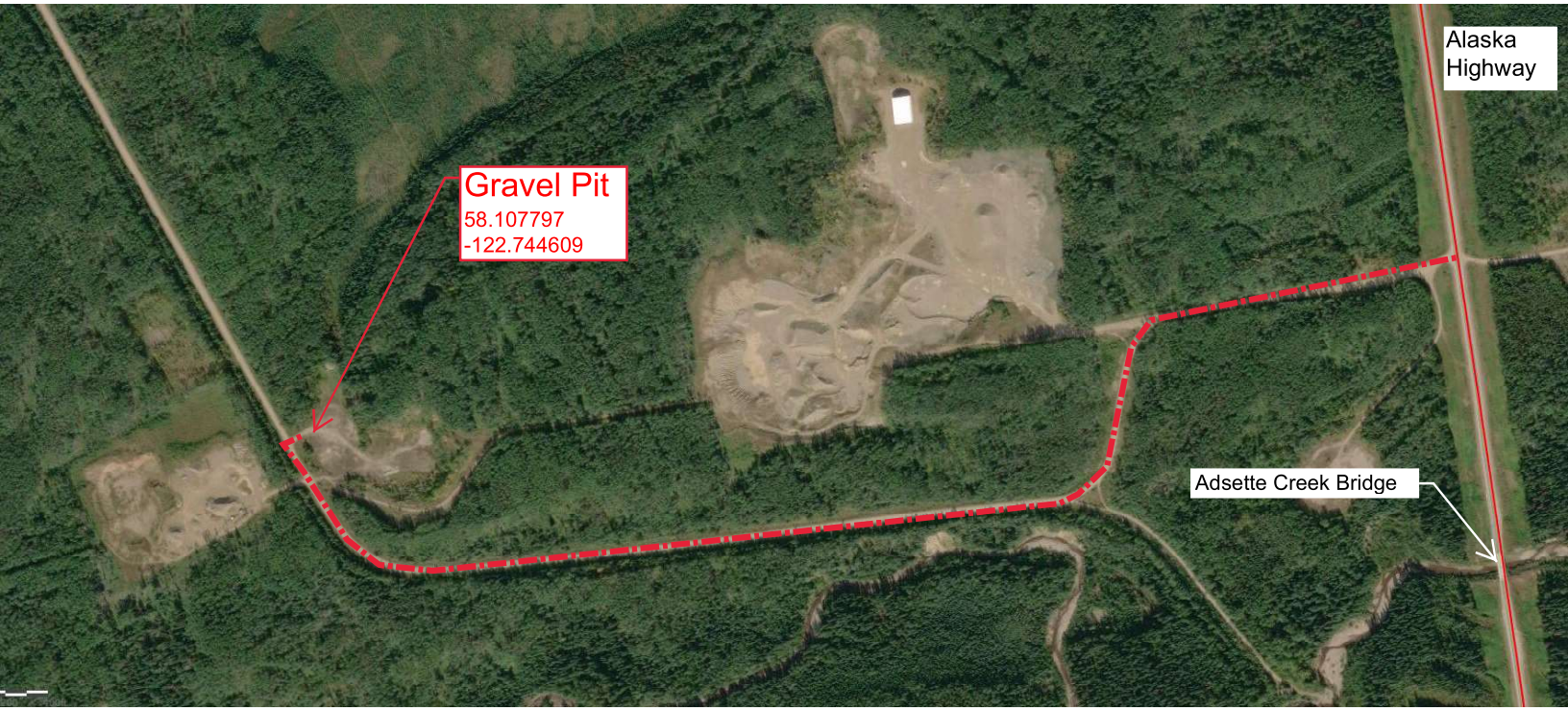
Attachments (To Be Inserted into the Specifications)

1. Appendix K – Gravel Pit Location
2. Borehole Logs

All other terms and conditions remain unchanged.

R.119901.002
Appendix K

Gravel Pit Location


Alaska
Highway
Gravel Pit
58.107797
-122.744609
Adsette Creek Bridge

Public Works and Government Services Canada

Borehole No: **TH17-01**

Project: Bougie Creek	Project No: 704-TRN.VHWY03084
Location: Alaska Highway	Ground Elev: 571.592 m
Prophet River, BC	UTM: 516589.062 E; 6433081.291 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	SPT (N) (20 40 60 80) / Pocket Pen. (kPa) (100 200 300 400)	Elevation (m)
0										
	Solid Stem Auger	CLAY, some silt, trace sand, trace gravel, trace organics (rootlets, decomposed wood), moist, firm to stiff, high plastic, dark grey; fine to coarse sand; fine sub-angular gravel; trace sulphates			1		32.1			571
1		SPT blow counts per 3 inches (1.5 m to 2.1 m) : 1/5//4/5/5/5//4/2 N-value (N): 19 Recovery: 0 m (catcher in SPT spoon placed backwards, prevented recovery) - becomes silty, some sand, very stiff below 1.6 m - becomes damp, medium plastic below 2.5 m			2	19				570
2		SPT blow counts per 3 inches (3.1 m to 3.7 m): 1/1//2/3/3/9//6/4 N-value (N): 17 Recovery: 0.43 m			SPT3	17	13.1			569
3		SAND and GRAVEL, silty, trace clay, well graded, wet, grey; fine to coarse sand; fine to coarse subangular gravel			SH4 5					568
4		SHELBY TUBE (4.6 m to 5.3 m) refused at 5.3 m Recovery: 0.48 m Tube severely damaged			6		12.5			567
5 10/4/2017		CLAY, silty, some sand, some gravel, damp, very stiff, medium plastic, dark grey; fine to coarse sand; fine to coarse sub-angular to sub-rounded gravel; trace sulphates - becomes sandy, trace gravel with depth SPT blow counts per 3 inches (6.1 m to 6.7 m): 3/3//3/5/6/6//7/8 N-value (N): 20 Recovery: 0.42 m			SPT7	20	13.8			566 10/4/2017
6		SPT blow counts per 3 inches (7.6 m to 8.2 m): 2/2//3/3/4/5//6/6 N-value (N): 15 Recovery: 0.48 m			SPT8	15	14.8			565
7		SPT blow counts per 3 inches (9.2 m to 9.8 m): 2/2//3/4/5/4//8/8 N-value (N): 16 Recovery: 0.52 m			SPT9	16	14.5			564
8		SPT blow counts per 3 inches (10.7 m to 11.3 m): 2/8//8/6/11/17//14/11 N-value (N): 42 Recovery: 0.47 m - 5 cm thick layer of SAND, gravelly, well-graded, dense, grey; fine to coarse sand; fine to coarse gravel at 11.0 m			SPT10	42				563
9		CLAY (TILL-LIKE), silty, some gravel, some sand, damp, hard, medium plastic, dark grey; fine to coarse sand; fine to coarse sub-angular to sub-rounded gravel				100				562
10		SPT blow counts per 2 inches (11.9 m to 11.95 m): 22/REFUSAL N-value (N): REFUSAL Recovery: 0 m - bouncing on cobble or boulder								561
11		End of borehole at 11.9 m (Auger and SPT refusal at 11.9 m depth) - Testhole backfilled with cuttings and bentonite. - Estimates of the soil consistency were determined from SPT blow counts, drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgment and are subjective.								560
12										559
13										558
14										557
15										

