APPENDIX C: AT PATHWAY GEOTECHNICAL REPORT

Quality Engineering | Valued Relationships

Tetra Tech Inc.

Lagimodiere Twin Overpasses and Pavement Renewal (Concordia Avenue & CPKC Keewatin)

Active Transport Pathway - Geotechnical Investigation Report

Prepared for:
Jeff Crang, P.Eng.
Tetra Tech Inc.
400-161 Portage Ave East
Winnipeg, Manitoba
R3B 0Y4

Project Number: 0002-130-01

Date: September 6, 2024

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TREK GEOTECHNICAL Quality Engineering | Valued Relationships

September 6, 2024 Our File No. 0002-130-01

Jeff Crang, P.Eng.
Tetra Tech Inc.
400-161 Portage Ave East
Winnipeg, Manitoba
R3B 0Y4

RE: Lagimodiere Twin Overpasses and Pavement Renewal (Concordia Avenue & CPKC Keewatin)
Active Transport Pathway - Geotechnical Investigation Report

TREK Geotechnical Inc. is pleased to submit our final geotechnical investigation report for the above noted project.

Please contact the undersigned should you have any questions.

Sincerely,

TREK Geotechnical Inc.
Per:

Brent Hay, M.Sc., P.Eng.
Senior Geotechnical Engineer

Encl.

Revision History

Revision No.	Author	Issue Date	Description
0	MK	September 6, 2024	Final Report

Authorization Signatures

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Senior Geotechnical Engineer

ENGINEERS
GEOSCIENTISTS
MANITOBA
Certificate of Authorization
TREK GEOTECHNICAL INC.
No. 4877

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1.0 Introduction

This report provides recommendations for new active transport (AT) pathways along Lagimodiere Boulevard between Almey Avenue and Ravelstone Avenue West, and Concordia Avenue between Molson Street and Peguis Street, in Winnipeg, MB. TREK Geotechnical Inc. (TREK) was retained by Tetra Tech Inc. (TT) to evaluate sub-surface conditions along the proposed pathway and provide recommendations to facilitate the design and construction for the sub-grade and AT pavement structures along the proposed alignment. This investigation is part of the detailed design for the Lagimodiere Twin Overpasses and Pavement Renewal Project.

2.0 Background

TREK previously completed preliminary design for the rehabilitation and widening of the existing overpass structures (over Concordia Avenue and CPR Keewatin) Details of the preliminary design are included under a separate cover.

In addition to the rehabilitation and widening of the overpass, the City of Winnipeg is also planning to include improvements to the AT network around the overpass. Approximately 1.2 km of AT pathway is planned to be constructed along the east side of northbound Lagimodiere Boulevard between Almey Avenue and Ravelstone Avenue West, and 0.9 km of AT pathway is planned to be constructed along the southside of eastbound Concordia Avenue between Molson Street and Peguis Street. The proposed AT Pathway and project limits are included in Appendix A and also shown on Figures 01 to 03.

3.0 Site Conditions

The AT pathways are located adjacent to existing collector and arterial roads in the City of Winnipeg. The proposed pathways will be located adjacent to roadways or road ditches along Lagimodiere Boulevard and Concordia Avenue. At present, the proposed AT alignment is either grass covered (where located adjacent to roadway ditches) or consists of paved and unpaved shoulders (where adjacent to roadways). The proposed alignment is relatively flat.

4.0 Field Program

4.1 Sub-surface Investigation

A sub-surface investigation was completed on August 8, 2024 under the supervision of TREK personnel to evaluate the soil stratigraphy and groundwater conditions along the proposed AT pathway. The investigation included drilling three test holes (TH24-01, TH24-02 and TH24-03) to 3.1 m depth at select locations as shown on Figures 01 to 03. TH24-01 is located near the west end of the AT path between Almey Avenue and Ravelstone Avenue West. TH24-02 and TH24-03 are located near the north and south ends of the AT between Molson Street and Peguis Street, respectively. The test holes were drilled using an Acker MP8 truck-mounted soils rig equipped with 125 mm diameter solid augers. All test holes were backfilled with auger cuttings, and bentonite chips to ground surface. TH24-01 was filled with asphalt cold patch at surface.

Sub-surface soils observed during drilling were visually classified based on the Unified Soil Classification System (USCS). Samples retrieved during drilling include disturbed (auger cutting) grab samples. Undrained shear strength testing was performed in the field on the grab samples using Torvane and/or Pocket Penetrometer testing devices. All samples retrieved during drilling were transported to TREK's testing laboratory in Winnipeg, Manitoba. Laboratory testing consisted of water content determination on all samples as well as Atterberg Limit and gradation (mechanical sieve and hydrometer method) on select samples.

Test hole locations were recorded using a handheld GPS. The test hole elevations were surveyed using a rod and level relative to temporary benchmarks (TBM) established at the sites during the investigation. The TBM's are illustrated on Figures 01 to 03 and were assigned elevations of 100.0 m (local).

Test hole logs are attached and include a description of the soil units encountered and other pertinent information such as groundwater and sloughing conditions, UTM coordinates, elevation (local), TBM descriptions, and a summary of the laboratory testing results.

4.2 Soil Stratigraphy

A brief description of the soil stratigraphy and groundwater conditions encountered during drilling is provided in the following sections. All interpretations of soil stratigraphy for the purposes of design should refer to the detailed information provided on the attached test hole logs.

The site soil stratigraphy generally consists of fill soils (granular or clay) overlying silty clay and silt.

Asphalt was encountered at the surface of TH24-01. The asphalt is 110 mm thick and overlies sand and gravel fill. Sand and gravel fill was also encountered at surface in TH24-03, and sand fill was encountered at surface in TH24-02. The sand and gravel fill contain trace clay, trace silt, and is brown, moist, compact and well graded. The sand fill is silty, contains trace clay and consists of loose, poorly graded fine sand.

Clay fill was encountered below the sand and gravel fill or sand fill in all test holes. The clay fill ranges between 0.3 and 1.0 m thick, and is generally silty, containing trace sand, and trace gravel, is dark grey, moist, stiff to very stiff and of high plasticity. The clay fill in TH24-02 also contains cobbles, and in TH24-03 has increased sand content, and is of intermediate plasticity.

The underlying *in-situ* clay extended to the maximum depth of exploration in TH24-02 and 03, and to 2.7 m in TH24-01 above a silt layer. The clay is silty, grey to brown, moist, stiff to very stiff and is of high plasticity. Trace silt inclusions were encountered in TH24-02 and 03.

A layer of silt was encountered below 2.7 m depth in TH24-01. The silt contains trace clay, trace sand, is light brown moist, soft and is of low plasticity.

4.3 Groundwater and Sloughing Conditions

Groundwater seepage was not observed in any test holes. Sloughing/caving was observed within the sand fill below 0.2 m depth in TH24-02. All test holes were dry upon completion.

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

5.0 Pavements

The following section on pavement structure should be used for asphalt pavements. The recommended pavement structure is provided in Table 1 for sidewalks and AT pathways. Crushed limestone base and sub-base materials that are consistent with the City of Winnipeg Specification No. CW 3110 are recommended.

Table 1. Recommended Pavement Sections for Roads and Parking Areas

Material	Layer Thickness	Compaction/Installation Requirements
Asphalt	50 mm	by others
20 mm down crushed limestone (Base)	50 mm	100% of the SPMDD
50 mm down crushed limestone (Sub-base)	150 mm	98% of the SPMDD

Additional Recommendations:

1. Existing fill materials, organics, silt, and any other deleterious material should be removed such that the sub-grade consists of native stiff to very silty clay. This may require the removal of up to 1.5 m of fill materials. It is anticipated that the removal of 1.5 m of fill will not be practical from a cost or constructability perspective. Provided the risk of additional movements is acceptable, the pavement structure may be placed on existing fill materials.
2. Excavation should be completed with an excavator equipped with a smooth bucket and operating from the edge of the excavation in order to minimize disturbance to the exposed sub-grade at all times.
3. After excavation, the sub-grade should be inspected by TREK prior to placement of granular base materials to identify soft areas, silt, or organics. Soft and silt areas should be repaired as per directions provided by TREK. This will likely consist of excavating an additional 150 to 300 mm and then placing a non-woven geotextile on the sub-grade and backfilling with granular fill placed in lifts no greater than 150 mm and compacted to a minimum of 95% of the SPMDD. Organics must be removed in their entirety.
4. The sub-grade should be protected from freezing, drying, inundation or disturbance. If any of these conditions occur, the sub-grade should be removed in its entirety until it is consistent with the above recommendations. If the granular backfill is disturbed, it should re-compacted as per the recommendations in Table 1.

