



GEOTECHNICAL FACTUAL REPORT

PAUARIKI BRIDGE, HIKUWAI ROAD RP0.56 (Bridge #02)

GISBORNE DISTRICT COUNCIL – BRIDGE REPLACEMENT



GISBORNE DISTRICT COUNCIL

Geotechnical Factual Report – Pauariki Bridge, Hikuwai Road RP0.56 – Bridge Replacement

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1. INTRODUCTION

Civil Assist Limited has been engaged by Gisborne District Council (GDC) to undertake a Geotechnical investigation campaign for the design and construction of a replacement bridge for the destroyed Pauariki Bridge on Hikuwai Road R.P.0.56, Gisborne.

As part of the commission, Civil Assist has undertaken site – specific investigations, based on the testing scope provided by GAIA Engineers, within the proposed bridge site to support the detailed design of the bridge. This report presents a summary of the factual results of the investigation.

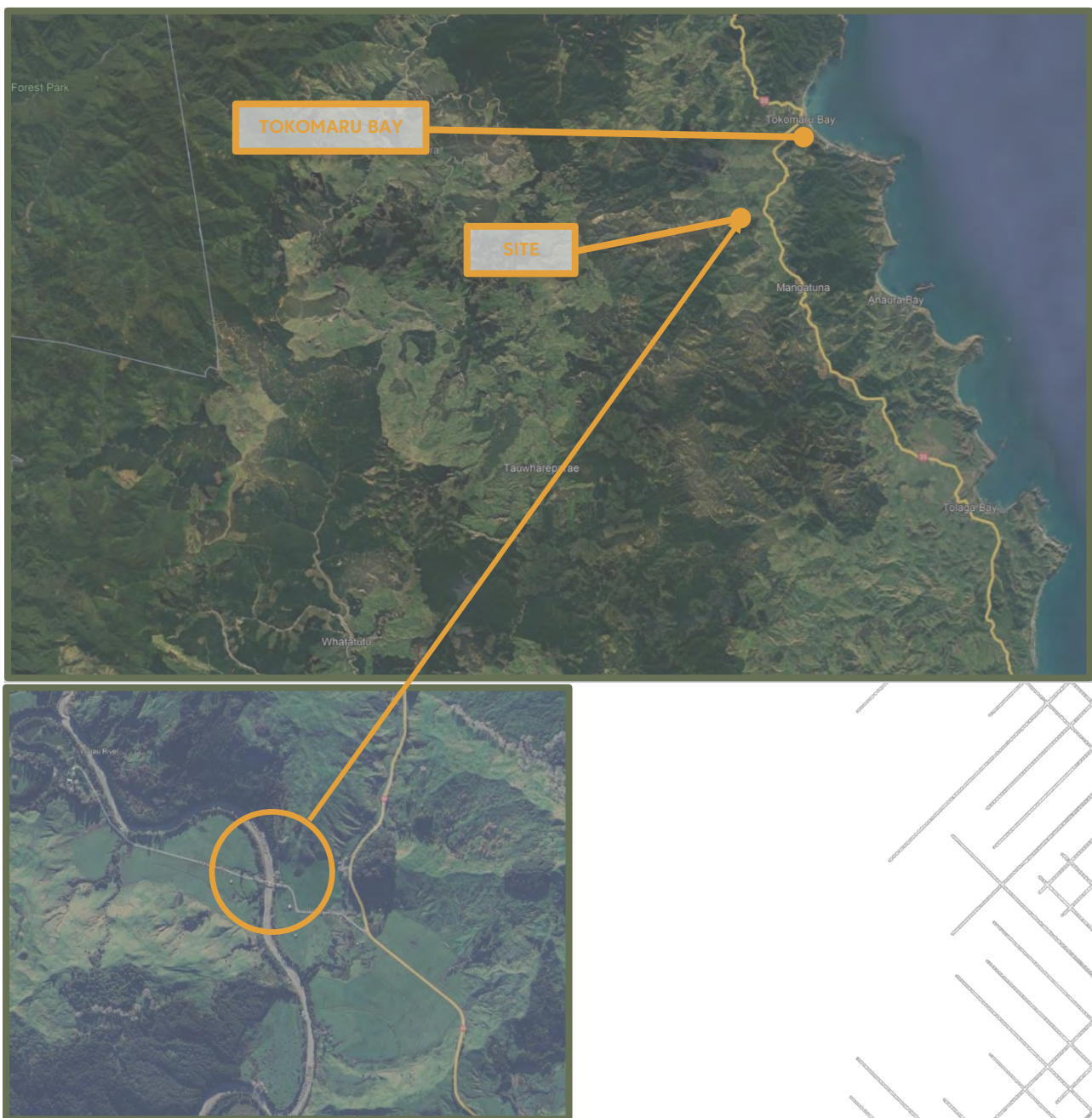


Figure 1-1: Location Plan (Google Earth)

2. SITE DESCRIPTION

Pauariki Bridge is located on Hikuwai Road, approximately 82km north of Gisborne City and 8.5km southwest of Tokomaru Bay. The Pauariki Bridge provides access across the Hikuwai River.



Figure 2-1: Bridge Location



Figure 2-2: Site Contour (Lidar Data)

The bridge has been destroyed beyond use during the Cyclone Gabrielle event in February 2023.

2.1 GEOMORPHOLOGY

The bridge site is situated along the flood plains of the Waiau River and is bounded by hills to the west and east from the Tolaga formation. The hills to the west result from a large fold in the Tolaga unit. The site is near the upper reaches of the Waiau flood plains and so the spread of the flood plain is fairly narrow, being between 250m and 500m wide. The site is at the downstream end of a 700m right hand curve in the river. The Waiau River has more gently sloping banks on the true right-hand side and steeper banks with erosion features on the left and side. The flood plains on the inside of the river bend have indications that the river has moved towards the left-hand bank (west) over the course of its life. This would explain the erosion features on the left-hand bank appearing active despite being heavily forested. The hills surrounding the area are of the Tolaga formation and are heavily incised, notably the western faces.



Figure 2-3: Site Topography and Slope profile alignment

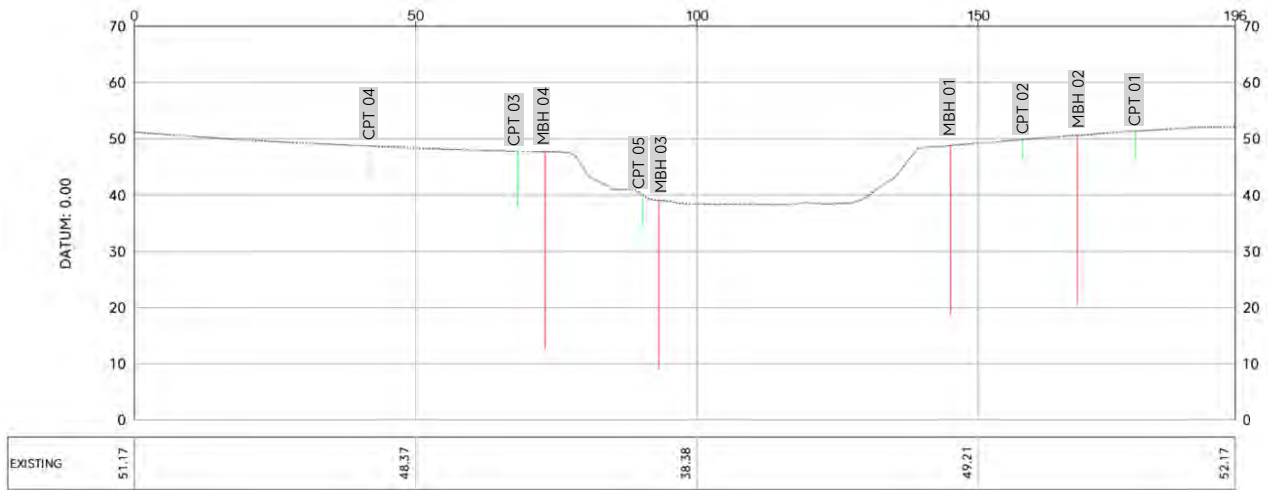


Figure 2-4: Profile 1 Section.

2.2 EXISTING BRIDGE

The destroyed concrete bridge was constructed at a level of approximately 48m above the mean sea level and was supported by concrete abutments protected by sheet piles at both ends and 2 x concrete piers. The sectional view of the design plan is included in Figure 2-7.

The eastern two spans of the bridge and the abutment were completely destroyed, being dislocated during the cyclone Gabrielle extreme weather event. The western (inland) span remains in place.



Figure 2-5: Current abutment west.



Figure 2-6: Current abutment east.