TETRA TECH

Contractor: Geotech Drilling	Completion Depth: 11.95 m
Drilling Rig Type: FRASTE MDXL	Start Date: October 3, 2017
Logged By: DG	Completion Date: October 4, 2017
Reviewed By: KJ	Page 1 of 2

Public Works and Government Services Canada

Borehole No: **TH17-01**

Project: Bougie Creek	Project No: 704-TRN.VHWY03084
Location: Alaska Highway	Ground Elev: 571.592 m
Prophet River, BC	UTM: 516589.062 E; 6433081.291 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	■SPT (N)■ 20 40 60 80 / ▲Pocket Pen. (kPa)▲ 100 200 300 400	Elevation (m)
15		- Reported SPT values are uncorrected field values. - Collar elevation and testhole coordinates were surveyed.								556
16										555
17										554
18										553
19										552
20										551
21										550
22										549
23										548
24										547
25										546
26										545
27										544
28										543
29										542
30										

TETRA TECH

Contractor: Geotech Drilling	Completion Depth: 11.95 m
Drilling Rig Type: FRASTE MDXL	Start Date: October 3, 2017
Logged By: DG	Completion Date: October 4, 2017
Reviewed By: KJ	Page 2 of 2

Public Works and Government Services Canada

Borehole No: **TH17-02**

Project: Bougie Creek	Project No: 704-TRN.VHWY03084
Location: Alaska Highway	Ground Elev: 550.822 m
Prophet River, BC	UTM: 516530.359 E; 6432806.421 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	SPT (N) (20 40 60 80) / Pocket Pen. (kPa) (100 200 300 400)	Elevation (m)
0										
1	Solid Stem Auger	CLAY, silty, some sand, some gravel, trace organics (rootlets, wood pieces), damp, firm to stiff, high plastic, dark grey; fine to coarse sand; fine to coarse angular to sub-rounded gravel; with thin silty sand laminations (<1 mm thick) - becomes trace sand, trace gravel below 0.9 m			1		28.8			550
2		SPT blow counts per 3 inches (1.5 m to 2.1 m) : 0/1//2/2/2/3//3/3 N-value (N): 9 Recovery: 0.52 m			SPT2	9				549
3		SPT blow counts per 3 inches (3.0 m to 3.6 m) : 0/0//1/1/1/2//2/2 N-value (N): 5 Recovery: 0.45 m			5		35.2			548
4		- becomes moist below 3.0 m CLAY, silty, moist, soft to firm, low plastic, dark grey			SPT3 4	5	29.3			547
5		CLAY, silty, trace sand, trace gravel, moist, firm to stiff, high plastic, dark grey; fine to coarse sand; fine to coarse angular to sub-rounded gravel; with frequent smooth glossy surfaces, horizontal to sub-vertical; trace sulphates SPT blow counts per 3 inches (4.6 m to 5.2 m) : 1/1//1/1/2/2//2/2 N-value (N): 6 Recovery: 0.64 m			SPT6	6				546
6		- becomes damp, stiff, medium plastic, dark grey; fine gravel			7		12.7			545
7		SPT blow counts per 3 inches (6.1 m to 6.7 m) : 1/2//2/3/4/3//5/6 N-value (N): 12 Recovery: 0.55 m			SPT8	12				544
8		SPT blow counts per 3 inches (7.6 m to 8.2 m) : 2/3//4/3/6/5//6/8 N-value (N): 18 Recovery: 0.62 m - becomes very stiff below 7.6 m - 20 mm thick layer of fine to medium sand at 7.85 m			SPT9	18	13.1			543
9		- becomes wet at 9.0 m								542
10		SPT blow counts per 3 inches (9.2 m to 9.8 m) :5/6//6/4/4/5//7/6 N-value (N): 19 Recovery: 0.54 m			SPT10A SPT10B	19				541
11		SAND, trace silt, trace gravel, poorly graded, fine to coarse (mostly fine), wet, grey brown CLAY, silty, some sand, some gravel, moist, stiff, medium plastic, dark grey; fine to coarse sand; fine sub-angular to sub-rounded gravel; trace sulphates			11	30	16.3			540
12		SPT blow counts per 3 inches (10.7 m to 11.3 m) : 2/4//6/6/9/9//14/13 N-value (N): 30 Recovery: 0.25 m - fractured piece of gravel or cobble was blocking SPT shoe and likely affected blowcounts			12	28	15.1			539
13		- becomes fine to coarse gravel below 10.7 m SPT blow counts per 3 inches (12.2 m to 12.8 m) : 2/4//4/5/10/9//7/9 N-value (N): 28 Recovery: 0.39 m								538
14		- occasional layers of well graded fine to coarse gravelly sand between 12.9 m and 13.2 m End of borehole at 13.7 m (Target depth reached) - Testhole backfilled with cuttings and bentonite.								537
15										536

10/8/2017

10/8/2017

TETRA TECH

Contractor: Geotech Drilling	Completion Depth: 13.7 m
Drilling Rig Type: FRASTE MDXL	Start Date: October 8, 2017
Logged By: DG	Completion Date: October 8, 2017
Reviewed By: KJ	Page 1 of 2

Public Works and Government Services Canada

Borehole No: **TH17-02**

Project: Bougie Creek	Project No: 704-TRN.VHWY03084
Location: Alaska Highway	Ground Elev: 550.822 m
Prophet River, BC	UTM: 516530.359 E; 6432806.421 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	■SPT (N)■ 20 40 60 80 / ▲Pocket Pen. (kPa)▲ 100 200 300 400	Elevation (m)
15		- Estimates of the soil consistency were determined from SPT blow counts, drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgment and are subjective. - Reported SPT values are uncorrected field values. - Collar elevation and testhole coordinates were surveyed.								535
16										534
17										533
18										532
19										531
20										530
21										529
22										528
23										527
24										526
25										525
26										524
27										523
28										522
29										521
30										

TETRA TECH

Contractor: Geotech Drilling	Completion Depth: 13.7 m
Drilling Rig Type: FRASTE MDXL	Start Date: October 8, 2017
Logged By: DG	Completion Date: October 8, 2017
Reviewed By: KJ	Page 2 of 2