5. The non-woven geotextile should be placed in accordance with the manufacturer's recommendations on the prepared sub-grade prior to placement of granular backfill.
6. Fill required to raise grades should consist of 50 to 100 mm down crushed limestone sub-base, in accordance with the City of Winnipeg Specification No. CW 3110.
7. The granular sub-base and base materials should consist of a well graded, durable crushed rock, in accordance with the City of Winnipeg Specification No. CW 3110.
8. The granular backfill, fill to raise grades, sub-base, and base materials should be placed in lifts not exceeding 150 mm and compacted to as per the recommendations in Table 1.
9. Movements of the pavement surface should be expected due to freeze/thaw and wetting/drying effects. The magnitude of these movements are difficult to predict however could be on the order of 50 mm or more. Increasing the sub-base thickness could be considered to reduce this risk, however, may become cost prohibitive. Maintenance of the pavement structure should be expected.

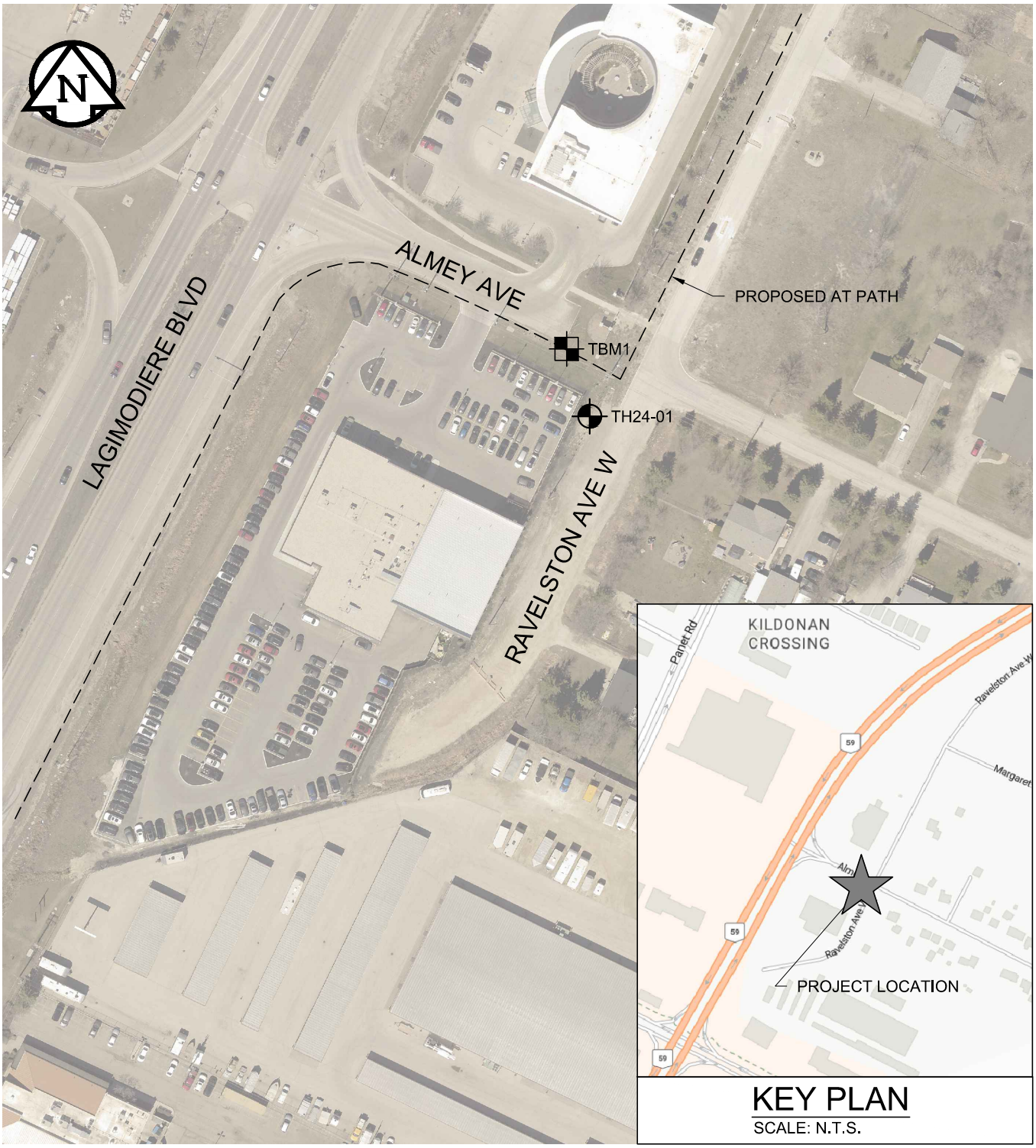
6.0 Closure

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 sub-surface 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 Tetra Tech 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.

Figures



KEY PLAN
SCALE: N.T.S.

LEGEND:

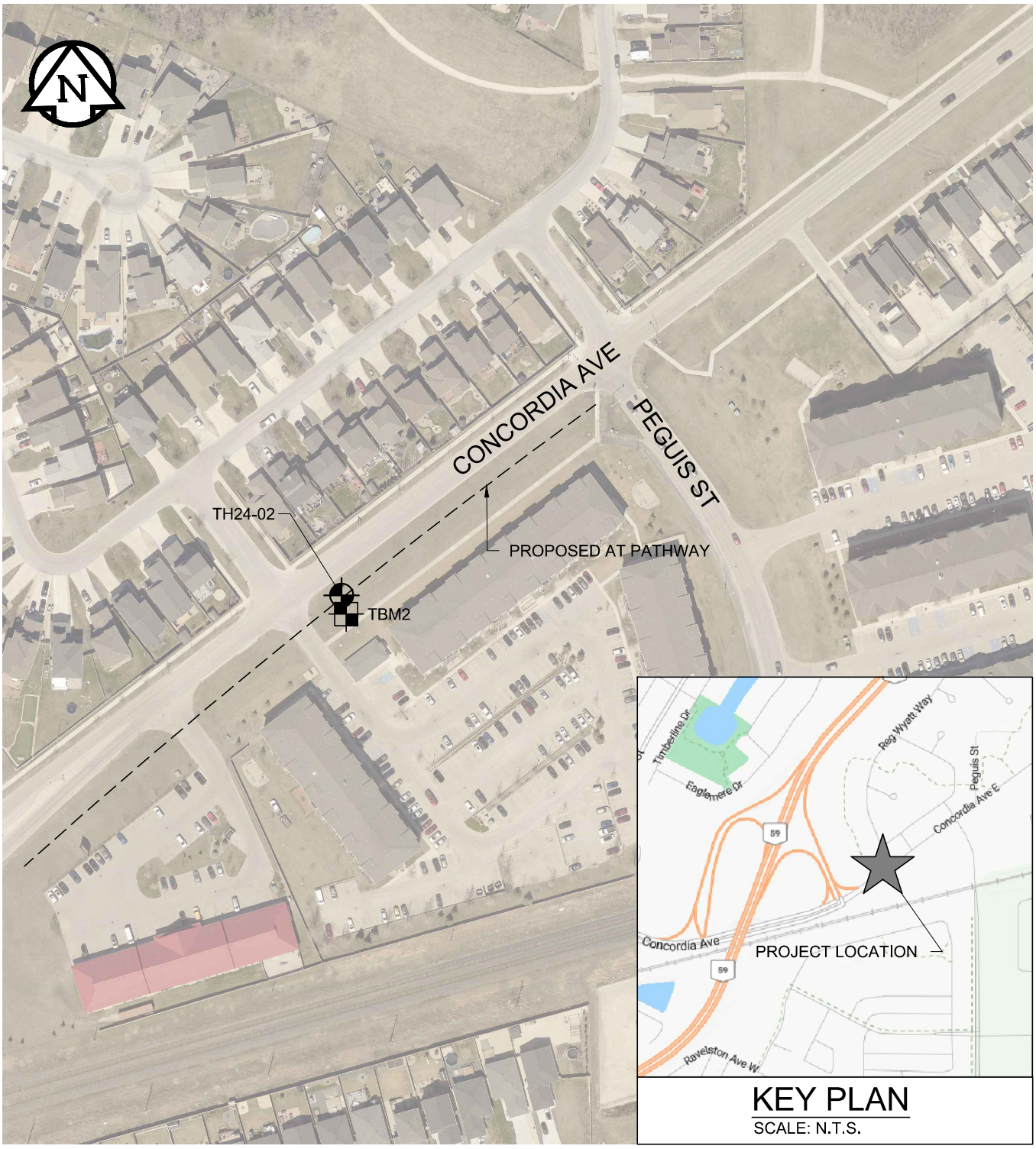
- TEST HOLE (TREK, 2024)
- TEMPORARY BENCHMARK

NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2021).
2. TEST HOLE LOCATIONS WERE RECORDED USING A HANDHELD GPS UNIT.
3. TEST HOLE ELEVATION TH24-01 WAS SURVEYED RELATIVE TO TBM1 (ASSIGNED LOCAL ELEVATION 100.0 m) LOCATED ON TOP OF THE FIRE HYDRANT (UTM 14U, 5529809.5 m N, 639080 m E).