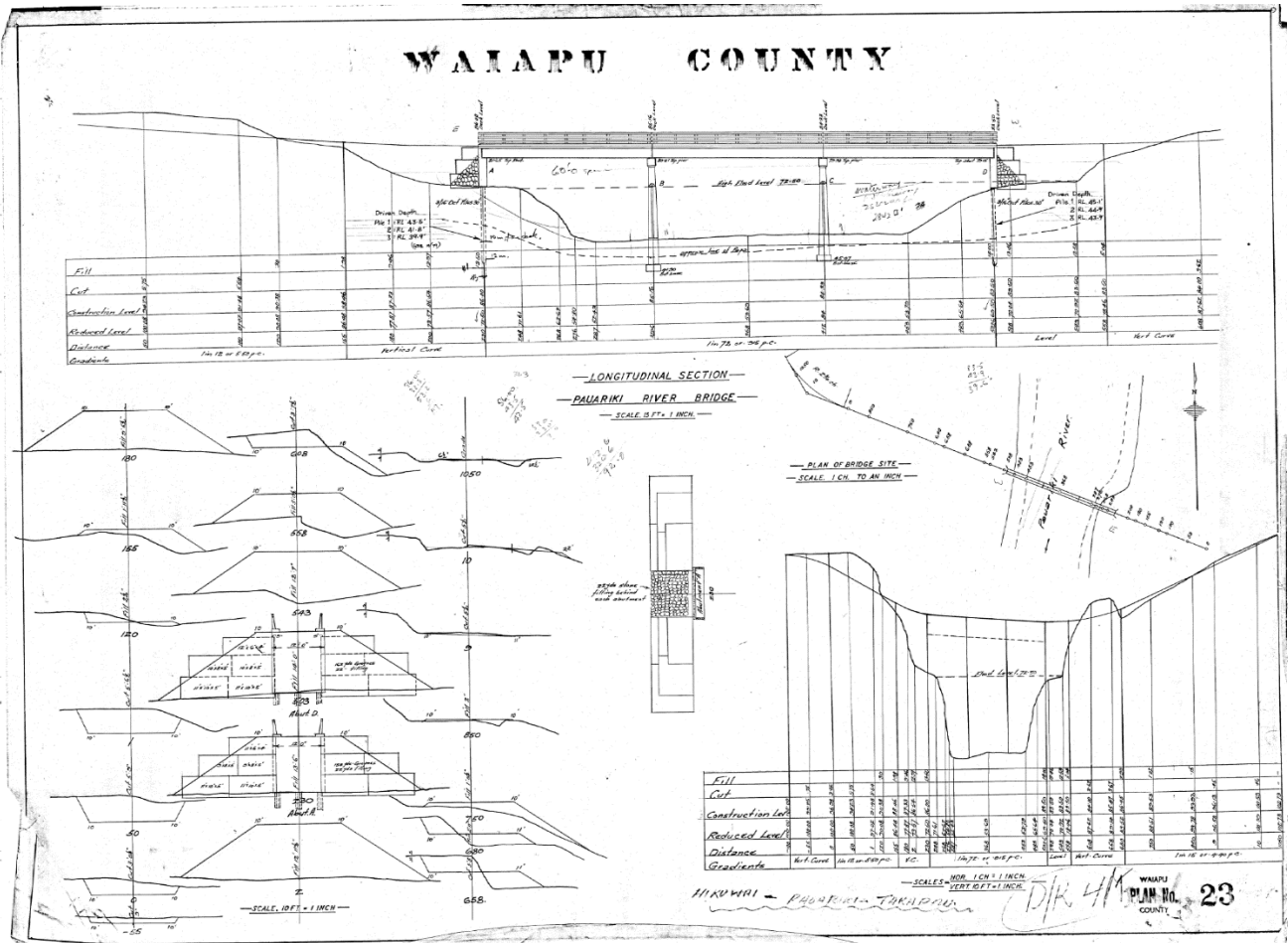


Figure 2-7: Design section of the existing bridge.



Figure 2-8: Bridge Washed out, east to west view (Civil Assist)



Figure 2-9: Bridge washed out south to north view (Civil Assist).

3. SITE GEOLOGY

The geological map (GNS interactive geological map of New Zealand 1:250,000) shows the site to be generally underlain by Early Miocene mudstone of the Tolaga Group Formation (MI). These deposits typically consist of undifferentiated massive and bedded, grey, slightly calcareous mudstone, with rare macrofossils and intercalated beds of fine-grained sandstone and conglomerate. Overlying the mudstone are Holocene River deposits consisting of gravel, sand, and silt.

The inactive Tokomaru exposed Fault is located approximately 970m east of the Bridge location, total slip unknown, with throw down to southeast displacement information. Another unnamed inactive concealed Fault is located approximately 1.8km south of the bridge location with unknown displacement info.

The nearest active Fault is an unnamed Fault, approximately 3.8km southeast of the site with total slip unknown, with throw down to northeast displacement info.

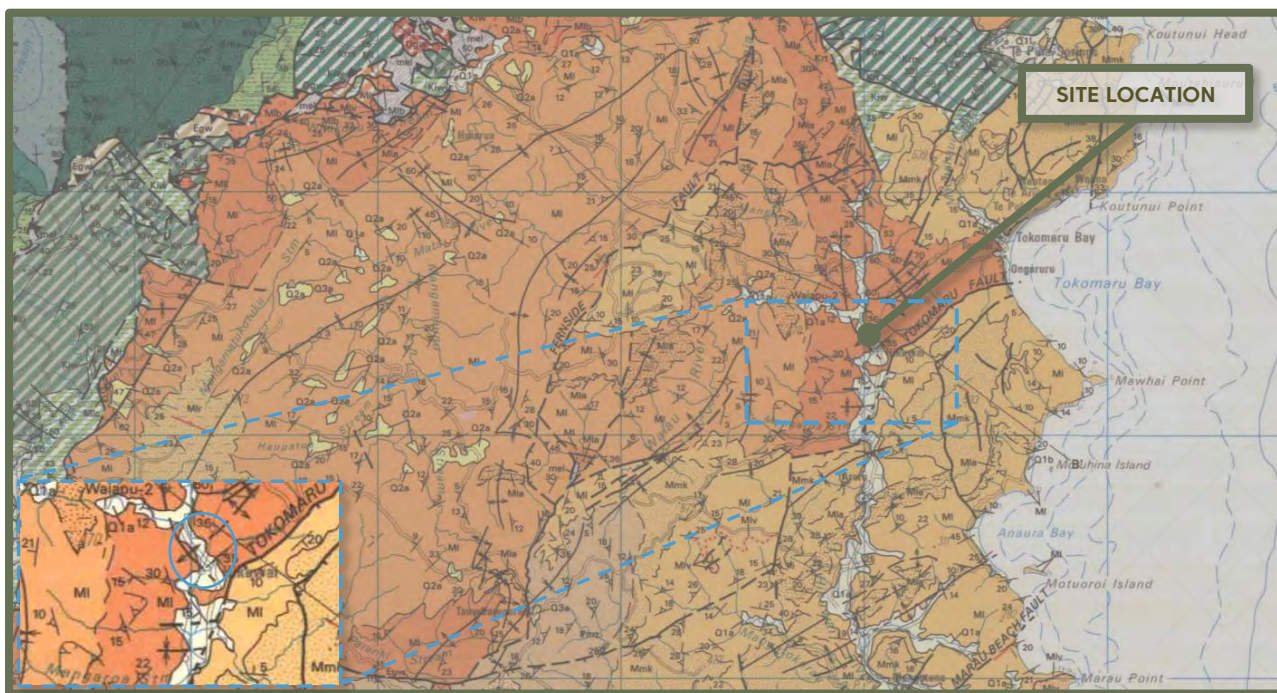


Figure 3-1: Site Geology from 'Geology of Raukumara' GNS Geological Map

The general geology of the site summarized above is the integrated output of our site investigation data, the 1:250,000 regional geological maps, and other published and unpublished data.

4. GEOTECHNICAL INVESTIGATION

The Site-specific ground investigation was undertaken on separate occasions due to limited access across the river with no other roads leading to the western side. CPTs 01 and 02 with DPSH test was conducted on 07 June 2023. Machine boreholes MBH01 and MBH02 were conducted between 05 June 2023 and 19 June 2023.

Due to heavy rain the boreholes and CPT on the western side were completed at a later stage. CPTs 03; 04 and 05 with one DPSH test were conducted on 30 August 2023 after the river level was low enough to cross. Machine boreholes MBH03 and MBH04 were conducted between 20 September 2023 and 13 October 2023.

The purpose of the investigations was to access the nature of the ground across the site. The investigations comprised of the following:

- 5 Cone Penetration Tests (CPTs) undertaken to refusal depth, followed by DPSH tests (CP01; CPT02 and CPT05)
- 4 machine boreholes undertaken to depths between 30.00 m and 35.00 m below ground level respectively.

The test locations are shown on the site testing plan – Appendix A.

4.1 CONE PENETRATION TEST (CPTs)

A total of 5 CPTs were conducted of which 2 CPTs (CPT01 to CPT02) were completed on 07 June 2023, and CPTs 03; 04 and 05 completed on 30 August 2023. The purpose of the tests is to provide guidance to the general subsurface soil profile within the investigated site. The CPTs refused at depths between 3.25m and 9.77m.

Testing was carried out using a track mounted rig (Pagani TG63-150). Maximum thrust capacity (kN)- (pounds) 150 – 33,721; Maximum extraction capacity (kN)- (pounds) 160 – 35,969; Test speed (cm/s) – (foot/s) 2 – 0.065 selector for CPTm tests with load cell and electronic board for manual data acquisition. Maximum thrust readable from the load cell (kN) – (pounds) 150 – 33,721.

Testing was undertaken in accordance with ASTM-D5778-12. All results were submitted to the project team for further verification.

Details of the CPTs are presented in Table 4-1. The CPT results are presented in Appendix B.

Table 4-1: Details of the CPTs.

TEST ID	TERMINATION DEPTH (m)*	NORTHING	EASTING	RL	GROUNDWATER LEVEL (m)**	REASON FOR TERMINATION
CPT 01	5.16 m	850636.92	432504.81	51.25	0.74 m	High QC reading >30Mpa
CPT 02	3.25 m	850649.70	432489.61	49.70	Collapsed 0.40 m	High QC reading >30Mpa
CPT 03	9.77 m	850700.07	432415.60	46.90	4.57 m	High QC reading >30Mpa, machine lifting
CPT 04	5.98 m	850714.95	432394.10	48.57	Collapsed 1.73 m	High QC reading >30Mpa, machine lifting
CPT 05	5.34 m	850685.98	432433.36	39.60	Collapsed 1.44 m	High QC reading >30Mpa, machine lifting

* CPT termination depths are measured from the existing ground level.

** Ground water levels are measured from the existing ground level at the end of each test.

4.2 DYNAMIC PENETROMETER SUPER HEAVY (DPSH) TEST

Dynamic Penetrometer Super Heavy (DPSH) tests are generally performed when a CPT has refused at a shallow depth, in order to confirm the properties and extent below the terminated layers. After shallow refusal of the CPTs, three DPSH tests were completed with the track mounted CPT rig (Pagani TG63-150) at either side of the bridge. DPSH were performed by dropping a 63.5kg hammer from a 750 mm height. A solid cone of 20 cm² - 90° attached to a Ø32 mm rod.

- CPT01 refused at a depth of 5.16m, blows per 200mm were recorded from 5.00m up to a depth of 5.20m.
- CPT02 refused at a depth of 3.25m, blows per 200mm were recorded from 3.00m up to a depth of 3.40m.
- CPT05 refused at a depth of 5.34m, blows per 200mm were recorded from 5.40m up to a depth of 5.60m.

The detailed DPSH results are presented in Appendix C.

4.3 MACHINE BOREHOLES

A total of 2 machine boreholes (MBH01 and MBH02) were drilled from 05 June 2023 to 19 June 2023, using a track mounted rig (Commachio), drilling was undertaken using the HQ3, triple-tube, rotary coring method.

