APPENDIX A: GEOTECHNICAL REPORT

TREK GEOTECHNICAL Quality Engineering | Valued Relationships

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RE: Louise Bridge Rehabilitation – Detailed Design of Pier Underpinning
Preliminary Design Recommendations for Micropiles

This letter summarizes the results of the geotechnical investigations completed by TREK Geotechnical Inc. (TREK) and includes preliminary design recommendations for micropiles for pier underpinning works as part of the Louise Bridge Rehabilitation over the Red River in Winnipeg, Manitoba. The terms of reference for this work are included in our preliminary design proposal to Tetra Tech Inc. (TT) dated December 13, 2024 and subsequent change order for detailed design of pier underpinning works dated August 20, 2025.

TREK previously submitted a draft preliminary design geotechnical report for the overall rehabilitation design. The current letter is provided as a stand-alone deliverable in support of detailed design of pier underpinning works, specifically for micropiles as the selected underpinning foundation alternative.

A detailed overview of project background and site conditions is provided in our preliminary design report and will not be repeated herein. This letter provides a summary of geotechnical sub-surface investigations completed by TREK, and preliminary design and construction recommendations for micropiles.

Sub-surface Investigation

A sub-surface investigation was completed under the supervision of TREK personnel to determine the soil stratigraphy and groundwater conditions at the site. Three test holes (TH25-01 to 03) and one probe hole (PH25-03A) were drilled by Paddock Drilling Ltd. from March 24, 2025, to April 4, 2025, using a CME 850 and a Mobile B57 track-mounted drill rig, equipped with 125 mm diameter solid stem auger and HQ coring. One test hole (TH25-03) and one probe hole (PH25-03A) were drilled near the south abutment, and two test holes (TH25-01 & 02) were drilled on either side of the north abutment of the bridge. Slope inclinometer casing SI25-01 was installed in TH25-01 to a depth of 16.2 m, while slope inclinometer casing SI25-03 was installed in a separate probe hole (PH25-03) located approximately 1.5 m east of TH25-03 to a depth of 18.4 m. Four Vibrating wire piezometers (VW's) were installed in both TH25-02 (two VW's) and TH25-03 (two VW's) at varying depths. All test holes were backfilled with a cement-bentonite grout mixture to surface.

Sub-surface soils encountered during drilling were visually classified based on the Unified Soil Classification System (USCS). Disturbed (auger grab and split spoon) samples were retrieved at regular intervals. Relatively undisturbed Shelby tube samples were obtained in clay, and HQ core samples were retrieved in till and bedrock. Standard Penetration Tests were performed at depths where split spoon samples were obtained.

Undrained shear strength testing was performed in the field on grab samples (i.e. auger cuttings / disturbed samples) using Torvane and/or Pocket Penetrometer testing devices.

All samples retrieved during drilling were transported to TREK's material testing laboratory in Winnipeg, Manitoba. Laboratory testing consisted of moisture content determination on all samples, unconfined compressive strength testing on Shelby tube samples, and uniaxial compressive strength testing on select rock core samples. Bedrock core samples were classified in general accordance with the Canadian Foundation Engineering Manual 5th Edition (2023).

The attached test hole logs include a description of the soil units encountered during drilling, groundwater conditions and a summary of the laboratory testing results. Laboratory testing results are included in Appendix A. Bedrock core photos are included in Appendix B. Test hole locations are shown in Figure 01.

Soil Stratigraphy

A brief description of the soil units and bedrock encountered at the test hole locations is provided in this report. All interpretations of soil stratigraphy and bedrock for the purposes of design should refer to the detailed information provided on the test hole logs.

North Abutment (TH25-01 and 02):

In general, the soil stratigraphy at the north abutment consisted of a 1.5 to 1.7 m thick layer of fill soils (clay and sand) overlying silty clay (lacustrine), silt till and dolomitic limestone. Silt within the silty clay was observed in TH25-02 and a sand layer below the silty clay in TH25-01 was also observed.

Clay fill extended to 1.7 and 1.2 m below ground surface (El.224.2 and 229.9 m) in TH25-01 and 02, respectively. The clay fill is silty, contains trace to some sand, trace gravel, is black, moist soft and is of low to intermediate plasticity.

Sand fill was encountered below the clay fill in TH25-02 and extended to 1.5 m below ground surface (El.229.9 m). The sand fill is silty, clayey, brown, dry to moist, loose and is of low plasticity.

Silty clay followed by clayey silt was encountered below the sand fill in TH25-02, to a depth of 3.7 m below ground surface. The silty clay contains trace sand, is moist, grey, very stiff and of high plasticity. The clayey silt contains trace to some sand, is light brown, moist, soft, and is of low plasticity.

Silty clay (lacustrine) was encountered below the fill soils (TH25-01) or the clayey silt (TH25-02) and extended to a depth of 12.8 m and 20.1 m below ground surface (El. 213.1 m & 211.0 m) in TH25-01 and 02 respectively. The silty clay contains trace sand, is brown becoming grey with depth, is moist and is of high plasticity. The silty clay is stiff to very stiff becoming soft to firm below 9.4 and 14.3 m depth in TH25-01 and 02, respectively.

Sand was encountered below the silty clay in TH25-01 and extended to a depth of 13.3 m below ground surface (El. 212.6 m). The sand is silty, contains trace gravel, is moist to wet, loose, and is poorly graded fine sand to fine gravel.

Silt till was encountered below the sand or silty clay and extended to the maximum depth of exploration of 16.8 m below ground surface (El. 209.1 m) in TH25-01 and to 27.5 m below ground surface (El. 203.6 m) in TH25-02. The silt till is sandy, contains trace clay, some gravel, is light grey, moist to wet, is very dense and is of no to low plasticity.

Dolomitic Limestone bedrock (Selkirk Member) was encountered below the silt till to the maximum explored depth of 27.5 m (El. 203.6 m) in TH25-02. The dolomitic limestone is slightly weathered (W2), is very fine grained, mottled cream to beige/light red, and weak to medium strong (R2-R3). The rock quality designation (RQD) of the dolomitic limestone in TH25-02 was measured to be 50 %,84%, 87% and 90% in four rock cores with a compressive strength of 38.1, 36.2 and 38.4 MPa at depths of 28.8, 29.3 and 30.5 m (El. 202.3, 201.8 and 200.4 m).

South Abutment (TH25-03):

In general, the soil stratigraphy at the south abutment consisted of a 1.8 m thick layer of clay fill overlying alluvial clay, silt till and dolomitic limestone. Sand within the alluvial clay was also observed in TH25-03 and PH25-03A.

The clay fill is silty, contains trace to some sand, trace to some gravel, is dark grey to black, moist, soft to firm, and is of intermediate to high plasticity.

Alluvial clay was encountered below the clay fill and extended to a depth of 13.7 m below ground surface (EL.214.1 m). The alluvial clay is silty, contains some sand becoming sandy with depth, trace organics, is brown, moist, firm to stiff becoming softer with depth, and is of intermediate to high plasticity.

Sand was encountered within the alluvial clay from 3.2 to 6.6 m below ground surface (El. 224.6 to 221.2 m). The sand contains trace clay becoming clayey with depth, trace to some silt, is brown, moist becoming wet with depth, loose, and is poorly graded fine sand.

Silt till was encountered below the alluvial clay and extended to a depth of 30.6 m below ground surface (El. 197.2 m). The silt till contains trace clay, some sand, some gravel, trace boulders, is light grey, moist, loose to compact becoming dense to very dense with depth and is of no to low plasticity.

Dolomitic Limestone bedrock (Selkirk Member) was encountered below the alluvial clay to the maximum explored depth of 33.5 m (El. 194.3 m) in TH25-03. The dolomitic limestone is slightly weathered (W2), is very fine grained, mottled cream to beige, and is weak to medium strong (R2-R3). The rock quality designation (RQD) of the dolomitic limestone in TH25-03 was measured to be 62 and 93%, in two rock cores with a compressive strength of 37.6 and 46.6 MPa at a depths of 31.5 and 32.0 m (El. 196.1 and 195.6 m).

Power Auger Refusal

Power auger refusal (PAR) was not observed due to the drilling method (HWT and HQ coring).

Groundwater and Sloughing Conditions

Groundwater seepage and sloughing conditions were not observed in any of the test holes due to the method of drilling (HWT and HQ coring). Table 1 summarizes the vibrating-wire piezometer installation details and groundwater measurements. Groundwater monitoring data is included in Appendix C.

Table 1. Piezometer Installation Details and Groundwater Measurements

Piezometer ID	Piezometer Tip Elevation (m)	Soil Layer	Average Groundwater Elevation 1 (m)	Maximum Groundwater Elevation1(m)
VW25-02A (S/N)	212.6	TILL	224.1	224.4
VW25-02B (S/N)	218.1	CLAY	225.4	226.4
VW25-03A (S/N)	212.6	TILL	224.9	225.1
VW25-03B (S/N)	218.1	CLAY	223.5	223.7

Note 1: Piezometer readings recorded between April 4, 2025, and May 21, 2025

The groundwater observations are short-term and should not be considered reflective of (static) groundwater levels at the site which would require monitoring over an extended period to determine. It is important to recognize that groundwater conditions may vary seasonally, annually, or as a result of construction activities.

Foundation Recommendations

Limit state design recommendations are provided below for preliminary design of micropile foundations that will be used for underpinning of the existing piers.

Limit State Design

The foundation recommendations provided in this report are based on limit state design. The National Building Code of Canada (NBCC, 2020), the Canadian Highway Bridge Design Code (CHBDC, 2019), and the American Association of State Highway and Transportation Officials (AASHTO, 2024) require the use of limit state design that utilize load and resistance factor design (LRFD) methodology. CHBDC (2019) also incorporates a consequence factor for geotechnical systems while NBCC (2020) does not.

Table 2 of this report summarizes the recommended ULS geotechnical resistance factors that can be used for the design of foundations based on based on the CHBDC, 2019. Depending on the relevant Code, resistance factors may depend upon the degree of understanding and verification testing completed during construction.

The following definitions from the 5th Ed. of the Canadian Foundation Engineering Manual (CFEM, 2023) are provided with additional notes to assist the reader with the limit state design terminology used in the building foundation recommendations.

Limit states: conditions beyond which a geotechnical system or component ceases to meet the criteria for which it was designed. The main ones are:

Serviceability limit states (SLS) – states corresponding to behaviour of the ground that causes unacceptable serviceability performance conditions, such as deformations, that restrict the intended use of the supported structure and (or) geotechnical system. Recommendations in this report are provided for evaluating the SLS that are developed based on limiting settlement to 25 mm or less. If a more stringent settlement tolerance is required, detailed settlement analysis should be conducted to refine the estimated settlement and/or adjust our recommendations.

Ultimate limit states (ULS) – states corresponding to a loss of stability of the geotechnical system and (or) failure of the supported structure.

Load factor – factor used to modify (usually increase) the characteristic load acting on and from a structure, for the limit state being considered.

Geotechnical resistance factor (ϕ)– multiplicative value that accounts for uncertainty in the geotechnical resistance to produce an acceptable and reliable geotechnical system.

Ultimate geotechnical resistance factor – resistance factor to be used at the ULS.

Characteristic (Nominal) geotechnical parameter – an appropriately conservative estimate of the mean value of a geotechnical parameter for individual strata within the zones of influence of applied loads.

Consequence factor (Y) - multiplicative factor applied to ultimate and serviceability geotechnical resistances, which accounts for consequences of exceeding the limit state under consideration.

Geotechnical resistance – load that the ground can support at a limit state. Different resistances can be defined, including:

Characteristic (nominal) ultimate geotechnical resistance – maximum load that the ground can support at the ULS, estimated using characteristic (nominal) geotechnical parameters.

Factored ultimate (ULS) geotechnical resistance – product of the consequence factor, the ultimate geotechnical resistance factor, and the characteristic (nominal) ultimate geotechnical resistance.

Table 2. ULS Geotechnical Resistance Factors for Foundations (CHBDC 2019)

Description	Resistance Factor for Low Degree of Understanding of Soil Conditions	Resistance Factor for Typical Degree of Understanding of Soil Conditions	Resistance Factor for High Degree of Understanding of Soil Conditions
Deep foundations in compression based on static analysis	0.35	0.40	0.45
Deep foundations in compression based on dynamic testing	0.40	0.50	0.55
Deep foundations in tension based on static analysis	0.20	0.30	0.40

Micropiles

Micropiles are small diameter, drilled, grouted, and reinforced piles that are commonly used for underpinning structures with restricted access and low overhead clearance. They generally have a diameter in the range of 75 to 320 mm and can be installed using a variety of drilling techniques (e.g. single tube, rotary percussive) and grouting (e.g. gravity, pressurized). It is important that an experienced micropile contractor be retained to design the micropiles and determine the proper installation and grouting methods for the sub-surface conditions at the site; performance and capacity of micropiles are directly related to proper installation and grouting techniques. Construction of a micropile typically consists of advancing steel casing to the target depth in the bearing stratum followed by placement of a single bar of reinforcing steel (typically a high-strength threaded bar) and placing high-strength cement grout from the bottom of the casing either by tremie or pressurized injection techniques as it is removed from the drilled shaft. The steel casing can then be retracted either fully or partially, leaving in place a bond length (socket) within competent soils or rock.

Typically, final design and construction of micropiles is the responsibility of the foundation Contactor that has experience with this specialized foundation type. Preliminary design of micropiles can be completed using the recommendations provided below.

Micropiles installed into bedrock (i.e. socketed into bedrock) will derive their capacity from shaft adhesion with the rock socket. End-bearing resistance should be neglected in design. Table 3 provides the recommended factored ULS and SLS unit geotechnical resistances for preliminary design of micropiles installed into good quality limestone bedrock. In this regard, bedrock was encountered at the site below Elev. 202.7 m (north abutment) and 197.2 m (south abutment).

Although not encountered in drilling at the site to date, the upper 1 to 2 m of bedrock in the general Winnipeg area may be fractured, and therefore the bond length (i.e. rock socket length) should be assumed to develop 1.5 m below the bedrock contact depth; the thickness of the fractured zone may vary across the site and installation of micropiles will need to be adjusted to suit bedrock conditions encountered during piling. A resistance factor of 0.40 was applied to calculate the factored ULS geotechnical unit bearing resistances, based on a typical level of understanding. The pile head settlement under unfactored service loads can be calculated based on 5 mm or less of pile tip displacement plus elastic shortening of the pile.

Table 3. Recommended Factored ULS and SLS Geotechnical Resistances for Micropiles

Soil Type	Factored ULS Resistance (kPa)		SLS Resistance (kPa)
	Compression (ϕ = 0.40)	Tension (ϕ = 0.30)	
	Shaft Adhesion	Shaft Adhesion	Shaft Adhesion
Good Quality Limestone Bedrock	400	300	330
Notes: 1) Shaft adhesion based on gravity placed grout.			

<u>Micropile Design Recommendations:</u>

1. Pile spacing from existing structures and piles should be confirmed in consultation with a qualified micropile contractor.
2. The weight of the embedded portion of the pile may be neglected.
3. Shaft adhesion should be neglected within overburden soils and the upper 1.5 m of bedrock.
4. Micropiles should be installed in good to excellent quality (RQD > 75%) dolomitic limestone bedrock.
5. Micropiles should have a minimum design socket length of 3 m.
6. Micropiles should have a minimum spacing of 760 mm or 3 micropile diameters, whichever is greater, measured center to center. If a closer spacing is required, TREK should be contacted to provide a reduction factor to account for potential group effects.
7. Micropile locations should be offset a sufficient distance from existing timber piles to prevent undermining of timber pile tips. The micropile contractor should be consulted relative to selecting an appropriate method of advancement in order to alleviate this concern.
8. Lateral resistance of vertical micropiles is expected to be limited due to the slenderness ratio and should be ignored. If lateral resistance is required, consideration could be given to installing some of the micropiles on an incline (i.e. battered) and/or performing static lateral load testing on one production pile per substructure unit. If static load testing is considered, the pile load schedule should be based on the lateral resistance desired for design.
9. Corrosion of the cased length over the design life needs to be accounted for.
10. Higher bearing resistances are possible depending on the grouting technique (i.e. injection vs gravity). An experienced micropile contractor should be contacted to verify available grouting techniques and the corresponding bearing resistances.

Micropile Installation Recommendations:

1. The contractor should plan to leave steel casings in place above the rock socket to prevent sloughing or caving of the micropile shaft or necking of the pile within fractured bedrock and/or overburden soils.
2. The final foundations should be designed by the foundation contractor to suit the subsurface conditions at the site and the contractors micropile experience and equipment. A shop drawing, installation procedure and static load testing program for the micropiles, signed and sealed by an engineer licensed to practise in Manitoba, should be provided for review. The pile layout may need to be adjusted by the micropile contractor.
3. Some micropile installation types can result in a void developing around the pile during installation, and settlement of existing foundations. Settlement monitoring and potential mitigative procedures should be included in the Contractor's shop drawing submission, which must be reviewed by TREK prior to construction.
4. Grout must be placed by gravity (tremie) methods. Grout placement by free-fall method must not be permitted under any circumstance.
5. Load testing should be specified to be completed by the Contractor. At least one verification load test (up to 2.0 to 2.5 times the factored pile load) should be completed prior to production piling at each substructure unit. Additional proof testing (up to 1.5 times the service load) should also be completed on 10% of production piles and at least 2 production piles per substructure unit.

Closure

The geotechnical information provided in this report is in accordance with current engineering principles and practices (Standard of Practice). The findings of this report were based on information provided (field investigation and laboratory testing). Soil conditions are natural deposits that can be highly variable across a site. If subsurface conditions are different than the conditions previously encountered on-site or those presented here, we should be notified to adjust our findings if necessary.

All information provided in this report is subject to our standard terms and conditions for engineering services, a copy of which is provided to each of our clients with the original scope of work or standard engineering services agreement. If these conditions are not attached, and you are not already in possession of such terms and conditions, contact our office and you will be promptly provided with a copy.

This report has been prepared by TREK Geotechnical Inc. (the Consultant) for the exclusive use of PCL Constructors Inc. (the Client) and their agents for the work product presented in the report. Any findings or recommendations provided in this report are not to be used or relied upon by any third parties, except as agreed to in writing by the Client and Consultant prior to use.

We appreciate the opportunity to work with you on this assignment. If you have any questions or require any additional information regarding any aspects of the proposed geotechnical program, please contact the undersigned at your convenience.

Kind Regards,

TREK Geotechnical Inc.
Per:

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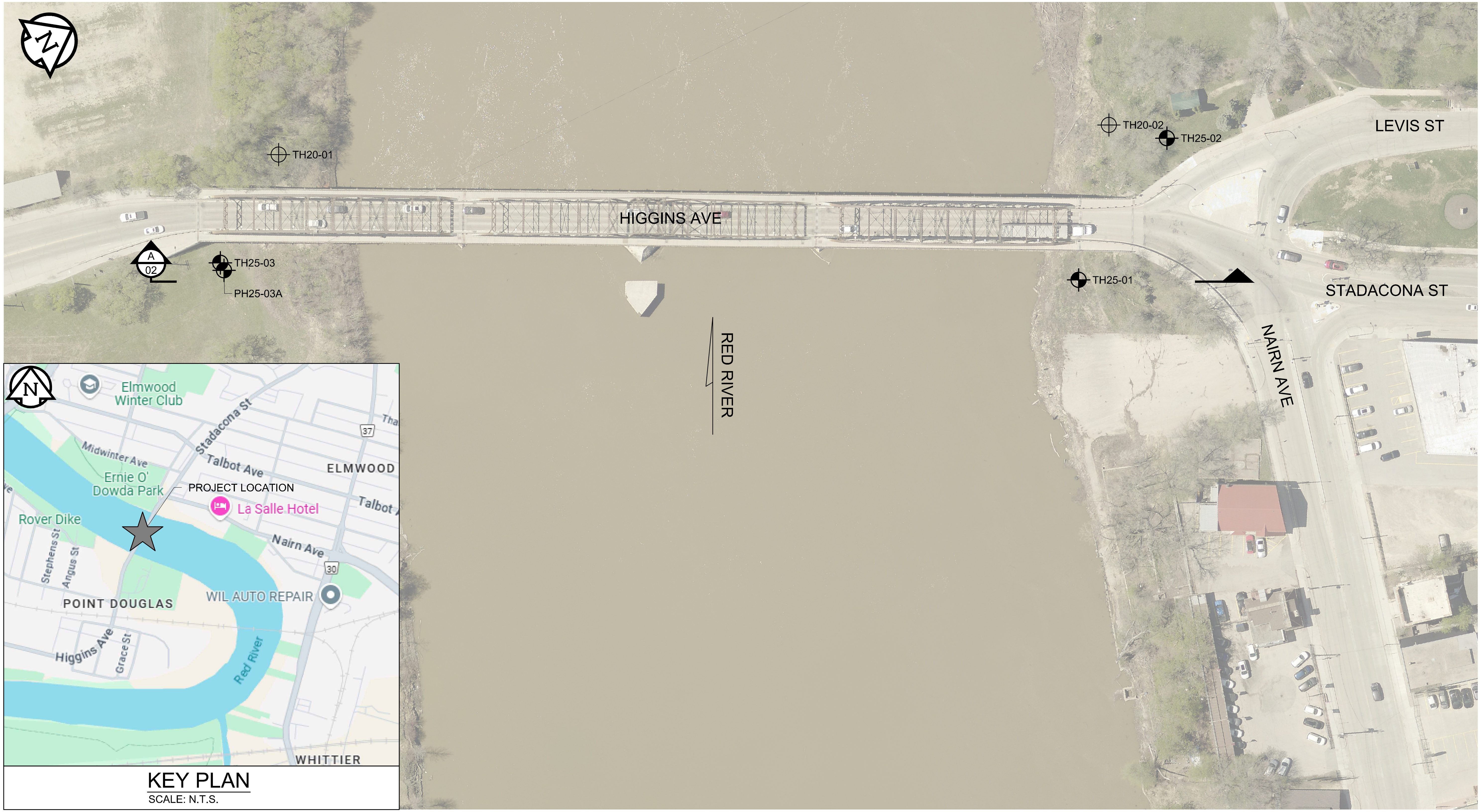
Figures



KEY PLAN
SCALE: N.T.S.

0 10 20 30 40 m
SCALE = 1 : 900 (279 mm x 432 mm)

LEGEND:

⊕ TEST HOLE (TREK, 2025)

⊕ TEST HOLE (KGS, 2020)

NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2024).
2. TEST HOLE LOCATIONS AND GEODETIC ELEVATIONS WERE ESTABLISHED USING AN RTK - GPS UNIT EQUIPPED WITH CAN-NET.

Figure 01
Test Hole Location Plan

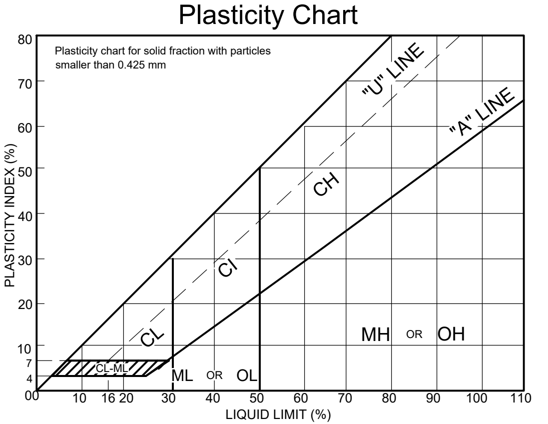
Z:\Projects\0002 Tetra Tech\0002 171 00 Louise Bridge Rehabilitation PD\3 Survey and Dwg\3.4 CAD\3.4.3 Working Folder\Fig 01 2025-04-15 Louise Bridge Rehab 0_A 0002-171-00.dwg, 2025-05-15 8:25:52 AM

Test Hole Logs

EXPLANATION OF FIELD AND LABORATORY TESTING

GENERAL NOTES

1. Classifications are based on the Unified Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.
2. Descriptions on these test hole logs apply only at the specific test hole locations and at the time the test holes were drilled. Variability of soil and groundwater conditions may exist between test hole locations.
3. When the following classification terms are used in this report or test hole logs, the primary and secondary soil fractions may be visually estimated.

Major Divisions			USCS Classification	Symbols	Typical Names	Laboratory Classification Criteria		
Coarse-Grained soils (More than half the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than 4.75 mm)	Clean gravel (Little or no fines)	GW	●	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain size curve, depending on percentage of fines (fraction smaller than No. 200 sieve) coarse-grained soils are classified as follows: Less than 5 percent....... GW, GP, SW, SP More than 12 percent...... GM, GC, SM, SC 6 to 12 percent...... Borderline case4s requiring dual symbols*	$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			GP	○	Poorly-graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW	
		Gravel with fines (Appreciable amount of fines)	GM	▥	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are border-line cases requiring use of dual symbols
			GC	▨	Clayey gravels, gravel-sand-silt mixtures		Atterberg limits above "A" line or P.I. greater than 7	
	Sands (More than half of coarse fraction is smaller than 4.75 mm)	Clean sands (Little or no fines)	SW	⁘	Well-graded sands, gravelly sands, little or no fines		$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			SP	⁚	Poorly-graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM	▥	Silty sands, sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are border-line cases requiring use of dual symbols
			SC	▨	Clayey sands, sand-clay mixtures		Atterberg limits above "A" line or P.I. greater than 7	
Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)	Silts and Clays (Liquid limit less than 50)		ML	▥	Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity			
			CL	▨	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			OL	▤	Organic silts and organic silty clays of low plasticity			
	Silts and Clays (Liquid limit greater than 50)		MH	▥	Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts			
			CH	▨	Inorganic clays of high plasticity, fat clays			
			OH	≋	Organic clays of medium to high plasticity, organic silts			
	Highly Organic Soils		Pt	⁂	Peat and other highly organic soils	Von Post Classification Limit	Strong colour or odour, and often fibrous texture	

Material		Particle Size mm	Particle Size ASTM Sieve sizes
Sand	Coarse	2.00 to 4.75	#10 to #4
	Medium	0.425 to 2.00	#40 to #10
	Fine	0.075 to 0.425	#200 to #40
Silt or Clay		< 0.075	< #200
Boulders		> 300	> 12 in.
Cobbles		75 to 300	3 in. to 12 in.
Gravel	Coarse	19 to 75	3/4 in. to 3 in.
	Fine	4.75 to 19	#4 to 3/4 in.