0 25 50 75 m
SCALE = 1 : 1 500 (216 mm x 279 mm)

Figure 01
Test Hole Location Plan



KEY PLAN
SCALE: N.T.S.

LEGEND:

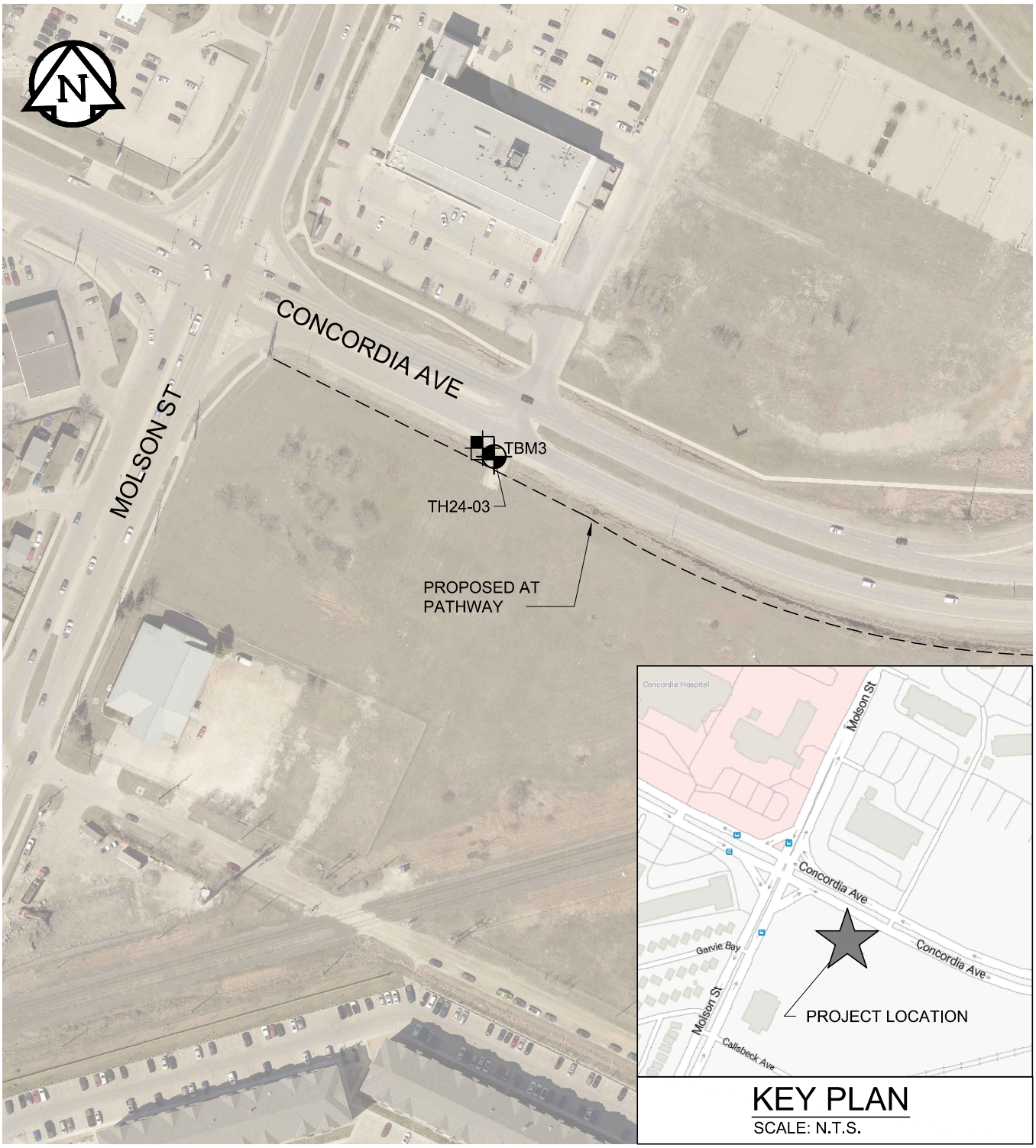
- TEST HOLE (TREK, 2024)
- TEMPORARY BENCHMARK TBM

NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2021).
2. TEST HOLE LOCATIONS WERE RECORDED USING A HANDHELD GPS UNIT.
3. TEST HOLE ELEVATION TH24-02 WAS SURVEYED RELATIVE TO TBM2 (ASSIGNED LOCAL ELEVATION 100.0 m) LOCATED ON TOP OF THE FIRE HYDRANT(UTM 14U, 5530778.5 m N, 640038.66 m E).

0 25 50 75 100 m
SCALE = 1 : 2 000 (216 mm x 279 mm)

Figure 02
Test Hole Location Plan



KEY PLAN
SCALE: N.T.S.

LEGEND:

- TEST HOLE (TREK, 2024)
- TEMPORARY BENCHMARK

NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2021).
2. TEST HOLE LOCATIONS WERE RECORDED USING A HANDHELD GPS UNIT.
3. TEST HOLE ELEVATION TH24-03 WAS SURVEYED RELATIVE TO TBM3 (ASSIGNED LOCAL ELEVATION 100.0 m) LOCATED AT THE LAMP POST BASE (TOP OF BOLT ON WEST CORNER) (UTM 14U, 5530553 m N, 639171 m E).

0 25 50 75 100 m
SCALE = 1 : 2 000 (216 mm x 279 mm)

Figure 03
Test Hole Location Plan

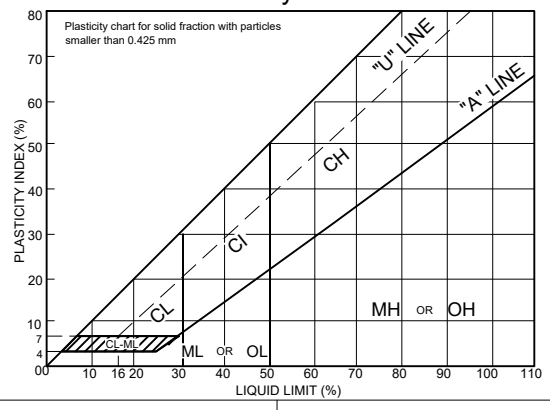
Test Hole Logs

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 Classi-fication	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 borderline cases requiring use of dual symbols
			GC		Clayey gravels, gravel-sand-silt mixtures		Atterberg limits above "A" line or P.I. greater than 7 — Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
	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 borderline cases requiring use of dual symbols
			SC		Clayey sands, sand-clay mixtures		Atterberg limits above "A" line or P.I. greater than 7 — Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
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	Plasticity Chart	
			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



Particle Size	ASTM Sieve sizes	mm	Material
	#10 to #4	2.00 to 4.75	Sand
	#40 to #10	0.425 to 2.00	Coarse
	#200 to #40	0.075 to 0.425	Medium
	< #200	< 0.075	Fine
			Silt or Clay

Particle Size	ASTM Sieve Sizes	mm	Material
	> 12 in.	> 300	Boulders
	3 in. to 12 in.	75 to 300	Cobbles
	3/4 in. to 3 in.	19 to 75	Gravel
	#4 to 3/4 in.	4.75 to 19	Coarse
			Fine