Due to heavy rain, access across the river was not viable. Another 2 machine boreholes (MBH03 and MBH04) were drilled between 20 September 2023 and 13 October 2023, using a track mounted rig (Hanjin 8D), drilling was undertaken using HQ3, triple-tube, rotary coring method. Both drilling events were associated with Standard Penetration Testing (SPT) performed using a hammer designed to drop 63.5kg in free fall from a height of 760mm. Calibration reports are presented in Appendix E.

Push tube samples were taken in MBH04, within the compressible soil layers and sealed with molten wax poured into the tube to prevent the samples from losing or adding moisture. The boreholes were terminated between 30m and 35m depth below existing ground level.

The soil samples retrieved from the boreholes were logged and securely stored at the Civil Assist office until further instructions on Laboratory tests to be conducted.

Details of the machine boreholes are presented in Table 4-2. The borehole logs and photographs are presented in Appendix D.

Table 4-2: Details of the machine boreholes.

TEST ID	TERMINATION DEPTH (m)*	NORTHING	EASTING	RL	GROUNDWATER LEVEL (m) **	STANDPIPE PIEZOMETER – FILTER DEPTHS(m)*
MBH01	30.00 m	850655.47	432478.33	48.80	6.20 m	-
MBH02	30.00 m	850642.10	432496.34	50.60	2.20 m	-
MBH03	30.00 m	850684.38	432434.82	39.15	2.72 m	Filter @ 9 – 15 m & 23 – 27 m
MBH04	35.00 m	850699.70	432421.39	47.68	3.10 m	Filter @ 8 – 13 m & 18 – 24 m

* MBH termination depth and Piezometer filter depths are measured from the existing ground level.

** Ground water levels are measured from the existing ground level at the end of each borehole.

4.4 GROUNDWATER MONITORING

The groundwater levels were measured and recorded within each borehole after allowing sufficient time for the water level to stabilize, upon completion of each borehole. Standpipe piezometers were installed within MBH03 and MBH04 in accordance with the specifications provided by GAIA Engineers. Monitoring of the groundwater levels will continue with the recommended frequency until further instructions. MBH03 and CPT05 was conducted on a platform adjacent to the riverbed thus has a higher groundwater level.

The recorded groundwater levels upon MBH completions and the standpipe installation depths are presented in Table 4-2.

5. LABORATORY SUBMITTANCE

Laboratory tests were performed by WSP Laboratory Gisborne according to the following New Zealand Standards NZS4402:1986:

- Test 6.3.1 Determination of the unconfined compressive strength of cohesive soil. (UCS)
- Test 2.1 Determination of the natural water content (Atterberg Limits)
- Test 2.2 Determination of the liquid limit (Atterberg Limits)
- Test 2.3 Determination of the plastic limit (Atterberg Limits)
- Test 2.4 Determination of the plasticity index (Atterberg Limits)

Additional laboratory tests were performed by Civil Assist as per GAIA Engineers requirements.

- Modified Slaking Tests. The purpose of the test is to measure the rate of material loss from a drilled core sample at the water and air interface.

Sample depths as presented in Table 5-1 below. Laboratory results are presented in Appendix F.

Table 5-1: Details of the laboratory tests

TEST ID	UCS TEST DEPTH (m)*	SLAKING TEST DEPTH (m)*	ATTERBERG TEST DEPTH (m)*
MBH01	08.40 – 08.70m	11.34 – 11.54m	02.30 – 02.60m
	23.60 – 23.90m	17.20 – 17.38m	
		23.30 – 23.60m	
MBH02	09.50 – 09.80m	06.90 – 07.30m	01.95 – 02.30m
		13.90 – 14.20m	
		18.55 – 18.70m	
MBH03	08.40 – 08.70m	09.00 – 09.30m	03.00 – 03.50m
		16.86 – 17.03m	
MBH04	09.30 – 09.70m	09.70 – 09.90m	03.00 – 03.40m
		16.25 – 16.46m	06.00 – 06.40m

* MBH sample depths measured from the existing ground level.

6. LIMITATIONS OF OUR REPORT

The ground conditions presented in this report are based on the tests undertaken at discrete locations across the site. Ground conditions may change suddenly over short distances resulting in variations between test positions across the site.

This report has been prepared for the benefit of the Gisborne District Council (GDC) for the purpose of providing sub-surface ground conditions for the replacement of the Pauariki Bridge. It is not to be relied upon or used out of context for any other purpose without agreement from Civil Assist.

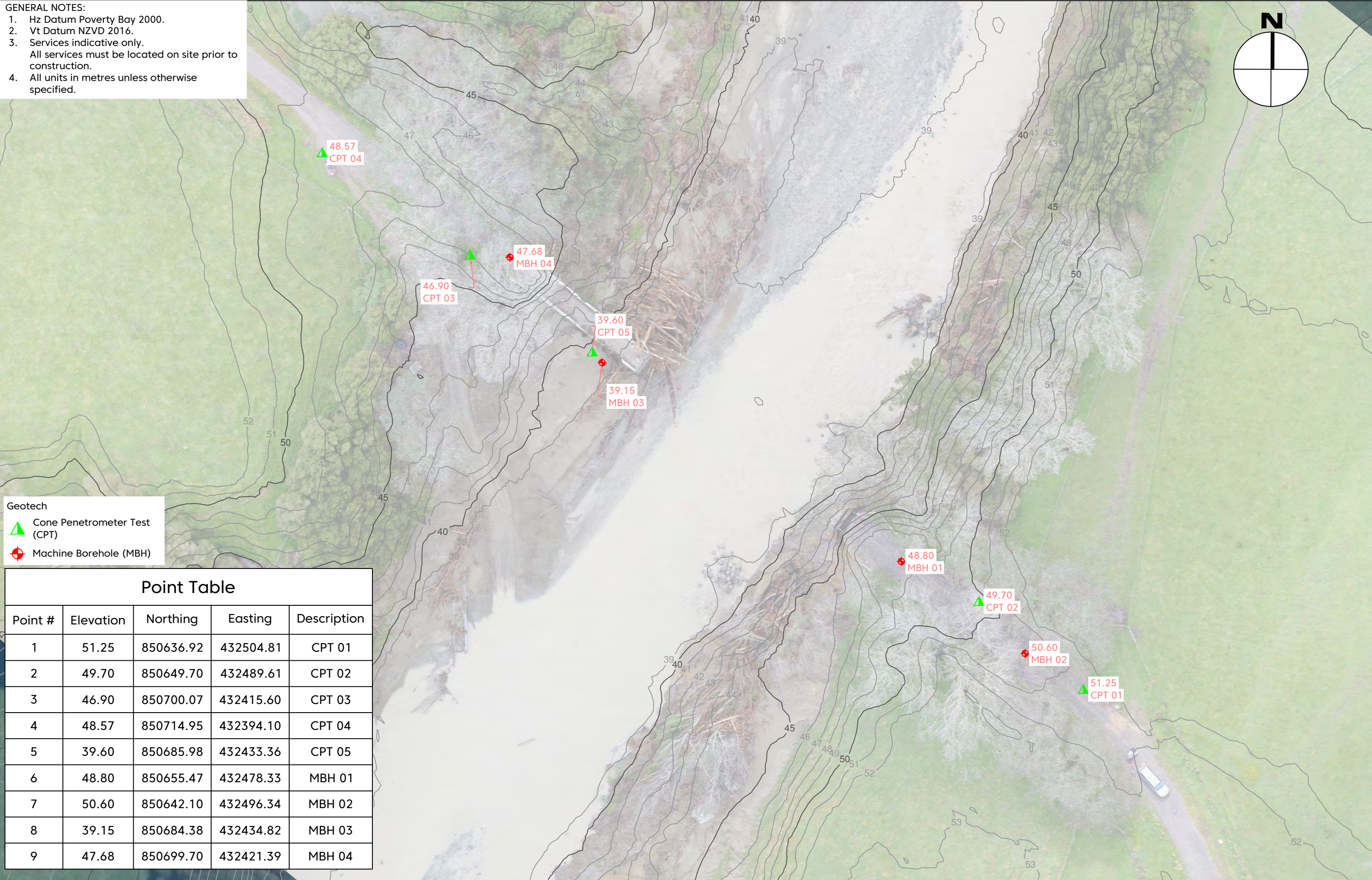
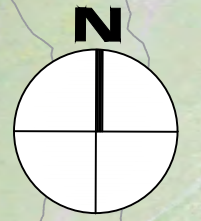
ABBREVIATION AND ACRONYMS

MBH	Machine Borehole
RC	Rotary Core Sample
PS	Push Tube Sample
SPT	Standard Penetration testing Sample
CBD	Central Business District
CPT	Cone Penetrometer Test
GDC	Gisborne District Council
NZGS	New Zealand Geotechnical Society
NZS	New Zealand Standard
NZTA	New Zealand Transport Agency

APPENDIX A - GEOTECHNICAL TESTING PLAN

GENERAL NOTES:

1. Hz Datum Poverty Bay 2000.
2. Vt Datum NZVD 2016.
3. Services indicative only.
All services must be located on site prior to construction.
4. All units in metres unless otherwise specified.