* Borderline classifications used for soils possessing characteristics of two groups are designated by combinations of groups symbols. For example; GW-GC, well-graded gravel-sand mixture with clay binder.

Other Symbol Types

■	Asphalt	▧	Bedrock (undifferentiated)	○	Cobbles
⁘	Concrete	⊞	Limestone Bedrock	●	Boulders and Cobbles
▩	Fill	▤	Cemented Shale	▥	Silt Till
		▨	Non-Cemented Shale	▨	Clay Till

TREK GEOTECHNICAL

EXPLANATION OF FIELD AND LABORATORY TESTING

LEGEND OF ABBREVIATIONS AND SYMBOLS

LL - Liquid Limit (%)
PL - Plastic Limit (%)
PI - Plasticity Index (%)
MC - Moisture Content (%)
SPT - Standard Penetration Test
RQD- Rock Quality Designation
Qu - Unconfined Compression
Su - Undrained Shear Strength

VW - Vibrating Wire Piezometer
SI - Slope Inclinometer

▽ Water Level at Time of Drilling
▼ Water Level at End of Drilling
▼ Water Level After Drilling as Indicated on Test Hole Logs

FRACTION OF SECONDARY SOIL CONSTITUENTS ARE BASED ON THE FOLLOWING TERMINOLOGY

TERM	EXAMPLES	PERCENTAGE
and	and CLAY	35 to 50 percent
"y" or "ey"	clayey, silty	20 to 35 percent
some	some silt	10 to 20 percent
trace	trace gravel	1 to 10 percent
with *	with silt, with sand	> 35 percent

* Used when the material is classified based on behaviour as a cohesive material

TERMS DESCRIBING CONSISTENCY OR COMPACTION CONDITION

The Standard Penetration Test blow count (N) of a non-cohesive soil can be related to compactness condition as follows:

Descriptive Terms	SPT (N) (Blows/300 mm)
Very loose	< 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	> 50

The Standard Penetration Test blow count (N) of a cohesive soil can be related to its consistency as follows:

Descriptive Terms	SPT (N) (Blows/300 mm)
Very soft	< 2
Soft	2 to 4
Firm	4 to 8
Stiff	8 to 15
Very stiff	15 to 30
Hard	> 30

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

Descriptive Terms	Undrained Shear Strength (kPa)
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200

EXPLANATION OF ROCK CLASSIFICATION

In general accordance with the
Canadian Foundation Engineering Manual, 5th Edition (2023)

ROCK LITHOLOGY DESCRIPTION FORMAT (underlined items described further in tables below)

PREDOMINANT ROCK TYPE (*% by volume*), weathering state, *grain size*, structure, colour, strength, *minor rock type (% by volume)* (Rock Formation).

- Discontinuity descriptions of roughness, aperture, evidence of water flow or infilling, joint spacing, rock quality designation.

(items in italics are provided only if applicable)

INTACT ROCK STRENGTH CLASSIFICATIONS (as per Table 4.21 of CFEM 2023)

Grade*	Term	Uniaxial Comp. Strength (MPa)	Point Load Index (MPa)	Field Estimate of Strength	Examples
R6	Extremely strong	>250	>10	Specimen can only be chipped with a geological hammer	Fresh basalt, chert, diabase, gneiss, granite, quartzite
R5	Very strong	100-250	4-10	Specimen requires many blows of a geological hammer to fracture it	Amphibolite, sandstone, basalt, gabbro, gneiss, granodiorite, peridotite, rhyolite, tuff
R4	Strong	50-100	2-4	Specimen requires more than one blow of a geological hammer to fracture it	Limestone, marble, sandstone, schist
R3	Medium Strong	25-50	1-2	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with a single blow from a geological hammer	Concrete, phyllite, schist, siltstone
R2	Weak	5-25	***	Can be peeled with a pocket knife with difficulty, shallow indentation made by a firm blow with the point of a geological hammer	Chalk, claystone, potash, marl, siltstone, shale, rocksalt
R1	Very weak	1-5	***	Crumbles under firm blows with point of a geological hammer, can be peeled with a pocket knife	Highly weathered or altered rock, shale
R0	Extremely weak	0.25-1	***	Indented by thumbnail	Stiff fault gouge

* Grade according to ISRM (1981).

** All rock types exhibit a broad range of uniaxial comprehensive strengths reflecting heterogeneity in composition and anisotropy in structure. Strong rocks are characterized by well-interlocked crystal fabric and few voids.

*** Rocks with a uniaxial compressive strength below 25 MPa are likely to yield highly ambiguous results under point load testing.

WEATHERING STATE CLASSIFICATIONS (as per Table 4.18 of CFEM 2023)

Term	Description	Symbol
Fresh	No visible sign of rock material weathering; perhaps slight discolouration on major discontinuity surfaces.	W1
Slightly Weathered	Slightly weathered Discolouration indicates weathering of rock material on discontinuity surfaces. All the rock material may be discoloured by weathering and may be somewhat weaker than in its fresh condition.	W2
Moderately Weathered	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discoloured rock is present either as a discontinuous framework or as corestones	W3
Highly Weathered	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discoloured rock is present either as a discontinuous framework or as corestones.	W4
Completely Weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.	W5
Residual Soil	The rock is completely changed to a soil in which the original rock texture has been completely destroyed.	W6

EXPLANATION OF ROCK CLASSIFICATION

In general accordance with the
Canadian Foundation Engineering Manual, 5th Edition (2023)

BEDDING THICKNESS CLASSIFICATION

(as per Table 4.17 of CFEM 2023)

Class	Bedding plane spacing	Class	Bedding plane spacing
Very thickly bedded (massive)	>2 m	Very thinly bedded	>20 to 60 mm
Thickly bedded	>0.6 to 2 m	Laminated	6 to 20 mm
Medium bedded	>0.2 to 0.6 m	Thinly laminated	<6 mm
Thinly bedded	>60mm to 0.2 m		

JOINT APERTURE CLASSIFICATION

(as per Table 4.22 of CFEM 2023)

Aperture	Description
<0.5 mm	Closed
0.5 to 10mm	Gapped
> 10 mm	Open

UNFILLED JOINT CLASSIFICATION

(as per Table 4.23 of CFEM 2023)

Class	Description
1	Water flow not possible
2	No evidence of water flow
3	Evidence of water flow (e.g. rust staining)
4	Dampness
5	Seepage
6	Flow (volume per unit time)

FILLED JOINT CLASSIFICATION

(as per Table 4.24 of CFEM 2023)

Class	Description
1	Filling is dry and low permeability
2	Filling is damp; no free water present
3	Filling is wet; drops of free water present
4	Filling shows outwash; continuous water flow present
5	Filling is locally washed out and there is considerable water flow along channels

JOINT SPACING CLASSIFICATION

(as per Table 4.25 of CFEM 2023)

Class	Spacing width (m)
Extremely Close	<0.02
Very Close	0.02 to <0.06
Close	0.06 to <0.20
Moderately Close	0.20 to <0.6
Wide	0.6 to <2.0
Very Wide	2.0 to 6.0
Extremely Wide	>6.0

ROCK QUALITY DESIGNATION (RQD) CLASSIFICATION

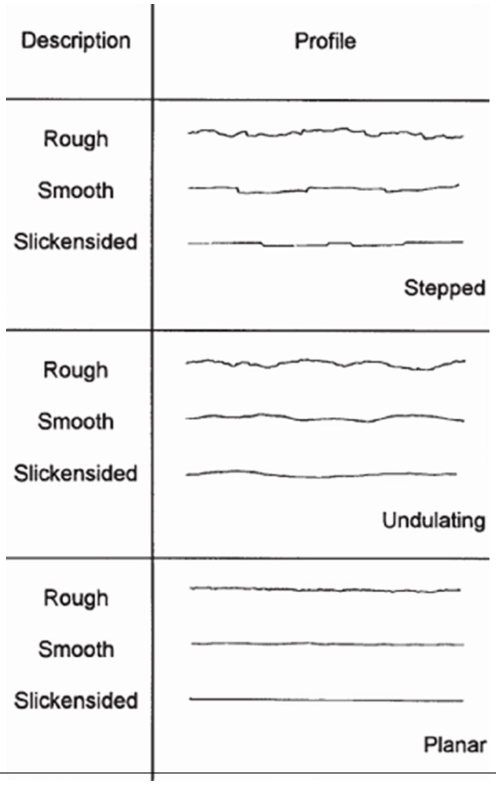
(as per Table 4.26 and Fig 4.5 of CFEM 2023)

RQD Class	RQD Value (%)
Very poor quality	< 25
Poor quality	25 to <50
Fair quality	50 to <75
Good quality	75 to <90
Excellent quality	90 to 100

$$RQD = \frac{\sum Core\ pieces > 100\ mm}{Total\ length\ of\ core\ run} \times 100$$

JOINT ROUGHNESS AND PROFILE

(based on Fig 4.4 of CFEM 2023)



Roughness assessed on small scale (<20cm)
Profile assessed on large (metre) scale

Sub-Surface Log

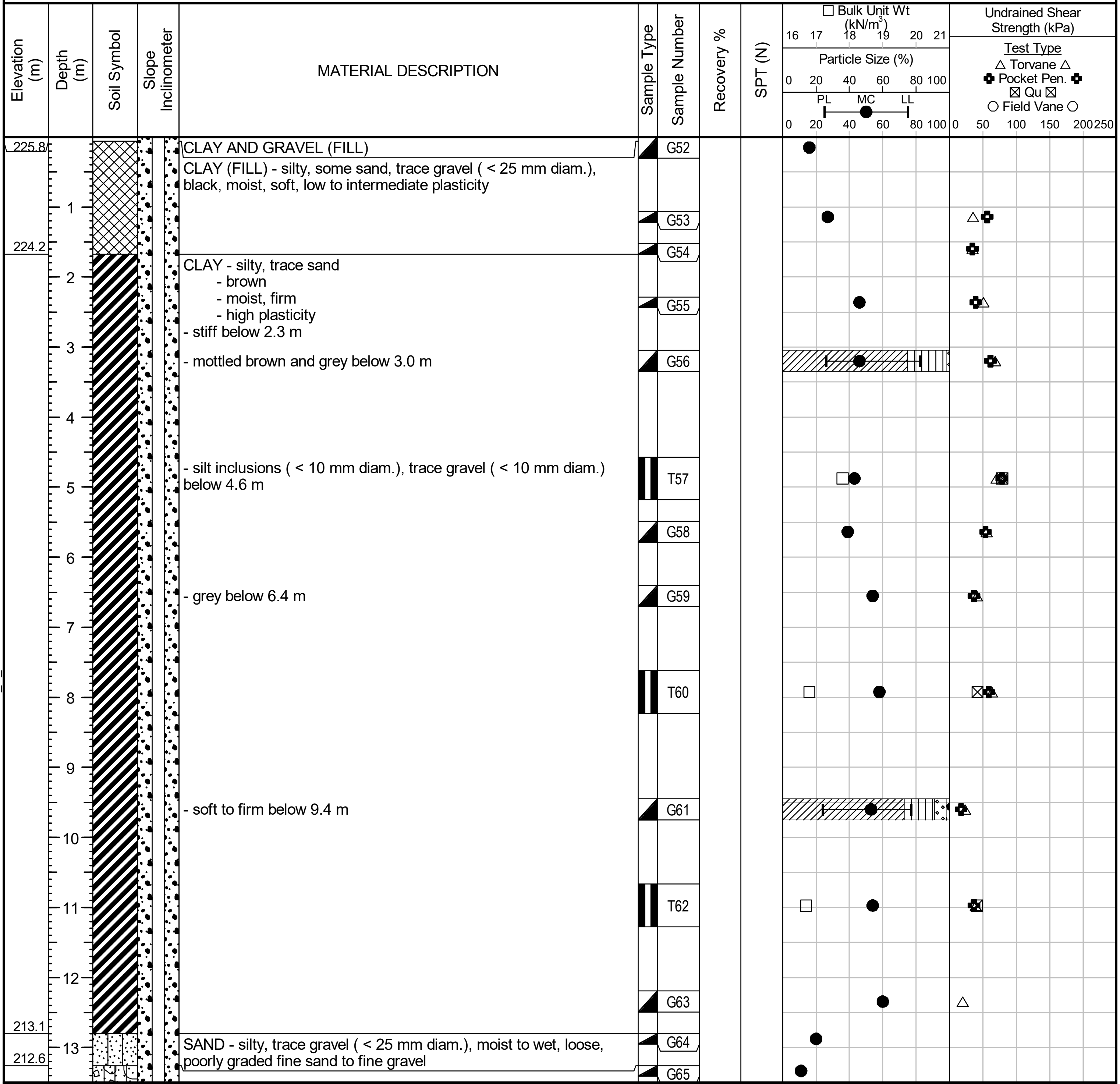
Test Hole TH25-01

Client:	Tetra Tech Inc.	**Project Number:**	0002-171-00
Project Name:	Louise Bridge Rehabilitation	**Location:**	14U, 5529907 m N, 635496 m E
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	225.89 m
Method:	125 mm Solid Stem Auger / HQ Coring, Mobile B57 Track Mounted Rig	**Date Drilled:**	3 April 2025

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Backfill Legend: Bentonite Cement Drill Cuttings Filter Pack Sand Grout Slough



CLAY AND GRAVEL (FILL)

CLAY (FILL) - silty, some sand, trace gravel (< 25 mm diam.), black, moist, soft, low to intermediate plasticity

CLAY - silty, trace sand
- brown
- moist, firm
- high plasticity

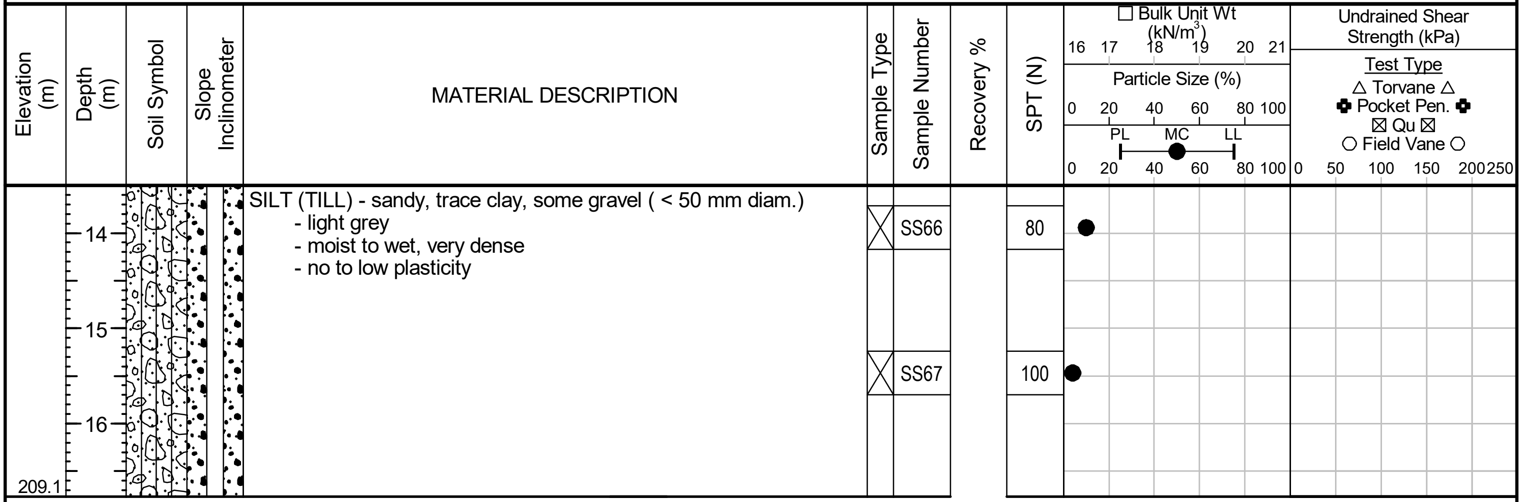
- stiff below 2.3 m
- mottled brown and grey below 3.0 m
- silt inclusions (< 10 mm diam.), trace gravel (< 10 mm diam.) below 4.6 m
- grey below 6.4 m
- soft to firm below 9.4 m

SAND - silty, trace gravel (< 25 mm diam.), moist to wet, loose, poorly graded fine sand to fine gravel

Logged By:	David Clark	**Reviewed By:**	Michael Van Helden	**Project Engineer:**	Nuno Mendonca

Sub-Surface Log

Test Hole TH25-01



Elevation (m)	Depth (m)	MATERIAL DESCRIPTION	Sample Type	Sample Number	Recovery %	SPT (N)
	14	SILT (TILL) - sandy, trace clay, some gravel (< 50 mm diam.) - light grey - moist to wet, very dense - no to low plasticity	☒	SS66		80
	15		☒	SS67		100
209.1	16					

END OF TEST HOLE AT 16.8 m IN SILT (TILL)

Notes:

1) Seepage and sloughing observed at 12.8 m depth.

2) Drilling method was switched to HWT casing at 12.8 m depth. Water level not measured due to drilling method.

3) Slope Inclinometer SI25-01 installed to 16.2 m depth.

4) Test hole backfilled with bentonite-cement grout mix to 1.0 m depth and bentonite chips to surface.

Logged By: David Clark **Reviewed By:** Michael Van Helden **Project Engineer:** Nuno Mendonca

Sub-Surface Log

Test Hole TH25-02

1 of 3

Client: Tetra Tech Inc.

Project Name: Louise Bridge Rehabilitation

Contractor: Paddock Drilling Ltd.

Method: 125 mm Solid Stem Auger / HQ Coring, Mobile B57 Track Mounted Rig

Project Number: 0002-171-00

Location: 14U, 5529946 m N, 635475 m E

Ground Elevation: 231.09 m

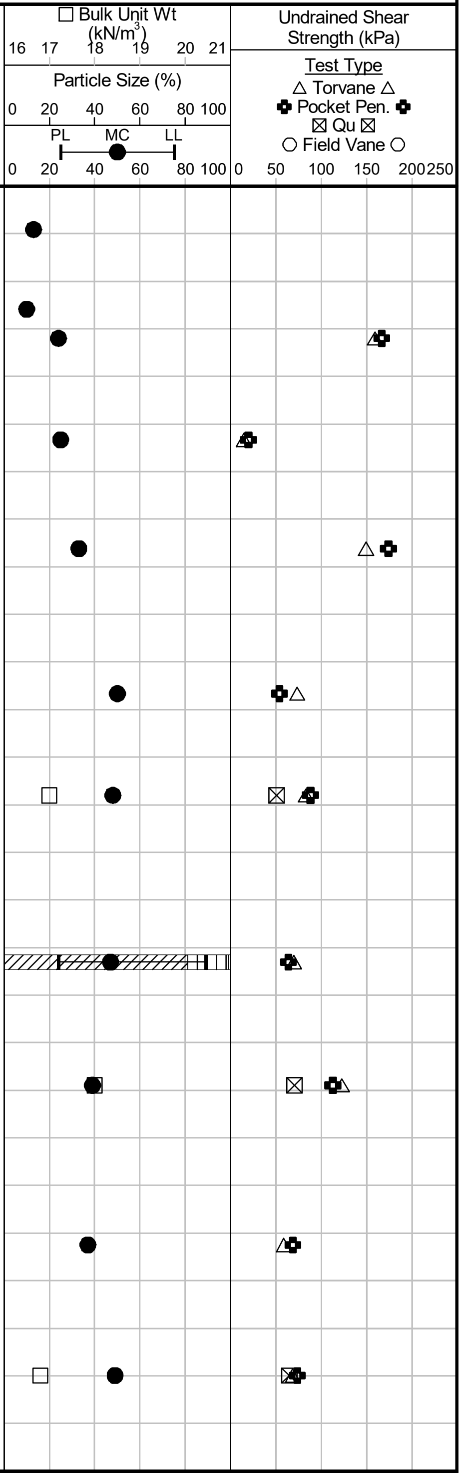
Date Drilled: 2 April 2025

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) / SPT | Split Barrel (SB) / LPT | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

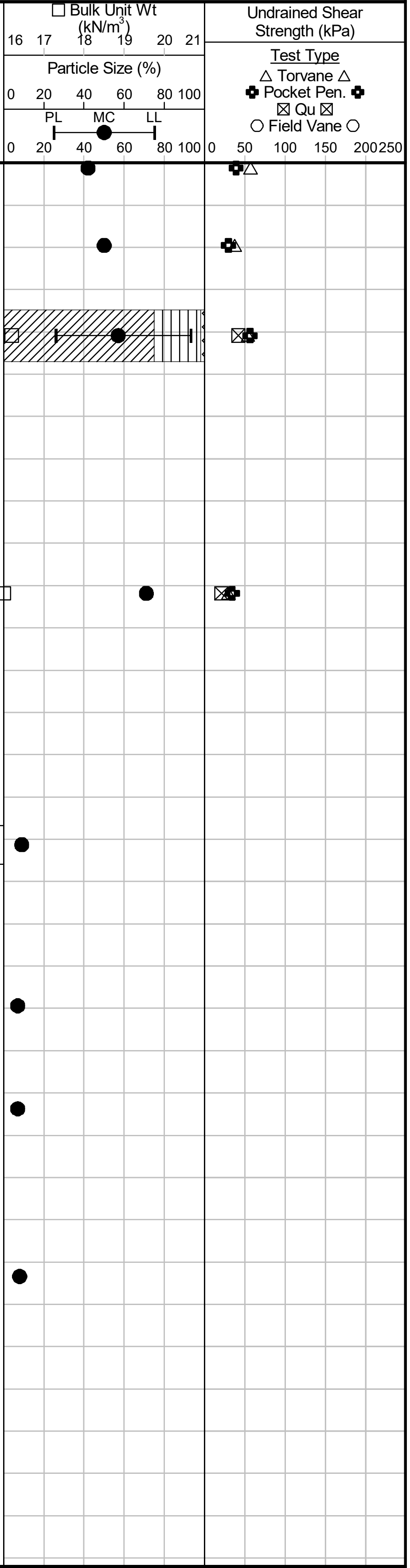
Backfill Legend: Bentonite | Cement | Drill Cuttings | Filter Pack Sand | Grout | Slough

Elevation (m)	Material Description	Sample Type	Sample Number
231.0	TOPSOIL		
	CLAY (FILL) - silty, some sand, trace gravel (< 25 mm diam.), black, moist, firm, low to intermediate plasticity	Grab	G28
229.9	SAND (FILL) - silty, clayey, brown, dry to moist, loose, low plasticity	Grab	G29
229.6	CLAY - silty, trace sand - grey, moist - very stiff, intermediate plasticity	Grab	G30
228.5	SILT - clayey, trace to some sand - light brown - moist, soft, low plasticity	Grab	G31
227.4	CLAY - silty, trace sand - grey - moist, very stiff - high plasticity	Grab	G32
	- stiff below 5.2 m	Grab	G33
	- silt inclusions (< 3 mm diam.), trace precipitates (< 5 mm diam.) below 6.4 m	Shelby Tube	T34
		Grab	G35
	- silt inclusions (< 10 mm diam.) below 9.1 m	Shelby Tube	T36
		Grab	G37
		Shelby Tube	T38



Logged By: David Clark **Reviewed By:** Michael Van Helden **Project Engineer:** Nuno Mendonca

Elevation (m)	Depth (m)	MATERIAL DESCRIPTION	Sample Type	Sample Number	Recovery % (RQD %)	SPT (N)
				G39		
	14.3	- firm below 14.3 m		G40		
				T41		
				T42		15.8
211.0	20	SILT (TILL) - sandy, trace clay, some gravel (< 50 mm diam.) - light grey - moist, very dense				
				SS43		100
				C44	100	
				C45	100	
				C46	100	
				C48	100	
202.7		DOLOMITIC LIMESTONE (100%) - slightly weathered, very fine grained, thinly laminated, massive, mottled cream to beige/light red, weak to medium strong (R2-R3), (Selkirk Member) - discontinuities smooth, open, no evidence of water flow, close spacing (0.06-0.20 m), good RQD - discontinuities smooth to rough, closed, no evidence of water flow, close spacing (0.06-0.20 m), good RQD below 28.3 m		C49	100 (84)	
				C50	100 (87)	



Logged By: David Clark **Reviewed By:** Michael Van Helden **Project Engineer:** Nuno Mendonca

Sub-Surface Log

Test Hole TH25-02

3 of 3

Elevation (m)	Depth (m)	Soil Symbol	VW Piezometer	MATERIAL DESCRIPTION	Sample Type	Sample Number	Recovery % (RQD %)	SPT (N)	☐ Bulk Unit Wt (kN/m^3) 16 17 18 19 20 21 Particle Size (%) 0 20 40 60 80 100 PL MC LL 0 20 40 60 80 100	Undrained Shear Strength (kPa) Test Type △ Torvane △ ✚ Pocket Pen. ✚ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
199.1	31 32			- compressive strength of 38.1 MPa at 28.8 m - discontinuities rough, closed, no evidence of water flow, close spacing (0.06-0.20 m), excellent RQD below 29.0 m - compressive strength of 36.2 MPa at 29.3 m - compressive strength of 38.4 MPa at 30.5 m		C51	100 (90)			

END OF TEST HOLE AT 32.0 m IN DOLOMITIC LIMESTONE

Notes:

1) Seepage and sloughing not observed due to drilling method.
2) Vibrating Wire Piezometers VW25-02A (SN-189698) installed at 21.3 m depth, and VW25-02B (SN-126131) installed at 9.1 m depth.
3) Test hole backfilled with bentonite-cement grout mix to 2.0 m depth and bentonite chips to surface.
4) Drilling method switched to HQ coring at 22.9 m.