* 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

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

Sub-Surface Log

Test Hole TH24-01
1 of 1

Client:	Tetratech	**Project Number:**	0002-130-01
Project Name:	Lagimodiere Overpass Detailed Design	**Location:**	UTM 14U, 5529792.00 m N, 639086.00 m E
Contractor:	Maple Leaf Drilling Ltd.	**Ground Elevation:**	99.00 m (local)
Method:	125 mm Solid Stem Auger, B57 Track Mounted Rig	**Date Drilled:**	August 8, 2024

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

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)
98.9			Asphalt - 110 mm thick			
			SAND AND GRAVEL (FILL) - trace clay, trace silt - brown - compact - well-graded, fine sand to coarse gravel (<40 mm diam.)		G01 G02	
98.5	0.5		CLAY (FILL) - silty, trace sand, trace gravel (<30 mm diam.) - moist, very stiff - dark grey - high plasticity		G03	
98.2			CLAY - silty - grey - moist, stiff to very stiff - high plasticity		G04 G05 G06	
	1.0					
	1.5					
	2.0		- brownish grey below 1.8 m			
	2.5		- grey below 2.1 m		G07	
96.3						
96.0	3.0		SILT - trace clay, trace sand - light brown - wet, soft - low plasticity		G08	

Bulk Unit Wt (kN/m³): 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): 0 50 100 150 200 250
Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○

END OF TEST HOLE AT 3.1 m IN SILT

Notes:
1. Sloughing and seepage not observed.
2. Test hole open to 3.1 m depth and dry after drilling.
3. Test hole backfilled with auger cuttings and bentonite to surface.
4. Test hole surveyed relative to TBM located at the top of the fire hydrant approximately 40 m south of Steinbach Credit Union. The TBM was assigned an elevation of 100.00 m.

Logged By: Paul Cortez **Reviewed By:** Brent Hay **Project Engineer:** Matt Klymochko

SUB-SURFACE LOG LOGS 2023-08-01 LAGIMODIERE OVERPASS DD AND CONS 0_A_PC 0002-130-01.GPJ TREK.GDT 9/5/24

Sub-Surface Log

Test Hole TH24-02

Client:	Tetratech	**Project Number:**	0002-130-01
Project Name:	Lagimodiere Overpass Detailed Design	**Location:**	UTM 14U, 5530785.51 m N, 640037.84 m E
Contractor:	Maple Leaf Drilling Ltd.	**Ground Elevation:**	99.39 m (local)
Method:	125 mm Solid Stem Auger, B57 Track Mounted Rig	**Date Drilled:**	August 8, 2024

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

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)
99.1	0		SAND (FILL) - silty, trace clay - dark brown to black - dry to moist, loose - poorly graded, fine grained		G09	
	0.5		CLAY (FILL) - silty, trace sand, trace gravel, trace cobbles (<150 mm diam.) - dark grey - moist, stiff to very stiff - high plasticity		G10	
					G11	
	1.0				G12	
					G13	
97.9	1.5		CLAY - silty, trace silt inclusions (<5 mm diam.) - brown - moist, very stiff - high plasticity		G14	
	2.0					
	2.5					
			- stiff below 2.7 m		G15	
96.3	3.0					

Bulk Unit Wt (kN/m³): 16 17 18 19 20 21

Particle Size (%): 0 20 40 60 80 100 — PL MC LL

Undrained Shear Strength (kPa): 0 50 100 150 200 250

Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○

END OF TEST HOLE AT 3.1 m IN CLAY

Notes:
1. Seepage not observed.
2. Sloughing/caving observed observed below 0.2 m depth.
3. Test hole open to 0.3 m depth and dry after drilling.
4. Test hole backfilled with auger cuttings and bentonite to surface.
5. Test hole surveyed relative to TBM located at the top of the fire hydrant approximately 10 m southwest of the test hole. The TBM was assigned an elevation of 100.00 m.

Logged By: Paul Cortez **Reviewed By:** Brent Hay **Project Engineer:** Matt Klymochko

Sub-Surface Log

Test Hole TH24-03
1 of 1

Client:	Tetratech	**Project Number:**	0002-130-01
Project Name:	Lagimodiere Overpass Detailed Design	**Location:**	UTM 14U, 5530550 m N, 639175 m E
Contractor:	Maple Leaf Drilling Ltd.	**Ground Elevation:**	99.62 m (local)
Method:	125 mm Solid Stem Auger, B57 Track Mounted Rig	**Date Drilled:**	August 8, 2024

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

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)
99.4	0		SAND AND GRAVEL (FILL) - trace clay, trace silt - light brown - compact, well-graded, fine sand to coarse gravel (<30 mm diam.)		G16	
	0.5		CLAY (FILL) - with sand, silty, trace gravel (<30 mm diam.) - dark grey - moist, stiff - intermediate plasticity		G17	
			- firm below 0.6 m		G18	
98.7	1.0		CLAY - silty - grey - moist, stiff - high plasticity		G19	
					G20	
	1.5				G21	
	2.0		- trace silt inclusions (<10 mm diam.) below 2.1 m			
	2.5					
96.6	3.0				G22	

Bulk Unit Wt (kN/m³): 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): 0 50 100 150 200 250
Test Type: △ Torvane △ | ✤ Pocket Pen. ✤ | ☒ Qu ☒ | ○ Field Vane ○

END OF TEST HOLE AT 3.1 m IN CLAY

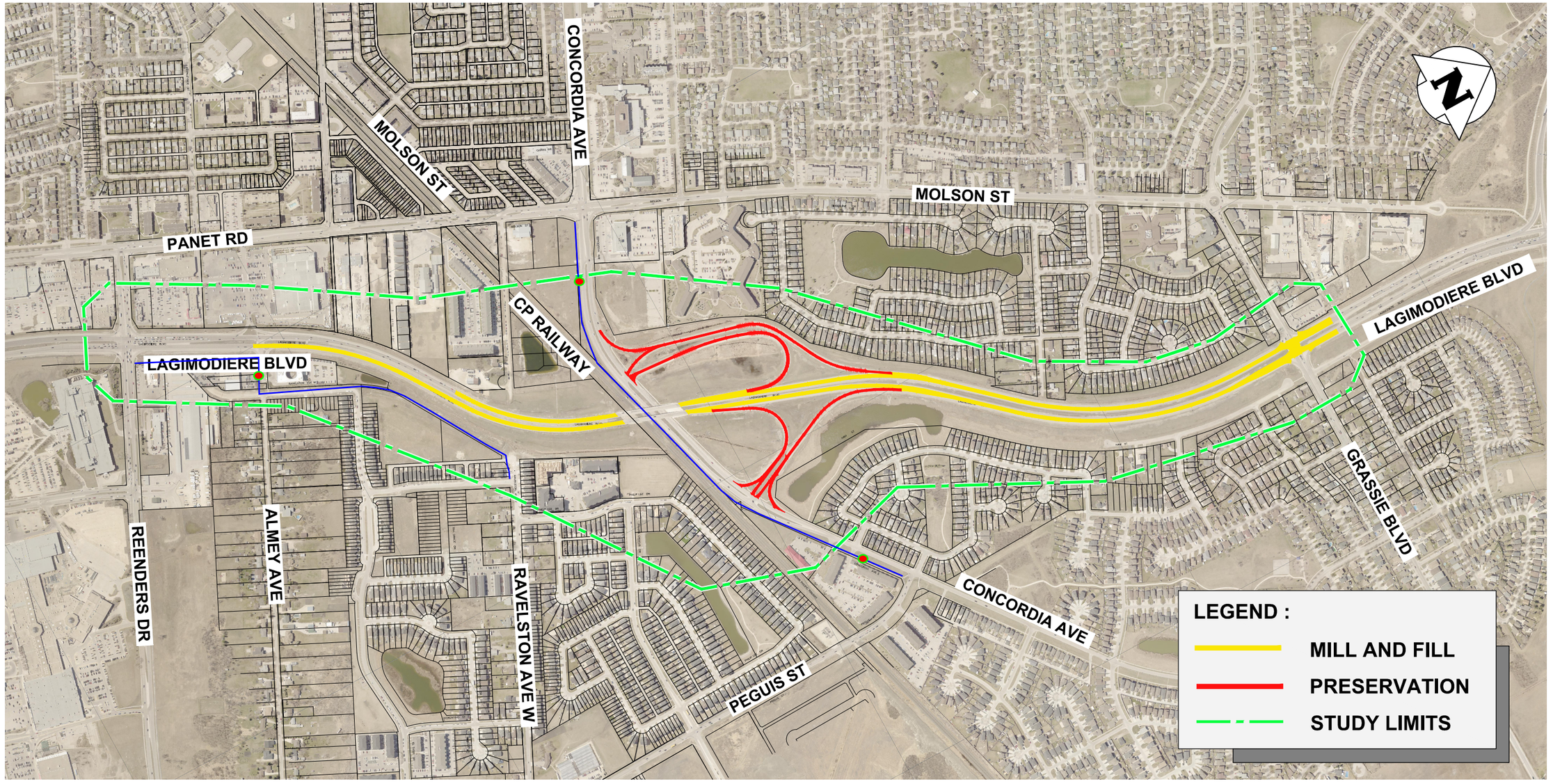
Notes:
1. Sloughing and seepage not observed.
2. Test hole open to 3.1 m depth and dry after drilling.
3. Test hole backfilled with auger cuttings and bentonite to surface.
4. Test hole surveyed relative to the top nut of the lamp post base approximately 4 m northwest of the test hole. The TBM was assigned an elevation of 100.00 m.