Geotech

- Cone Penetrometer Test (CPT)
- Machine Borehole (MBH)

Point Table				
Point #	Elevation	Northing	Easting	Description
1	51.25	850636.92	432504.81	CPT 01
2	49.70	850649.70	432489.61	CPT 02
3	46.90	850700.07	432415.60	CPT 03
4	48.57	850714.95	432394.10	CPT 04
5	39.60	850685.98	432433.36	CPT 05
6	48.80	850655.47	432478.33	MBH 01
7	50.60	850642.10	432496.34	MBH 02
8	39.15	850684.38	432434.82	MBH 03
9	47.68	850699.70	432421.39	MBH 04

			SURVEYED		
			DRAWN	ML	17/10/2023
			CHECKED	KN	17/10/2023
			APPROVED	RA	17/10/2023
REVISION					

TITLE
**PAUARIKI BRIDGE
 TEST LOCATIONS**

CLIENT
GDC

LOCATION
HIKUWAI RD

PROJECT NO.
001.110.03.08

DRAWING NO.
01

SCALE
1:500

SHEET
01

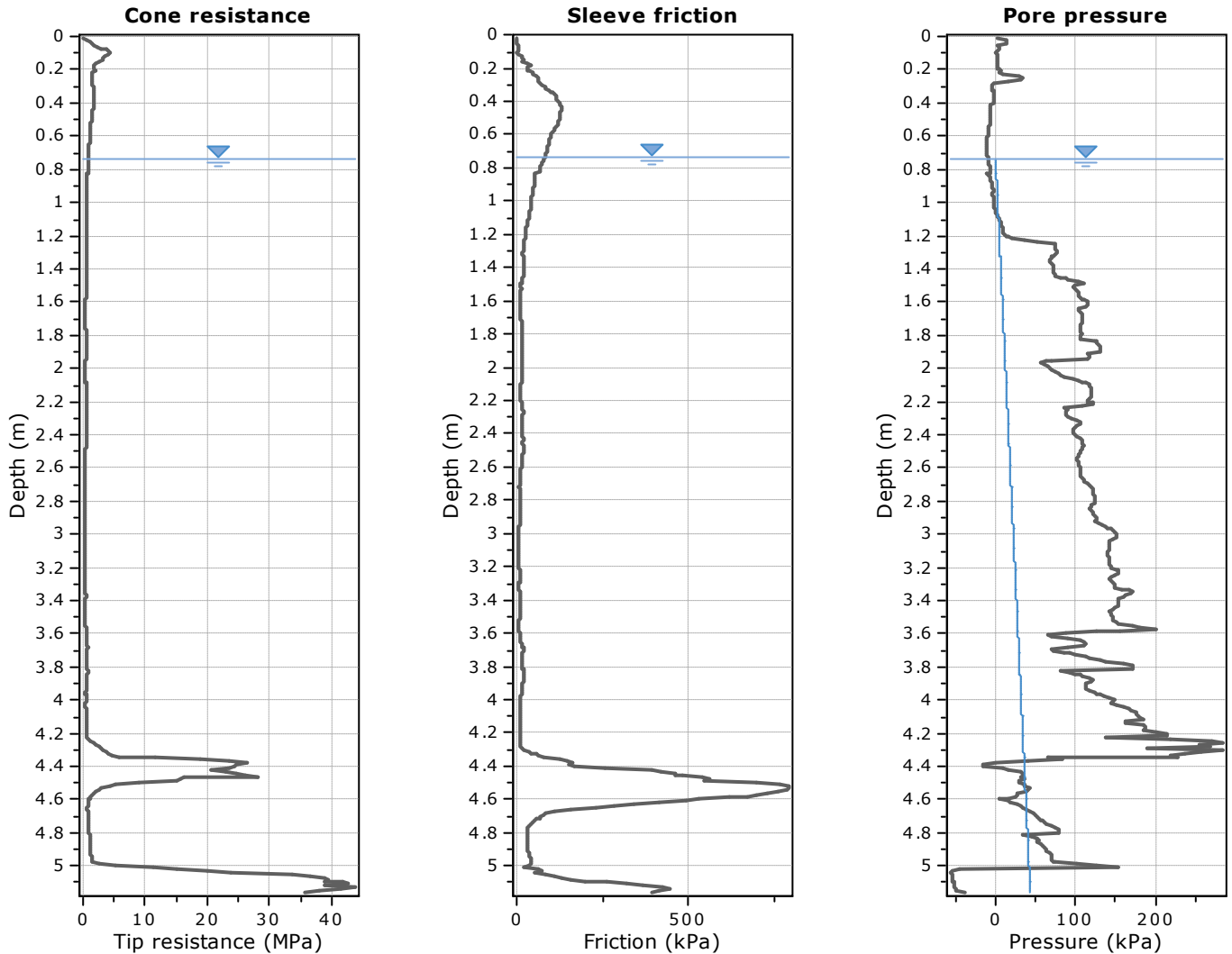
PAGE SIZE
A3

REVISION
R0



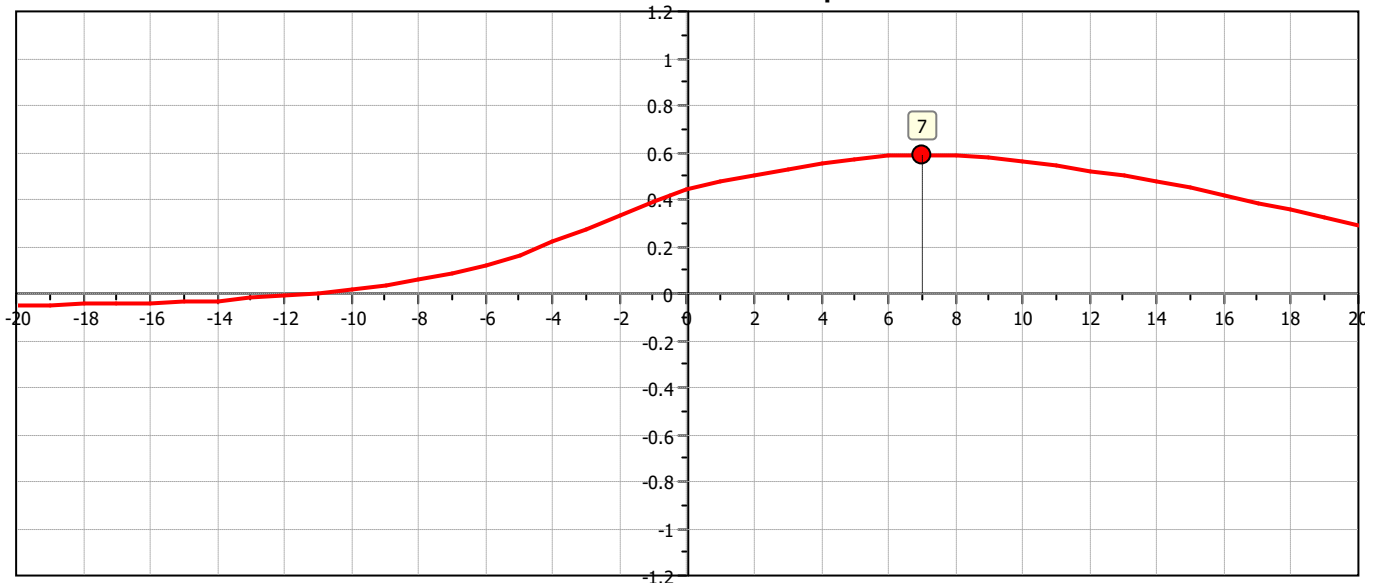
20 Grey St
 Gisborne, NZ
 0800 248 451
 civilassist.nz