Logged By: David Clark **Reviewed By:** Michael Van Helden **Project Engineer:** Nuno Mendonca

Sub-Surface Log

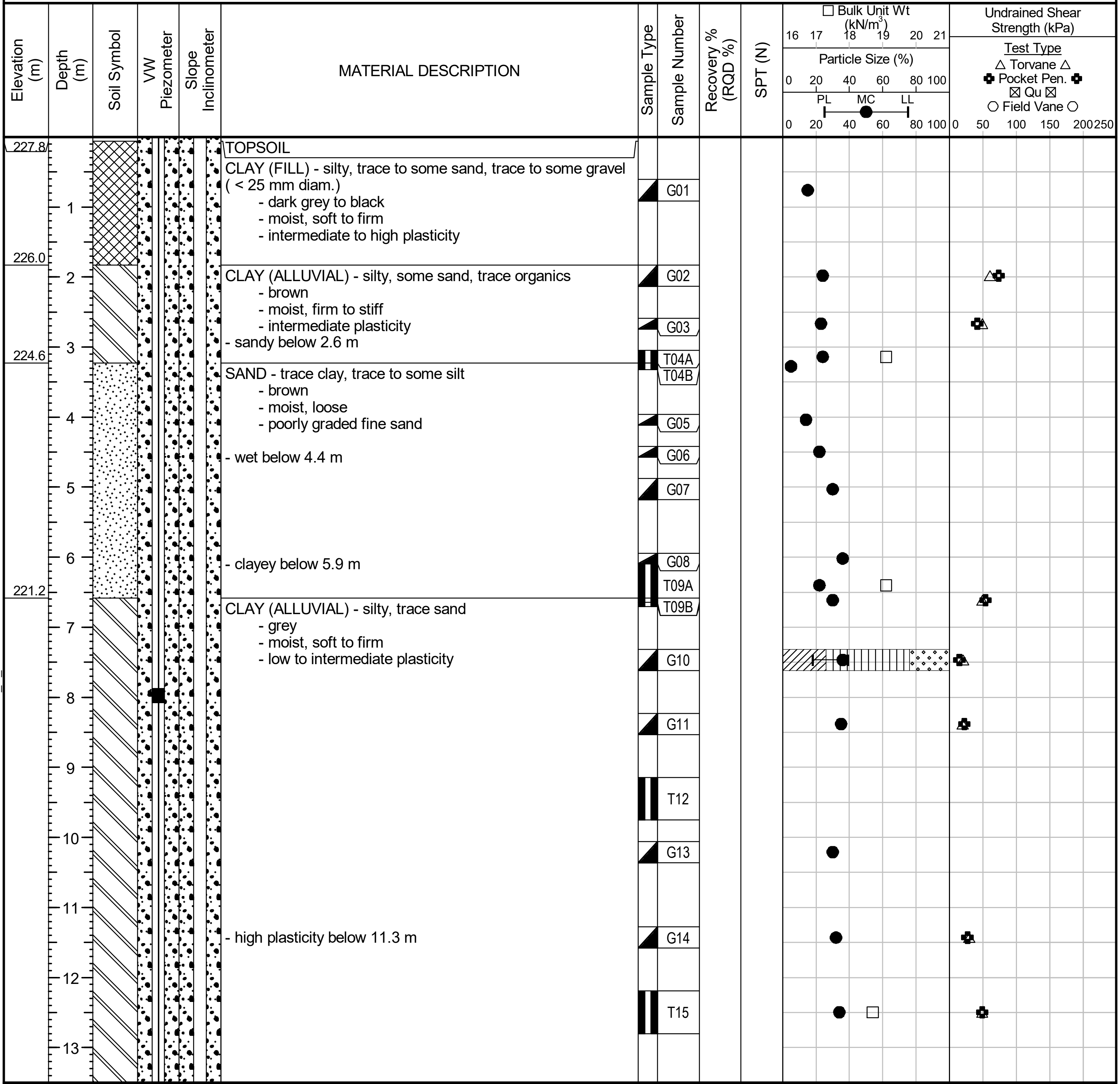
Test Hole TH25-03

Client:	Tetra Tech Inc.	**Project Number:**	0002-171-00
Project Name:	Louise Bridge Rehabilitation	**Location:**	14U, 5529720 m N, 635400 m E
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	227.81 m
Method:	125 mm Solid Stem Auger / HQ Coring CME-850 Track Mounted Rig	**Date Drilled:**	30 March 2025

Sample Type: ◪ Grab (G) ▮ Shelby Tube (T) ☒ Split Spoon (SS) / SPT ☒ Split Barrel (SB) / LPT ▯ Core (C)

Particle Size Legend: ▦ Fines ▨ Clay ▥ Silt ⁙ Sand ● Gravel ○ Cobbles ■ Boulders

Backfill Legend: ■ Bentonite ▩ Cement ▨ Drill Cuttings ⁙ Filter Pack Sand ⁘ Grout ▩ Slough



Elevation (m)	MATERIAL DESCRIPTION
227.8	TOPSOIL
	CLAY (FILL) - silty, trace to some sand, trace to some gravel (< 25 mm diam.) - dark grey to black - moist, soft to firm - intermediate to high plasticity
226.0	CLAY (ALLUVIAL) - silty, some sand, trace organics - brown - moist, firm to stiff - intermediate plasticity - sandy below 2.6 m
224.6	SAND - trace clay, trace to some silt - brown - moist, loose - poorly graded fine sand - wet below 4.4 m - clayey below 5.9 m
221.2	CLAY (ALLUVIAL) - silty, trace sand - grey - moist, soft to firm - low to intermediate plasticity - high plasticity below 11.3 m

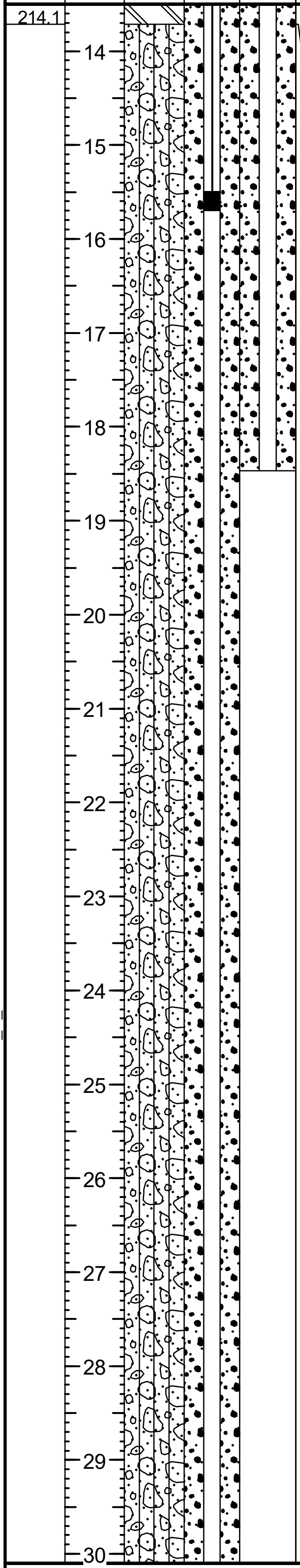
Sample Number: G01, G02, G03, T04A, T04B, G05, G06, G07, G08, T09A, T09B, G10, G11, T12, G13, G14, T15

Logged By: David Clark **Reviewed By:** Michael Van Helden **Project Engineer:** Nuno Mendonca

Sub-Surface Log

Test Hole TH25-03

2 of 3



MATERIAL DESCRIPTION

- boulder at 13.7 m

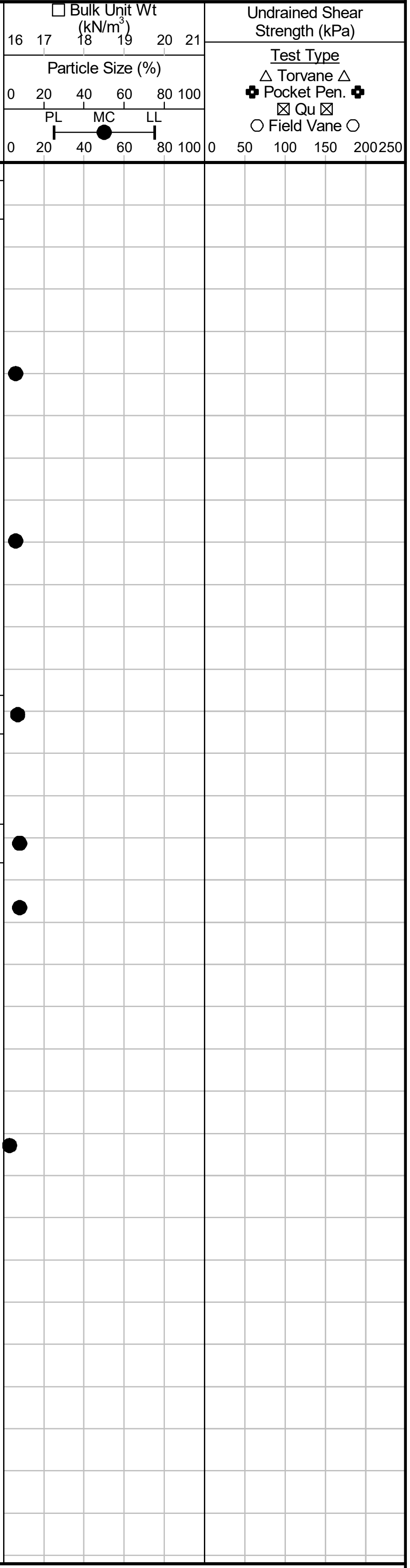
SILT (TILL) - trace clay, some sand, some gravel (< 25 mm diam.)
- light grey
- moist, loose to compact
- no to low plasticity

- very dense below 18.0 m

- boulder at 21.0 m

- boulder at 22.9 m

Sample Type	Sample Number	Recovery % (RQD %)	SPT (N)
☒	SS16A		100
	C16	100	
	C17	100	
☒	SS18		100
☒	SS19		100
	C20	100	
	C21	100	
	C22	100	
	C23	100	
	C24	100	
	C25	100	



Logged By: David Clark **Reviewed By:** Michael Van Helden **Project Engineer:** Nuno Mendonca

Test Hole TH25-03

3 of 3

Sub-Surface Log

Elevation (m)	Depth (m)	Soil Symbol	VW Piezometer	Slope Inclinometer	MATERIAL DESCRIPTION	Sample Type	Sample Number	Recovery % (RQD %)	SPT (N)	☐ Bulk Unit Wt (kN/m^3) 16 17 18 19 20 21 Particle Size (%) 0 20 40 60 80 100 PL MC LL 0 20 40 60 80 100	Undrained Shear Strength (kPa) Test Type △ Torvane △ ✚ Pocket Pen. ✚ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
197.2											
	31 32 33				DOLOMITIC LIMESTONE (100%) - slightly weathered, very fine grained, thinly laminated, massive, mottled cream to beige, weak to medium strong (R2-R3), (Selkirk Member) - discontinuities rough, closed, no evidence of water flow, damp, no free water, close spacing (0.06-0.20 m), fair RQD - compressive strength of 37.6 MPa at 31.5 m - discontinuities rough, gapped, no evidence of water flow, damp, close spacing (0.06-0.20 m), excellent RQD below 32.0 m - compressive strength of 46.6 MPa at 32.0 m		C26 C27	100 (62) 100 (93)			
194.3											

END OF TEST HOLE AT 33.5 m IN DOLOMITIC LIMESTONE

Notes:

1) Seepage and sloughing not observed due to drilling method.

2) Drilling method changed to HQ coring at 15.2 m.

3) Vibrating Wire Piezometers VW25-03A (SN-188353) installed at 15.5 m depth, and VW25-03B (SN-183291) installed at 7.9 m depth.

4) Slope Inclinometer SI25-03 installed 2.0 m east of TH25-03 to a depth of 18.5 m.

5) Test hole backfilled with bentonite-cement grout mix to 2.0 m depth and bentonite chips to surface.

Logged By: David Clark **Reviewed By:** Michael Van Helden **Project Engineer:** Nuno Mendonca

Appendix A

Laboratory Testing Results

GEOTECHNICAL Quality Engineering | Valued Relationships

MEMORANDUM

Date	April 25, 2025
To	David Clark, TREK Geotechnical
From	Angela Fidler-Kliewer, TREK Geotechnical
Project No.	0002-171-00
Project	Louise Bridge Rehabilitation
Subject	Laboratory Testing Results – Lab Req. R25-102
Distribution	Nuno Mendonca, Michael Van Helden

Attached are the laboratory testing results for the above noted project. The testing included moisture content determinations, Atterberg Limit and grain size distribution (Hydrometer method) and unconfined compressive strength and related testing on shelby tube samples.

Regards,

Angela Fidler-Kliewer, C.Tech.

Attach.

Review Control:

Prepared By: AFK	*Reviewed By:* AFK	*Checked By:* NJF

TREK GEOTECHNICAL

LABORATORY REQUISITION

CLIENT Tetra Tech Inc.

PROJECT NAME Louise Bridge Rehabilitation

PROJECT NO: 0002-171-00

FIELD TECHNICIAN: David Clark

TEST HOLE NUMBER	SAMPLE NUMBER	DEPTH OF SAMPLE (ft)	Sample Date	MOISTURE	VISUAL CLASS.	ATTERBERG LIMITS	HYDROMETER	GRADATION	STD. PROCTOR	UNCONFINED AND AUXILLARY TESTS	SO4 - Water Soluble Sulfate (CSA-A23.2-3B)				Soil Description/Comments
TH25-01	G52	0.0 - 1.0		X											CLAY FILL
TH25-01	G53	3.5 - 4.0		X											
TH25-01	G54	5.0 - 5.5													
TH25-01	G55	7.5 - 8.0													CLAY
TH25-01	G56	10.0 - 11.0		X		X	X								
TH25-01	T57	15.0 - 17.0								X					
TH25-01	G58	18.0 - 19.0		X											
TH25-01	G59	21.0 - 22.0		X											
TH25-01	T60	25.0 - 27.0								X					
TH25-01	G61	31.0 - 32.0		X		X	X								
TH25-01	T62	35.0 - 37.0								X					
TH25-01	G63	40.0 - 41.0		X											
TH25-01	G64	42.0 - 42.5		X											SAND
TH25-01	G65	43.5 - 44.0		X											SILT TILL
TH25-01	SS66	45.0 - 46.5		X											
TH25-01	SS67	50.0 - 51.5		X											Boulder/Rock
TH25-02	G28	1.0 - 2.0		X											CLAY FILL
TH25-02	G29	4.0 - 4.5		X											SAND FILL
TH25-02	G30	5.0 - 5.5		X											CLAY
TH25-02	G31	8.5 - 9.0		X											SILT
TH25-02	G32	12.0 - 13.0		X											CLAY
TH25-02	G33	17.0 - 18.0		X											
TH25-02	T34	20.0 - 22.0								X					
TH25-02	G35	26.5 - 27.0		X		X	X								
TH25-02	T36	30.0 - 32.0								X					
TH25-02	G37	36.0 - 37.0		X											
TH25-02	T38	40.0 - 42.0								X					
TH25-02	G39	44.0 - 45.0		X											
TH25-02	G40	47.0 - 48.0		X											
TH25-02	T41	50.0 - 52.0				X	/			X					
TH25-02	T42	60.0 - 62.0								X					
TH25-02	SS43	70.0 - 71.5		X											SILT TILL (rocks sample)
TH25-02	C44	75.0 - 78.0		X											
TH25-02	C45	78.0 - 83.0		X											
TH25-02	C46	83.0 - 88.0		X											

REQUESTED BY: David Clark

REPORT TO: DC, NM, MVH

REQUISITION DATE: APR 14/25

DATE REQUIRED: APR 25/25

COMMENTS:

REQUISITION NO. R25-102

PAGE 1 OF 2

TREK GEOTECHNICAL

LABORATORY REQUISITION

CLIENT Tetra Tech Inc.
PROJECT NO: 0002-171-00
PROJECT NAME Louise Bridge Rehabilitation
FIELD TECHNICIAN: David Clark

TEST HOLE NUMBER	SAMPLE NUMBER	DEPTH OF SAMPLE (ft)	Sample Date	MOISTURE	VISUAL CLASS.	ATTERBERG LIMITS	HYDROMETER	GRADATION	STD. PROCTOR	UNCONFINED AND AUXILLARY TESTS	SO4 - Water Soluble Sulfate (CSA-A23.2-3B)				Soil Description/Comments
TH25-02	C48	88.0 - 93.0													Bedrock
TH25-02	C49	93.0 - 95.0													
TH25-02	C50	95.0 - 100.0													
TH25-02	C51	100.0 - 105.0													↓
TH25-03	G01	2.0 - 3.0		X											CLAY FILL
TH25-03	G02	6.0 - 7.0		X											CLAY (ALLUVIAL)
TH25-03	G03	8.5 - 9.0		X											
TH25-03	T04	10.0 - 12.0								X					CLAY / SAND unable todo Qu
TH25-03	G05	13.0 - 13.5		X											SAND
TH25-03	G06	14.5 - 15.0		X											
TH25-03	G07	16.0 - 17.0		X											
TH25-03	G08	19.5 - 20.0		X											↓
TH25-03	T09	20.0 - 22.0								X					SAND / CLAY unable to do Qu
TH25-03	G10	24.0 - 25.0		X		X	/								CLAY
TH25-03	G11	27.0 - 28.0		X											
TH25-03	T12	30.0 - 32.0								⊘					NO RECOVERY
TH25-03	G13	33.0 - 34.0		X											
TH25-03	G14	37.0 - 38.0		X											
TH25-03	T15	40.0 - 42.0								X					↓ UNABLE TO DO QU
TH25-03	SS16A	45.0 - 46.5													SILT TILL (No Recovery)
TH25-03	C16	50.0 - 55.0		X											
TH25-03	C17	55.0 - 60.0		X											
TH25-03	SS18	65.0 - 66.5		X											
TH25-03	SS19	70.0 - 71.5		X											
TH25-03	C20	71.5 - 75.0		X											
TH25-03	C21	75.0 - 80.0													No recovery
TH25-03	C22	80.0 - 85.0		X											
TH25-03	C23	85.0 - 90.0		/											
TH25-03	C24	90.0 - 95.0		/											↓
TH25-03	C25	95.0 - 100.0													Bedrock
TH25-03	C26	100.0 - 105.0													
TH25-03	C27	105.0 - 110.0													↓

C23, C24 - all contains Rocks so no moisture was performed on these samples

REQUESTED BY: David Clark
REPORT TO: DC / NM / MVH
REQUISITION DATE: APR 14/25
DATE REQUIRED: APR 25/25
COMMENTS:

REQUISITION NO. R25-102

PAGE 2 OF 2

www.trekgeotechnical.ca
1712 St. James Street
Winnipeg, MB R3H 0L3
Tel: 204.975.9433 Fax: 204.975.9435

Moisture Content Report
ASTM D2216-98

Project No. 0002-171-01
Client Tetra Tech Inc.
Project Louise Bridge Rehabilitation

Sample Date 24-Mar-25
Test Date 14-Apr-25
Technician Z. Dypianco

Test Hole	TH25-01	TH25-01	TH25-01	TH25-01	TH25-01	TH25-01
Depth (m)	0.0 - 0.3	1.1 - 1.2	3.0 - 3.4	5.5 - 5.8	6.4 - 6.7	9.4 - 9.8
Sample #	G52	G53	G56	G58	G59	G61
Tare ID	F58	H30	D227	A100	H1	E60
Mass of tare	8.8	8.7	6.7	9.1	8.3	6.8
Mass wet + tare	210.8	211.4	415.4	210.4	213.4	418.2
Mass dry + tare	183.3	168.6	285.9	154.0	141.7	276.3
Mass water	27.5	42.8	129.5	56.4	71.7	141.9
Mass dry soil	174.5	159.9	279.2	144.9	133.4	269.5
Moisture %	15.8%	26.8%	46.4%	38.9%	53.7%	52.7%

Test Hole	TH25-01	TH25-01	TH25-01	TH25-01	TH25-01	TH25-02
Depth (m)	12.2 - 12.5	12.8 - 13.0	13.3 - 13.4	13.7 - 14.2	15.2 - 15.7	0.3 - 0.6
Sample #	G63	G64	G65	SS66	SS67	G28
Tare ID	M48	B12	E99	N23	P33	Z08
Mass of tare	7.1	6.7	8.5	8.7	8.4	8.5
Mass wet + tare	218.4	213.4	162.7	216.7	156.9	210.7
Mass dry + tare	139.0	179.5	146.9	198.4	151.2	187.7
Mass water	79.4	33.9	15.8	18.3	5.7	23.0
Mass dry soil	131.9	172.8	138.4	189.7	142.8	179.2
Moisture %	60.2%	19.6%	11.4%	9.6%	4.0%	12.8%

Test Hole	TH25-02	TH25-02	TH25-02	TH25-02	TH25-02	TH25-02
Depth (m)	1.2 - 1.4	1.5 - 1.7	2.6 - 2.7	3.7 - 4.0	5.2 - 5.5	8.1 - 8.2
Sample #	G29	G30	G31	G32	G33	G35
Tare ID	Z02	F51	M16	F125	C5	D218
Mass of tare	7.1	8.4	7.0	9.0	8.8	6.8
Mass wet + tare	210.4	215.0	212.6	211.7	212.5	410.6
Mass dry + tare	191.8	174.9	172.2	161.6	144.9	282.1
Mass water	18.6	40.1	40.4	50.1	67.6	128.5
Mass dry soil	184.7	166.5	165.2	152.6	136.1	275.3
Moisture %	10.1%	24.1%	24.5%	32.8%	49.7%	46.7%

Moisture Content Report
ASTM D2216-98

Project No. 0002-171-01
Client Tetra Tech Inc.
Project Louise Bridge Rehabilitation

Sample Date 24-Mar-25
Test Date 14-Apr-25
Technician Z. Dypianco

Test Hole	TH25-02	TH25-02	TH25-02	TH25-02	TH25-02	TH25-02
Depth (m)	11.0 - 11.3	13.4 - 13.7	14.3 - 14.6	21.3 - 21.8	23.5 - 23.8	24.7 - 24.8
Sample #	G37	G39	G40	SS43	C44	C45
Tare ID	QT78	QT79	B7	D217	D208	W74
Mass of tare	8.2	8.2	6.8	6.8	6.9	8.6
Mass wet + tare	212.2	213.7	217.2	141.5	177.9	220.6
Mass dry + tare	157.3	152.5	147.3	131.0	166.9	206.0
Mass water	54.9	61.2	69.9	10.5	11.0	14.6
Mass dry soil	149.1	144.3	140.5	124.2	160.0	197.4
Moisture %	36.8%	42.4%	49.8%	8.5%	6.9%	7.4%

Test Hole	TH25-02	TH25-03	TH25-03	TH25-03	TH25-03	TH25-03
Depth (m)	26.7 - 26.8	0.6 - 0.9	1.8 - 2.1	2.6 - 2.7	4.0 - 4.1	4.4 - 4.6
Sample #	C46	G01	G02	G03	G05	G06
Tare ID	D210	F109	Z136	E35	W98	E01
Mass of tare	7.0	8.6	8.3	8.5	8.6	7.4
Mass wet + tare	223.4	243.8	255.7	239.3	239.5	336.3
Mass dry + tare	208.2	213.7	208.6	196.4	211.0	277.5
Mass water	15.2	30.1	47.1	42.9	28.5	58.8
Mass dry soil	201.2	205.1	200.3	187.9	202.4	270.1
Moisture %	7.6%	14.7%	23.5%	22.8%	14.1%	21.8%

Test Hole	TH25-03	TH25-03	TH25-03	TH25-03	TH25-03	TH25-03
Depth (m)	4.9 - 5.2	5.9 - 6.1	7.3 - 7.6	8.2 - 8.5	10.1 - 10.4	11.3 - 11.6
Sample #	G07	G08	G10	G11	G13	G14
Tare ID	M85	F69	QT36	D214	D221	W103
Mass of tare	7.0	8.6	8.0	6.8	6.8	8.5
Mass wet + tare	244.9	238.6	432.3	256.4	262.2	240.0
Mass dry + tare	189.6	178.0	320.6	192.4	203.2	183.7
Mass water	55.3	60.6	111.7	64.0	59.0	56.3
Mass dry soil	182.6	169.4	312.6	185.6	196.4	175.2
Moisture %	30.3%	35.8%	35.7%	34.5%	30.0%	32.1%

Moisture Content Report
ASTM D2216-98

Project No.	0002-171-01
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation
Sample Date	24-Mar-25
Test Date	14-Apr-25
Technician	Z. Dypianco

Test Hole	TH25-03	TH25-03	TH25-03	TH25-03	TH25-03	TH25-03
Depth (m)	15.2 - 16.8	16.8 - 18.3	19.8 - 20.3	21.3 - 21.8	21.8 - 22.9	24.4 - 25.9
Sample #	C16	C17	SS18	SS19	C20	C22
Tare ID	B18	B114	QT69	D204	QT31	K11
Mass of tare	6.8	8.7	8.1	6.8	8.2	8.8
Mass wet + tare	89.3	782.9	207.5	234.5	151.8	408.2
Mass dry + tare	84.4	738.9	194.1	217.2	140.9	395.6
Mass water	4.9	44.0	13.4	17.3	10.9	12.6
Mass dry soil	77.6	730.2	186.0	210.4	132.7	386.8
Moisture %	6.3%	6.0%	7.2%	8.2%	8.2%	3.3%

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Atterberg Limits
ASTM D4318-10e1

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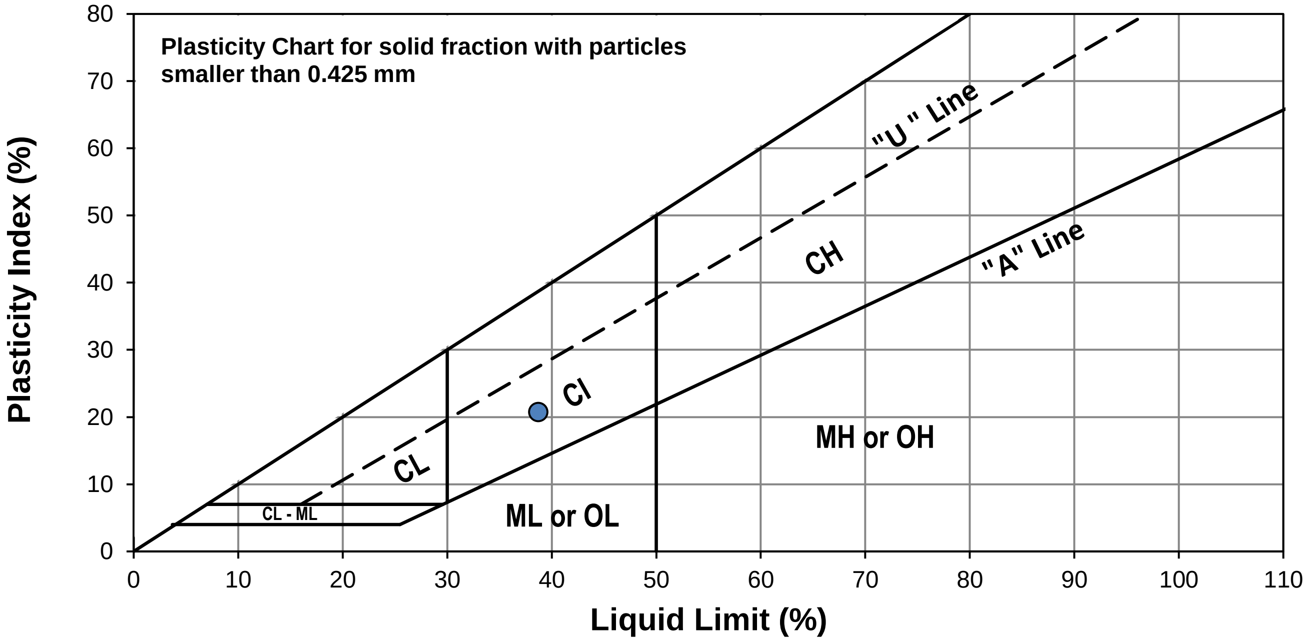
Project No.	0002-171-01
Client	Tetra Tech
Project	Louise Bridge Rehabilitation
Test Hole	TH25-03
Sample #	G10
Depth (m)	7.6 - 7.6
Sample Date	24-Mar-25
Test Date	17-Apr-25
Technician	M. Thomsen

Liquid Limit	39
Plastic Limit	18
Plasticity Index	21

Liquid Limit

Trial #	**1**	**2**	**3**		
Number of Blows (N)	19	26	30		
Mass Tare (g)	14.062	14.151	13.784		
Mass Wet Soil + Tare (g)	28.886	27.019	26.151		
Mass Dry Soil + Tare (g)	24.650	23.440	22.754		
Mass Water (g)	4.236	3.579	3.397		
Mass Dry Soil (g)	10.588	9.289	8.970		
Moisture Content (%)	40.008	38.529	37.871		



Plastic Limit

Trial #	**1**	**2**	**3**	**4**	**5**
Mass Tare (g)	14.153	14.148			
Mass Wet Soil + Tare (g)	24.884	23.868			
Mass Dry Soil + Tare (g)	23.273	22.365			
Mass Water (g)	1.611	1.503			
Mass Dry Soil (g)	9.120	8.217			
Moisture Content (%)	17.664	18.291			

Note: Additional information recorded/measured for this test is available upon request.