Logged By: Paul Cortez **Reviewed By:** Brent Hay **Project Engineer:** Matt Klymochko

SUB-SURFACE LOG LOGS 2023-08-01 LAGIMODIERE OVERPASS DD AND CONS 0_A_PC 0002-130-01.GPJ TREK.GDT 9/5/24

Appendix A

AT Pathway and Project Limits



Proposed AT Pathway Holes

Proposed AT Pathway

NO.	DATE	DESCRIPTION	DRAWN	REVIEWED	ISSUED	APPROVED

REVISIONS/ISSUE | DRAFTING | ENGINEERING

3D MODEL REF No:

DESIGNED BY:	DRAWN BY:	REVIEWED BY:
JT	JT	JNC
APPROVED BY:	DATE:	SCALE:
JNC	2022.11.04	AS NOTED

CLIENT: CITY OF WINNIPEG

TETRA TECH

PROJECT NAME: LAGIMODIERE BLVD. TWIN OVERPASS REHABILITATION

DRAWING DESCRIPTION: BASE PLAN

PROJECT NO:	SHEET NO:	REV:
734-2200070600	SKT-C005	A

TT DOCUMENT I.D. No:

B (279 x 431)

Appendix B

Laboratory Testing Results

MEMORANDUM

TREK GEOTECHNICAL Quality Engineering | Valued Relationships

Date	August 12, 2024
To	Paul Cortez, TREK Geotechnical
From	Angela Fidler-Kliewer, TREK Geotechnical
Project No.	0002-130-01
Project	Lagimodiere Overpass DD and Cons
Subject	Laboratory Testing Results – Lab Req. R24-369
Distribution	Matt Klymochko

Attached are the laboratory testing results for the above noted project. The testing included moisture content determinations, Atterberg limits, particle size analysis (Mechanical Sieve and Hydrometer method).

Regards,

Angela Fidler-Kliewer, C.Tech.,

Attach.

Review Control:

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

LABORATORY REQUISITION

CLIENT Tetratech **PROJECT NO:** 0002-130-01

PROJECT NAME Lagimodiere Overpass DD and Cons **FIELD TECHNICIAN:** Paul Cortez

TEST HOLE NUMBER	SAMPLE NUMBER	DEPTH OF SAMPLE (ft)	TARE NUMBER (LAB USE ONLY)	MOISTURE	VISUAL CLASS.	ATTERBERG LIMITS	HYDROMETER	GRADATION	STD. PROCTOR	UNCONFINED AND AUXILLARY TESTS					Soil Description/Comments
TH23-01	G01	0.5 - 1.0		X				X							GRAVEL FILL (ON sieves)
TH23-01	G02	1.0 - 1.5		X											↓
TH23-01	G03	2.0 - 2.5		X											CLAY FILL
TH23-01	G04	3.0 - 3.5		X		X	X								CLAY
TH23-01	G05	4.0 - 4.5		X											↓
TH23-01	G06	5.0 - 6.0		X											
TH23-01	G07	7.0 - 7.5		X											
TH23-01	G08	9.0 - 10.0		X											SILT
TH23-02	G09	0.5 - 1.0		X											CLAY FILL
TH23-02	G10	1.0 - 1.5		X											↓
TH23-02	G11	2.0 - 2.5		X		X	X								
TH23-02	G12	3.0 - 3.5		X											
TH23-02	G13	4.0 - 4.5		X											
TH23-02	G14	5.0 - 6.0		X											CLAY
TH23-02	G15	9.0 - 10.0		X											↓
TH23-03	G16	0.0 - 0.7		X											GRAVEL FILL
TH23-03	G17	1.0 - 1.5		X											CLAY FILL
TH23-03	G18	2.0 - 2.5		X		X	X								↓
TH23-03	G19	3.0 - 3.5		X											CLAY
TH23-03	G20	4.0 - 4.5		X											↓
TH23-03	G21	5.0 - 6.0		X											
TH23-03	G22	9.0 - 10.0		X											

- If G01 is not enough, add G02

SAMPLING DATE - AUGUST 1, 24

REQUESTED BY: Paul Cortez **REPORT TO:** ~~PB~~ PC / MF

REQUISITION DATE: Aug 2 **DATE REQUIRED:** Aug 16

COMMENTS:

REQUISITION NO. R24 - 369.

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Moisture Content Report
ASTM D2216-98

Project No. 0002-130-01
Client Tetra Tech
Project Lagimodiere Overpass DD and Cons

Sample Date 01-Aug-24
Test Date 02-Aug-24
Technician SL

Test Hole	TH24-01	TH24-01	TH24-01	TH24-01	TH24-01	TH24-01
Depth (m)	0.2 - 0.3	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.8
Sample #	G01	G02	G03	G04	G05	G06
Tare ID	THC	AB01	W102	AB38	A01	F86
Mass of tare	401.0	6.7	8.6	6.7	8.7	8.8
Mass wet + tare	1749.6	247.9	264.1	412.2	253.1	239.8
Mass dry + tare	1688.5	235.3	209.8	321.7	195.7	185.5
Mass water	61.1	12.6	54.3	90.5	57.4	54.3
Mass dry soil	1287.5	228.6	201.2	315.0	187.0	176.7
Moisture %	4.7%	5.5%	27.0%	28.7%	30.7%	30.7%

Test Hole	TH24-01	TH24-01	TH24-02	TH24-02	TH24-02	TH24-02
Depth (m)	2.1 - 2.3	2.7 - 3.0	0.2 - 0.3	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1
Sample #	G07	G08	G09	G10	G11	G12
Tare ID	F38	Z103	F57	E54	W23	Z134
Mass of tare	8.6	8.7	8.7	6.8	8.6	8.7
Mass wet + tare	218.2	251.4	250.0	226.4	412.6	239.5
Mass dry + tare	157.4	204.0	244.1	173.0	317.0	187.0
Mass water	60.8	47.4	5.9	53.4	95.6	52.5
Mass dry soil	148.8	195.3	235.4	166.2	308.4	178.3
Moisture %	40.9%	24.3%	2.5%	32.1%	31.0%	29.4%

Test Hole	TH24-02	TH24-02	TH24-02	TH24-03	TH24-03	TH24-03
Depth (m)	1.2 - 1.4	1.5 - 1.8	2.7 - 3.0	0.0 - 0.2	0.3 - 0.5	0.6 - 0.8
Sample #	G13	G14	G15	G16	G17	G18
Tare ID	N22	P31	E31	AA23	W13	F128
Mass of tare	8.5	8.4	6.7	6.7	6.8	8.5
Mass wet + tare	228.8	227.8	210.4	242.2	228.2	416.9
Mass dry + tare	180.6	168.8	146.3	229.3	181.5	336.3
Mass water	48.2	59.0	64.1	12.9	46.7	80.6
Mass dry soil	172.1	160.4	139.6	222.6	174.7	327.8
Moisture %	28.0%	36.8%	45.9%	5.8%	26.7%	24.6%

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Moisture Content Report
ASTM D2216-98

Project No. 0002-130-01
Client Tetra Tech
Project Lagimodiere Overpass DD and Cons