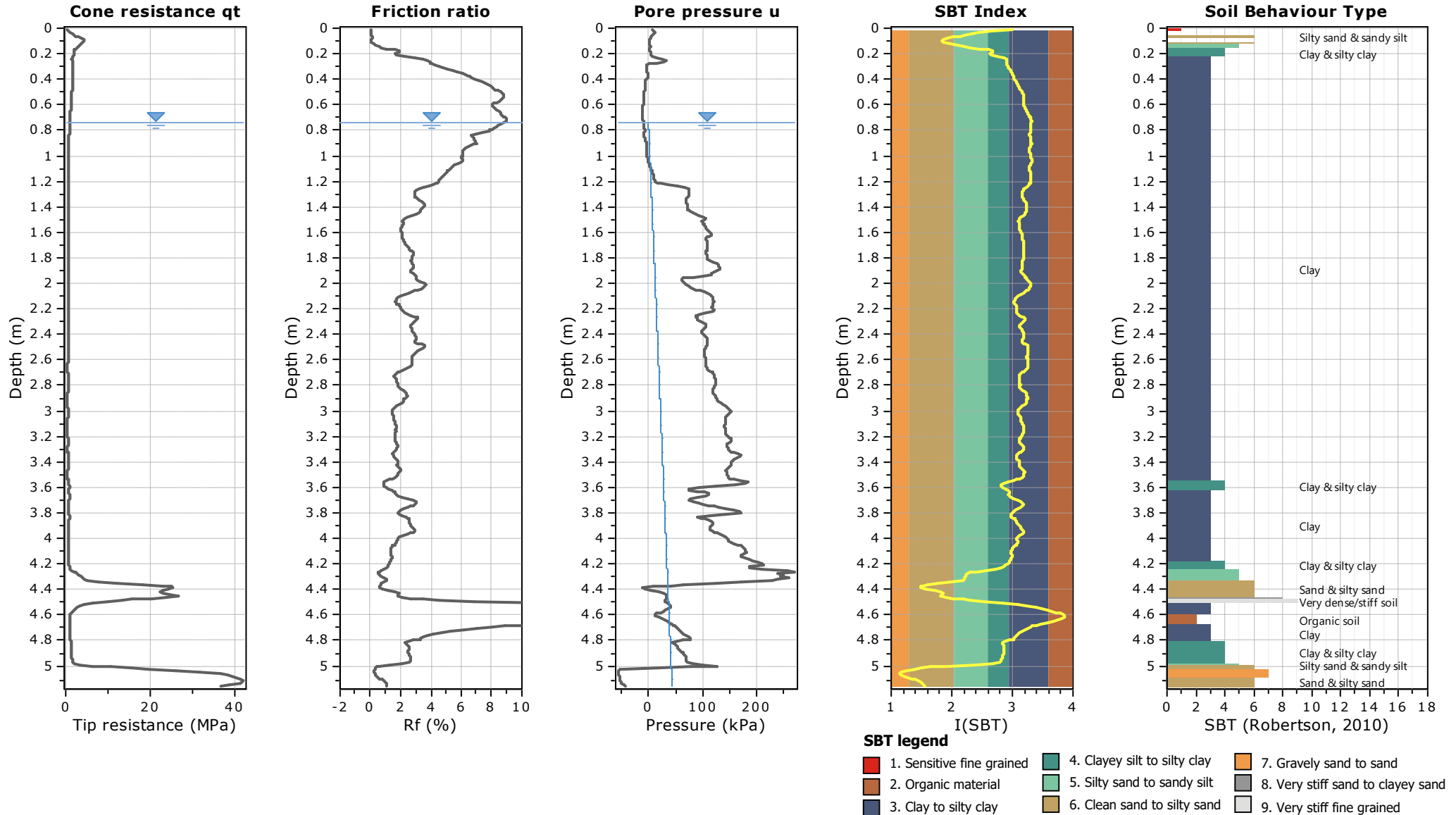
APPENDIX B - CPT TEST RESULTS

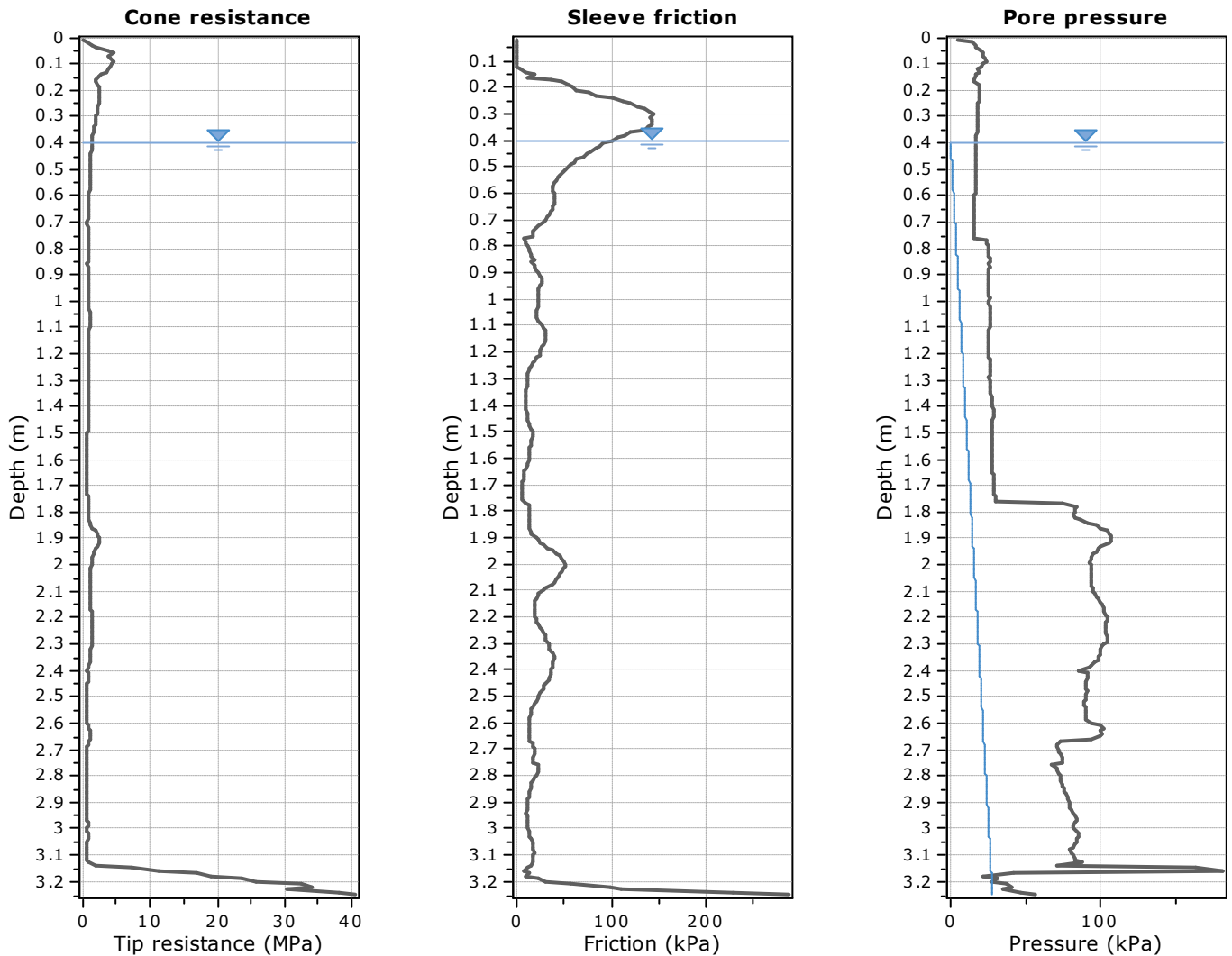


The plot below presents the cross correlation coefficient between the raw q_c and f_s values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between q_c & f_s