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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

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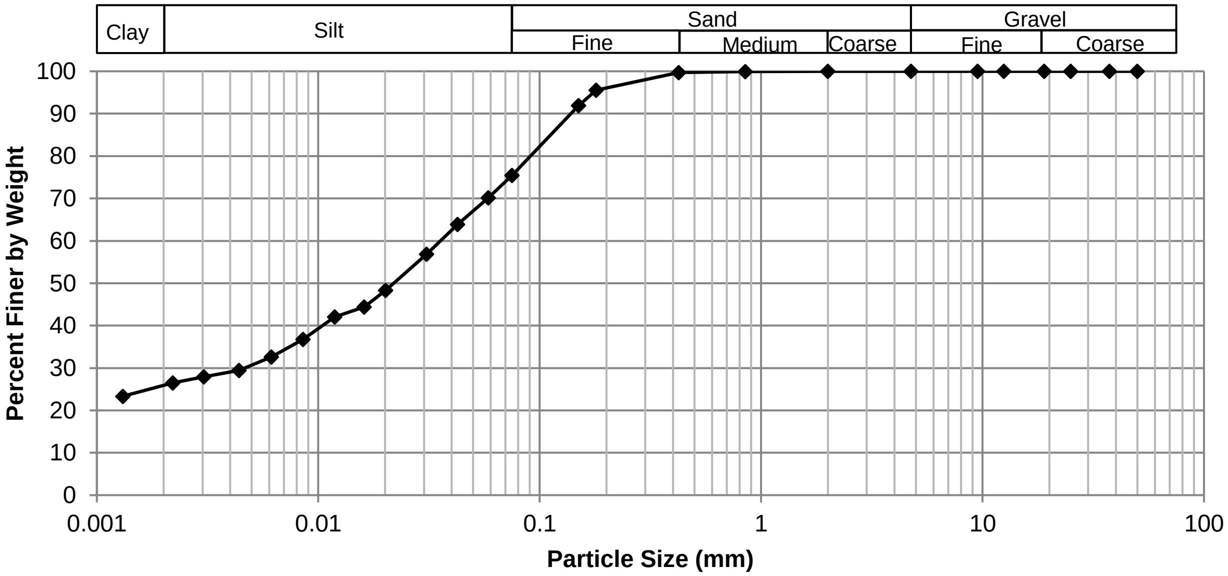
Project No.	0002-171-01
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation
Test Hole	TH25-03
Sample #	G10
Depth (m)	7.3 - 7.6
Sample Date	24-Mar-25
Test Date	17-Apr-25
Technician	A. Dustmamatov

Gravel	0.0%
Sand	24.5%
Silt	49.7%
Clay	25.8%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	75.47
37.5	100.00	2.00	100.00	0.0587	70.18
25.0	100.00	0.850	99.93	0.0426	63.93
19.0	100.00	0.425	99.70	0.0309	56.89
12.5	100.00	0.180	95.58	0.0202	48.29
9.50	100.00	0.150	91.92	0.0161	44.39
4.75	100.00	0.075	75.47	0.0119	42.04
				0.0086	36.73
				0.0061	32.57
				0.0044	29.45
				0.0030	27.93
				0.0022	26.50
				0.0013	23.34

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Atterberg Limits
ASTM D4318-10e1

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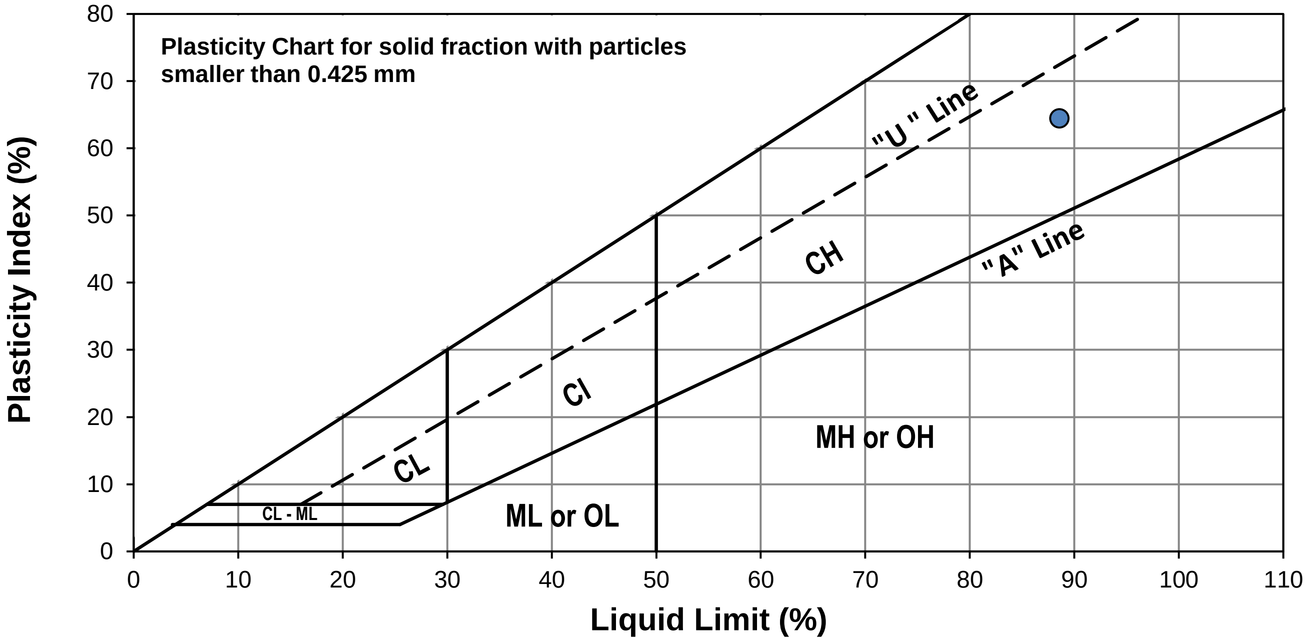
Project No. 0002-171-01
Client Tetra Tech
Project Louise Bridge Rehabilitation

Test Hole TH25-02
Sample # G35
Depth (m) 8.1 - 8.2
Sample Date 24-Mar-25
Test Date 16-Apr-25
Technician A. Bhullar

Liquid Limit	89
Plastic Limit	24
Plasticity Index	64

Liquid Limit

Trial #	**1**	**2**	**3**		
Number of Blows (N)	16	23	35		
Mass Tare (g)	13.845	13.964	14.108		
Mass Wet Soil + Tare (g)	27.302	28.221	30.387		
Mass Dry Soil + Tare (g)	20.807	21.467	22.927		
Mass Water (g)	6.495	6.754	7.460		
Mass Dry Soil (g)	6.962	7.503	8.819		
Moisture Content (%)	93.292	90.017	84.590		



Plastic Limit

Trial #	**1**	**2**	**3**	**4**	**5**
Mass Tare (g)	14.061	13.741			
Mass Wet Soil + Tare (g)	20.803	20.004			
Mass Dry Soil + Tare (g)	19.480	18.799			
Mass Water (g)	1.323	1.205			
Mass Dry Soil (g)	5.419	5.058			
Moisture Content (%)	24.414	23.824			

Note: Additional information recorded/measured for this test is available upon request.

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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

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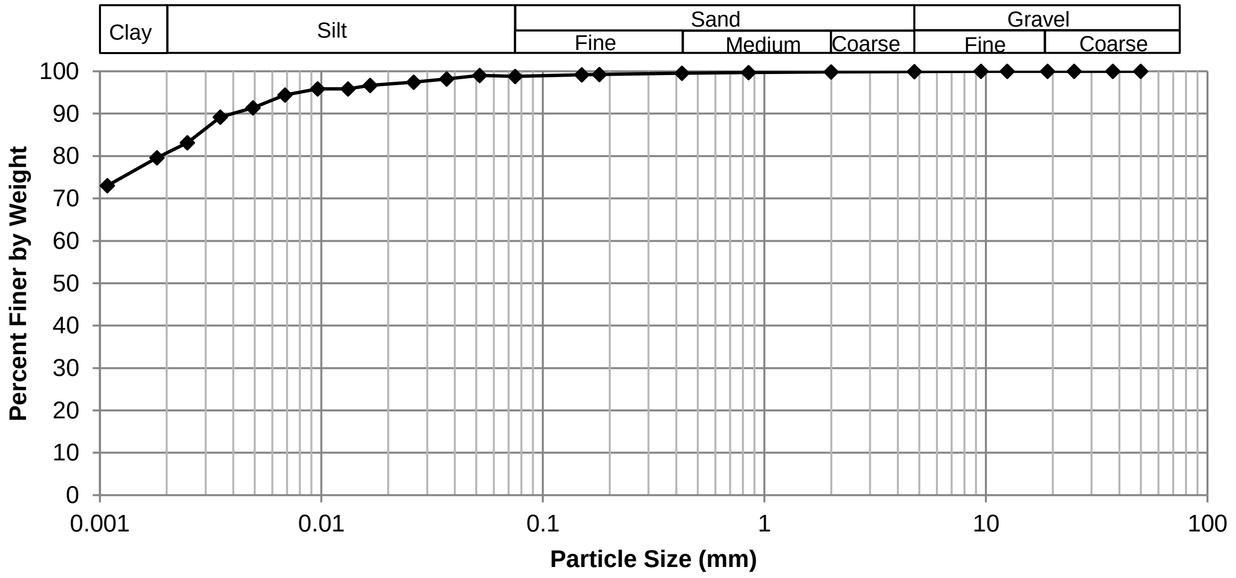
Project No.	0002-171-01
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation
Test Hole	TH25-02
Sample #	G35
Depth (m)	8.1 - 8.2
Sample Date	24-Mar-25
Test Date	16-Apr-25
Technician	A. Dustmamatov

Gravel	0.1%
Sand	1.1%
Silt	18.2%
Clay	80.6%

Particle Size Distribution Curve



Gravel		**Sand**		**Silt and Clay**	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	99.92	0.0750	98.81
37.5	100.00	2.00	99.86	0.0519	99.01
25.0	100.00	0.850	99.67	0.0368	98.23
19.0	100.00	0.425	99.52	0.0262	97.45
12.5	100.00	0.180	99.24	0.0166	96.67
9.50	100.00	0.150	99.15	0.0132	95.89
4.75	99.92	0.075	98.81	0.0096	95.89
				0.0069	94.39
				0.0049	91.39
				0.0035	89.17
				0.0025	83.17
				0.0018	79.58
				0.0011	73.03

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Atterberg Limits
ASTM D4318-10e1

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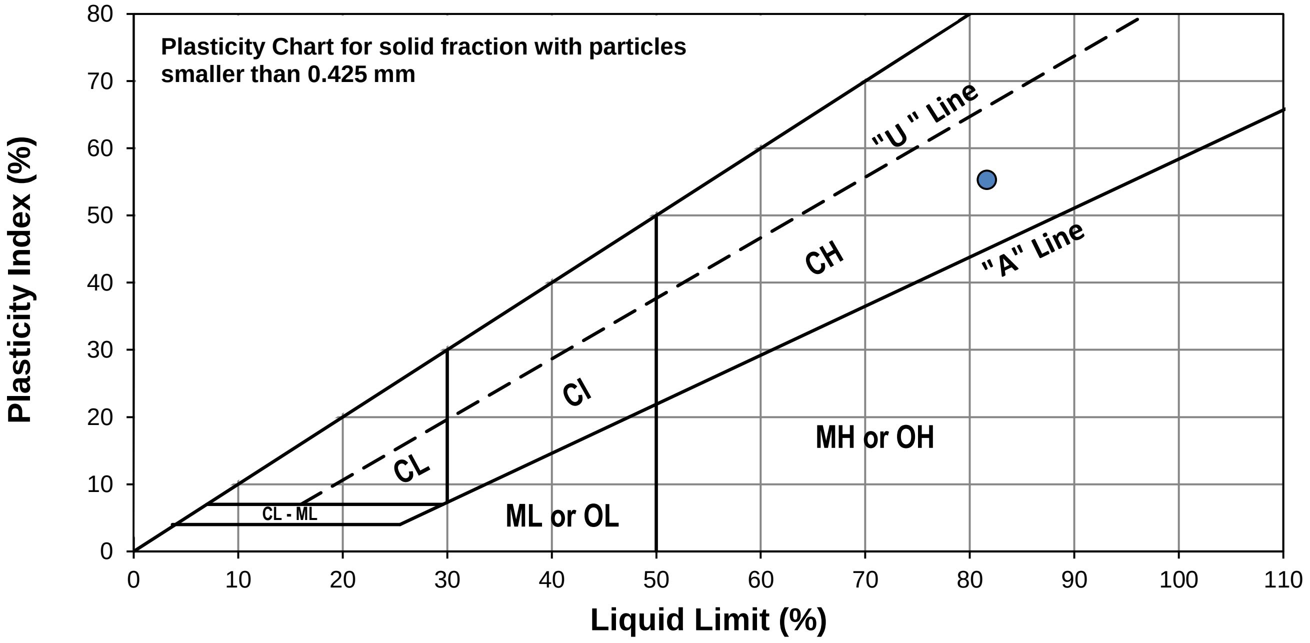
For specific tests as listed on www.ccil.com

Project No.	0002-171-01
Client	Tetra Tech
Project	Louise Bridge Rehabilitation
Test Hole	TH25-01
Sample #	G56
Depth (m)	3.0 - 3.4
Sample Date	24-Mar-25
Test Date	16-Apr-25
Technician	I.Araquil

Liquid Limit	82
Plastic Limit	26
Plasticity Index	55

Liquid Limit

Trial #	**1**	**2**	**3**		
Number of Blows (N)	18	23	32		
Mass Tare (g)	14.009	14.043	14.006		
Mass Wet Soil + Tare (g)	23.031	25.216	23.821		
Mass Dry Soil + Tare (g)	18.892	20.164	19.483		
Mass Water (g)	4.139	5.052	4.338		
Mass Dry Soil (g)	4.883	6.121	5.477		
Moisture Content (%)	84.763	82.536	79.204		



Plastic Limit

Trial #	**1**	**2**	**3**	**4**	**5**
Mass Tare (g)	14.099	14.062			
Mass Wet Soil + Tare (g)	21.307	22.148			
Mass Dry Soil + Tare (g)	19.811	20.456			
Mass Water (g)	1.496	1.692			
Mass Dry Soil (g)	5.712	6.394			
Moisture Content (%)	26.190	26.462			

Note: Additional information recorded/measured for this test is available upon request.

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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

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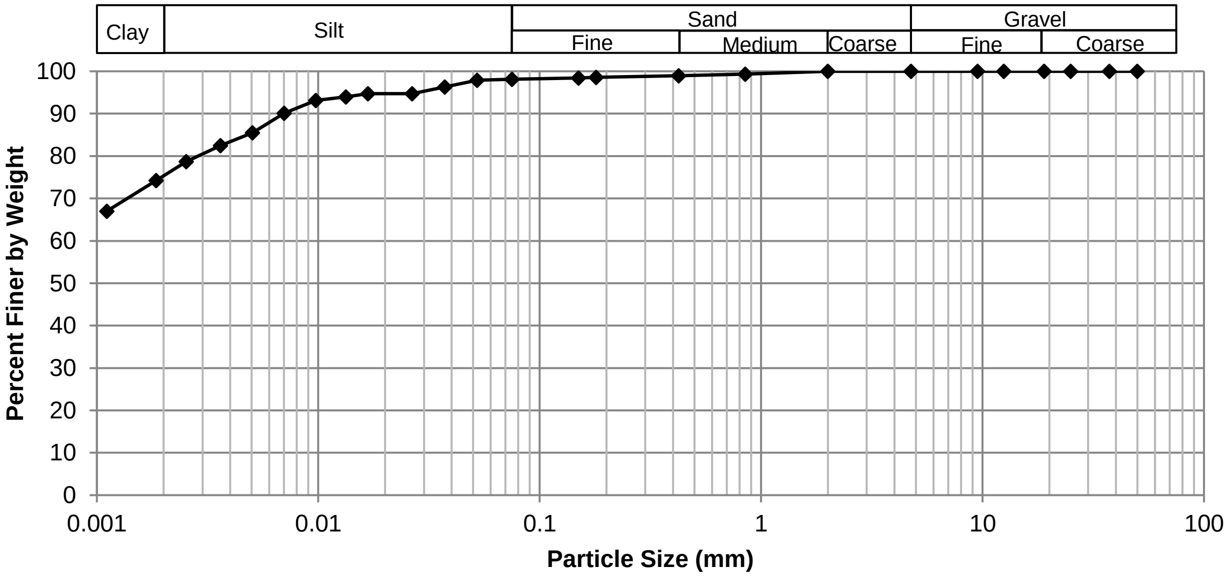
Project No.	0002-171-01
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation
Test Hole	TH25-01
Sample #	G56
Depth (m)	3.0 - 3.4
Sample Date	24-Mar-25
Test Date	16-Apr-25
Technician	A. Dustmamatov

Gravel	0.0%
Sand	1.9%
Silt	22.9%
Clay	75.2%

Particle Size Distribution Curve



Gravel		**Sand**		**Silt and Clay**	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	98.12
37.5	100.00	2.00	100.00	0.0522	97.86
25.0	100.00	0.850	99.34	0.0372	96.30
19.0	100.00	0.425	98.99	0.0266	94.73
12.5	100.00	0.180	98.54	0.0168	94.73
9.50	100.00	0.150	98.45	0.0133	93.95
4.75	100.00	0.075	98.12	0.0098	93.17
				0.0070	90.09
				0.0051	85.49
				0.0036	82.46
				0.0025	78.73
				0.0019	74.27
				0.0011	67.01

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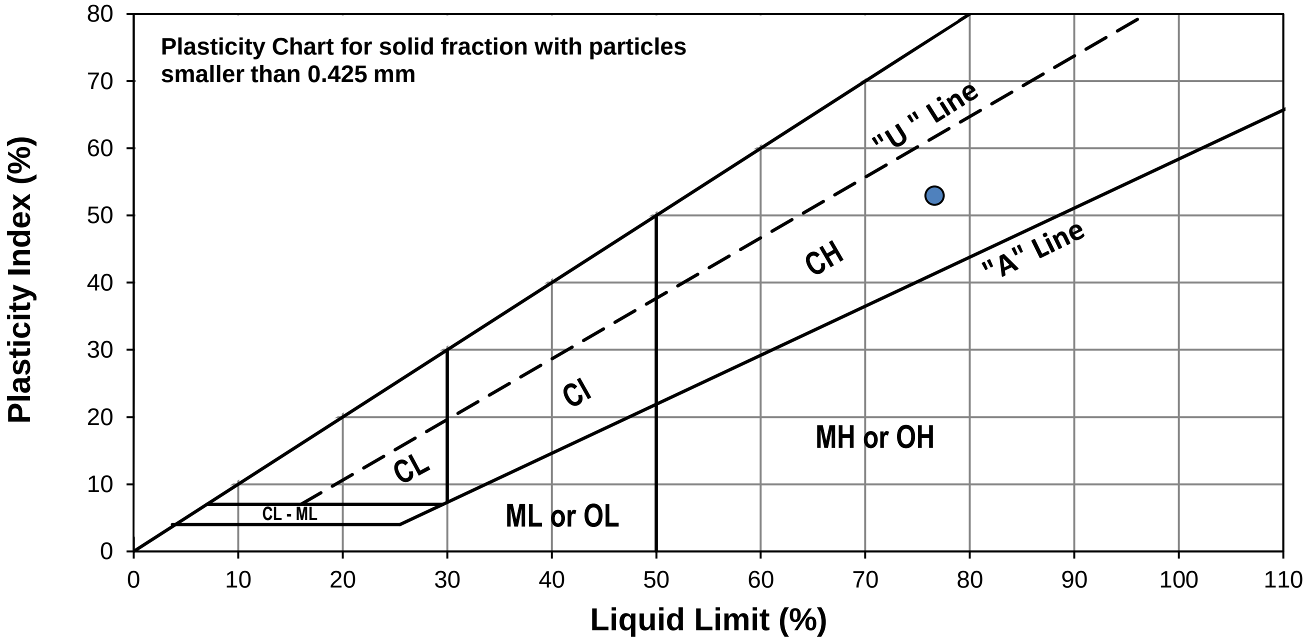
Atterberg Limits
ASTM D4318-10e1

Project No.	0002-171-01
Client	Tetra Tech
Project	Louise Bridge Rehabilitation
Test Hole	TH25-01
Sample #	G61
Depth (m)	9.4 - 9.8
Sample Date	24-Mar-25
Test Date	16-Apr-25
Technician	I. Araquil

Liquid Limit	77
Plastic Limit	24
Plasticity Index	53

Liquid Limit

Trial #	**1**	**2**	**3**		
Number of Blows (N)	18	23	32		
Mass Tare (g)	14.042	14.037	14.029		
Mass Wet Soil + Tare (g)	24.055	23.780	22.334		
Mass Dry Soil + Tare (g)	19.672	19.536	18.761		
Mass Water (g)	4.383	4.244	3.573		
Mass Dry Soil (g)	5.630	5.499	4.732		
Moisture Content (%)	77.851	77.178	75.507		



Plastic Limit

Trial #	**1**	**2**	**3**	**4**	**5**
Mass Tare (g)	13.965	14.042			
Mass Wet Soil + Tare (g)	20.945	22.457			
Mass Dry Soil + Tare (g)	19.607	20.847			
Mass Water (g)	1.338	1.610			
Mass Dry Soil (g)	5.642	6.805			
Moisture Content (%)	23.715	23.659			

Note: Additional information recorded/measured for this test is available upon request.