Sample Date 01-Aug-24
Test Date 02-Aug-24
Technician SL

Test Hole	TH24-03	TH24-03	TH24-03	TH24-03		
Depth (m)	0.9 - 1.1	1.2 - 1.4	1.5 - 1.8	2.7 - 3.0		
Sample #	G19	G20	G21	G22		
Tare ID	Z67	AB03	Z56	W103		
Mass of tare	8.6	6.8	8.5	8.7		
Mass wet + tare	256.9	252.3	230.2	239.3		
Mass dry + tare	197.2	192.1	164.5	159.7		
Mass water	59.7	60.2	65.7	79.6		
Mass dry soil	188.6	185.3	156.0	151.0		
Moisture %	31.7%	32.5%	42.1%	52.7%		

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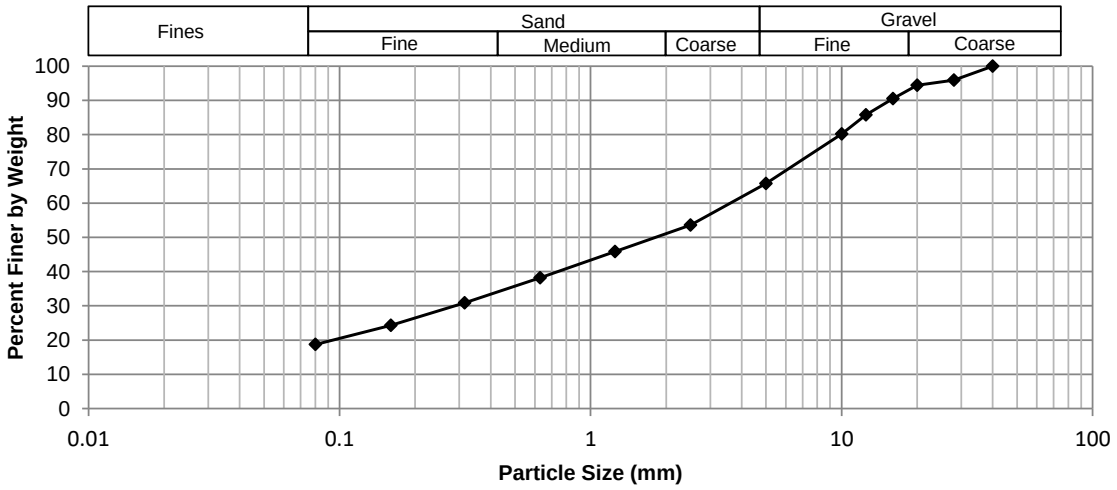
Grain Size Analysis (Sieve Method)
ASTM C136-06

Project No.	0002-130-01
Client	Tetra Tech
Project	Lagimodiere Overpass DD and Cons
Test Hole	TH24-01
Sample #	G01
Depth (m)	0.5-1.0
Date Sampled	1-Aug-24
Date Tested	2-Aug-24
Technician	A.Dustmamatov

Total Weight (g)	1287.5
Gravel %	34.2
Sand %	47.1
Fines %	18.7

Particle Size Distribution Curve



Sieve Opening (mm)	Percent Passing	Specification (Min-Max)
28.0	96	-
20.0	94	-
16.0	91	-
12.5	86	-
10.0	80	-
5.0	66	-
2.50	54	-
1.25	46	-
0.630	38	-
0.315	31	-
0.160	24	-
0.080	19	-

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Atterberg Limits
ASTM D4318-10e1

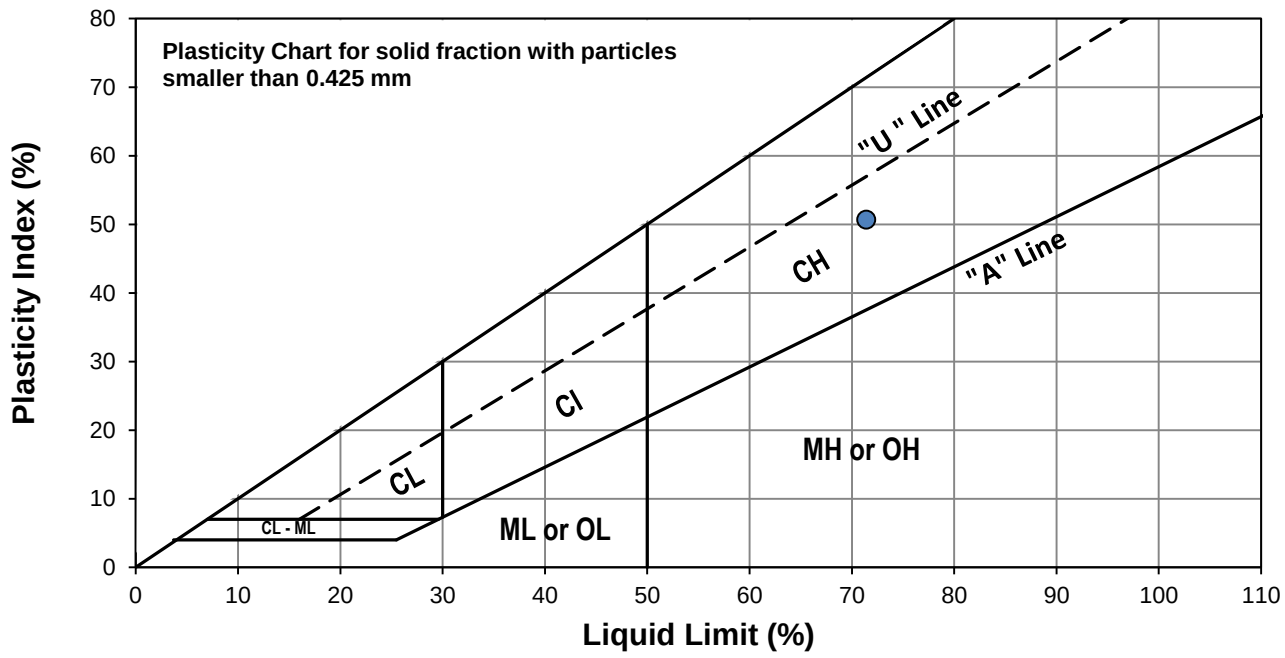
CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

Project No.	0002-130-01
Client	Tetra Tech
Project	Lagimodiere Overpass DD and Cons
Test Hole	TH24-01
Sample #	G04
Depth (m)	0.9 - 1.1
Sample Date	01-Aug-24
Test Date	07-Aug-24
Technician	SL

Liquid Limit	71
Plastic Limit	21
Plasticity Index	51

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	18	22	31		
Mass Tare (g)	14.236	13.959	14.068		
Mass Wet Soil + Tare (g)	23.069	23.175	22.908		
Mass Dry Soil + Tare (g)	19.315	19.302	19.277		
Mass Water (g)	3.754	3.873	3.631		
Mass Dry Soil (g)	5.079	5.343	5.209		
Moisture Content (%)	73.912	72.487	69.706		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	13.936	14.227			
Mass Wet Soil + Tare (g)	20.960	20.562			
Mass Dry Soil + Tare (g)	19.768	19.460			
Mass Water (g)	1.192	1.102			
Mass Dry Soil (g)	5.832	5.233			
Moisture Content (%)	20.439	21.059			

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

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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No.	0002-130-01
Client	Tetra Tech
Project	Lagimodiere Overpass DD and Cons
Test Hole	TH24-01
Sample #	G04
Depth (m)	0.9 - 1.1
Sample Date	1-Aug-24
Test Date	7-Aug-24
Technician	HBV