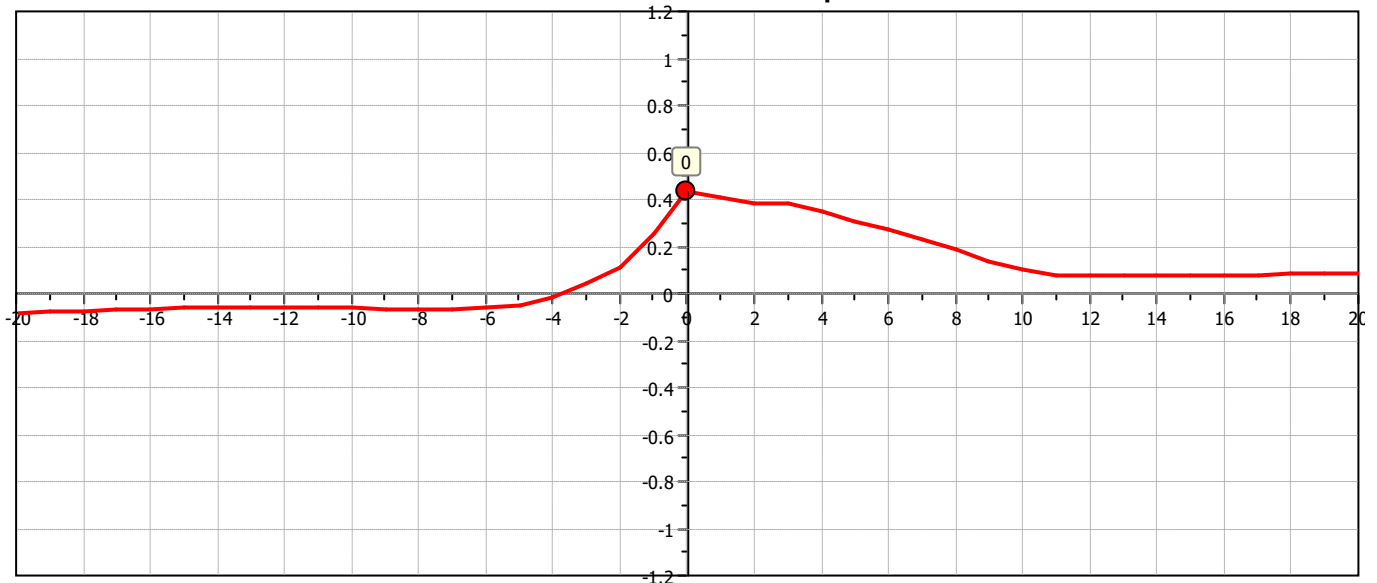


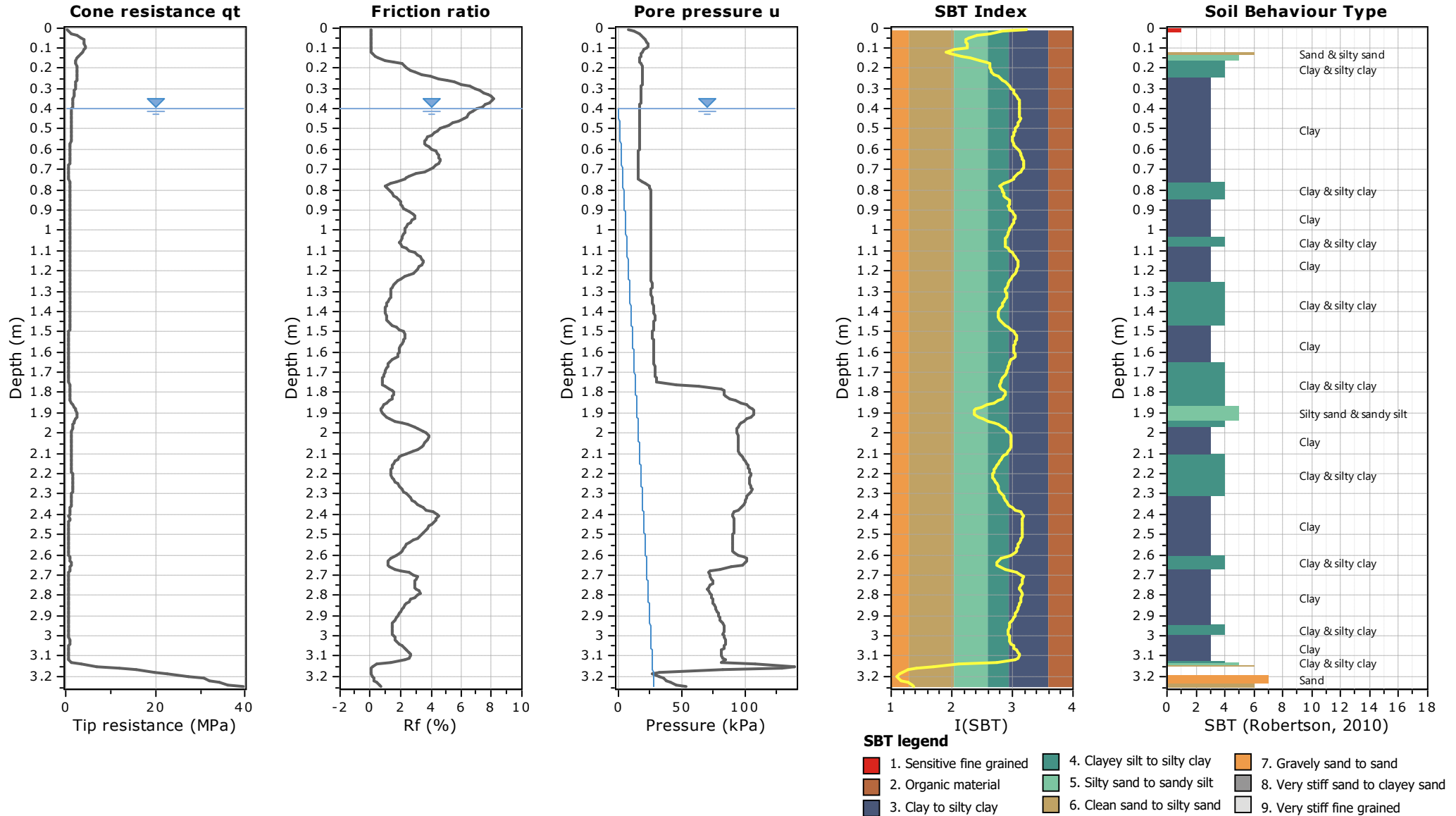


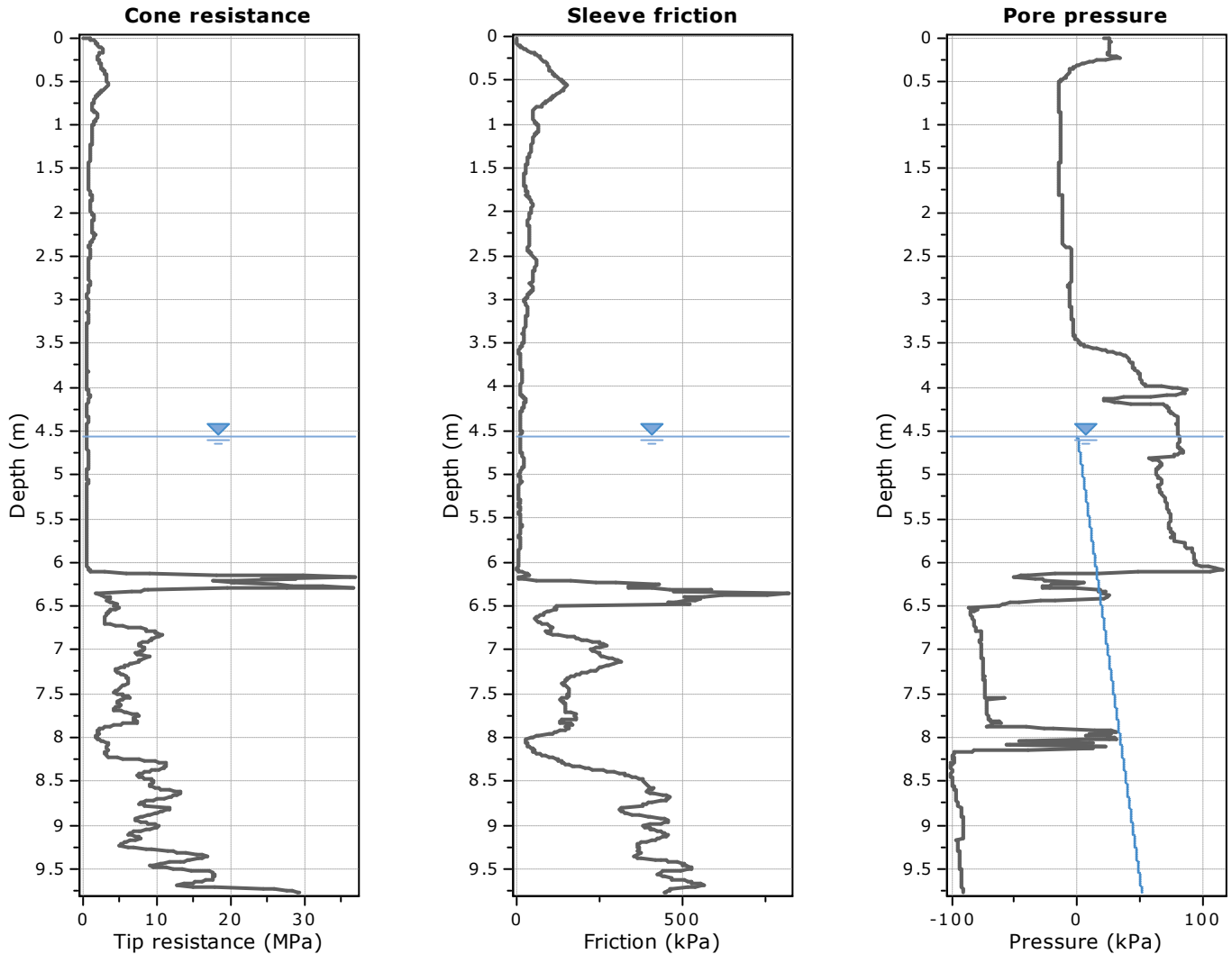


The plot below presents the cross correlation coefficient between the raw q_c and f_s values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between q_c & f_s