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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

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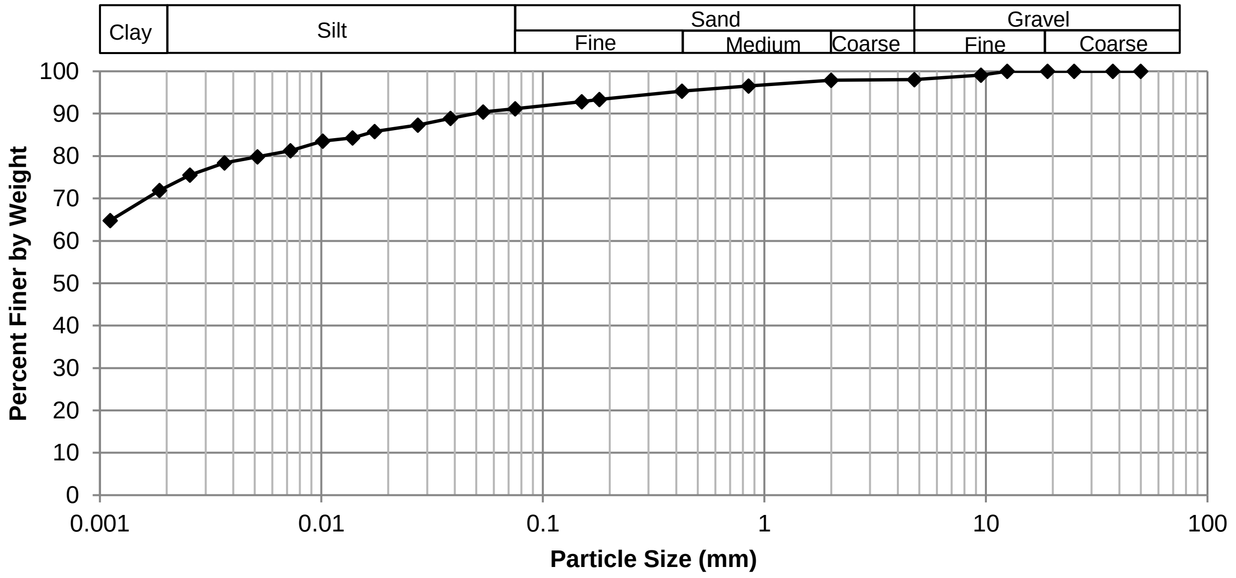
Project No.	0002-171-01
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation
Test Hole	TH25-01
Sample #	G61
Depth (m)	9.4 - 9.8
Sample Date	24-Mar-25
Test Date	16-Apr-25
Technician	A. Dustmamatov

Gravel	1.9%
Sand	6.9%
Silt	18.5%
Clay	72.6%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	98.07	0.0750	91.18
37.5	100.00	2.00	97.93	0.0538	90.40
25.0	100.00	0.850	96.50	0.0383	88.87
19.0	100.00	0.425	95.30	0.0273	87.34
12.5	100.00	0.180	93.34	0.0174	85.81
9.50	99.11	0.150	92.85	0.0139	84.28
4.75	98.07	0.075	91.18	0.0102	83.51
				0.0072	81.26
				0.0051	79.82
				0.0037	78.38
				0.0026	75.50
				0.0019	71.91
				0.0011	64.79

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Atterberg Limits
ASTM D4318-10e1

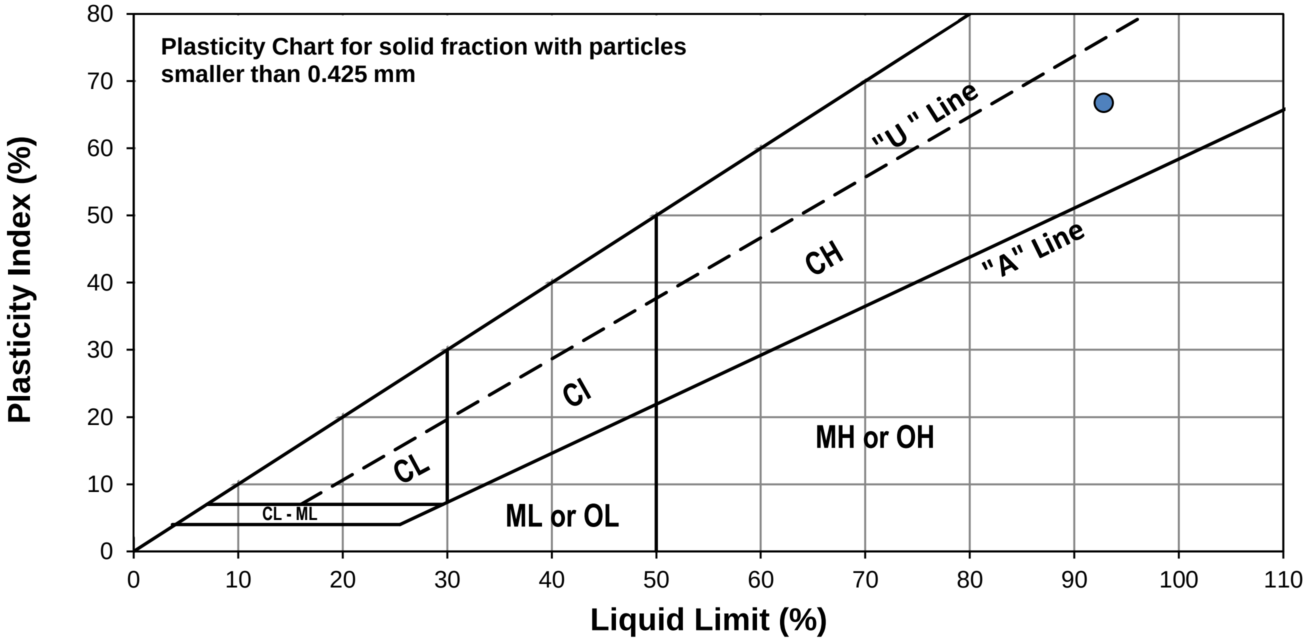
Project No. 0002-171-01
Client Tetra Tech
Project Louise Bridge Rehabilitation

Test Hole TH25-02
Sample # T41
Depth (m) 15.2 - 15.8
Sample Date 24-Mar-25
Test Date 17-Apr-25
Technician M. Thomsen

Liquid Limit	93
Plastic Limit	26
Plasticity Index	67

Liquid Limit

Trial #	**1**	**2**	**3**		
Number of Blows (N)	15	27	33		
Mass Tare (g)	14.082	13.906	14.084		
Mass Wet Soil + Tare (g)	24.229	24.552	24.475		
Mass Dry Soil + Tare (g)	19.237	19.446	19.534		
Mass Water (g)	4.992	5.106	4.941		
Mass Dry Soil (g)	5.155	5.540	5.450		
Moisture Content (%)	96.838	92.166	90.661		



Plastic Limit

Trial #	**1**	**2**	**3**	**4**	**5**
Mass Tare (g)	14.123	14.086			
Mass Wet Soil + Tare (g)	22.990	23.272			
Mass Dry Soil + Tare (g)	21.150	21.380			
Mass Water (g)	1.840	1.892			
Mass Dry Soil (g)	7.027	7.294			
Moisture Content (%)	26.185	25.939			

Note: Additional information recorded/measured for this test is available upon request.

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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

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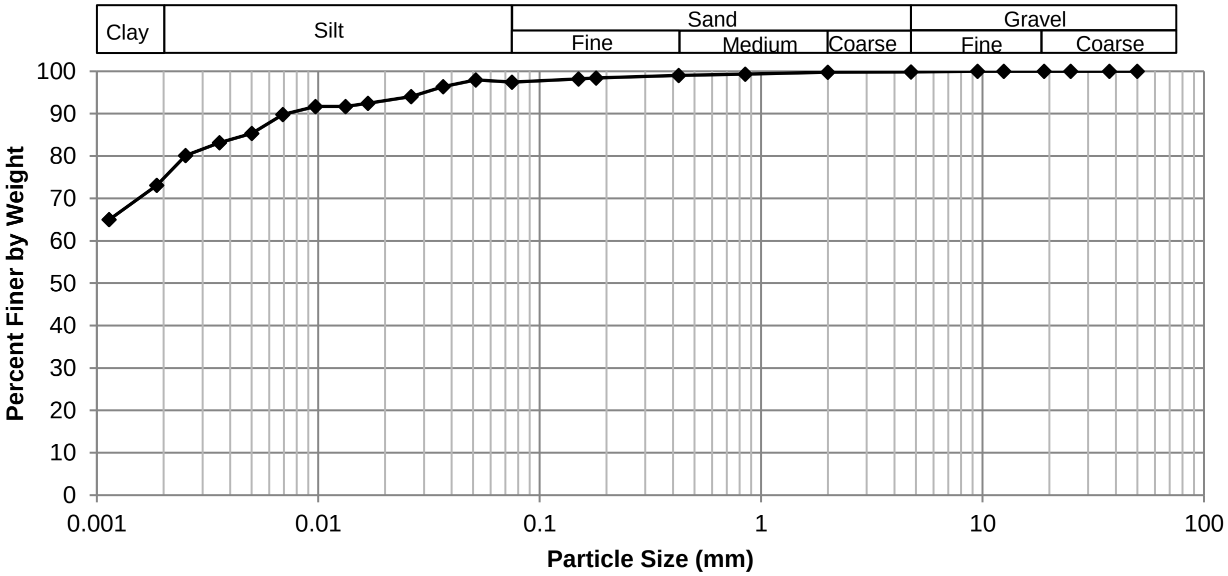
Project No.	0002-171-01
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation
Test Hole	TH25-02
Sample #	T41
Depth (m)	15.2 - 15.8
Sample Date	01-Apr-25
Test Date	17-Apr-25
Technician	A. Dustmamatov

Gravel	0.1%
Sand	2.4%
Silt	22.9%
Clay	74.6%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	99.88	0.0750	97.45
37.5	100.00	2.00	99.75	0.0515	97.95
25.0	100.00	0.850	99.37	0.0367	96.39
19.0	100.00	0.425	99.03	0.0263	94.05
12.5	100.00	0.180	98.41	0.0168	92.49
9.50	100.00	0.150	98.21	0.0133	91.71
4.75	99.88	0.075	97.45	0.0097	91.71
				0.0069	89.84
				0.0050	85.35
				0.0036	83.17
				0.0025	80.11
				0.0019	73.12
				0.0011	65.00

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Shelby Tube Visual

Project No.	0002-171-00
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation
Test Hole	TH25-03
Sample #	T04
Depth (m)	3.0 - 3.7
Sample Date	24-Mar-25
Test Date	17-Apr-25
Technician	A. Dustmamatov

Tube Extraction

Recovery (mm) 620

Bottom **A**	3.23 m	**B** 3.15 m
3.31 m		**Top** **3.05 m**
Moisture Content Visual	Moisture Content Visual PP/TV	Bulk
80 mm (A)	80 mm (B)	100 mm (B)

Visual Classification

	A	B
Material	SAND	CLAY and SAND
Composition	trace silt	silty
		trace gravel (<10mm diam.)
Color	beige	brown
Moisture	dry to moist	moist
Consistency	loose	stiff
Plasticity	non plastic	low to intermediate plasticity
Structure		
Gradation	well graded	

Moisture Content

	A	B
Tare ID	W94	EX01
Mass tare (g)	8.8	6.8
Mass wet + tare (g)	238.2	356.2
Mass dry + tare (g)	228.2	289.2
Moisture %	4.6%	23.7%

Unit Weight

Bulk Weight (g)		-	638.60
Length (mm)	**1**	-	81.26
	2	-	82.15
	3	-	82.38
	4	-	81.87
Average Length (m)		-	0.082
Diam. (mm)	**1**	-	68.55
	2	-	71.32
	3	-	72.98
	4	-	72.41
Average Diameter (m)		-	0.071
Volume (m^3)		-	3.27E-04
Bulk Unit Weight (kN/m^3)		-	19.1
Bulk Unit Weight (pcf)		-	121.8
Dry Unit Weight (kN/m^3)		-	15.5
Dry Unit Weight (pcf)		-	98.5

Torvane

	A	B	
Reading	-	0.55	
Vane Size (s,m,l)	m	m	
Undrained Shear Strength	-	53.9	(kPa)

Pocket Penetrometer

		A	B	
Reading	**1**	-	1.20	
	2	-	1.00	
	3	-	1.20	
	Average	-	1.13	
Undrained Shear Strength		-	55.6	(kPa)

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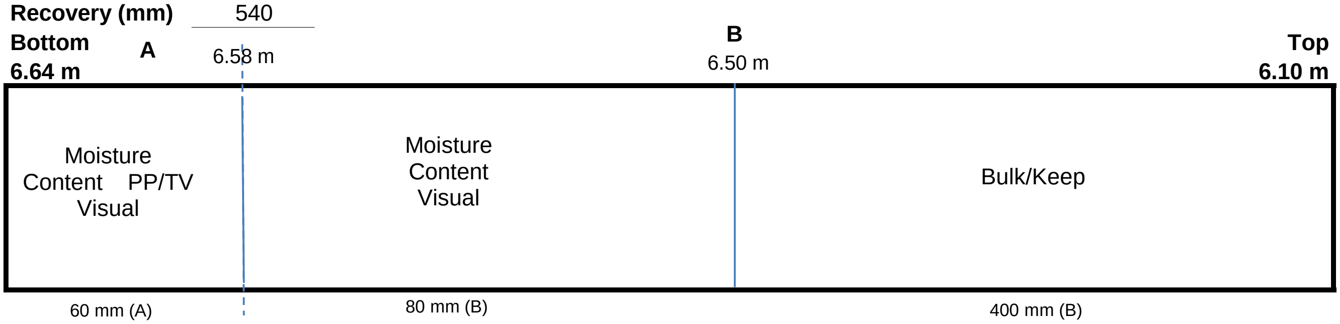
Shelby Tube Visual

Project No.	0002-171-00
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation
Test Hole	TH25-03
Sample #	T09
Depth (m)	6.1 - 6.7
Sample Date	24-Mar-25
Test Date	17-Apr-25
Technician	A. Dustmamatov

Tube Extraction

Recovery (mm) 540



Visual Classification

	A	B
Material	CLAY	SAND
Composition	silty	trace clay
	trace fine sand	trace silt
	trace oxidation	trace oxidation
Color	grey	beige
Moisture	moist	moist
Consistency	firm to stiff	compact
Plasticity	intermediate plasticity	no to low plasticity
Structure		
Gradation		

Torvane

	A	B	
Reading	0.5	-	
Vane Size (s,m,l)	m	m	
Undrained Shear Strength	49.0	-	(kPa)

Pocket Penetrometer

		A	B	
Reading	1	1.00	-	
	2	1.20	-	
	3	1.20	-	
	Average	1.13	-	
Undrained Shear Strength		55.6	-	(kPa)

Moisture Content

	A	B
Tare ID	E04	AA7
Mass tare (g)	6.8	6.6
Mass wet + tare (g)	292.4	538.0
Mass dry + tare (g)	226.4	441.0
Moisture %	30.1%	22.3%

Unit Weight

Bulk Weight (g)		-	1127.20
Length (mm)	1	-	143.11
	2	-	143.11
	3	-	143.21
	4	-	143.00
Average Length (m)		-	0.143
Diam. (mm)	1	-	71.40
	2	-	72.20
	3	-	72.40
	4	-	70.79
Average Diameter (m)		-	0.072
Volume (m^3)		-	5.78E-04
Bulk Unit Weight (kN/m^3)		-	19.1
Bulk Unit Weight (pcf)		-	121.8
Dry Unit Weight (kN/m^3)		-	15.6
Dry Unit Weight (pcf)		-	99.6

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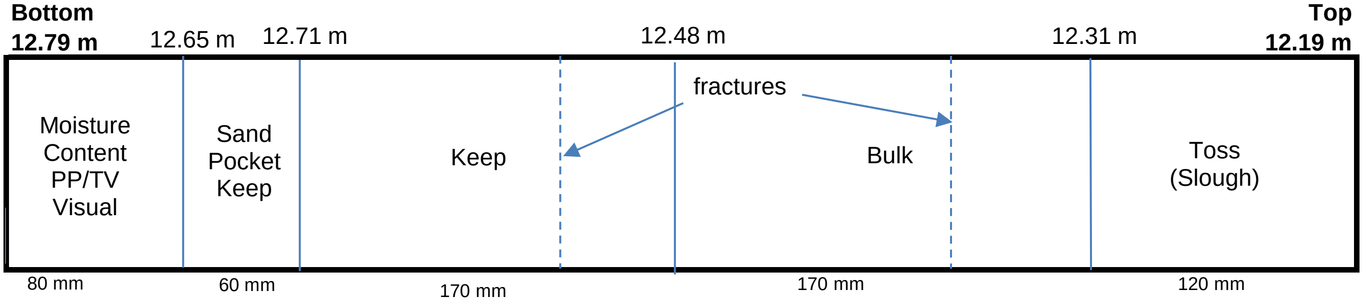
Shelby Tube Visual

Project No.	0002-171-00
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation
Test Hole	TH25-03
Sample #	T15
Depth (m)	12.2 - 12.8
Sample Date	24-Mar-25
Test Date	17-Apr-25
Technician	A. Dustmamatov

Tube Extraction

Recovery (mm) 600



Visual Classification

Material	CLAY
Composition	silty
trace to some fine sand	
trace organics	
Color	dark grey
Moisture	moist
Consistency	firm to stiff
Plasticity	intermediate to high plasticity
Structure	friable
Gradation	-

Torvane

Reading	0.50
Vane Size (s,m,l)	m
Undrained Shear Strength (kPa)	49.0

Pocket Penetrometer

Reading	**1**	1.00
	2	1.20
	3	1.20
	Average	1.13
Undrained Shear Strength (kPa)		55.6

Moisture Content

Tare ID	QT76
Mass tare (g)	8.2
Mass wet + tare (g)	340.2
Mass dry + tare (g)	256.8
Moisture %	33.5%

Unit Weight

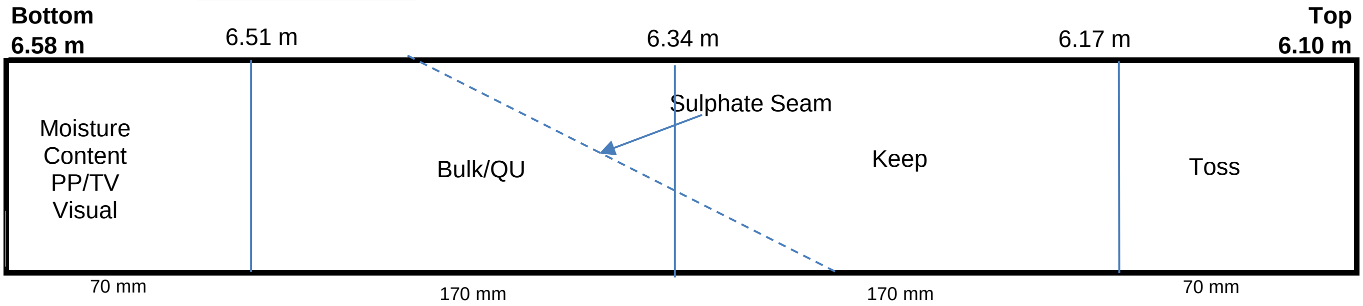
Bulk Weight (g)		966.0
Length (mm)	**1**	122.92
	2	122.68
	3	122.55
	4	122.79
Average Length (m)		0.123
Diam. (mm)	**1**	72.58
	2	72.46
	3	72.29
	4	72.44
Average Diameter (m)		0.072
Volume (m^3)		5.06E-04
Bulk Unit Weight (kN/m^3)		18.7
Bulk Unit Weight (pcf)		119.2
Dry Unit Weight (kN/m^3)		14.0
Dry Unit Weight (pcf)		89.3

Shelby Tube Visual

Project No.	0002-171-00
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation
Test Hole	TH25-02
Sample #	T34
Depth (m)	6.1 - 6.7
Sample Date	24-Mar-25
Test Date	17-Apr-25
Technician	A. Dustmamatov

Tube Extraction

Recovery (mm) 480



Visual Classification

Material	CLAY
Composition	silty
trace silt inclusions (<3mm diam.)	
trace precipitates (sulphate seam, <5mm thick)	
trace rootlets	
Color	mottled grand and brown
Moisture	moist
Consistency	stiff
Plasticity	high plasticity
Structure	laminated (brown and grey clay, <1mm thick)
Gradation	-

Torvane

Reading	0.85
Vane Size (s,m,l)	m
Undrained Shear Strength (kPa)	83.4

Pocket Penetrometer

Reading	**1**	1.70
	2	1.80
	3	1.70
	Average	1.73
Undrained Shear Strength (kPa)		85.0

Moisture Content

Tare ID	P14
Mass tare (g)	8.6
Mass wet + tare (g)	333.4
Mass dry + tare (g)	228.2
Moisture %	47.9%

Unit Weight

Bulk Weight (g)		1061.0
Length (mm)	**1**	149.07
	2	149.02
	3	149.31
	4	149.18
Average Length (m)		0.149
Diam. (mm)	**1**	72.57
	2	72.45
	3	72.30
	4	72.06
Average Diameter (m)		0.072
Volume (m^3)		6.13E-04
Bulk Unit Weight (kN/m^3)		17.0
Bulk Unit Weight (pcf)		108.0
Dry Unit Weight (kN/m^3)		11.5
Dry Unit Weight (pcf)		73.0

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Unconfined Compressive Strength

ASTM D2166

Project No.	0002-171-00
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation

Test Hole	TH25-02
Sample #	T34
Depth (m)	6.1 - 6.7
Sample Date	24-Mar-25
Test Date	17-Apr-25
Technician	A. Dustmamatov

Unconfined Strength

	kPa	ksf
Max q_u	101.3	2.1
Max S_u	50.7	1.1

Specimen Data

Description CLAY - silty, trace silt inclusions (<3mm diam.), trace precipitates (sulphate seam, <5mm thick), trace rootlets, mottled grand and brown, moist, stiff, high plasticity, laminated (brown and grey clay, <1mm thick)

Length	149.1	(mm)	**Moisture %**	48%	
Diameter	72.3	(mm)	**Bulk Unit Wt.**	17.0	(kN/m^3)
L/D Ratio	2.1		**Dry Unit Wt.**	11.5	(kN/m^3)
Initial Area	0.00411	(m^2)	**Liquid Limit**	-	
Load Rate	1.00	(%/min)	**Plastic Limit**	-	
			Plasticity Index	-	

Undrained Shear Strength Tests

Torvane

Reading	**Undrained Shear Strength**	
tsf	**kPa**	**ksf**
0.85	83.4	1.74
Vane Size		
m		

Pocket Penetrometer

	Reading	**Undrained Shear Strength**	
	tsf	**kPa**	**ksf**
	1.70	83.4	1.74
	1.80	88.3	1.84
	1.70	83.4	1.74
Average	**1.73**	**85.0**	**1.8**

Failure Geometry

Sketch:

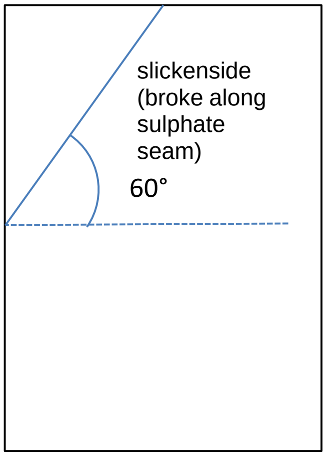


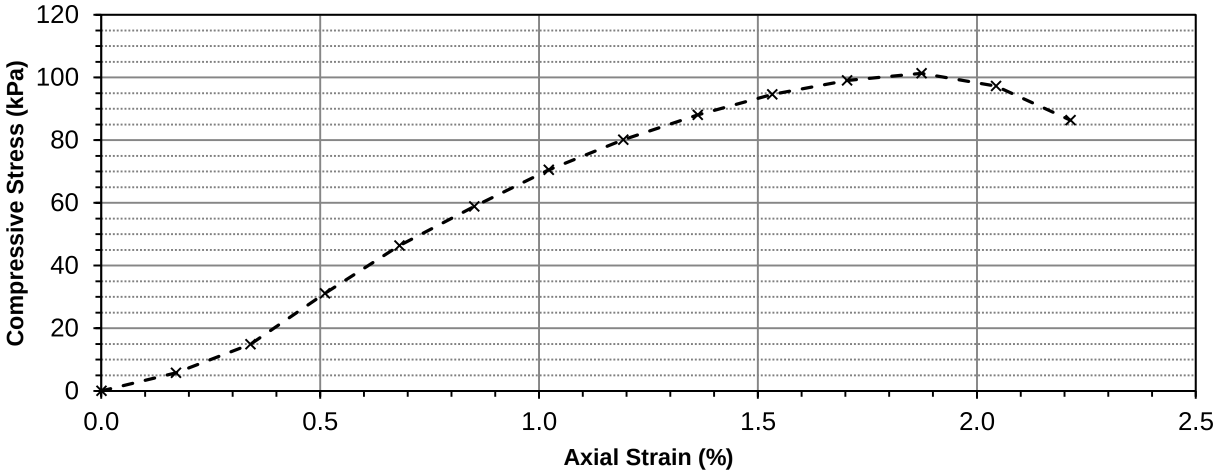
Photo:

Unconfined Compressive Strength

ASTM D2166

Project No. 0002-171-00
Client Tetra Tech Inc.
Project Louise Bridge Rehabilitation

Unconfined Compression Test Graph



Unconfined Compression Test Data

Deformation Dial Reading	Load Ring Dial Reading	Deflection (mm)	Axial Strain (%)	Corrected Area (m^2)	Axial Load (N)	Compressive Stress, q_u (kPa)	Shear Stress, S_u (kPa)
0	1.02	0.0000	0.00	0.004111	0.0	0.00	0.00
10	1.49	0.2540	0.17	0.004118	23.7	5.75	2.88
20	2.24	0.5080	0.34	0.004125	61.5	14.91	7.45
30	3.57	0.7620	0.51	0.004132	128.5	31.11	15.55
40	4.83	1.0160	0.68	0.004139	192.0	46.40	23.20
50	5.86	1.2700	0.85	0.004146	244.0	58.84	29.42
60	6.83	1.5240	1.02	0.004153	292.8	70.51	35.26
70	7.63	1.7780	1.19	0.004160	333.2	80.08	40.04
80	8.30	2.0320	1.36	0.004167	366.9	88.05	44.02
90	8.85	2.2860	1.53	0.004175	394.7	94.54	47.27
100	9.24	2.5400	1.70	0.004182	414.3	99.07	49.54
110	9.44	2.7940	1.87	0.004189	424.4	101.31	50.65
120	9.12	3.0480	2.04	0.004196	408.3	97.29	48.64
130	8.22	3.3020	2.21	0.004204	362.9	86.33	43.16