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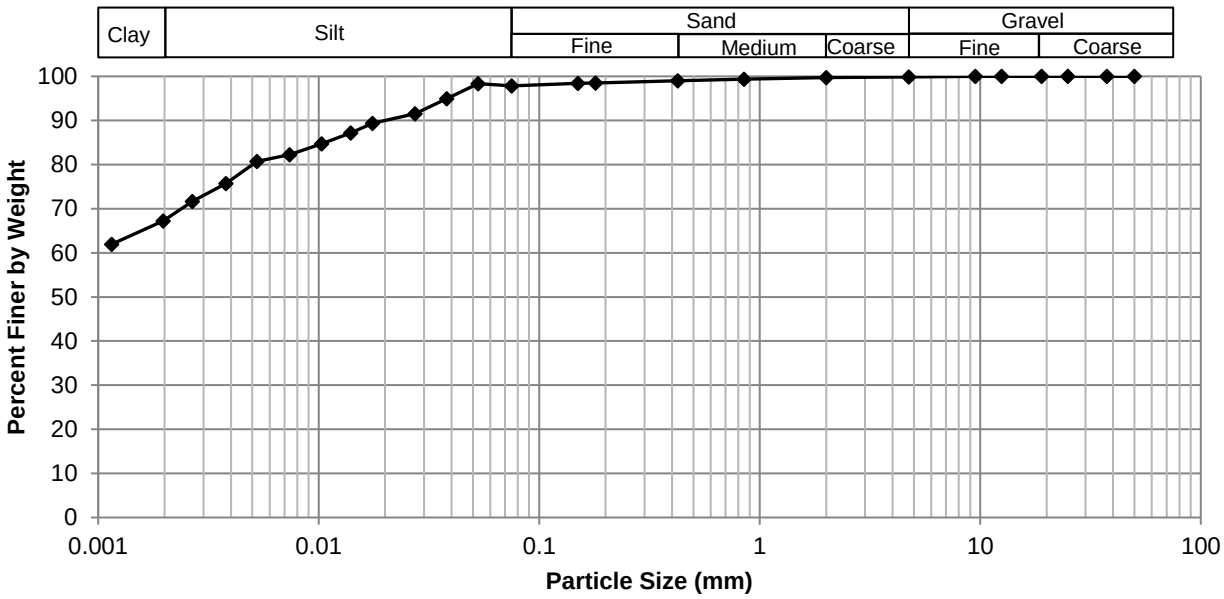
Gravel	0.2%
Sand	2.0%
Silt	30.3%
Clay	67.5%

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	99.84	0.0750	97.83
37.5	100.00	2.00	99.70	0.0529	98.37
25.0	100.00	0.850	99.36	0.0381	94.94
19.0	100.00	0.425	99.01	0.0274	91.51
12.5	100.00	0.180	98.53	0.0175	89.33
9.50	100.00	0.150	98.41	0.0140	87.15
4.75	99.84	0.075	97.83	0.0103	84.71
				0.0074	82.22
				0.0052	80.72
				0.0038	75.74
				0.0027	71.68
				0.0020	67.20
				0.0012	61.95

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Atterberg Limits
ASTM D4318-10e1

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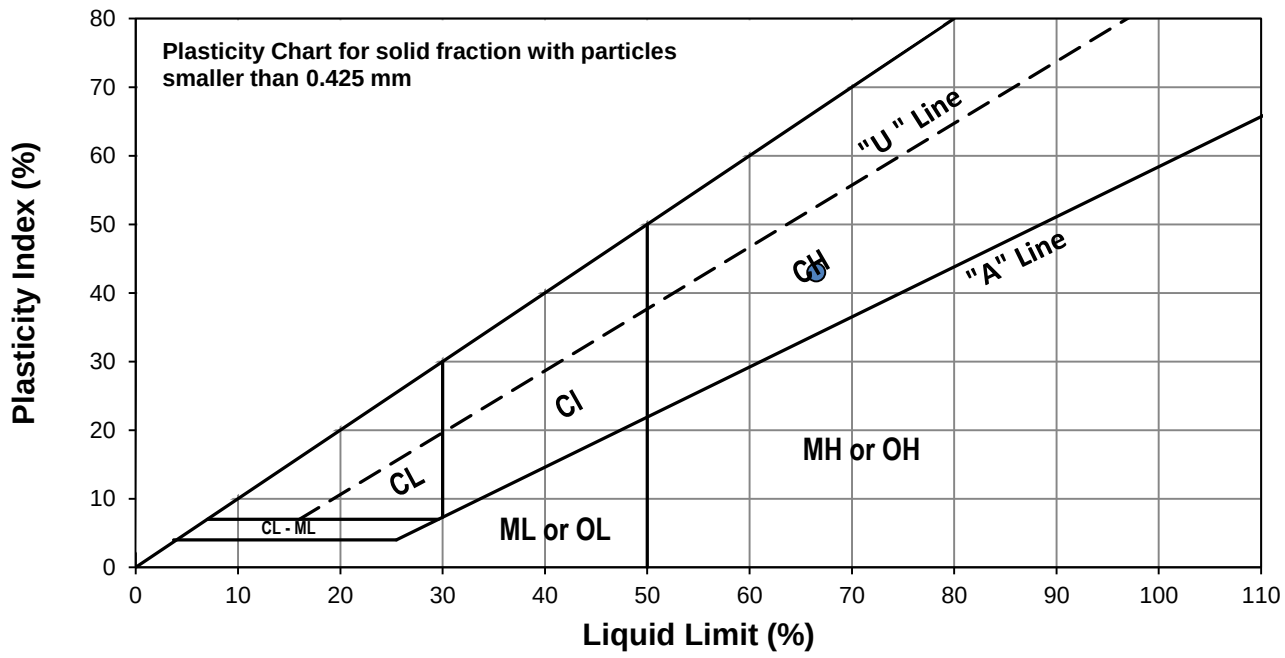
Project No.	0002-130-01
Client	Tetra Tech
Project	Lagimodiere Overpass DD and Cons
Test Hole	TH24-02
Sample #	G11
Depth (m)	0.6 - 0.8
Sample Date	01-Aug-24
Test Date	07-Aug-24
Technician	ZD

Liquid Limit	67
Plastic Limit	24
Plasticity Index	43

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	17	27	34		
Mass Tare (g)	13.678	14.054	14.005		
Mass Wet Soil + Tare (g)	27.359	24.834	21.971		
Mass Dry Soil + Tare (g)	21.807	20.540	18.830		
Mass Water (g)	5.552	4.294	3.141		
Mass Dry Soil (g)	8.129	6.486	4.825		
Moisture Content (%)	68.299	66.204	65.098		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.060	14.157			
Mass Wet Soil + Tare (g)	20.060	21.448			
Mass Dry Soil + Tare (g)	18.902	20.075			
Mass Water (g)	1.158	1.373			
Mass Dry Soil (g)	4.842	5.918			
Moisture Content (%)	23.916	23.200			

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

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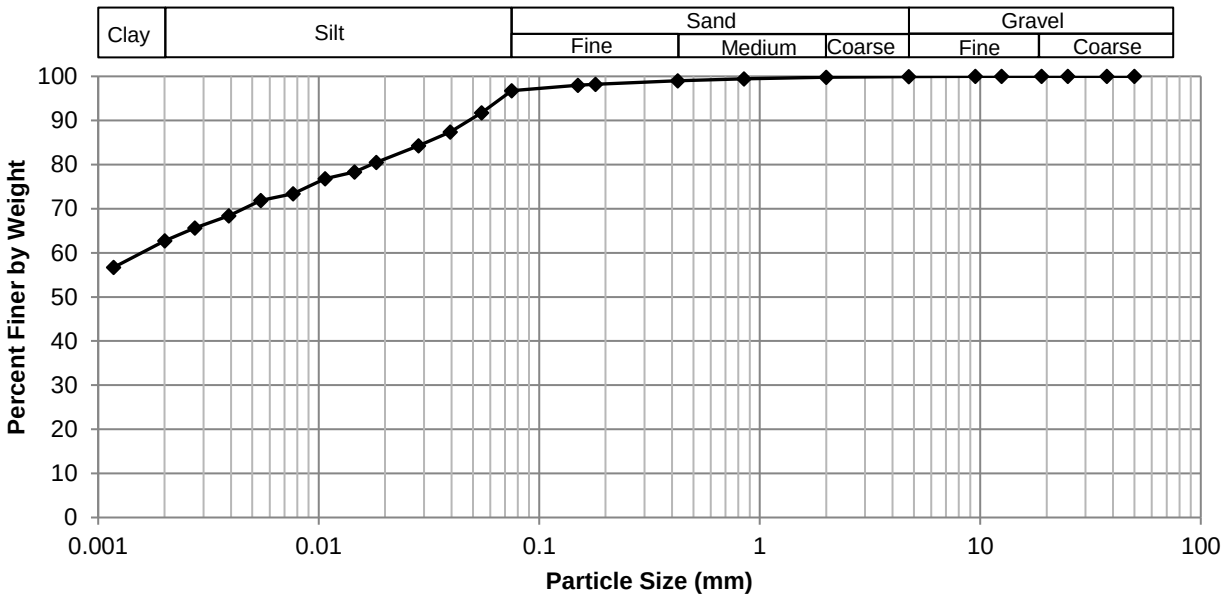
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No.	0002-130-01
Client	Tetra Tech
Project	Lagimodiere Overpass DD and Cons
Test Hole	TH24-02
Sample #	G11
Depth (m)	0.6 - 0.8
Sample Date	1-Aug-24
Test Date	7-Aug-24
Technician	HBV