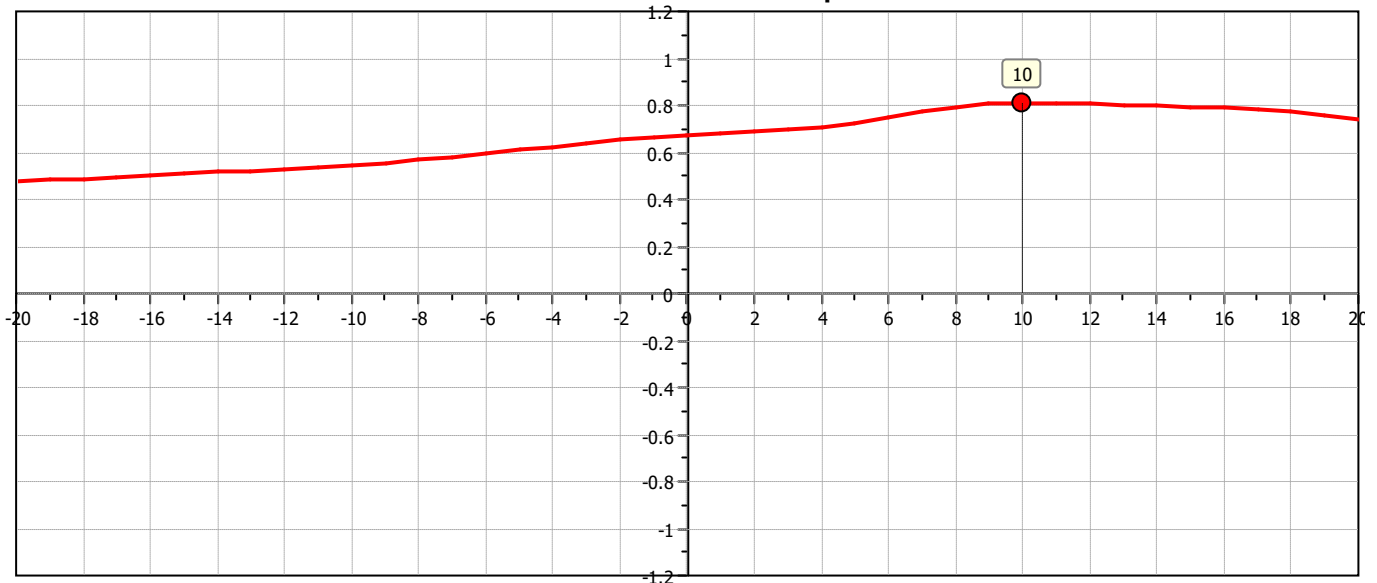


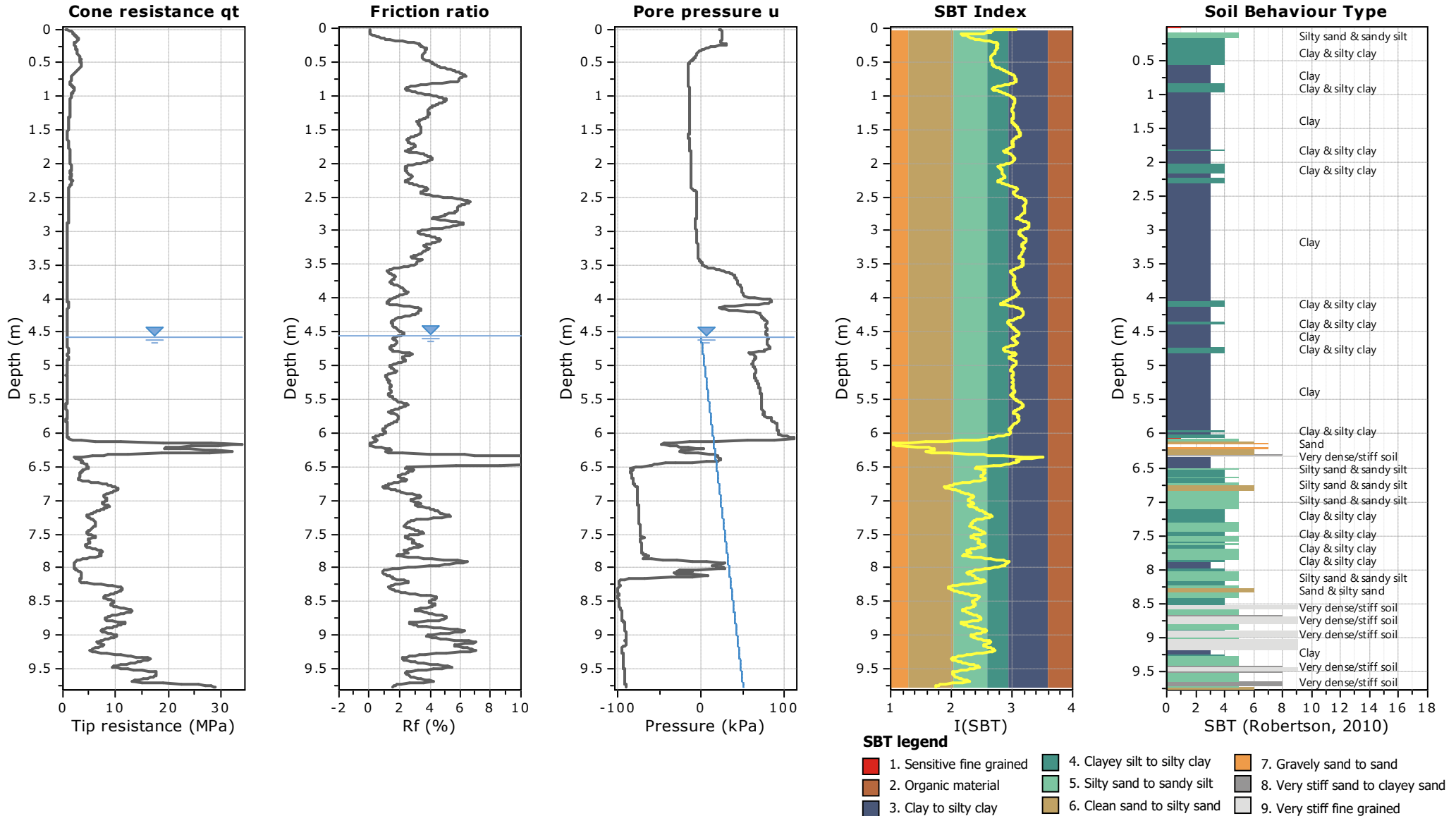


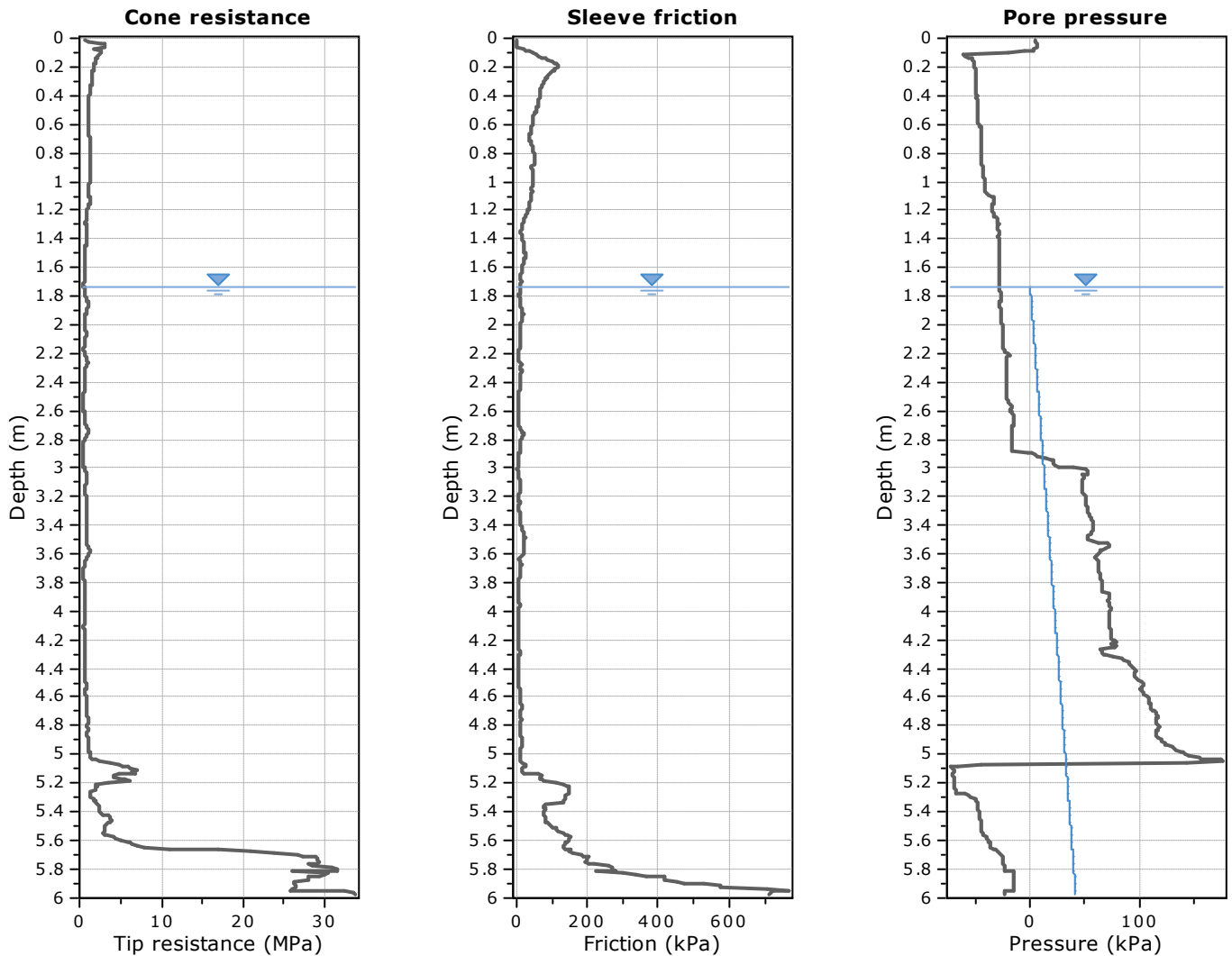


The plot below presents the cross correlation coefficient between the raw q_c and f_s values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between q_c & f_s