Public Works and Government Services Canada

Borehole No: **TH17-03**

Project: Bougie Creek	Project No: 704-TRN.VHWY03084
Location: Alaska Highway	Ground Elev: 540 m
Prophet River, BC	UTM: 516466 E; 6432691 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	SPT (N) (20 40 60 80)	SI17-03	VW17-03	Elevation (m)
0		ROAD FILL - No recovery										540
1												539
2												538
3		CLAY, silty, trace sand, trace gravel, trace organics (wood pieces), damp, firm, high plastic, dark grey with brown mottling; fine to coarse sand; fine to coarse sub-angular to sub-rounded gravel; with thin silty sand laminations (<1 mm thick) and lenses (<10 mm thick); trace sulphates			SPT1	7	21.6					537
4		SPT blow counts per 3 inches (3.0 m to 3.6 m) : 1/1//1/1/2/3//3/4 N-value (N): 7 Recovery: 0.28 m										536
5		SHELBY TUBE (4.6 m to 5.35 m) Recovery: 0.42 m			SH2		18.8					535
6		- becomes no organics below 6.0 m SPT blow counts per 3 inches (6.1 m to 6.7 m) : 0/1//1/2/1/3//2/4 N-value (N): 7 Recovery: 0.34 m			SPT3	7	43.1					534
7	Mud-Rotary	- becomes trace sand, moist, grey with brown laminations below 6.1 m			SPT4A							533
8		SILT, sandy, wet, soft to firm, non-plastic, grey - depth to top of stratum may be shallower SPT blow counts per 3 inches (7.6 m to 8.2 m) : 1/2//1/1/1/2//2/1 N-value (N): 5 Recovery: 0.48 m			SPT4B	5	25.5					532
9					SPT5A	7	25.8					531
					SPT5B		14.6					
					SPT5C							
10		CLAY, silty, trace sand, frequent organics (wood pieces and black amorphous material), moist, soft, medium plastic, grey brown, organic odour SPT blow counts per 3 inches (8.5 m to 9.1 m) : 1/2//2/2/2/1//3/2 N-value (N): 7 Recovery: 0.46 m										530
11		SILT, sandy, trace clay, moist, non-plastic, very soft, grey brown			SPT6	11	15.8					529
12		CLAY, silty, trace sand, trace gravel, moist, soft, high plastic, dark grey; fine to coarse sand; fine sub-angular gravel										528
13		CLAY, some silt, trace sand, trace gravel, moist, stiff, medium plastic, dark grey; fine to coarse sand (mostly fine); fine sub-angular to sub-rounded gravel; lenses of fine sand, trace silt less than 10 mm thick SPT blow counts per 3 inches (10.7 m to 11.3 m) : 1/1//2/3/3/3//3/5 N-value (N): 11 Recovery: 0.44 m										527
14					SPT7	11	16.2					526
15		SPT blow counts per 3 inches (13.7 m to 14.3 m) : 2/2//2/3/3/3//4/4										525

TETRA TECH

Contractor: Geotech Drilling	Completion Depth: 19.5 m
Drilling Rig Type: FRASTE MDXL	Start Date: October 19, 2017
Logged By: DG	Completion Date: October 19, 2017
Reviewed By: KJ	Page 1 of 2

Public Works and Government Services Canada

Borehole No: **TH17-03**

Project: Bougie Creek	Project No: 704-TRN.VHWY03084
Location: Alaska Highway	Ground Elev: 540 m
Prophet River, BC	UTM: 516466 E; 6432691 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	SPT (N) (20 40 60 80)	SI17-03	VW17-03	Elevation (m)
15												525
16	Mud-Rotary	N-value (N): 11 Recovery: 0.63 m - soft wet disturbed zone from 14.0 m to 14.1 m No recovery below 14.3 m - Mud-rotary drilling to 19.5 m depth for SI installation. No recovery below 14.3 m - Mud-rotary drilling to 19.5 m depth for SI installation.										524
17												523
18												522
19												521
20		End of borehole at 19.5 m (Target depth reached) - VW piezometer and 70 mm diameter SI installed and grouted in testhole upon completion and protected with a flush mount well cover. VW Model: RST VW2100-0.35 Serial Number: VW40757 Depth: 18.95 m - Estimates of the soil consistency were determined from SPT blow counts, drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgment and are subjective. - Reported SPT values are uncorrected field values. - Testhole coordinates obtained with handheld GPS and are approximate.									520
21												519
22												518
23												517
24												516
25												515
26												514
27												513
28												512
29												511
30												510

TETRA TECH

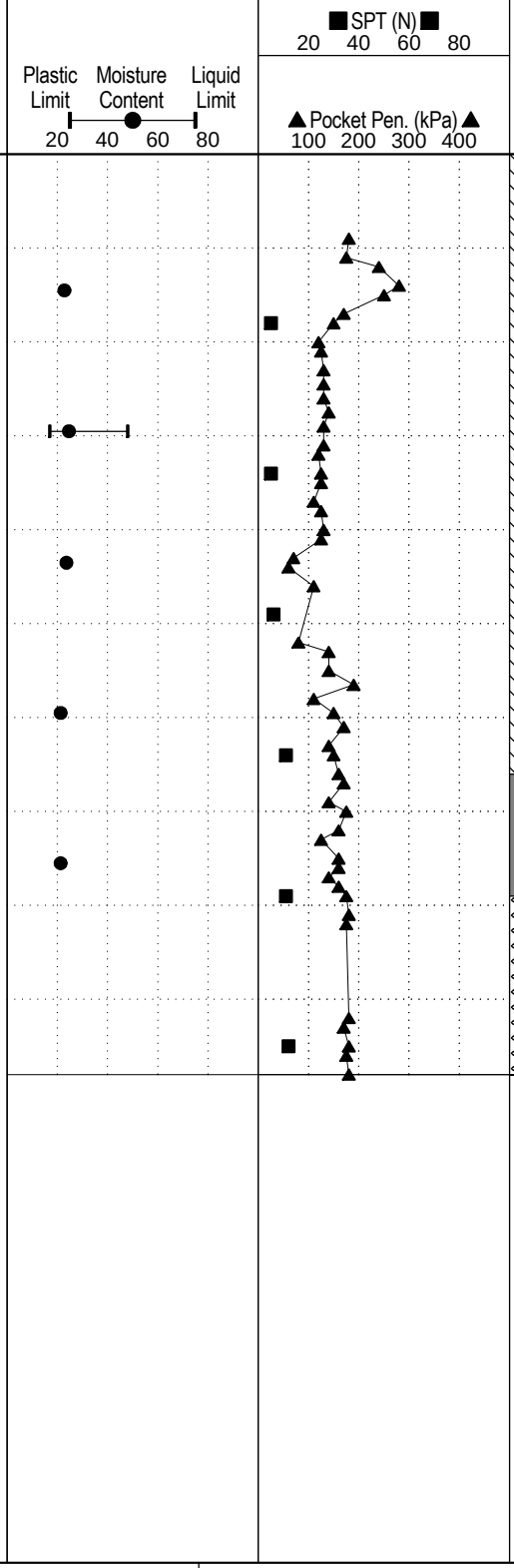
Contractor: Geotech Drilling	Completion Depth: 19.5 m
Drilling Rig Type: FRASTE MDXL	Start Date: October 19, 2017
Logged By: DG	Completion Date: October 19, 2017
Reviewed By: KJ	Page 2 of 2