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Shelby Tube Visual

Project No.	0002-171-00
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation
Test Hole	TH25-02
Sample #	T36
Depth (m)	9.1 - 9.8
Sample Date	24-Mar-25
Test Date	17-Apr-25
Technician	A. Dustmamatov

Tube Extraction

Recovery (mm) 510

Bottom **9.65 m**	9.49 m	9.42 m	9.24 m	**Top** **9.14 m**
Keep	Moisture Content PP/TV Visual	Bulk/QU	Toss	
160 mm	70 mm	180 mm	100 mm	

Visual Classification

Material	CLAY
Composition	silty
trace silt inclusions (<10mm diam.)	
trace oxidation	
Color	grey
Moisture	moist
Consistency	very stiff
Plasticity	high plasticity
Structure	friable
Gradation	-

Torvane

Reading	0.50
Vane Size (s,m,l)	s
Undrained Shear Strength (kPa)	122.6

Pocket Penetrometer

Reading	**1**	2.50
	2	2.30
	3	2.20
	Average	2.33
Undrained Shear Strength (kPa)		114.4

Moisture Content

Tare ID	D203
Mass tare (g)	6.8
Mass wet + tare (g)	342.4
Mass dry + tare (g)	248.7
Moisture %	38.7%

Unit Weight

Bulk Weight (g)		1144.4
Length (mm)	**1**	151.94
	2	152.02
	3	152.16
	4	152.13
Average Length (m)		0.152
Diam. (mm)	**1**	72.30
	2	72.39
	3	72.28
	4	72.38
Average Diameter (m)		0.072
Volume (m^3)		6.25E-04
Bulk Unit Weight (kN/m^3)		18.0
Bulk Unit Weight (pcf)		114.3
Dry Unit Weight (kN/m^3)		12.9
Dry Unit Weight (pcf)		82.4

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Unconfined Compressive Strength

ASTM D2166

Project No.	0002-171-00
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation

Test Hole	TH25-02
Sample #	T36
Depth (m)	9.1 - 9.8
Sample Date	24-Mar-25
Test Date	17-Apr-25
Technician	A. Dustmamatov

Unconfined Strength

	kPa	ksf
Max q_u	141.2	2.9
Max S_u	70.6	1.5

Specimen Data

Description CLAY - silty, trace silt inclusions (<10mm diam.), trace oxidation, grey, moist, very stiff, high plasticity, friable

Length	152.1	(mm)
Diameter	72.3	(mm)
L/D Ratio	2.1	
Initial Area	0.00411	(m^2)
Load Rate	1.00	(%/min)

Moisture %	39%	
Bulk Unit Wt.	18.0	(kN/m^3)
Dry Unit Wt.	12.9	(kN/m^3)
Liquid Limit	-	
Plastic Limit	-	
Plasticity Index	-	

Undrained Shear Strength Tests

Torvane

Reading	**Undrained Shear Strength**	
tsf	**kPa**	**ksf**
0.50	122.6	2.56

Vane Size

s

Pocket Penetrometer

	Reading	**Undrained Shear Strength**	
	tsf	**kPa**	**ksf**
	2.50	122.6	2.56
	2.30	112.8	2.36
	2.20	107.9	2.25
Average	**2.33**	**114.5**	**2.4**

Failure Geometry

Sketch:

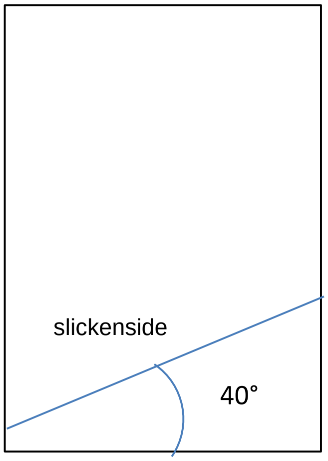


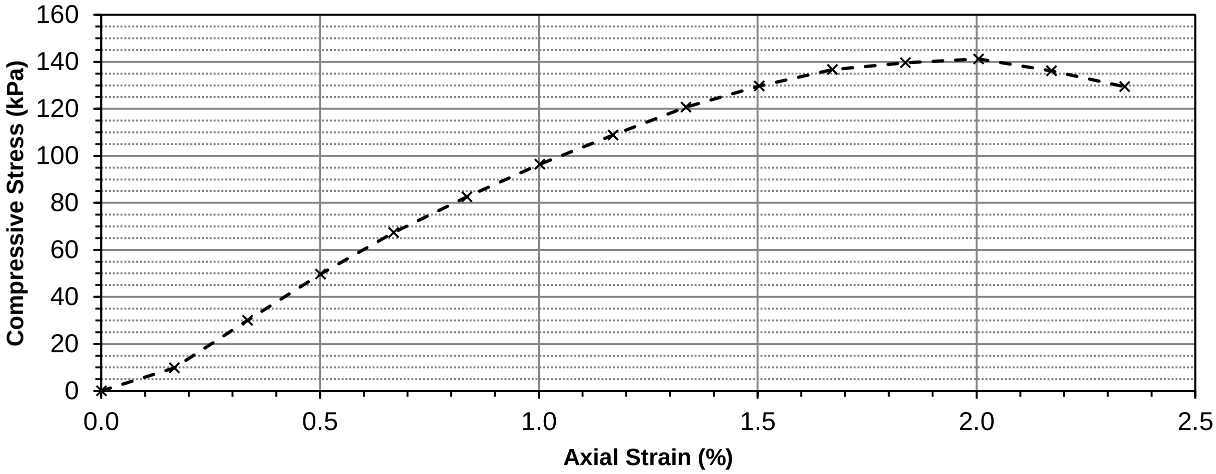
Photo:

Unconfined Compressive Strength

ASTM D2166

Project No. 0002-171-00
Client Tetra Tech Inc.
Project Louise Bridge Rehabilitation

Unconfined Compression Test Graph



Unconfined Compression Test Data

Deformation Dial Reading	Load Ring Dial Reading	Deflection (mm)	Axial Strain (%)	Corrected Area (m^2)	Axial Load (N)	Compressive Stress, q_u (kPa)	Shear Stress, S_u (kPa)
0	1.13	0.0000	0.00	0.004110	0.0	0.00	0.00
10	1.93	0.2540	0.17	0.004117	40.3	9.79	4.90
20	3.58	0.5080	0.33	0.004124	123.5	29.95	14.97
30	5.20	0.7620	0.50	0.004130	205.1	49.67	24.83
40	6.66	1.0160	0.67	0.004137	278.7	67.37	33.68
50	7.92	1.2700	0.84	0.004144	342.2	82.58	41.29
60	9.07	1.5240	1.00	0.004151	400.2	96.40	48.20
70	10.11	1.7780	1.17	0.004158	452.6	108.84	54.42
80	11.10	2.0320	1.34	0.004165	502.5	120.64	60.32
90	11.86	2.2860	1.50	0.004172	540.8	129.62	64.81
100	12.46	2.5400	1.67	0.004180	571.1	136.63	68.32
110	12.72	2.7940	1.84	0.004187	584.2	139.53	69.77
120	12.88	3.0480	2.00	0.004194	592.2	141.22	70.61
130	12.48	3.3020	2.17	0.004201	572.1	136.18	68.09
140	11.93	3.5560	2.34	0.004208	544.4	129.36	64.68

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Shelby Tube Visual

Project No.	0002-171-00
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation
Test Hole	TH25-02
Sample #	T38
Depth (m)	12.2 - 12.8
Sample Date	24-Mar-25
Test Date	16-Apr-25
Technician	A. Dustmamatov

Tube Extraction

Recovery (mm) 540

Bottom **12.73 m**	12.65 m	12.47 m	12.30 m	**Top** **12.19 m**
Moisture Content PP/TV Visual	Bulk/QU	Keep	Toss	
80 mm	180 mm	170 mm	110 mm	

Visual Classification

Material	CLAY
Composition	silty
trace silt inclusions (<10mm diam.)	
trace sand	
Color	grey
Moisture	moist
Consistency	stiff
Plasticity	high plasticity
Structure	-
Gradation	-

Torvane

Reading	0.75
Vane Size (s,m,l)	m
Undrained Shear Strength (kPa)	73.6

Pocket Penetrometer

Reading	**1**	1.50
	2	1.60
	3	1.60
	Average	1.57
Undrained Shear Strength (kPa)		76.8

Moisture Content

Tare ID	QT40
Mass tare (g)	8.4
Mass wet + tare (g)	381.0
Mass dry + tare (g)	257.8
Moisture %	49.4%

Unit Weight

Bulk Weight (g)		1046.6
Length (mm)	**1**	148.45
	2	148.59
	3	148.45
	4	148.43
Average Length (m)		0.148
Diam. (mm)	**1**	72.09
	2	72.39
	3	71.90
	4	72.74
Average Diameter (m)		0.072
Volume (m^3)		6.09E-04
Bulk Unit Weight (kN/m^3)		16.8
Bulk Unit Weight (pcf)		107.2
Dry Unit Weight (kN/m^3)		11.3
Dry Unit Weight (pcf)		71.8

Unconfined Compressive Strength
ASTM D2166

Project No.	0002-171-00
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation

Test Hole	TH25-02
Sample #	T38
Depth (m)	12.2 - 12.8
Sample Date	24-Mar-25
Test Date	16-Apr-25
Technician	A. Dustmamatov

Unconfined Strength

	kPa	**ksf**
Max q_u	129.7	2.7
Max S_u	64.9	1.4

Specimen Data

Description CLAY - silty, trace silt inclusions (<10mm diam.), trace sand, grey, moist, stiff, high plasticity

Length	148.5	(mm)	**Moisture %**	49%	
Diameter	72.3	(mm)	**Bulk Unit Wt.**	16.8	(kN/m^3)
L/D Ratio	2.1		**Dry Unit Wt.**	11.3	(kN/m^3)
Initial Area	0.00410	(m^2)	**Liquid Limit**	-	
Load Rate	1.00	(%/min)	**Plastic Limit**	-	
			Plasticity Index	-	

Undrained Shear Strength Tests

Torvane

Reading	**Undrained Shear Strength**	
tsf	**kPa**	**ksf**
0.75	73.6	1.54
Vane Size		
m		

Pocket Penetrometer

	Reading	**Undrained Shear Strength**	
	tsf	**kPa**	**ksf**
	1.50	73.6	1.54
	1.60	78.5	1.64
	1.60	78.5	1.64
Average	**1.57**	**76.8**	**1.6**

Failure Geometry

Sketch:

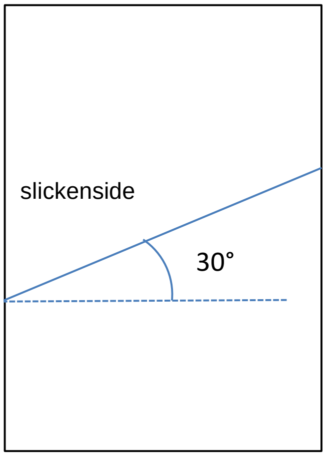


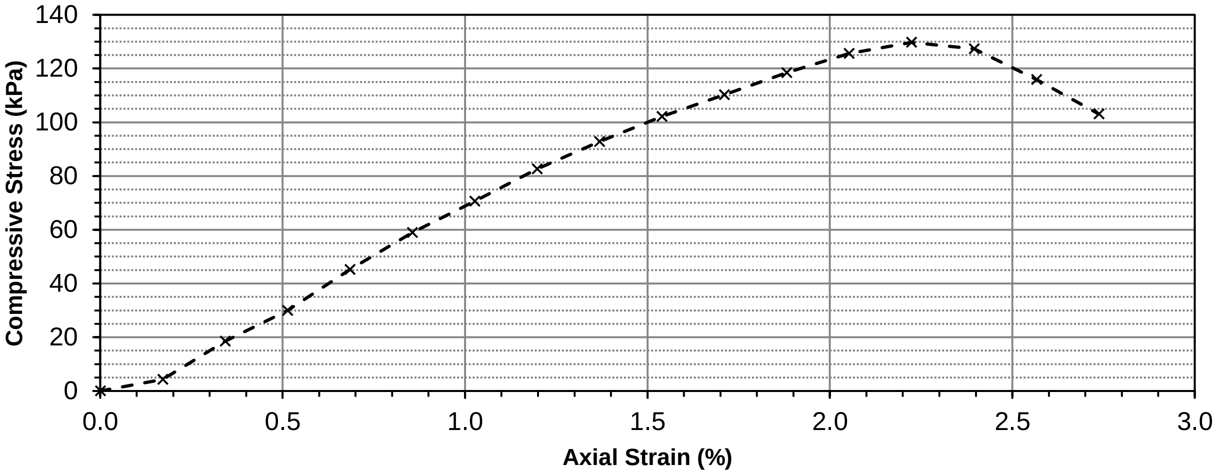
Photo:

Unconfined Compressive Strength

ASTM D2166

Project No. 0002-171-00
Client Tetra Tech Inc.
Project Louise Bridge Rehabilitation

Unconfined Compression Test Graph



Unconfined Compression Test Data

Deformation Dial Reading	Load Ring Dial Reading	Deflection (mm)	Axial Strain (%)	Corrected Area (m^2)	Axial Load (N)	Compressive Stress, q_u (kPa)	Shear Stress, S_u (kPa)
0	1.09	0.0000	0.00	0.004103	0.0	0.00	0.00
10	1.44	0.2540	0.17	0.004110	17.6	4.29	2.15
20	2.60	0.5080	0.34	0.004117	76.1	18.48	9.24
30	3.54	0.7620	0.51	0.004124	123.5	29.94	14.97
40	4.79	1.0160	0.68	0.004132	186.5	45.14	22.57
50	5.93	1.2700	0.86	0.004139	244.0	58.94	29.47
60	6.90	1.5240	1.03	0.004146	292.8	70.64	35.32
70	7.90	1.7780	1.20	0.004153	343.2	82.65	41.33
80	8.75	2.0320	1.37	0.004160	386.1	92.81	46.40
90	9.54	2.2860	1.54	0.004167	425.9	102.20	51.10
100	10.22	2.5400	1.71	0.004175	460.2	110.23	55.12
110	10.92	2.7940	1.88	0.004182	495.5	118.48	59.24
120	11.53	3.0480	2.05	0.004189	526.2	125.61	62.80
130	11.89	3.3020	2.22	0.004197	544.4	129.71	64.86
140	11.71	3.5560	2.39	0.004204	535.3	127.33	63.66
150	10.77	3.8100	2.57	0.004211	487.9	115.86	57.93
160	9.72	4.0640	2.74	0.004219	435.0	103.11	51.55

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Tel: 204.975.9433 Fax: 204.975.9435

Shelby Tube Visual

Project No.	0002-171-00
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation
Test Hole	TH25-02
Sample #	T41
Depth (m)	15.2 - 15.8
Sample Date	24-Mar-25
Test Date	15-Apr-25
Technician	A. Dustmamatov

Tube Extraction

Recovery (mm) 610

Bottom **15.85 m**	15.68 m	15.51 m	15.41 m	**Top** **15.24 m**
Keep	Bulk/QU	Moisture Content PP/TV Visual	Toss	
170 mm	170 mm	100 mm	170 mm	

Visual Classification

Material	CLAY
Composition	silty
trace silt inclusions (<5mm diam.)	
trace fine sand	
trace silt seam (5mm thick)	
Color	grey
Moisture	moist
Consistency	stiff
Plasticity	high plasticity
Structure	-
Gradation	-

Torvane

Reading	0.55
Vane Size (s,m,l)	m
Undrained Shear Strength (kPa)	53.9

Pocket Penetrometer

Reading	**1**	1.10
	2	1.00
	3	1.10
	Average	1.07
Undrained Shear Strength (kPa)		52.3

Moisture Content

Tare ID	QT02
Mass tare (g)	8.2
Mass wet + tare (g)	458.2
Mass dry + tare (g)	294.8
Moisture %	57.0%

Unit Weight

Bulk Weight (g)		1015.4
Length (mm)	**1**	148.44
	2	148.99
	3	148.55
	4	148.44
Average Length (m)		0.149
Diam. (mm)	**1**	71.95
	2	72.71
	3	72.46
	4	72.74
Average Diameter (m)		0.072
Volume (m^3)		6.13E-04
Bulk Unit Weight (kN/m^3)		16.2
Bulk Unit Weight (pcf)		103.4
Dry Unit Weight (kN/m^3)		10.3
Dry Unit Weight (pcf)		65.9

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Unconfined Compressive Strength

ASTM D2166

Project No. 0002-171-00
Client Tetra Tech Inc.
Project Louise Bridge Rehabilitation

Test Hole TH25-02
Sample # T41
Depth (m) 15.2 - 15.8
Sample Date 24-Mar-25
Test Date 15-Apr-25
Technician A. Dustmamatov

Unconfined Strength

	kPa	ksf
Max q_u	83.7	1.7
Max S_u	41.8	0.9

Specimen Data

Description CLAY - silty, trace silt inclusions (<5mm diam.), trace fine sand, trace silt seam (5mm thick), grey, moist, stiff, high plasticity

Length	148.6	(mm)
Diameter	72.5	(mm)
L/D Ratio	2.1	
Initial Area	0.00412	(m^2)
Load Rate	1.00	(%/min)

Moisture %	57%	
Bulk Unit Wt.	16.2	(kN/m^3)
Dry Unit Wt.	10.3	(kN/m^3)
Liquid Limit	93	
Plastic Limit	26	
Plasticity Index	67	

Undrained Shear Strength Tests

Torvane

Reading	**Undrained Shear Strength**	
tsf	**kPa**	**ksf**
0.55	53.9	1.13
Vane Size		
m		

Pocket Penetrometer

	Reading	**Undrained Shear Strength**	
	tsf	**kPa**	**ksf**
	1.10	54.0	1.13
	1.00	49.1	1.02
	1.10	54.0	1.13
Average	**1.07**	**52.3**	**1.1**

Failure Geometry

Sketch:

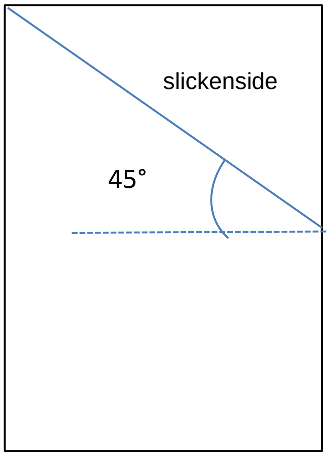

Photo:


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Project 0002-171-00
Location LOUISE BRIDGE REHAB
Hole No. TH25-02 Sample No. T41
Depth 50'-52'
Technician DC Date APR 1, 2025

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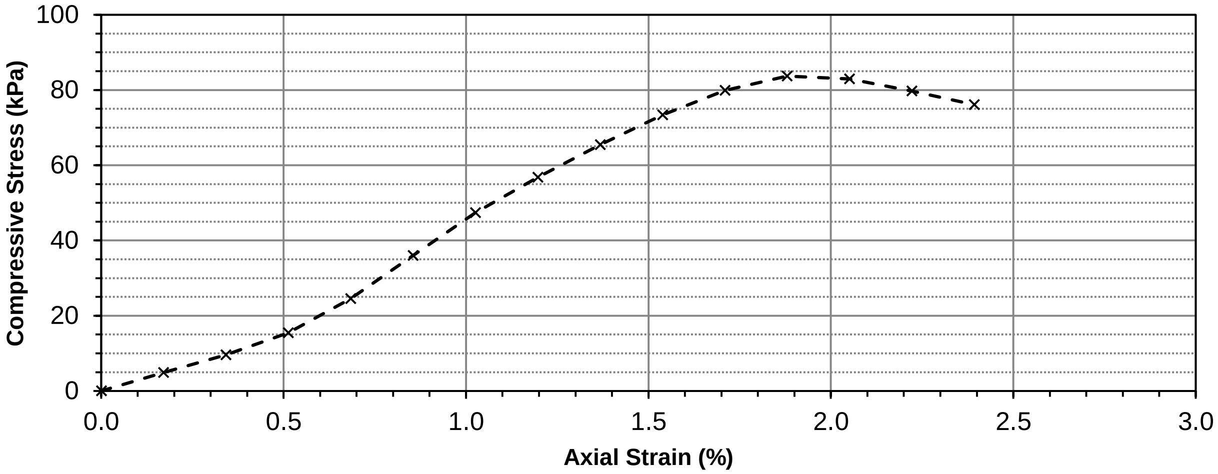
Unconfined Compressive Strength

ASTM D2166

Project No. 0002-171-00
Client Tetra Tech Inc.
Project Louise Bridge Rehabilitation

Unconfined Compression Test Graph



Unconfined Compression Test Data

Deformation Dial Reading	Load Ring Dial Reading	Deflection (mm)	Axial Strain (%)	Corrected Area (m^2)	Axial Load (N)	Compressive Stress, q_u (kPa)	Shear Stress, S_u (kPa)
0	1.09	0.0000	0.00	0.004124	0.0	0.00	0.00
10	1.49	0.2540	0.17	0.004131	20.2	4.88	2.44
20	1.88	0.5080	0.34	0.004138	39.8	9.62	4.81
30	2.36	0.7620	0.51	0.004146	64.0	15.44	7.72
40	3.11	1.0160	0.68	0.004153	101.8	24.52	12.26
50	4.06	1.2700	0.85	0.004160	149.7	35.99	17.99
60	5.01	1.5240	1.03	0.004167	197.6	47.42	23.71
70	5.79	1.7780	1.20	0.004174	236.9	56.75	28.38
80	6.52	2.0320	1.37	0.004181	273.7	65.45	32.73
90	7.19	2.2860	1.54	0.004189	307.5	73.40	36.70
100	7.74	2.5400	1.71	0.004196	335.2	79.88	39.94
110	8.07	2.7940	1.88	0.004203	351.8	83.70	41.85
120	8.02	3.0480	2.05	0.004211	349.3	82.96	41.48
130	7.76	3.3020	2.22	0.004218	336.2	79.70	39.85
140	7.47	3.5560	2.39	0.004225	321.6	76.10	38.05

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Shelby Tube Visual

Project No.	0002-171-00
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation
Test Hole	TH25-02
Sample #	T42
Depth (m)	18.3 - 18.9
Sample Date	02-Apr-25
Test Date	16-Apr-25
Technician	A. Dustmamatov

Tube Extraction

Recovery (mm) 510

Bottom **18.80 m**	18.70 m	18.53 m	18.36 m	**Top** **18.29 m**
Moisture Content PP/TV Visual	Bulk/QU	Keep	Toss	
100 mm	170 mm	170 mm	70 mm	

Visual Classification

Material	CLAY
Composition	silty
trace silt inclusions (<5mm diam.)	
Color	grey
Moisture	moist
Consistency	firm
Plasticity	high plasticity
Structure	-
Gradation	-

Torvane

Reading	0.30
Vane Size (s,m,l)	m
Undrained Shear Strength (kPa)	29.4

Pocket Penetrometer

Reading	**1**	0.60
	2	0.70
	3	0.60
	Average	0.63
Undrained Shear Strength (kPa)		31.1

Moisture Content

Tare ID	D237
Mass tare (g)	7.2
Mass wet + tare (g)	376.0
Mass dry + tare (g)	222.4
Moisture %	71.4%

Unit Weight

Bulk Weight (g)		988.8
Length (mm)	**1**	150.30
	2	150.29
	3	150.13
	4	150.09
Average Length (m)		0.150
Diam. (mm)	**1**	72.02
	2	71.97
	3	72.23
	4	72.67
Average Diameter (m)		0.072
Volume (m^3)		6.15E-04
Bulk Unit Weight (kN/m^3)		15.8
Bulk Unit Weight (pcf)		100.3
Dry Unit Weight (kN/m^3)		9.2
Dry Unit Weight (pcf)		58.5

Unconfined Compressive Strength

ASTM D2166

Project No.	0002-171-00
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation

Test Hole	TH25-02
Sample #	T42
Depth (m)	18.3 - 18.9
Sample Date	02-Apr-25
Test Date	16-Apr-25
Technician	A. Dustmamatov

Unconfined Strength

	kPa	ksf
Max q_u	42.2	0.9
Max S_u	21.1	0.4

Specimen Data

Description CLAY - silty, trace silt inclusions (<5mm diam.), grey, moist, firm, high plasticity

Length	150.2	(mm)
Diameter	72.2	(mm)
L/D Ratio	2.1	
Initial Area	0.00410	(m^2)
Load Rate	1.00	(%/min)

Moisture %	71%	
Bulk Unit Wt.	15.8	(kN/m^3)
Dry Unit Wt.	9.2	(kN/m^3)
Liquid Limit	-	
Plastic Limit	-	
Plasticity Index	-	

Undrained Shear Strength Tests

Torvane

Reading	**Undrained Shear Strength**	
tsf	**kPa**	**ksf**
0.30	29.4	0.61
Vane Size		
m		

Pocket Penetrometer

	Reading	**Undrained Shear Strength**	
	tsf	**kPa**	**ksf**
	0.60	29.4	0.61
	0.70	34.3	0.72
	0.60	29.4	0.61
Average	**0.63**	**31.1**	**0.6**

Failure Geometry

Sketch:

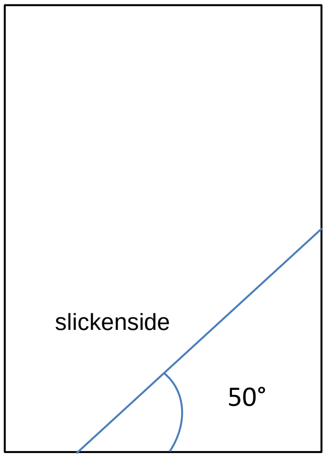
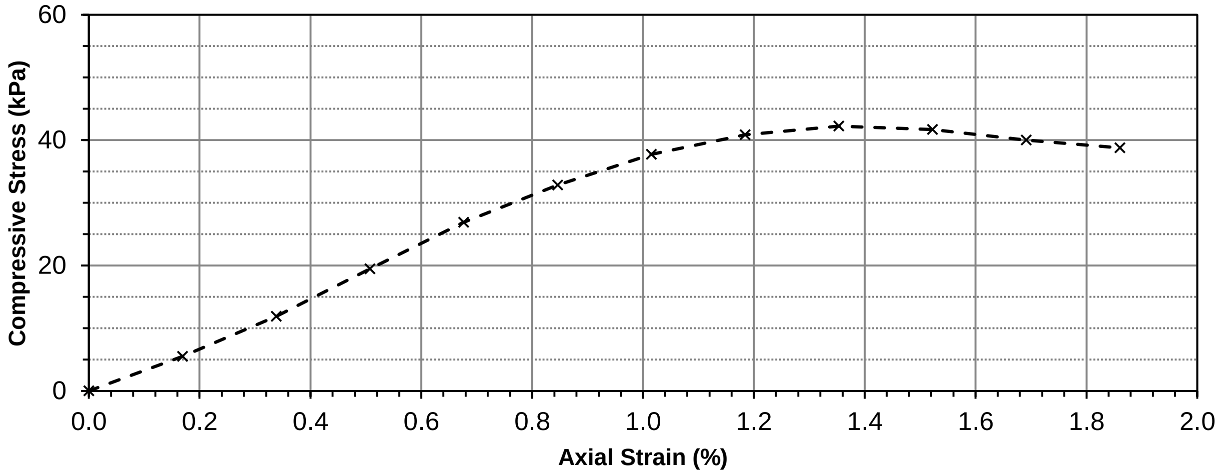


Photo:

Unconfined Compressive Strength
ASTM D2166

Project No. 0002-171-00
Client Tetra Tech Inc.
Project Louise Bridge Rehabilitation

Unconfined Compression Test Graph



Unconfined Compression Test Data

Deformation Dial Reading	Load Ring Dial Reading	Deflection (mm)	Axial Strain (%)	Corrected Area (m^2)	Axial Load (N)	Compressive Stress, q_u (kPa)	Shear Stress, S_u (kPa)
0	1.08	0.0000	0.00	0.004097	0.0	0.00	0.00
10	1.53	0.2540	0.17	0.004104	22.7	5.53	2.76
20	2.05	0.5080	0.34	0.004111	48.9	11.89	5.95
30	2.67	0.7620	0.51	0.004118	80.1	19.46	9.73
40	3.28	1.0160	0.68	0.004125	110.9	26.88	13.44
50	3.77	1.2700	0.85	0.004132	135.6	32.82	16.41
60	4.18	1.5240	1.01	0.004139	156.2	37.75	18.88
70	4.44	1.7780	1.18	0.004146	169.4	40.85	20.42
80	4.56	2.0320	1.35	0.004153	175.4	42.24	21.12
90	4.52	2.2860	1.52	0.004160	173.4	41.68	20.84
100	4.39	2.5400	1.69	0.004167	166.8	40.04	20.02
110	4.29	2.7940	1.86	0.004174	161.8	38.76	19.38

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Shelby Tube Visual

Project No.	0002-171-00
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation
Test Hole	TH25-01
Sample #	T57
Depth (m)	4.6 - 5.2
Sample Date	03-Apr-25
Test Date	14-Apr-25
Technician	A. Bhullar

Tube Extraction

Recovery (mm) 535

Bottom **Top**

5.11 m 5.05 m 4.87 m 4.64 m **4.57 m**

Moisture Content PP/TV Visual	Bulk/QU	Keep	Keep
60 mm	180 mm	230 mm	65 mm

Visual Classification

Material	CLAY
Composition	silty
trace sand	
trace gravel (<10mm diam.)	
trace silt inclusions (<10mm diam.)	
trace oxidation	
Color	greyish brown
Moisture	moist
Consistency	stiff
Plasticity	high plasticity
Structure	-
Gradation	-

Torvane

Reading	0.75
Vane Size (s,m,l)	m
Undrained Shear Strength (kPa)	73.6

Pocket Penetrometer

Reading	**1**	1.50
	2	1.50
	3	1.60
	Average	1.53
Undrained Shear Strength (kPa)		75.2

Moisture Content

Tare ID	AB61
Mass tare (g)	6.8
Mass wet + tare (g)	426.4
Mass dry + tare (g)	300.8
Moisture %	42.7%

Unit Weight

Bulk Weight (g)		1131.6
Length (mm)	**1**	151.63
	2	152.20
	3	151.90
	4	151.80
Average Length (m)		0.152
Diam. (mm)	**1**	72.20
	2	72.50
	3	72.50
	4	72.06
Average Diameter (m)		0.072
Volume (m^3)		6.24E-04
Bulk Unit Weight (kN/m^3)		17.8
Bulk Unit Weight (pcf)		113.2
Dry Unit Weight (kN/m^3)		12.5
Dry Unit Weight (pcf)		79.3

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Unconfined Compressive Strength

ASTM D2166

Project No.	0002-171-00
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation

Test Hole	TH25-01
Sample #	T57
Depth (m)	4.6 - 5.2
Sample Date	03-Apr-25
Test Date	14-Apr-25
Technician	A. Bhullar

Unconfined Strength

	kPa	**ksf**
Max q_u	158.0	3.3
Max S_u	79.0	1.6

Specimen Data

Description CLAY - silty, trace sand, trace gravel (<10mm diam.), trace silt inclusions (<10mm diam.), trace oxidation, greyish brown, moist, stiff, high plasticity

Length	151.9	(mm)	**Moisture %**	43%	
Diameter	72.3	(mm)	**Bulk Unit Wt.**	17.8	(kN/m^3)
L/D Ratio	2.1		**Dry Unit Wt.**	12.5	(kN/m^3)
Initial Area	0.00411	(m^2)	**Liquid Limit**	-	
Load Rate	1.00	(%/min)	**Plastic Limit**	-	
			Plasticity Index	-	

Undrained Shear Strength Tests

Torvane

Reading	**Undrained Shear Strength**	
tsf	**kPa**	**ksf**
0.75	73.6	1.54
Vane Size		
m		

Pocket Penetrometer

	Reading	**Undrained Shear Strength**	
	tsf	**kPa**	**ksf**
	1.50	73.6	1.54
	1.50	73.6	1.54
	1.60	78.5	1.64
Average	**1.53**	**75.2**	**1.6**

Failure Geometry

Sketch:

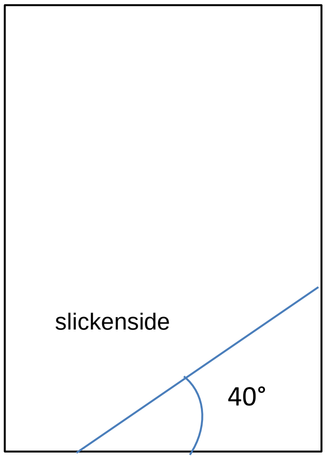
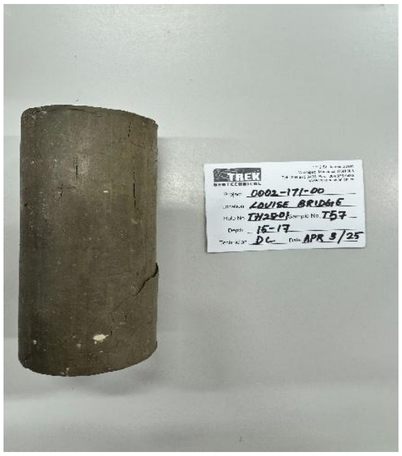


Photo:

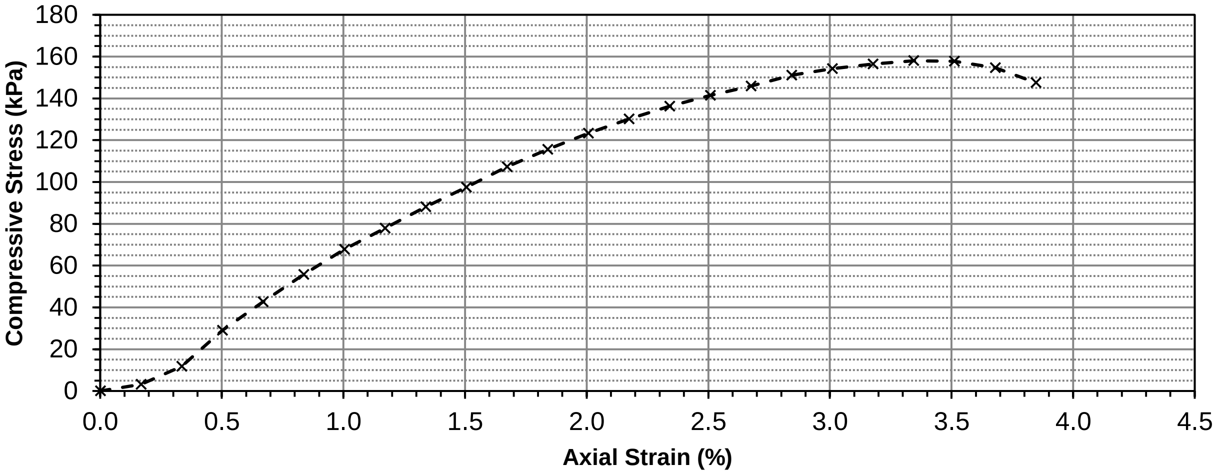


Unconfined Compressive Strength

ASTM D2166

Project No. 0002-171-00
Client Tetra Tech Inc.
Project Louise Bridge Rehabilitation

Unconfined Compression Test Graph



Unconfined Compression Test Data

Deformation Dial Reading	Load Ring Dial Reading	Deflection (mm)	Axial Strain (%)	Corrected Area (m^2)	Axial Load (N)	Compressive Stress, q_u (kPa)	Shear Stress, S_u (kPa)
0	1.02	0.0000	0.00	0.004107	0.0	0.00	0.00
10	1.28	0.2540	0.17	0.004114	13.1	3.19	1.59
20	1.98	0.5080	0.33	0.004121	48.4	11.74	5.87
30	3.39	0.7620	0.50	0.004128	119.5	28.94	14.47
40	4.52	1.0160	0.67	0.004135	176.4	42.66	21.33
50	5.60	1.2700	0.84	0.004142	230.8	55.74	27.87
60	6.60	1.5240	1.00	0.004149	281.2	67.79	33.89
70	7.44	1.7780	1.17	0.004156	323.6	77.86	38.93
80	8.30	2.0320	1.34	0.004163	366.9	88.14	44.07
90	9.08	2.2860	1.51	0.004170	406.2	97.42	48.71
100	9.91	2.5400	1.67	0.004177	448.1	107.27	53.64
110	10.61	2.7940	1.84	0.004184	483.4	115.52	57.76
120	11.27	3.0480	2.01	0.004191	516.6	123.26	61.63
130	11.86	3.3020	2.17	0.004198	546.4	130.13	65.07
140	12.39	3.5560	2.34	0.004206	573.1	136.26	68.13
150	12.84	3.8100	2.51	0.004213	595.8	141.41	70.71
160	13.23	4.0640	2.68	0.004220	615.4	145.83	72.91
170	13.69	4.3180	2.84	0.004227	638.6	151.06	75.53
180	13.97	4.5720	3.01	0.004235	652.7	154.14	77.07
190	14.19	4.8260	3.18	0.004242	663.8	156.48	78.24
200	14.34	5.0800	3.34	0.004249	671.4	157.99	79.00
210	14.34	5.3340	3.51	0.004257	671.4	157.72	78.86
220	14.10	5.5880	3.68	0.004264	659.3	154.61	77.31
230	13.52	5.8420	3.85	0.004272	630.0	147.50	73.75

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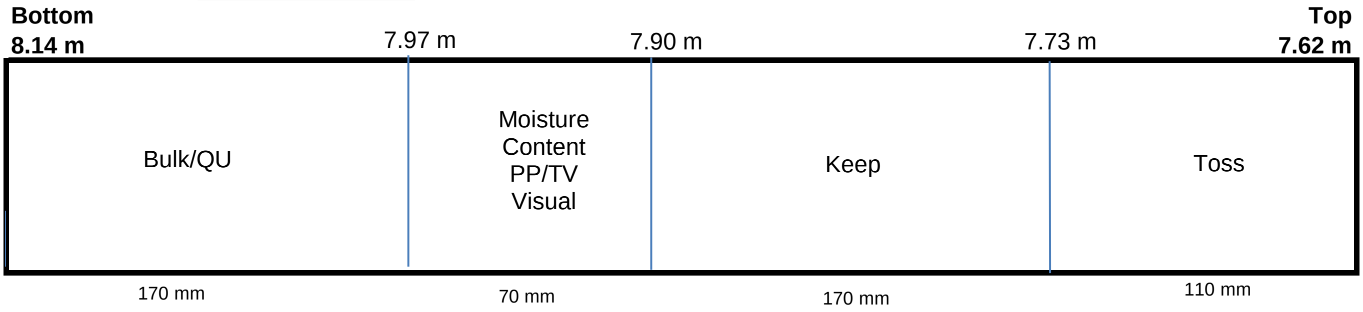
Shelby Tube Visual

Project No.	0002-171-00
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation
Test Hole	TH25-01
Sample #	T60
Depth (m)	7.6 - 8.2
Sample Date	03-Apr-25
Test Date	14-Apr-25
Technician	A. Dustmamatov

Tube Extraction

Recovery (mm) 520



Visual Classification

Material	CLAY
Composition	silty
trace gravel (<10mm diam.)	
trace silt inclusions (<5mm diam.)	
Color	grey
Moisture	moist
Consistency	stiff
Plasticity	high plasticity
Structure	-
Gradation	-

Torvane

Reading	0.65
Vane Size (s,m,l)	m
Undrained Shear Strength (kPa)	63.8

Pocket Penetrometer

Reading	**1**	1.20
	2	1.30
	3	1.20
	Average	1.23
Undrained Shear Strength (kPa)		60.5

Moisture Content

Tare ID	D227
Mass tare (g)	6.8
Mass wet + tare (g)	391.0
Mass dry + tare (g)	250.8
Moisture %	57.5%

Unit Weight

Bulk Weight (g)		1062.2
Length (mm)	**1**	150.68
	2	151.09
	3	151.01
	4	150.75
Average Length (m)		0.151
Diam. (mm)	**1**	72.10
	2	72.48
	3	72.02
	4	72.48
Average Diameter (m)		0.072
Volume (m^3)		6.19E-04
Bulk Unit Weight (kN/m^3)		16.8
Bulk Unit Weight (pcf)		107.1
Dry Unit Weight (kN/m^3)		10.7
Dry Unit Weight (pcf)		68.0

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Unconfined Compressive Strength
ASTM D2166

Project No. 0002-171-00
Client Tetra Tech Inc.
Project Louise Bridge Rehabilitation

Test Hole TH25-01
Sample # T60
Depth (m) 7.6 - 8.2
Sample Date 03-Apr-25
Test Date 14-Apr-25
Technician A. Dustmamatov

Unconfined Strength

	kPa	ksf
Max q_u	83.7	1.7
Max S_u	41.9	0.9

Specimen Data

Description CLAY - silty, trace gravel (<10mm diam.), trace silt inclusions (<5mm diam.), grey, moist, stiff, high plasticity

Length	150.9	(mm)	**Moisture %**	57%	
Diameter	72.3	(mm)	**Bulk Unit Wt.**	16.8	(kN/m^3)
L/D Ratio	2.1		**Dry Unit Wt.**	10.7	(kN/m^3)
Initial Area	0.00410	(m^2)	**Liquid Limit**	-	
Load Rate	1.00	(%/min)	**Plastic Limit**	-	
			Plasticity Index	-	

Undrained Shear Strength Tests

Torvane

Reading	**Undrained Shear Strength**	
tsf	**kPa**	**ksf**
0.65	63.8	1.33
Vane Size		
m		

Pocket Penetrometer

	Reading	**Undrained Shear Strength**	
	tsf	**kPa**	**ksf**
	1.20	58.9	1.23
	1.30	63.8	1.33
	1.20	58.9	1.23
Average	**1.23**	**60.5**	**1.3**

Failure Geometry

Sketch:

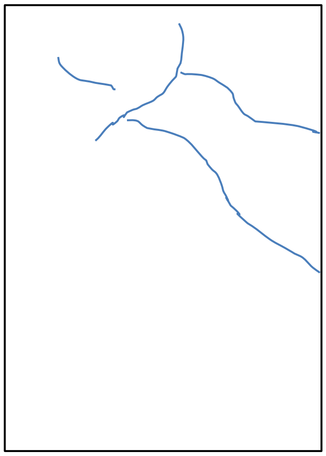


Photo:

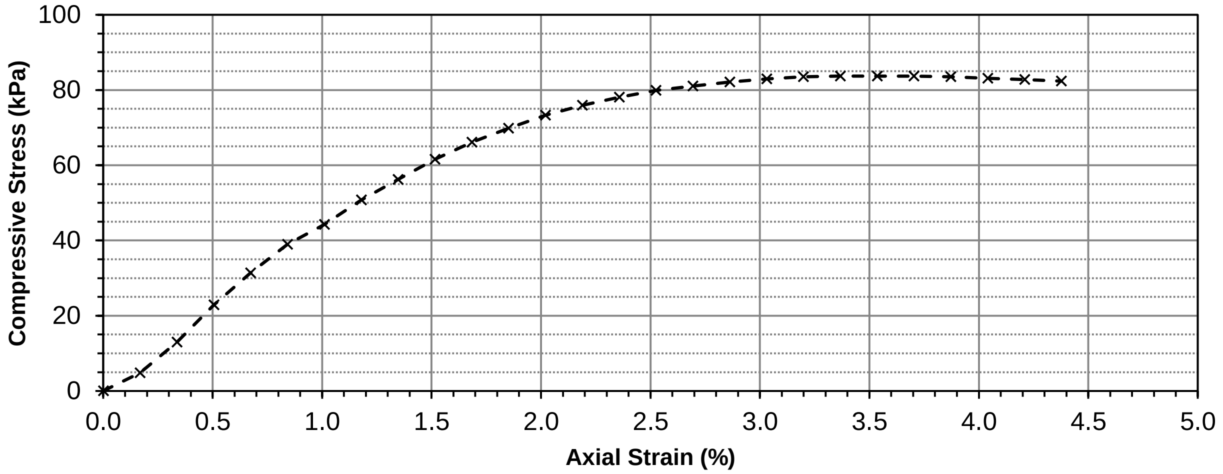
TREK GEOTECHNICAL
Project 0002-171-00
Location LOUISE BRIDGE REHAB
Hole No. TH25-01 Sample No. T60
Depth 25.0'-27.0'
Technician DC Date APR 5, 2025

Unconfined Compressive Strength

ASTM D2166

Project No. 0002-171-00
Client Tetra Tech Inc.
Project Louise Bridge Rehabilitation

Unconfined Compression Test Graph



Unconfined Compression Test Data

Deformation Dial Reading	Load Ring Dial Reading	Deflection (mm)	Axial Strain (%)	Corrected Area (m^2)	Axial Load (N)	Compressive Stress, q_u (kPa)	Shear Stress, S_u (kPa)
0	1.05	0.0000	0.00	0.004102	0.0	0.00	0.00
10	1.44	0.2540	0.17	0.004109	19.7	4.78	2.39
20	2.11	0.5080	0.34	0.004116	53.4	12.98	6.49
30	2.92	0.7620	0.51	0.004123	94.3	22.86	11.43
40	3.62	1.0160	0.67	0.004130	129.5	31.37	15.68
50	4.25	1.2700	0.84	0.004137	161.3	38.99	19.49
60	4.69	1.5240	1.01	0.004144	183.5	44.27	22.14
70	5.23	1.7780	1.18	0.004151	210.7	50.75	25.38
80	5.69	2.0320	1.35	0.004158	233.9	56.24	28.12
90	6.14	2.2860	1.52	0.004165	256.6	61.59	30.80
100	6.52	2.5400	1.68	0.004172	275.7	66.08	33.04
110	6.84	2.7940	1.85	0.004179	291.8	69.83	34.91
120	7.14	3.0480	2.02	0.004187	307.0	73.32	36.66
130	7.37	3.3020	2.19	0.004194	318.5	75.96	37.98
140	7.56	3.5560	2.36	0.004201	328.1	78.10	39.05
150	7.72	3.8100	2.53	0.004208	336.2	79.89	39.94
160	7.83	4.0640	2.69	0.004216	341.7	81.06	40.53
170	7.93	4.3180	2.86	0.004223	346.8	82.12	41.06
180	8.01	4.5720	3.03	0.004230	350.8	82.93	41.46
190	8.07	4.8260	3.20	0.004238	353.8	83.50	41.75
200	8.10	5.0800	3.37	0.004245	355.3	83.71	41.85
210	8.11	5.3340	3.54	0.004252	355.8	83.68	41.84
220	8.12	5.5880	3.70	0.004260	356.3	83.65	41.83
230	8.12	5.8420	3.87	0.004267	356.3	83.51	41.75

Unconfined Compressive Strength

ASTM D2166

Project No. 0002-171-00
Client Tetra Tech Inc.
Project Louise Bridge Rehabilitation

Unconfined Compression Test Data (cont'd)

Deformation Dial Reading	Load Ring Dial Reading	Deflection (mm)	Axial Strain (%)	Corrected Area (m^2)	Axial Load (N)	Compressive Stress, q_u (kPa)	Shear Stress, S_u (kPa)
240	8.10	6.0960	4.04	0.004275	355.3	83.12	41.56
250	8.08	6.3500	4.21	0.004282	354.3	82.74	41.37
260	8.06	6.6040	4.38	0.004290	353.3	82.36	41.18

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Shelby Tube Visual

Project No.	0002-171-00
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation
Test Hole	TH25-01
Sample #	T62
Depth (m)	10.7 - 11.3
Sample Date	03-Apr-25
Test Date	16-Apr-25
Technician	A. Dustmamatov

Tube Extraction

Recovery (mm) 680

Bottom **11.35 m**	11.25 m	11.07 m	10.89 m	**Top** **10.67 m**
Moisture Content PP/TV Visual	Bulk/QU	Keep	Toss	
100 mm	180 mm	180 mm	220 mm	

Visual Classification

Material	CLAY
Composition	silty
trace sand	
trace gravel (<25mm diam.)	
trace silt inclusions (<15mm diam.)	
Color	grey
Moisture	moist
Consistency	firm
Plasticity	high plasticity
Structure	-
Gradation	-

Torvane

Reading	0.40
Vane Size (s,m,l)	m
Undrained Shear Strength (kPa)	39.2

Pocket Penetrometer

Reading	**1**	0.90
	2	0.80
	3	0.80
	Average	0.83
Undrained Shear Strength (kPa)		40.9

Moisture Content

Tare ID	M28
Mass tare (g)	7.0
Mass wet + tare (g)	334.8
Mass dry + tare (g)	220.0
Moisture %	53.9%

Unit Weight

Bulk Weight (g)		1037.2
Length (mm)	**1**	147.48
	2	147.58
	3	147.63
	4	147.85
Average Length (m)		0.148
Diam. (mm)	**1**	72.42
	2	72.39
	3	72.43
	4	72.39
Average Diameter (m)		0.072
Volume (m^3)		6.08E-04
Bulk Unit Weight (kN/m^3)		16.7
Bulk Unit Weight (pcf)		106.5
Dry Unit Weight (kN/m^3)		10.9
Dry Unit Weight (pcf)		69.2

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Unconfined Compressive Strength

ASTM D2166

Project No.	0002-171-00
Client	Tetra Tech Inc.
Project	Louise Bridge Rehabilitation
Test Hole	TH25-01
Sample #	T62
Depth (m)	10.7 - 11.3
Sample Date	03-Apr-25
Test Date	16-Apr-25
Technician	A. Dustmamatov

Unconfined Strength

	kPa	ksf
Max q_u	82.0	1.7
Max S_u	41.0	0.9

Specimen Data

Description CLAY - silty, trace sand, trace gravel (<25mm diam.), trace silt inclusions (<15mm diam.), grey, moist, firm, high plasticity

Length	147.6	(mm)
Diameter	72.4	(mm)
L/D Ratio	2.0	
Initial Area	0.00412	(m^2)
Load Rate	1.00	(%/min)

Moisture %	54%	
Bulk Unit Wt.	16.7	(kN/m^3)
Dry Unit Wt.	10.9	(kN/m^3)
Liquid Limit	-	
Plastic Limit	-	
Plasticity Index	-	

Undrained Shear Strength Tests

Torvane

Reading	Undrained Shear Strength	
tsf	kPa	ksf
0.40	39.2	0.82
Vane Size		
m		

Pocket Penetrometer

	Reading	Undrained Shear Strength	
	tsf	kPa	ksf
	0.90	44.1	0.92
	0.80	39.2	0.82
	0.80	39.2	0.82
Average	**0.83**	**40.9**	**0.9**

Failure Geometry

Sketch:

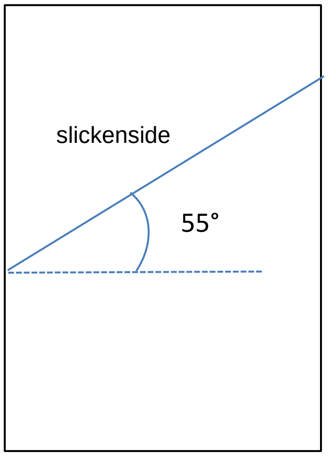

Photo:

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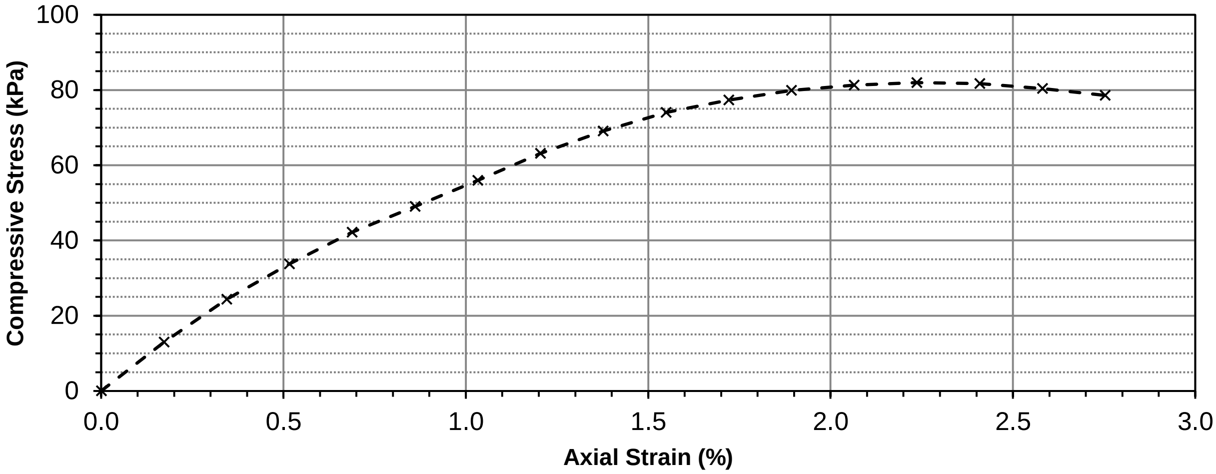
Unconfined Compressive Strength

ASTM D2166

Project No. 0002-171-00
Client Tetra Tech Inc.
Project Louise Bridge Rehabilitation

Unconfined Compression Test Graph



Unconfined Compression Test Data

Deformation Dial Reading	Load Ring Dial Reading	Deflection (mm)	Axial Strain (%)	Corrected Area (m^2)	Axial Load (N)	Compressive Stress, q_u (kPa)	Shear Stress, S_u (kPa)
0	1.03	0.0000	0.00	0.004118	0.0	0.00	0.00
10	2.09	0.2540	0.17	0.004125	53.4	12.95	6.48
20	3.03	0.5080	0.34	0.004132	100.8	24.40	12.20
30	3.80	0.7620	0.52	0.004139	139.6	33.73	16.87
40	4.50	1.0160	0.69	0.004146	174.9	42.18	21.09
50	5.07	1.2700	0.86	0.004153	203.6	49.03	24.51
60	5.65	1.5240	1.03	0.004161	232.9	55.97	27.98
70	6.25	1.7780	1.20	0.004168	263.1	63.13	31.56
80	6.75	2.0320	1.38	0.004175	288.3	69.05	34.53
90	7.17	2.2860	1.55	0.004182	309.5	73.99	37.00
100	7.46	2.5400	1.72	0.004190	324.1	77.35	38.68
110	7.68	2.7940	1.89	0.004197	335.2	79.86	39.93
120	7.81	3.0480	2.06	0.004205	341.7	81.28	40.64
130	7.88	3.3020	2.24	0.004212	345.3	81.97	40.99
140	7.87	3.5560	2.41	0.004219	344.8	81.71	40.85
150	7.77	3.8100	2.58	0.004227	339.7	80.37	40.19
160	7.63	4.0640	2.75	0.004234	332.7	78.56	39.28

TREK GEOTECHNICAL Quality Engineering | Valued Relationships

MEMORANDUM

Date	May 13, 2025
To	Nuno Mendonca, Micheal Van Helden TREK Geotechnical
From	Angela Fidler-Kliewer, TREK Geotechnical
Project No.	0002-171-00
Project	Louise Bridge
Subject	Laboratory Testing Results – Lab Req. R25-142
Distribution	David Clark

Attached are the laboratory testing results for the above noted project. The testing included unconfined compressive strength on Rock Core samples.