Gravel	0.1%
Sand	3.2%
Silt	34.0%
Clay	62.8%

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	99.94	0.0750	96.77
37.5	100.00	2.00	99.81	0.0547	91.76
25.0	100.00	0.850	99.41	0.0395	87.39
19.0	100.00	0.425	98.99	0.0284	84.27
12.5	100.00	0.180	98.19	0.0182	80.52
9.50	100.00	0.150	98.00	0.0146	78.34
4.75	99.94	0.075	96.77	0.0107	76.81
				0.0077	73.42
				0.0055	71.85
				0.0039	68.42
				0.0027	65.61
				0.0020	62.74
				0.0012	56.70

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Atterberg Limits
ASTM D4318-10e1

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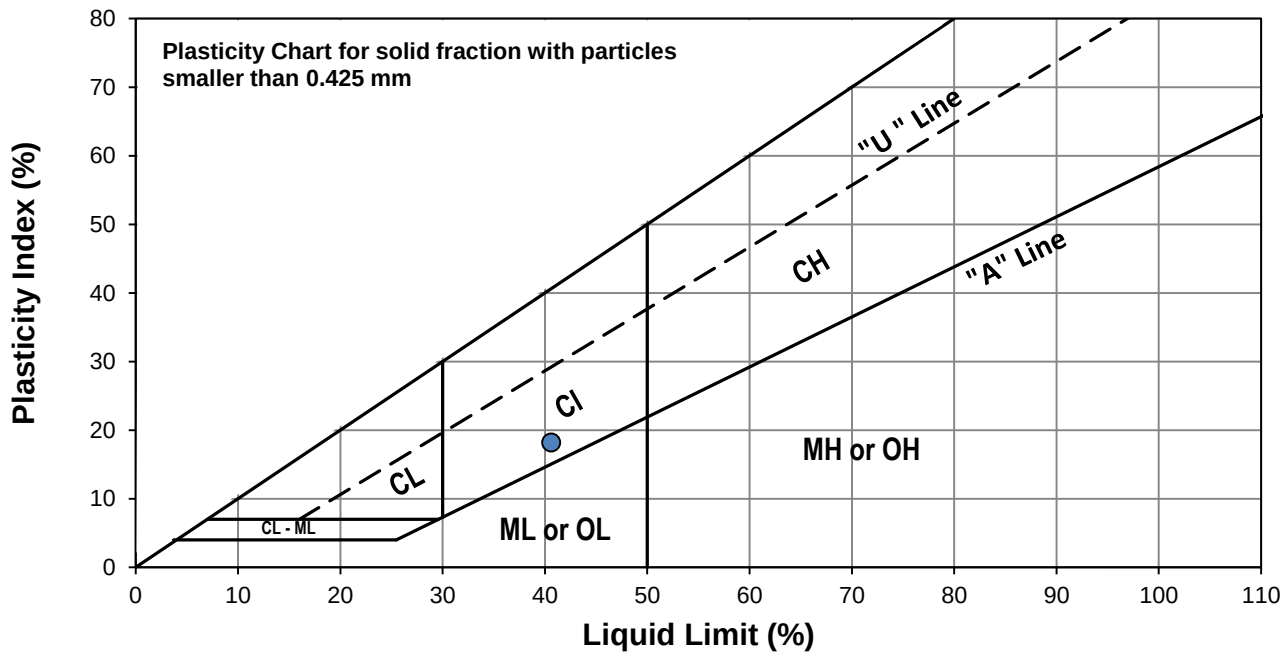
Project No.	0002-130-01
Client	Tetra Tech
Project	Lagimodiere Overpass DD and Cons
Test Hole	TH24-03
Sample #	G18
Depth (m)	0.6 - 0.8
Sample Date	01-Aug-24
Test Date	07-Aug-24
Technician	IA

Liquid Limit	41
Plastic Limit	22
Plasticity Index	18

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	18	23	32		
Mass Tare (g)	14.244	14.126	14.225		
Mass Wet Soil + Tare (g)	28.471	25.889	24.874		
Mass Dry Soil + Tare (g)	24.255	22.469	21.858		
Mass Water (g)	4.216	3.420	3.016		
Mass Dry Soil (g)	10.011	8.343	7.633		
Moisture Content (%)	42.114	40.992	39.513		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.150	14.068			
Mass Wet Soil + Tare (g)	23.181	22.347			
Mass Dry Soil + Tare (g)	21.519	20.834			
Mass Water (g)	1.662	1.513			
Mass Dry Soil (g)	7.369	6.766			
Moisture Content (%)	22.554	22.362			

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

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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No.	0002-130-01
Client	Tetra Tech
Project	Lagimodiere Overpass DD and Cons
Test Hole	TH24-03
Sample #	G18
Depth (m)	0.6 - 0.8
Sample Date	1-Aug-24
Test Date	7-Aug-24
Technician	HBV

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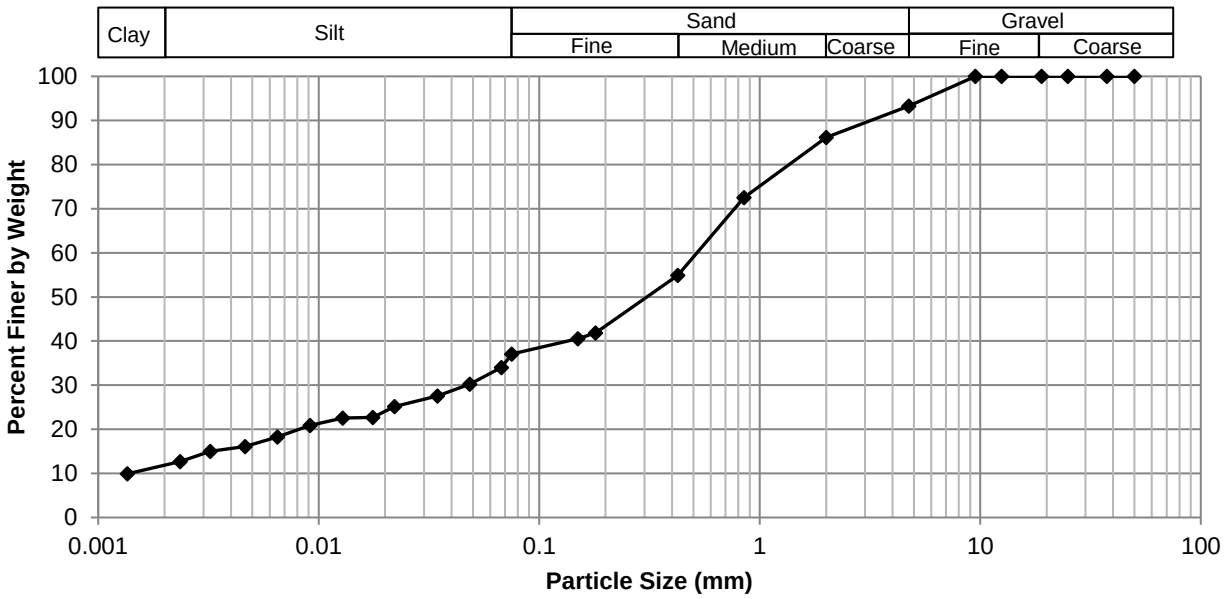
Gravel	6.7%
Sand	56.2%
Silt	25.3%
Clay	11.7%

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	93.25	0.0750	37.05
37.5	100.00	2.00	86.14	0.0675	34.03
25.0	100.00	0.850	72.53	0.0484	30.26
19.0	100.00	0.425	54.91	0.0346	27.57
12.5	100.00	0.180	41.85	0.0221	25.14
9.50	100.00	0.150	40.56	0.0176	22.72
4.75	93.25	0.075	37.05	0.0128	22.51
				0.0091	20.90
				0.0065	18.27
				0.0046	16.11
				0.0032	15.04
				0.0024	12.69
				0.0014	9.91