Public Works and Government Services Canada

Borehole No: **TH17-08**

Project: Bougie Creek	Project No: 704-TRN.VHWY03084
Location: Alaska Highway	Ground Elev: 528.388 m
Prophet River, BC	UTM: 516310.68 E; 6431949.106 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	SPT (N)	Moisture Content (%)
0		SAND and GRAVEL (FILL), trace silt, frequent cobbles, well graded, damp, compact, mottled brown; fine to coarse sand; fine to coarse angular to sub-rounded gravel; cobbles up to 150 mm diameter			1		
1	Solid Stem Auger	CLAY, silty, trace gravel, trace sand, damp, stiff, medium plastic, dark grey; fine to coarse sand; fine to coarse angular to sub-rounded gravel; with laminations and lenses of silty brown sand; trace sulphates			2		22.8
2		SPT blow counts per 3 inches (1.5 m to 2.1 m) : 0/0//1/1/1/2//2/1 N-value (N): 5 Recovery: 0.07 m Only slough recovered in sample. - becomes firm, high plastic below 1.5 m				5	
3					3		24.6
4		SPT blow counts per 3 inches (3.1 m to 3.7 m) : 0/1//1/1/2/1//3/2 N-value (N): 5 Recovery: 0.11 m Only slough recovered in sample. - becomes some sand below 3.1 m			4	5	23.6
5		SPT blow counts per 3 inches (4.6 m to 5.2 m) : 0/1//1/1/2/2//3/3 N-value (N): 6 Recovery: 0.18 m				6	
6		SPT blow counts per 3 inches (6.1 m to 6.7 m) : 1/2//2/2/3/4//4/4 N-value (N): 11 Recovery: 0.61 m - becomes stiff below 6.1 m			5	11	21.3
7							
8		SPT blow counts per 3 inches (7.6 m to 8.2 m) : 1/2//2/2/4/3//4/4 N-value (N): 11 Recovery: 0.68 m			6 SPT7	11	21.3
9							
10		SPT blow counts per 3 inches (9.2 m to 9.8 m) : 1/2//2/3/3/4//4/5 N-value (N): 12 Recovery: 0.62 m			SPT8	12	
11		End of borehole at 9.8 m (Target depth reached) - Standpipe piezometer installed in testhole upon completion and protected with a raised monument. - Estimates of the soil consistency were determined from SPT blow counts, drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgment and are subjective. - Reported SPT values are uncorrected field values. - Collar elevation and testhole coordinates were surveyed.					
12							
13							
14							
15							



Elevation (m)
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514

TETRA TECH

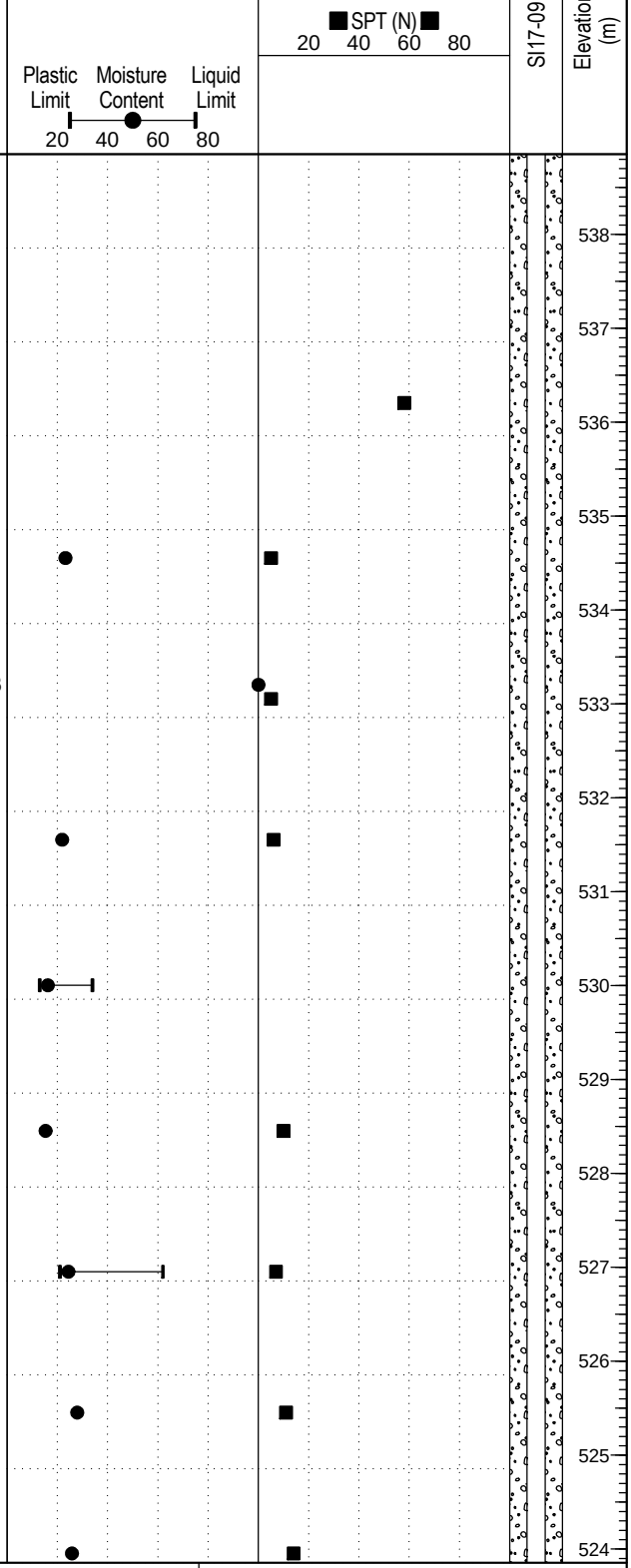
Contractor: Geotech Drilling	Completion Depth: 9.8 m
Drilling Rig Type: FRASTE MDXL	Start Date: October 10, 2017
Logged By: DG	Completion Date: October 11, 2017
Reviewed By: KJ	Page 1 of 1