Regards,

Angela Fidler-Kliewer, C.Tech.

Attach.

Review Control:

Prepared By: KM	*Reviewed By: AFK*	*Checked By: NJF*

Lab Requisition

TREK GEOTECHNICAL
1712 St. James Street
Winnipeg, Manitoba R3H 0L3
T 204.975.9433 F 204.975.9435

PROJECT: LOUISE BRIDGE PROJECT NO: 0002-171-00

CLIENT: TETRA TECH FIELD TECHNICIAN: DC

TEST HOLE NUMBER	SAMPLE NUMBER	Sample Start Depth (ft)	Sample End Depth (ft)		MOISTURE	VISUAL CLASS.	ATTERBERG LIMITS	HYDROMETER	GRADATION	STD. PROCTOR	UNCONFINED AND AUXILLARY TESTS	SULPHATE			Soil Description/ Comments
TH25-02	C49	94'4"	94'11"	Apr/2nd							X				Rock Core
TH25-02	C50	96'3"	96'9.5"	"							X				
TH25-02	C51	100'1.5"	100'9.5"	"							X				
TH25-03	C26	103'6"	104'3"	Mar/30							X				
TH25-03	C27	105'	105'8"	"							X				

REQUESTED BY: NM REPORT TO: DC/NM/MVH

REQUISTION DATE: 2025-05-12 DATE REQUIRED: 2025-05-26

COMMENTS:

REQUISITION NO.
R25-142

SHEET 1 OF 1

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Rock Core Unconfined Compressive Strength Report

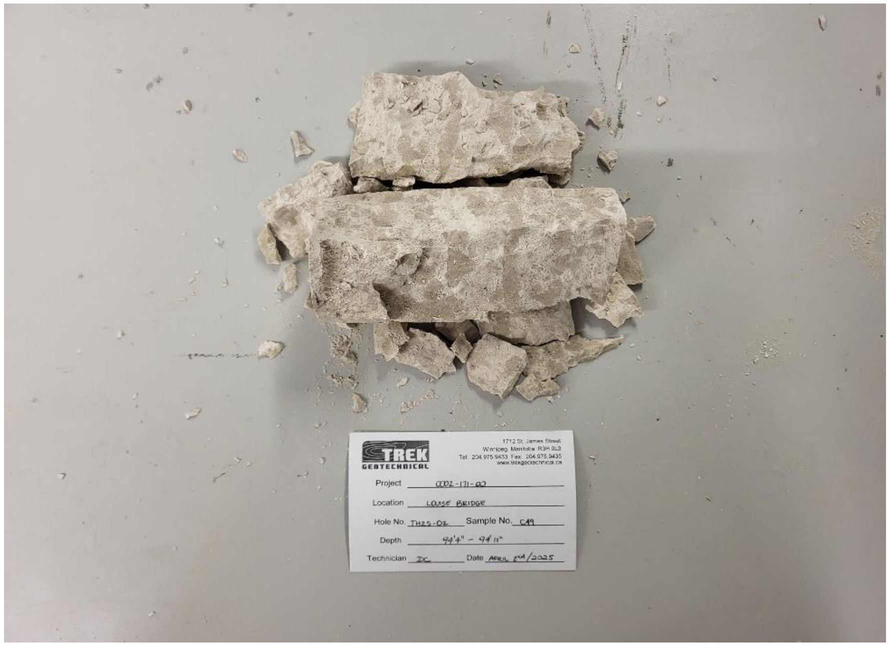
STANDARD TEST METHOD FOR UNCONFINED COMPRESSIVE STRENGTH OF INTACT ROCK CORE SPECIMEN (ASTM D 7012)

Project No. 0002-171-00
Project Louise Bridge
Client Tetra Tech

Date Received 12-May-25
Sampled by D. Clark
Requested by N. Mendonca

Test Date 13-May-25
Report No. R25-142
Technician K. Manchur

Core No.	Core Length as Received (mm)	Core Diameter (mm)	Core Length (mm)	Core Weight (g)	Density (g/mm³)	Area (sq.mm)	Core Load (kN)	Core Strength (Mpa)	Notes
TH25-02, C49	230	63.00	128.00	977.2	2.449E-03	3117.245	118.68	38.1	28.8 - 28.9m



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Project 0002-171-00
Location LOUISE BRIDGE
Hole No. TH25-02 Sample No. C49
Depth 94'4" - 94'11"
Technician DC Date APRIL 2nd/2025

Comments:

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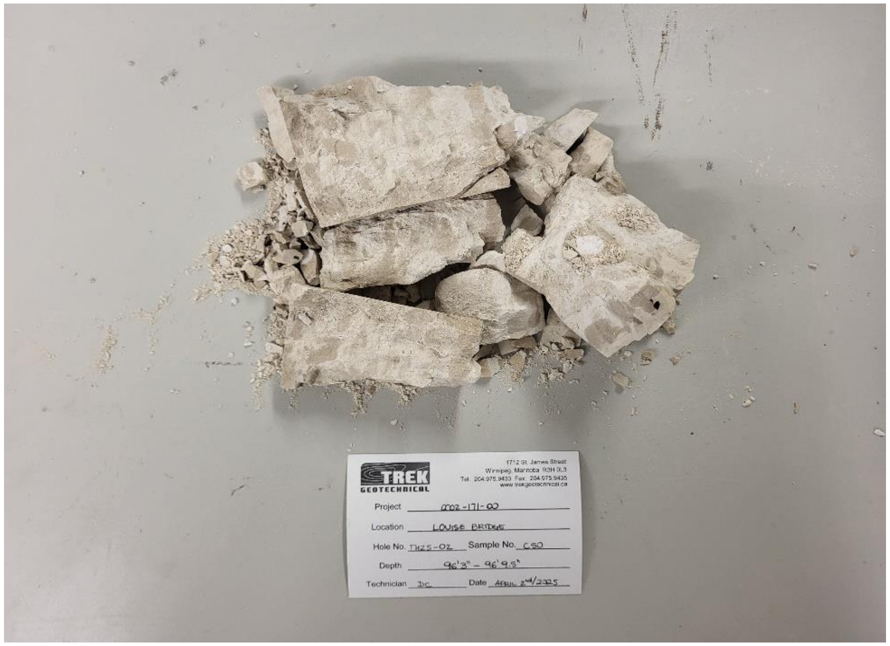
Rock Core Unconfined Compressive Strength Report

STANDARD TEST METHOD FOR UNCONFINED COMPRESSIVE STRENGTH OF INTACT ROCK CORE SPECIMEN (ASTM D 7012)

Project No.	0002-171-00	**Date Received**	12-May-25	**Test Date**	13-May-25
Project	Louise Bridge	**Sampled by**	D. Clark	**Report No.**	R25-142
Client	Tetra Tech	**Requested by**	N. Mendonca	**Technician**	K. Manchur

Core No.	Core Length as Received (mm)	Core Diameter (mm)	Core Length (mm)	Core Weight (g)	Density (g/mm³)	Area (sq.mm)	Core Load (kN)	Core Strength (Mpa)	Notes
TH25-02, C50	190	63.00	135.00	992.8	2.359E-03	3117.245	112.86	36.2	29.3 - 29.5m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Project 0002-171-00
Location LOUISE BRIDGE
Hole No. TH25-02 Sample No. C50
Depth 96'3" - 96'9.5"
Technician DC Date April 2nd/2025

Comments:

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Rock Core Unconfined Compressive Strength Report

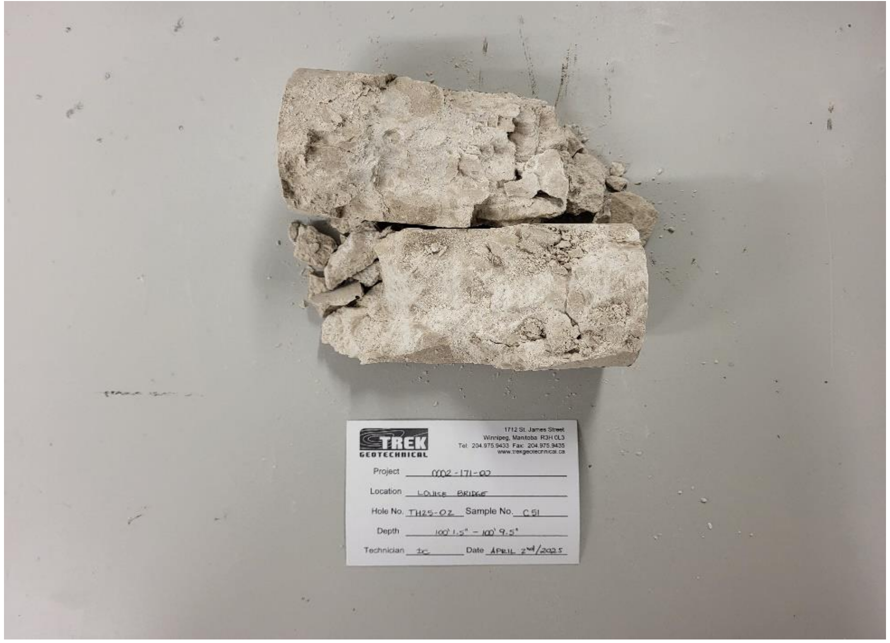
STANDARD TEST METHOD FOR UNCONFINED COMPRESSIVE STRENGTH OF INTACT ROCK CORE SPECIMEN (ASTM D 7012)

Project No. 0002-171-00
Project Louise Bridge
Client Tetra Tech

Date Received 12-May-25
Sampled by D. Clark
Requested by N. Mendonca

Test Date 13-May-25
Report No. R25-142
Technician K. Manchur

Core No.	Core Length as Received (mm)	Core Diameter (mm)	Core Length (mm)	Core Weight (g)	Density (g/mm³)	Area (sq.mm)	Core Load (kN)	Core Strength (Mpa)	Notes
TH25-02, C51	224	63.00	135.00	1012	2.405E-03	3117.245	119.76	38.4	30.5 - 30.7m



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Project 0002-171-00
Location LOUISE BRIDGE
Hole No. TH25-02 Sample No. C51
Depth 100' 1.5" - 100' 9.5"
Technician DC Date APRIL 2nd/2025

Comments:

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Rock Core Unconfined Compressive Strength Report

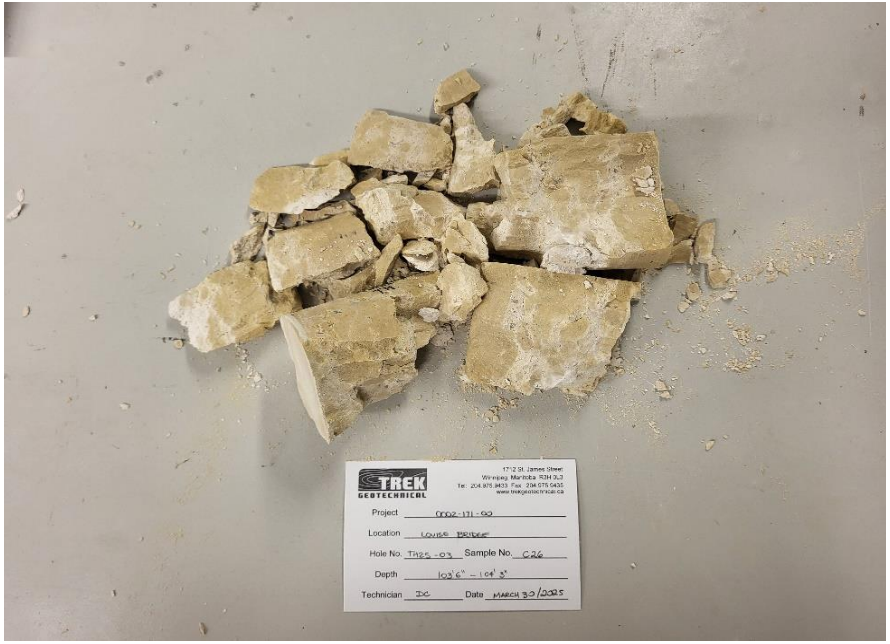
STANDARD TEST METHOD FOR UNCONFINED COMPRESSIVE STRENGTH OF INTACT ROCK CORE SPECIMEN (ASTM D 7012)

Project No. 0002-171-00
Project Louise Bridge
Client Tetra Tech

Date Received 12-May-25
Sampled by D. Clark
Requested by N. Mendonca

Test Date 13-May-25
Report No. R25-142
Technician K. Manchur

Core No.	Core Length as Received (mm)	Core Diameter (mm)	Core Length (mm)	Core Weight (g)	Density (g/mm³)	Area (sq.mm)	Core Load (kN)	Core Strength (Mpa)	Notes
TH25-03, C26	235	63.00	135.00	1014.2	2.410E-03	3117.245	117.33	37.6	31.5 - 31.8m



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Project 0002-171-00
Location LOUISE BRIDGE
Hole No. TH25-03 Sample No. C26
Depth 103'6" - 104' 3"
Technician DC Date MARCH 30/2025

Comments:

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Rock Core Unconfined Compressive Strength Report

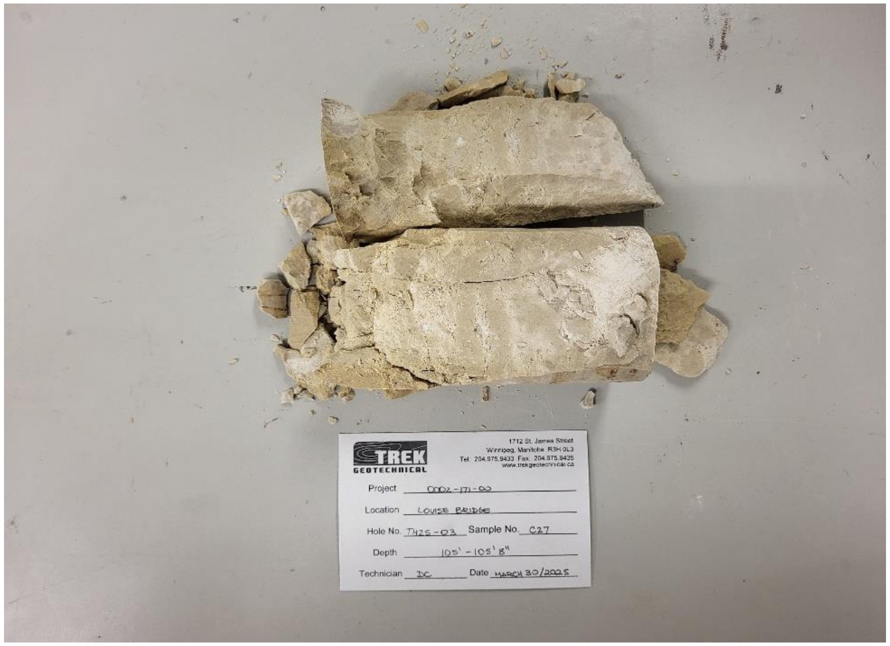
STANDARD TEST METHOD FOR UNCONFINED COMPRESSIVE STRENGTH OF INTACT ROCK CORE SPECIMEN (ASTM D 7012)

Project No. 0002-171-00
Project Louise Bridge
Client Tetra Tech

Date Received 12-May-25
Sampled by D. Clark
Requested by N. Mendonca

Test Date 13-May-25
Report No. R25-142
Technician K. Manchur

Core No.	Core Length as Received (mm)	Core Diameter (mm)	Core Length (mm)	Core Weight (g)	Density (g/mm³)	Area (sq.mm)	Core Load (kN)	Core Strength (Mpa)	Notes
TH25-03, C27	208	63.00	134.00	1015.4	2.431E-03	3117.245	145.34	46.6	32.0 - 32.2m



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Project 0002-171-00
Location LOUISE BRIDGE
Hole No. TH25-03 Sample No. C27
Depth 105' - 105' 8"
Technician DC Date MARCH 30/2025

Comments:

Appendix B

Bedrock Core Photos

Louise Bridge Rehabilitation PD

TH25-02

Rock Core: C49

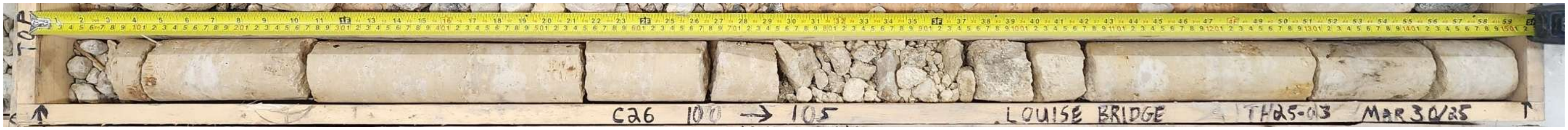
Depth: 28.3 m to 29.0 m

Project Number:	**Date:**	**Location:**	**Rock Core Elevation**	**Created By:**	**Reviewed By:**
0002 171 00	April 2, 2025	5529946 N, 635475 E El. 231.09 m	202.79 m to 202.09 m	DC	MVH

Louise Bridge Rehabilitation PD
TH25-02
Rock Core: C50 & C51
Depth: 29.0 m to 32.0 m

Project Number:	**Date:**	**Location:**	**Rock Core Elevation**	**Created By:**	**Reviewed By:**
0002 171 00	April 2, 2025	5529946 N, 635475 E El. 231.09 m	202.09 m to 199.09 m	DC	MVH

Louise Bridge Rehabilitation PD
TH25-03
Rock Core: C26
Depth: 30.5 m to 32.0 m



Project Number:	Date:	Location:	Rock Core Elevation	Created By:	Reviewed By:
0002 171 00	March 30, 2025	5529720 N, 635400 E El. 227.81 m	197.31 m to 195.81 m	DC	MVH

Louise Bridge Rehabilitation PD

TH25-03

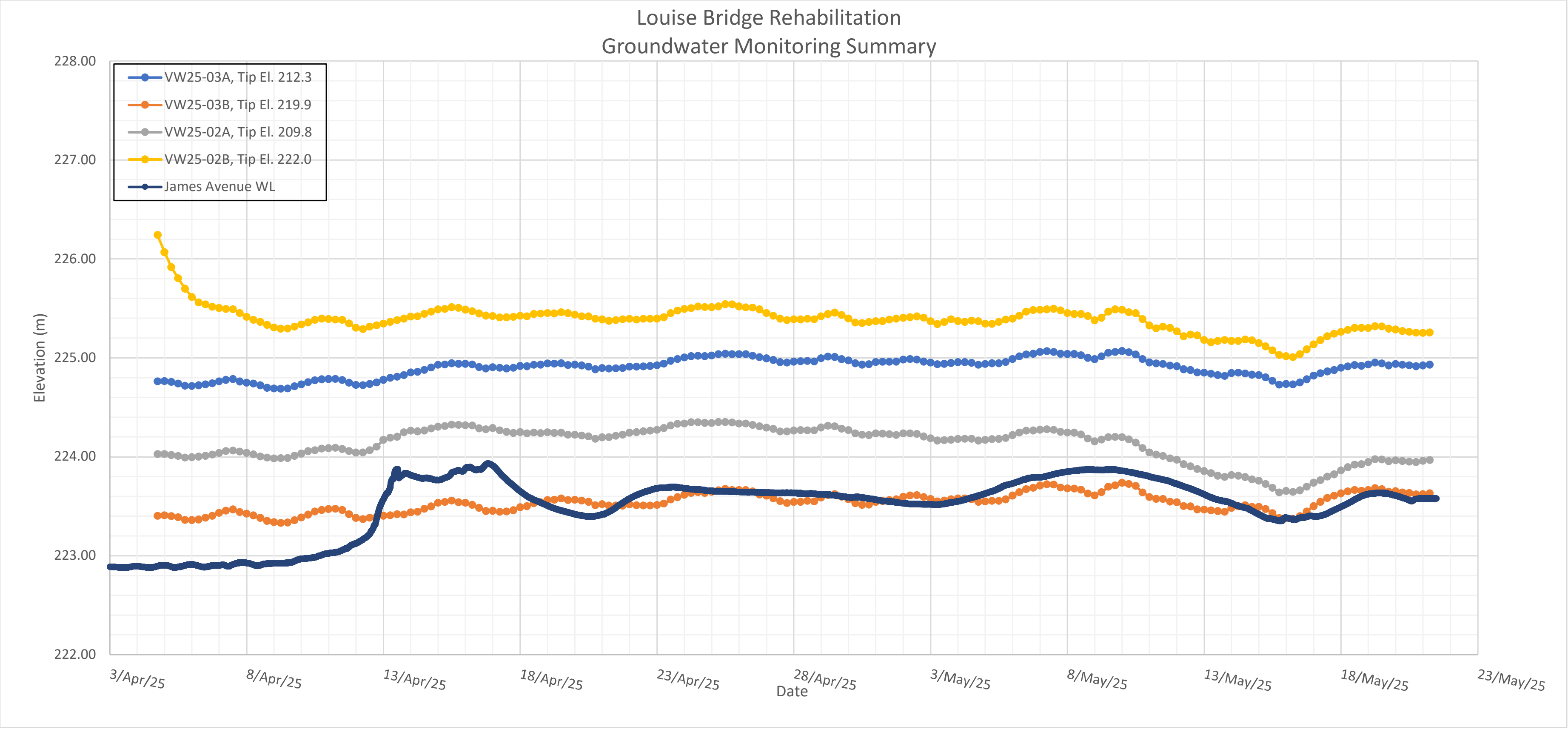
Rock Core: C27

Depth: 32.0 m to 33.5 m

Project Number:	Date:	Location:	Rock Core Elevation	Created By:	Reviewed By:
0002 171 00	March 30, 2025	5529720 N, 635400 E El. 227.81 m	195.81 m to 194.31 m	DC	MVH

Appendix C

Groundwater Monitoring Results


Louise Bridge Rehabilitation
Groundwater Monitoring Summary
VW25-03A, Tip El. 212.3
VW25-03B, Tip El. 219.9
VW25-02A, Tip El. 209.8
VW25-02B, Tip El. 222.0
James Avenue WL
Elevation (m)
228.00
227.00
226.00
225.00
224.00
223.00
222.00
Date
3/Apr/25
8/Apr/25
13/Apr/25
18/Apr/25
23/Apr/25
28/Apr/25
3/May/25
8/May/25
13/May/25
18/May/25
23/May/25