Public Works and Government Services Canada

Borehole No: **TH17-09**

Project: Bougie Creek	Project No: 704-TRN.VHWY03084
Location: Alaska Highway	Ground Elev: 538.854 m
Prophet River, BC	UTM: 516478.817 E; 6431626.505 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	SPT (N)	Moisture Content (%)
0	Mud-Rotary	ROAD FILL - No recovery to 2.4 m					
		SPT blow counts per 3 inches (2.4 m to 2.9 m) : 8/12//14/13/15/16 N-value (N): 58 Recovery: 0.15 m Stopped SPT at 2.9 m because rods were pulling down 5" casing. Crushed rock/gravel in sample.				58	
4		SPT blow counts per 3 inches (4.0 m to 4.6 m) : 1/1//1/1/1/2//1/2 N-value (N): 5 Recovery: 0.10 m			SPT2	5	23.2
		CLAY, silty, trace sand, trace gravel, moist, firm, high plastic, dark grey; fine to coarse sand SPT blow counts per 3 inches (5.5 m to 6.1 m) : 0/1//1/2/1/1//1/2 N-value (N): 5 Recovery: 0.29 m			SPT3A SPT3B	5	124.3
		- layer of PEAT, silty, trace sand, wet, fibrous, very soft, brown to black, organic odour at 5.5 m, at least 150 mm thick - becomes trace organics, trace gravel, fine to coarse, sub-angular, with lenses of silt below 5.7 m SPT blow counts per 3 inches (7.0 m to 7.6 m) : 1/1//1/2/1/2//2/2 N-value (N): 6 Recovery: 0.21 m - trace organics (grass, wood fibres) from 7.0 m to 7.6 m			SPT4	6	21.9
9		SHELBY TUBE (8.5 m to 9.2 m) Recovery: 0.42 m			SH5		16.2
		SPT blow counts per 3 inches (10.1 m to 10.7 m) : 1/2//2/3/2/3//2/3 N-value (N): 10 Recovery: 0.44 m			SPT6	10	15.3
12		CLAY, silty, trace sand, trace gravel, moist, stiff, high plastic, dark grey; fine to coarse sand; fine to coarse sub-rounded gravel; with laminations of fine silty brown sand; trace sulphates SPT blow counts per 3 inches (11.6 m to 12.2 m) : 3/5//1/2/2/2//3/3 N-value (N): 7 Recovery: 0.60 m - becomes firm below 11.6 m - smooth glossy surfaces at 20 to 35 degrees from horizontal at 0.03 to 0.07 m spacing observed from 11.7 m to 12.2 m			SPT7	7	24.4
					SPT8	11	27.9
15		SPT blow counts per 3 inches (13.1 m to 13.7 m) : 1/2//2/3/2/4//4/5 N-value (N): 11 Recovery: 0.73 m			SPT9	14	25.8



TETRA TECH

Contractor: Geotech Drilling	Completion Depth: 30.5 m
Drilling Rig Type: FRASTE MDXL	Start Date: October 14, 2017
Logged By: DG	Completion Date: October 15, 2017
Reviewed By: KJ	Page 1 of 3

Public Works and Government Services Canada

Borehole No: **TH17-09**

Project: Bougie Creek	Project No: 704-TRN.VHWY03084
Location: Alaska Highway	Ground Elev: 538.854 m
Prophet River, BC	UTM: 516478.817 E; 6431626.505 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	SPT (N) (20 40 60 80)	SI17-09	Elevation (m)
15											
16	Mud-Rotary	- becomes stiff below 13.1 m - smooth glossy surface at 75 degrees from horizontal at 13.3 m SPT blow counts per 3 inches (14.6 m to 15.2 m) : 1/2//3/3/3/5//5/5 N-value (N): 14 Recovery: 0.72 m - no laminations below 14.6 m			SPT10	14	25.2				523
17		SPT blow counts per 3 inches (16.2 m to 16.65 m) : 2/2//2/3/4/5 N-value (N): 14 Recovery: 0.59 m - slickensided surface at 60 degrees from horizontal at 16.4 m									522
18		SPT blow counts per 3 inches (17.7 m to 18.15 m) : 3/3//3/3/4/5 N-value (N): 15 Recovery: 0.44 m			SPT11	15	25				521
19											520
20		SPT blow counts per 3 inches (19.2 m to 19.8 m) : 2/3//3/4/5/5//6/5 N-value (N): 17 Recovery: 0.69 m - becomes very stiff below 19.2 m			SPT12	17	24.2				519
21		SPT blow counts per 3 inches (20.7 m to 21.3 m) : 2/2//4/3/5/5//6/6 N-value (N): 17 Recovery: 0.65 m			SPT13	17					518
22											517
23		SPT blow counts per 3 inches (22.3 m to 22.9 m) : 2/4//4/5/6/6//7/8 N-value (N): 21 Recovery: 0.69 m - slickensided or smooth glossy surfaces at 30 to 50 degrees from horizontal at 0.04 m to 0.07 m spacing below 22.6 m			SPT14	21	20.4				516
24		SHELBY TUBE (23.8 m to 24.55 m) Recovery: 0.81 m			SH15		32.8				515
25											514
26		SPT blow counts per 3 inches (25.3 m to 25.9 m) : 2/3//5/4/5/7//7/7 N-value (N): 21 Recovery: 0.71 m - with laminations of fine silty sand, less than 1 mm thick below 25.3 m			SPT16	21	35.9				513
27		- smooth glossy surfaces at 45 to 60 degrees from horizontal from 23.8 m to 24.0 m SPT blow counts per 3 inches (26.8 m to 27.4 m) : 3/3//4/5/6/7//7/8 N-value (N): 22 Recovery: 0.70 m			SPT17	22	35.3				512
28		- smooth glossy surfaces at 40 to 60 degrees from horizontal at 26.95 m and 27.05 m			SPT18A	55					511
29		SPT blow counts per 3 inches (28.4 m to 29.0 m) : 6/7//13/13/15/14//16/16 N-value (N): 55 Recovery: 0.56 m			SPT18B						510
30		- becomes hard, TILL-LIKE below 28.4 m									509

TETRA TECH

Contractor: Geotech Drilling	Completion Depth: 30.5 m
Drilling Rig Type: FRASTE MDXL	Start Date: October 14, 2017
Logged By: DG	Completion Date: October 15, 2017
Reviewed By: KJ	Page 2 of 3

Public Works and Government Services Canada

Borehole No: **TH17-09**

Project: Bougie Creek	Project No: 704-TRN.VHWY03084
Location: Alaska Highway	Ground Elev: 538.854 m
Prophet River, BC	UTM: 516478.817 E; 6431626.505 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	SPT (N) (20 40 60 80)	SI17-09	Elevation (m)
30											
	Mud-Rotary	SILT, some sand, moist, very stiff, non plastic, dark grey; poorly graded fine sand			SPT19	37	21.7				
		SPT blow counts per 3 inches (29.9 m to 30.5 m) : 6/10//8/10/9/10//10/13									
		N-value (N): 37									
		Recovery: 0.57 m									
		becomes dense below 29.9 m									
31		SAND and SILT, trace clay, poorly graded, fine, moist, dense, dark grey									508
32		End of borehole at 30.5 m (Target depth reached)									507
33		- 70 mm diameter SI installed and grouted in testhole upon completion and protected with a raised monument.									506
34		- Estimates of the soil consistency were determined from SPT blow counts, drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgment and are subjective.									505
35		- Reported SPT values are uncorrected field values.									504
36		- Collar elevation and testhole coordinates were surveyed.									503
37											502
38											501
39											500
40											499
41											498
42											497
43											496
44											495
45											494

TETRA TECH

Contractor: Geotech Drilling	Completion Depth: 30.5 m
Drilling Rig Type: FRASTE MDXL	Start Date: October 14, 2017
Logged By: DG	Completion Date: October 15, 2017
Reviewed By: KJ	Page 3 of 3

Public Works and Government Services Canada

Borehole No: **TH17-10**

Project: Bougie Creek	Project No: 704-TRN.VHWY03084
Location: Alaska Highway	Ground Elev: 553.917 m
Prophet River, BC	UTM: 516432.317 E; 6431504.606 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	SPT (N) (20 40 60 80) / Pocket Pen. (kPa) (100 200 300 400)	Elevation (m)
0		PEAT (TOPSOIL), fibrous and amorphous, mulched wood, roots, grass, moist, very soft, dark brown, organic odour			1					
1		SILT, clayey, some sand, trace organics, damp, very soft to firm, low plastic, brown, slight organic odour; with lenses of soft organic amorphous material interbedded with CLAY, silty, trace gravel, trace sand, trace organics, damp, soft to firm, high plastic, grey; fine to coarse sand; fine to coarse sub-angular to sub-rounded gravel; with laminations and lenses of fine silty sand; with lenses of organic material; trace sulphates			2		25			553
2		10/11/2017			3	3				552
3		SPT blow counts per 3 inches (1.5 m to 2.1 m) : 0/1//0/1/1/1//2/1 N-value (N): 3 Recovery: 0.0 m - becomes moist below 1.5 m			4		24.8			551
4		SPT blow counts per 3 inches (3.1 m to 3.7 m) : 1/1//2/1/2/2//2/2 N-value (N): 7 Recovery: 0.36 m			5	7	20.3			550
					6		19.3			
5		SPT blow counts per 3 inches (4.6 m to 5.2 m) : 0/1//1/1/2/2//3/2 N-value (N): 6 Recovery: 0.54 m			7	6				549
6	Solid Stem Auger	CLAY, silty, sandy, trace gravel, trace organics, frequent gypsum crystals, damp, very soft to firm, low plastic, brown, slight organic odour; with lenses of soft organic amorphous material; with laminations of fine brown sand; trace sulphates			SPT8	6	17.6			548
7		SPT blow counts per 3 inches (6.1 m to 6.8 m) : 0/1//1/1/2/2//3/3 N-value (N): 6 Recovery: 0.42 m			9					547
8		SPT blow counts per 3 inches (7.6 m to 8.2 m) : 1/3//2/3/3/4//4/5 N-value (N): 12 Recovery: 0.32 m becomes stiff, abundant gypsum crystals below 7.6 m			10	12	15.5			546
9		CLAY, silty, trace gravel, trace sand, damp, stiff, medium plastic, dark grey; fine to coarse sand; fine to coarse angular to sub-rounded gravel; with laminations and lenses of fine silty sand; with lenses of organic material; trace sulphates			11		15.9			545
10		SPT blow counts per 3 inches (9.2 m to 9.8 m) : 1/2//2/2/3/4//4/5 N-value (N): 11 Recovery: 0.30 m				11				544
					12		17.1			
11		SPT blow counts per 3 inches (10.7 m to 11.3 m) : 1/2//2/3/3/4//5/5 N-value (N): 12 Recovery: 0.43 m - becomes low plastic below 10.7 m				12				543
12		SPT blow counts per 3 inches (12.2 m to 12.8 m) : 2/3//3/6/6/7//6/9 N-value (N): 22 Recovery: 0.39 m - becomes very stiff, high plastic below 12.2 m			13		24.4			542
13						22				541
					14					
14		SPT blow counts per 3 inches (13.7 m to 14.3 m) : 2/2//4/4/4/5//8/7 N-value (N): 17 Recovery: 0.50 m				17				540
15		- becomes soft to firm from 14.0 m to 14.5 m, potentially due to								539

TETRA TECH

Contractor: Geotech Drilling	Completion Depth: 20.4 m
Drilling Rig Type: FRASTE MDXL	Start Date: October 10, 2017
Logged By: DG	Completion Date: October 12, 2017
Reviewed By: KJ	Page 1 of 2

Public Works and Government Services Canada

Borehole No: **TH17-10**

Project: Bougie Creek	Project No: 704-TRN.VHWY03084
Location: Alaska Highway	Ground Elev: 553.917 m
Prophet River, BC	UTM: 516432.317 E; 6431504.606 N; Z 10

Depth (m)	Method	Soil Description	Sample Number	SPT (N)	Moisture Content (%)
15	Solid Stem Auger	drilling disturbance	15		
		SPT blow counts per 3 inches (15.3 m to 15.9 m) : 2/3//4/4/5/7//6/7 N-value (N): 20 Recovery: 0.51 m		20	
16			16		20.8
17		SPT blow counts per 3 inches (16.8 m to 17.4 m) : 3/3//5/4/REFUSAL N-value (N): REFUSAL Recovery: 0.31 m SPT stopped due to refusal on cobble (10 blows with no movement)		100	
18		SPT blow counts per 3 inches (18.3 m to 18.9 m) : 1/4//4/5/6/7//9/7 N-value (N): 22 Recovery: 0.59 m	17	22	
19					
20		SPT blow counts per 3 inches (19.8 m to 20.4 m) : 3/4//5/6/7/7//10/10 N-value (N): 25 Recovery: 0.59 m	18	25	21.8
21		End of borehole at 20.4 m (Target depth reached) - VW piezometer installed in testhole upon completion and protected with a raised monument. VW Model: Roctest FR-100DPWS350K Serial Number: 100D1753439 Depth: 20.3 m - Estimates of the soil consistency were determined from SPT blow counts, drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgment and are subjective. - Reported SPT values are uncorrected field values. - Collar elevation and testhole coordinates were surveyed.			
22					
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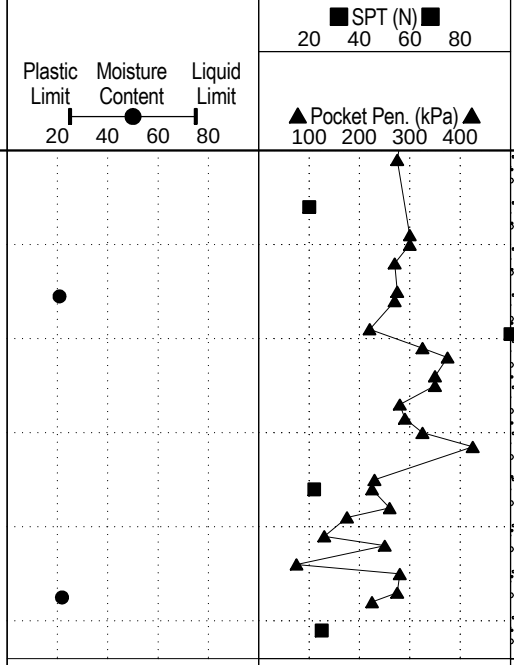

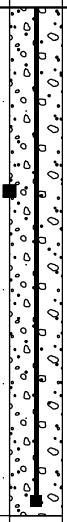

Elevation (m)
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TETRA TECH

Contractor: Geotech Drilling	Completion Depth: 20.4 m
Drilling Rig Type: FRASTE MDXL	Start Date: October 10, 2017
Logged By: DG	Completion Date: October 12, 2017
Reviewed By: KJ	Page 2 of 2

Public Works and Government Services Canada

Borehole No: TH17-11

Project: Bougie Creek	Project No: 704-TRN.VHWY03084
Location: Alaska Highway	Ground Elev: 550.749 m
Prophet River, BC	UTM: 516469.727 E; 6431438.764 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit	SPT (N) / Pocket Pen. (kPa)	Elevation (m)
0	Solid Stem Auger	PEAT (TOPSOIL), fibrous, silty, with mulched wood, roots, grass, moist, very soft, dark brown to black, organic odour			1					550
		CLAY, some silt, trace organics, moist, firm, medium plastic, dark grey			2		40.7			
1		SILT, clayey, abundant organics, moist, very soft, medium plastic, brown, slight organic odour; with laminations of fine silty brown sand			3		23.8			
2		CLAY, silty, trace sand, trace organics, moist, firm, high plastic, dark grey; with laminations of fine silty brown sand				6				549
		SPT blow counts per 3 inches (1.5 m to 2.1 m) : 0/1//1/1/2/2//1/2								
		N-value (N): 6								
3		Recovery: 0.23 m			4		26.7			
		- becomes some gravel, some sand								
		- becomes soft below 2.4 m				4				548
		SPT blow counts per 3 inches (3.1 m to 3.7 m) : 0/1//0/1/2/1//2/2								
4		N-value (N): 4								
		Recovery: 0.26 m			5		132.2			
		- becomes trace gravel, trace sand, abundant organics (large pieces of wood, lenses of amorphous organic material) below 3.1 m			6		23.6			547
5		PEAT, silty, trace clay, trace sand, fibrous, with wood chips, moist, very soft, black to brown, strong organic odour				7				
		CLAY, silty, trace fine to coarse sand, abundant organics (wood fibres, amorphous material), moist, firm, medium plastic, grey with black speckles of organic matter, organic odour; with lenses of organic material			7		27			546
6		SPT blow counts per 3 inches (4.6 m to 5.2 m) : 1/1//1/2/2/2//3/3								
		N-value (N): 7				8				
7		Recovery: 0.46 m			8		28			545
		PEAT, fibrous, silty, trace clay, with wood chips, moist, very soft, black to brown, strong organic odour								
		CLAY, silty, trace fine to coarse sand, abundant organics (wood fibres, amorphous material), moist, firm, medium plastic, grey with black speckles of organic matter, organic odour; with lenses of organic material				6				544
8		SILT and SAND, trace clay, trace organics, moist, soft to firm, non-plastic, brown; poorly graded fine sand			9		26.6			
		with interbeds of CLAY			SPT10	9				543
9		SPT blow counts per 3 inches (6.1 m to 6.7 m) : 1/2//1/2/2/3//2/3								
		N-value (N): 8								
10		Recovery: 0.37 m								542
		becomes wet below 6.1 m								
		PEAT, fibrous, silty, trace clay, with wood chips, moist, very soft, black to brown, strong organic odour								
11		CLAY, silty, abundant organics (fibrous and amorphous), moist, soft, grey, strong organic odour								541
		CLAY, some sand, trace gravel, some silt, trace organics, moist, firm, high plastic, dark grey; fine to coarse sand; fine to coarse angular to sub-rounded gravel								
12		SPT blow counts per 3 inches (7.6 m to 8.2 m) : 1/1//2/1/1/2//2/2								540
		N-value (N): 6								
13		Recovery: 0.38 m								539
		SILT, some sand, trace clay, moist to wet, firm, non-plastic, grey brown; fine sand								
		interbedded with								538
14		CLAY, some sand, trace gravel, some silt, trace organics, moist, firm, high plastic, dark grey; fine to coarse sand; fine to coarse angular to sub-rounded gravel								
		SPT blow counts per 3 inches (9.2 m to 9.8 m) : 1/1//2/2/2/3//3/3								537
15										536

10/13/2017

Contractor: Geotech Drilling	Completion Depth: 9.8 m
Drilling Rig Type: FRASTE MDXL	Start Date: October 12, 2017
Logged By: DG	Completion Date: October 13, 2017
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TETRA TECH

Public Works and Government Services Canada

Borehole No: TH17-11

Project: Bougie Creek	Project No: 704-TRN.VHWY03084
Location: Alaska Highway	Ground Elev: 550.749 m
Prophet River, BC	UTM: 516469.727 E; 6431438.764 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	■SPT (N)■ 20 40 60 80 / ▲Pocket Pen. (kPa)▲ 100 200 300 400	MW17-11	Elevation (m)
15		N-value (N): 9 Recovery: 0.57 m - becomes stiff below 9.2 m									535
16		End of borehole at 9.8 m (Target depth reached) - Standpipe piezometer installed in testhole upon completion and protected with a raised monument. - Estimates of the soil consistency were determined from SPT blow counts, drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgment and are subjective. - Reported SPT values are uncorrected field values. - Collar elevation and testhole coordinates were surveyed.									534
17											533
18											532
19											531
20											530
21											529
22											528
23											527
24											526
25											525
26											524
27											523
28											522
29											521
30											

TETRA TECH

Contractor: Geotech Drilling	Completion Depth: 9.8 m
Drilling Rig Type: FRASTE MDXL	Start Date: October 12, 2017
Logged By: DG	Completion Date: October 13, 2017
Reviewed By: KJ	Page 2 of 2

Public Works and Government Services Canada

Borehole No: TH17-12

Project: Bougie Creek	Project No: 704-TRN.VHWY03084
Location: Alaska Highway	Ground Elev: 535.693 m
Prophet River, BC	UTM: 516334.985 E; 6431833.458 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	SPT (N) (20 40 60 80) / Pocket Pen. (kPa) (100 200 300 400)	SI17-12	VW17-12	Elevation (m)
0	Solid Stem Auger	PEAT (TOPSOIL), amorphous and fibrous, moist, very soft, black and brown; with wood pieces and fibres			1							535
1		CLAY, silty, trace sand, trace organics, moist, soft, high plastic, grey brown;			2		38.2					
		interbedded with										
		PEAT, amorphous and fibrous, moist, very soft, black and brown; with wood pieces and fibres			SPT1	3						534
2		SPT blow counts per 3 inches (1.2 m to 1.8 m) : 0/1//0/1/1/1//1/1										
		N-value (N): 3										
		Recovery: 0.53 m										
3		becomes wet, very soft below 1.2 m			SPT2	3	25.3					533
		SILT, sandy, trace clay, wet, very soft to soft, low plastic, brown; fine sand										
		interbedded with										
4		CLAY, silty, some sand, some gravel, moist, soft, high plastic, grey brown; fine to coarse sand; fine to coarse angilar to sub-rounded gravel			SPT3	100						532
		SPT blow counts per 3 inches (2.8 m to 3.4 m) : 0/0//1/0/1/1//2/2										
5		N-value (N): 3										531
		Recovery: 0.45 m										
6		SPT blow counts per 3 inches (4.0 m to 4.3 m) : 1/1//2/REFUSAL			SPT4	12	22.8					530
		N-value (N): REFUSAL										
		Recovery: 0.21 m										
7		SPT was stopped due to rods bouncing on obstruction (9 blows with no advancement).			SPT5	17						529
		SPT blow counts per 3 inches (5.8 m to 5.4 m) : 4/4//4/2/3/3//3/4										
8		N-value (N): 12										528
		Recovery: 0.32 m										
	Mud-Rotary	CLAY, silty, some sand, trace gravel, moist, stiff, medium to high plastic, dark grey; fine to coarse sand; fine to coarse sub-angular to sub-rounded gravel; with laminations of fine silty sand; trace sulphates			SPT6	10	22.6					527
9		- smooth glossy surface at 40 degrees from horizontal at 5.9 m										
10		SPT blow counts per 3 inches (7.0 m to 7.6 m) : 4/4//5/4/5/3//4/2			SPT7	15	21.6					526
		N-value (N): 17										
		Recovery: 0.03 m										
11		SPT shoe blocked by piece of gravel.										525
		SPT blow counts per 3 inches (8.5 m to 9.1 m) : 1/1//2/2/3/3//4/3										
12		N-value (N): 10			SH8		19.4					524
		Recovery: 0.56 m										
		- becomes silty below 8.5 m										
13		SPT blow counts per 3 inches (10.1 m to 10.7 m) : 1/2//3/3/4/5//7/6										523
		N-value (N): 15										
		Recovery: 0.64 m			SPT9	23	20.1					
14		SHELBY TUBE (11.6 m to 12.35 m)										522
		Recovery: 0.65 m										
		SPT blow counts per 3 inches (13.1 m to 13.7 m) : 2/3//4/6/6/7//8/8										
15		N-value (N): 23										521

TETRA TECH

Contractor: Geotech Drilling	Completion Depth: 30.5 m
Drilling Rig Type: FRASTE MDXL	Start Date: October 15, 2017
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Public Works and Government Services Canada

Borehole No: TH17-12

Project: Bougie Creek	Project No: 704-TRN.VHWY03084
Location: Alaska Highway	Ground Elev: 535.693 m
Prophet River, BC	UTM: 516334.985 E; 6431833.458 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	SPT (N) (20 40 60 80) / Pocket Pen. (kPa) (100 200 300 400)	SI17-12	VW17-12	Elevation (m)
15		Recovery: 0.60 m - becomes damp, very stiff below 13.1 m - smooth glossy surfaces at 45 to 60 degrees below horizontal at 0.01 m to 0.05 m spacing below 13.6 m										520
16		SPT blow counts per 3 inches (16.2 m to 16.8 m) : 1/3//4/3/4/5//5/6 N-value (N): 16 Recovery: 0.67 m - slickensided surface at 5 degrees from horizontal at 16.8 m			SPT10	16	22.2	●	■			519
17												518
18												517
19		SPT blow counts per 3 inches (19.2 m to 19.8 m) : 2/3//3/4/5/6//8/7 N-value (N): 18 Recovery: 0.37 m - becomes moist below 19.2 m			SPT11	18	27.5	●	■			516
20												515
21		- Driller reported material getting softer below 21.4 m										514
22	Mud-Rotary	SHELBY TUBE (22.3 m to 22.9 m) Recovery: 0.76 m			SH12							513
23												512
24		SPT blow counts per 3 inches (23.8 m to 24.4 m) : 2/2//4/3/4/4//6/6 N-value (N): 15 Recovery: 0.67 m - becomes trace sand below 23.8 m - smooth glossy surfaces at 15 to 45 degrees from horizontal at 0.01 m to 0.08 m spacing from 23.8 m to 24.4 m			SPT13	15	35.5	●	■			511
25												510
26		- Driller reported material getting stiffer below 26.1 m										509
27		SAND, some silt, poorly graded, fine, moist, dense, dark grey SPT blow counts per 3 inches (26.8 m to 27.4 m) : 5/9//9/10/11/12//15/14 N-value (N): 42 Recovery: 0.51 m			SPT14	42	20.3	●	■			508
28		- Driller reported material being softer from 27.8 m to 29.9 m										507
29		CLAY, silty, damp, very stiff, medium plastic, dark grey										506
30												

TETRA TECH

Contractor: Geotech Drilling	Completion Depth: 30.5 m
Drilling Rig Type: FRASTE MDXL	Start Date: October 15, 2017
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Public Works and Government Services Canada

Borehole No: TH17-12

Project: Bougie Creek	Project No: 704-TRN.VHWY03084
Location: Alaska Highway	Ground Elev: 535.693 m
Prophet River, BC	UTM: 516334.985 E; 6431833.458 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	■ SPT (N) ■ (20 40 60 80) / ▲ Pocket Pen. (kPa) ▲ (100 200 300 400)	SI17-12	VW17-12	Elevation (m)
30												
31	Mud-Rotary	SPT blow counts per 3 inches (29.9 m to 30.5 m) : 4/5//8/11/14/13//14/14 N-value (N): 46 Recovery: 0.57 m SAND and SILT, poorly graded, fine, moist, dense, dark grey			SPT15	46	24.6	●	■			505
32		End of borehole at 30.5 m (Target depth reached) - VW piezometer and 70 mm diameter SI installed in testhole upon completion and protected with a raised monument. VW Model: Roctest FR-100DPWS350K Serial Number: 100D1700245 Depth: 14.2 m - SI casing grouted to surface. - Estimates of the soil consistency were determined from SPT blow counts, drill rig performance, and visual classification of recovered samples. These estimates are based on engineering judgment and are subjective. - Reported SPT values are uncorrected field values. - Collar elevation and testhole coordinates were surveyed.										504
33												503
34												502
35												501
36												500
37												499
38												498
39												497
40												496
41												495
42												494
43												493
44												492
45												491

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Contractor: Geotech Drilling	Completion Depth: 30.5 m
Drilling Rig Type: FRASTE MDXL	Start Date: October 15, 2017
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LIMITATIONS ON USE OF THIS DOCUMENT

GEOTECHNICAL

1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

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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.