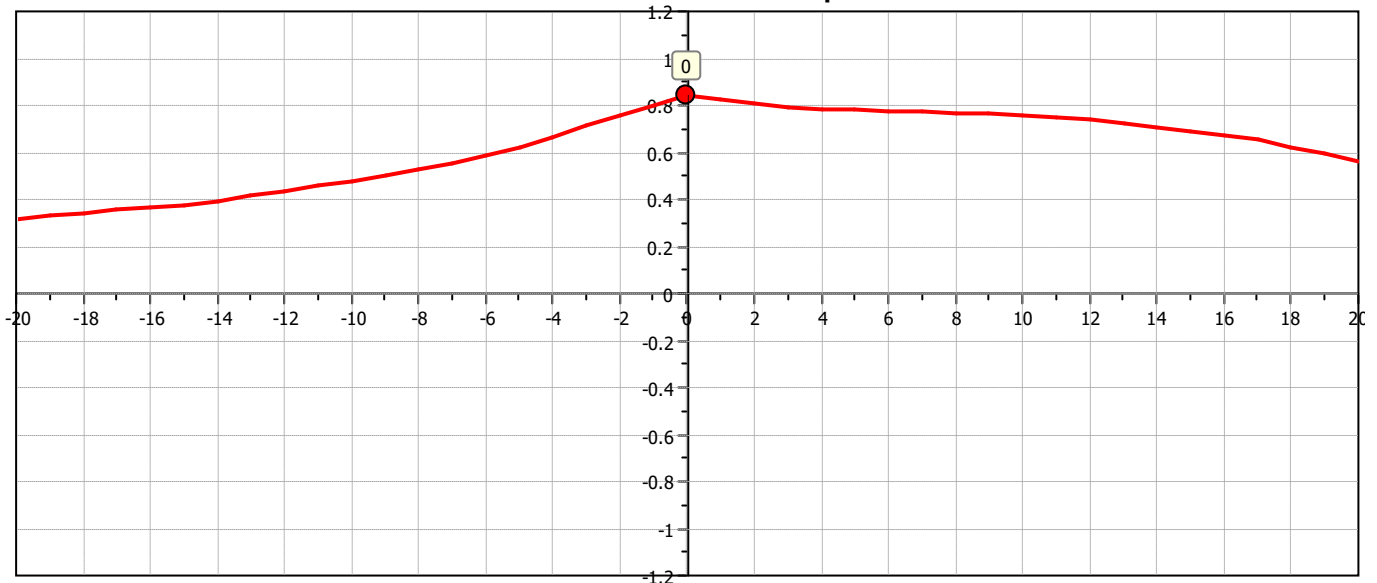


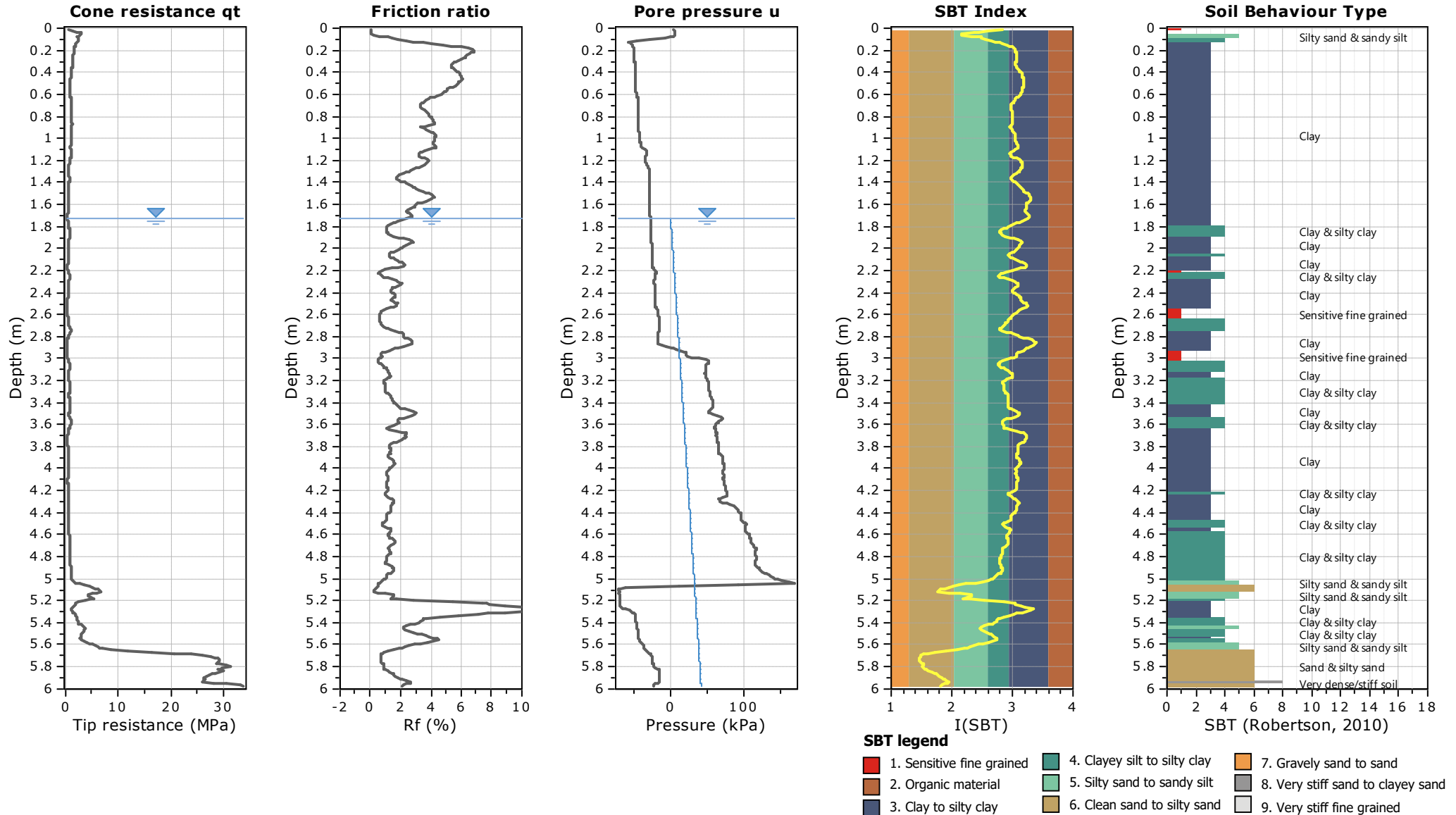


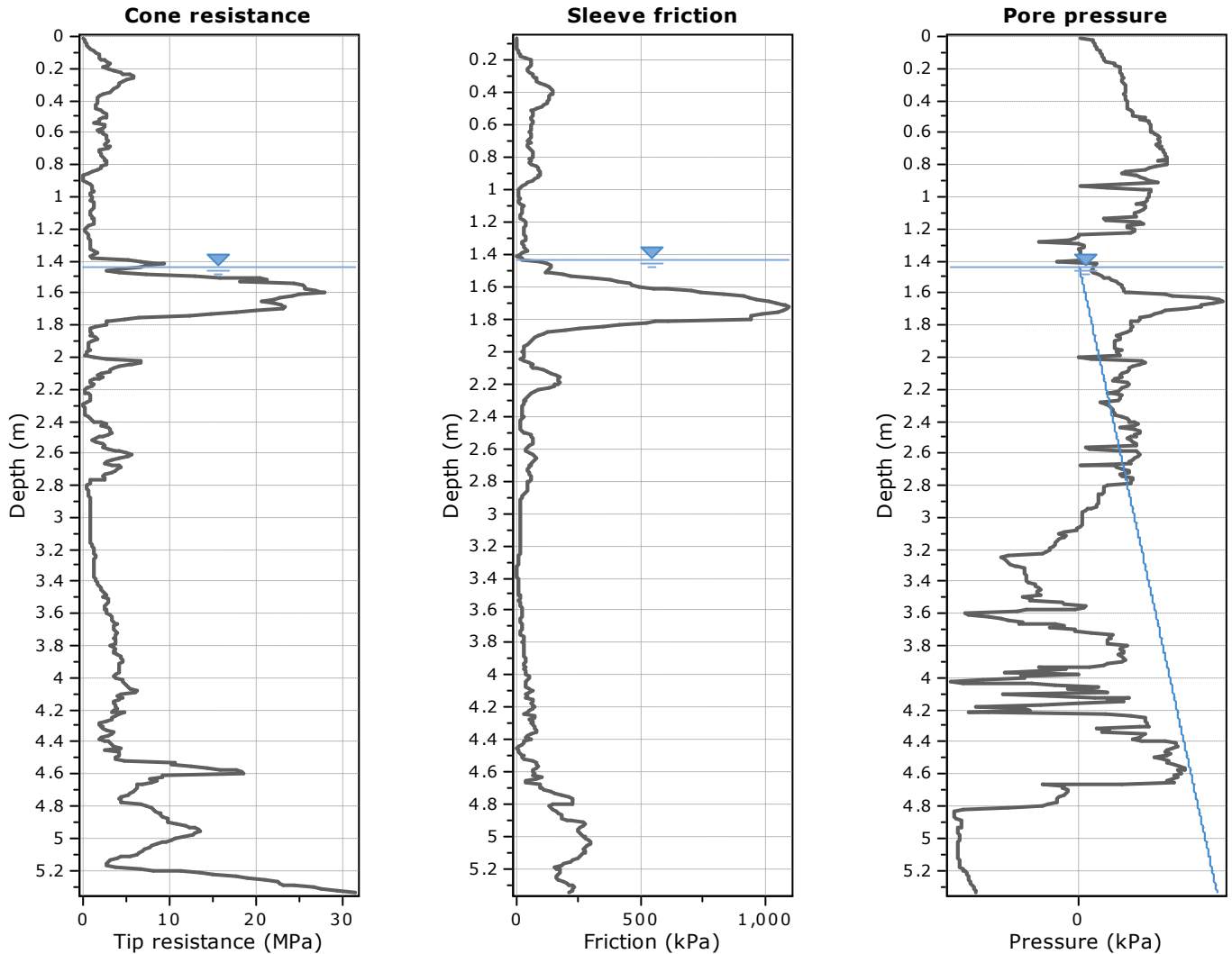


The plot below presents the cross correlation coefficient between the raw q_c and f_s values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between q_c & f_s

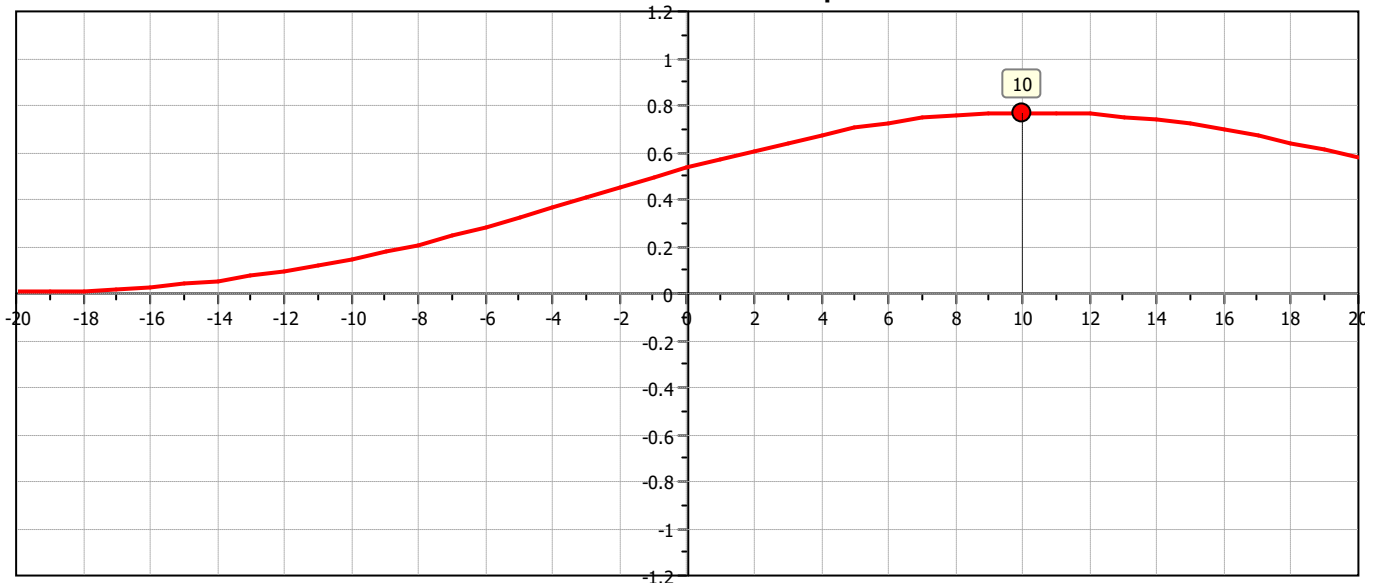


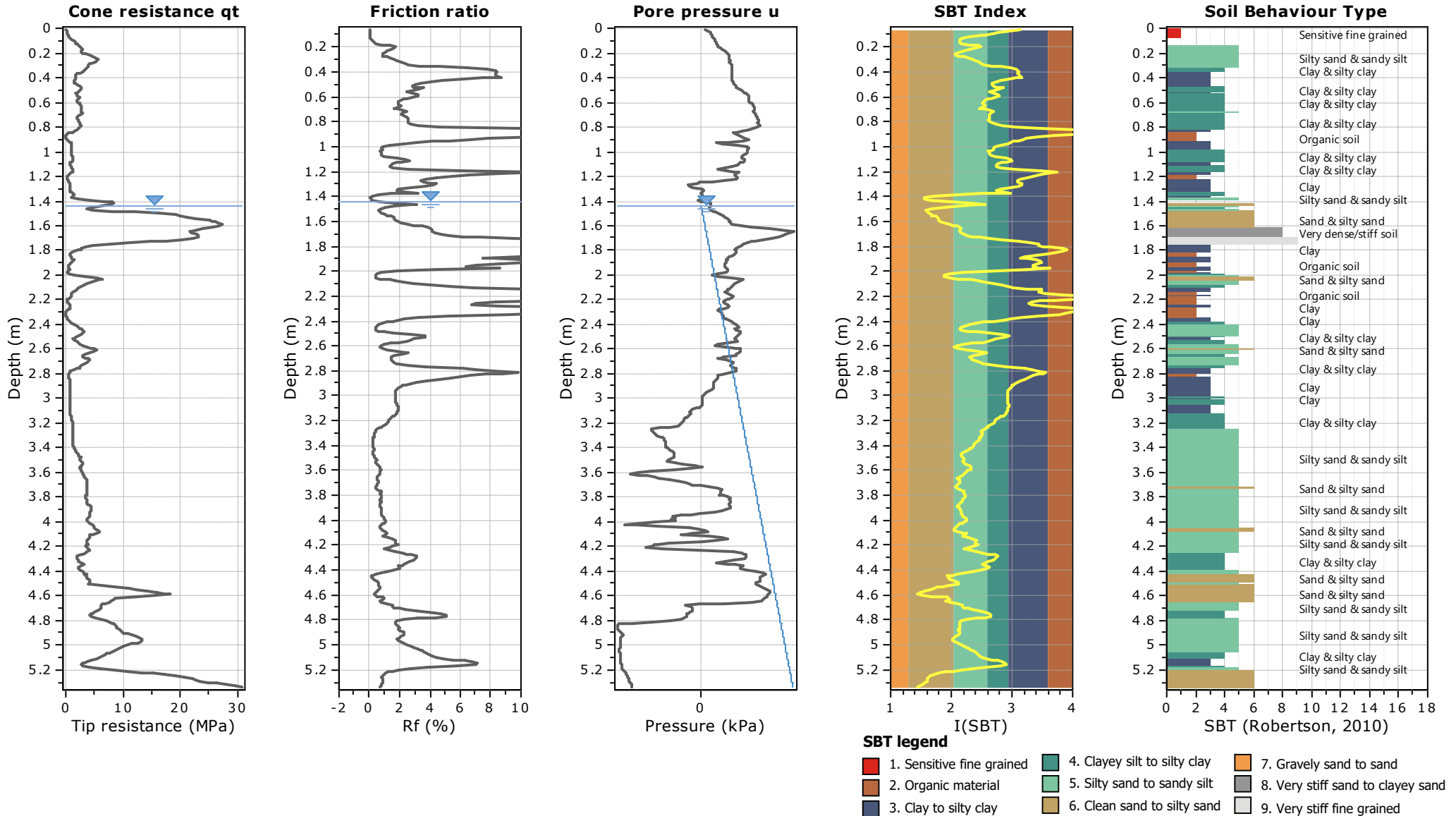




The plot below presents the cross correlation coefficient between the raw q_c and f_s values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between q_c & f_s





APPENDIX C - DPSH RESULTS

JOB NAME: Bridge Inspection & Testing
JOB LOCATION: Pauariki Bridge- Hikuwai road - Bridge No. BR02
JOB NUMBER: 001.110.03.08

LOGGED: YAY/LN PLOTTED: YAY
DATE LOGGED: 07.06.2023
CHECKED: AR

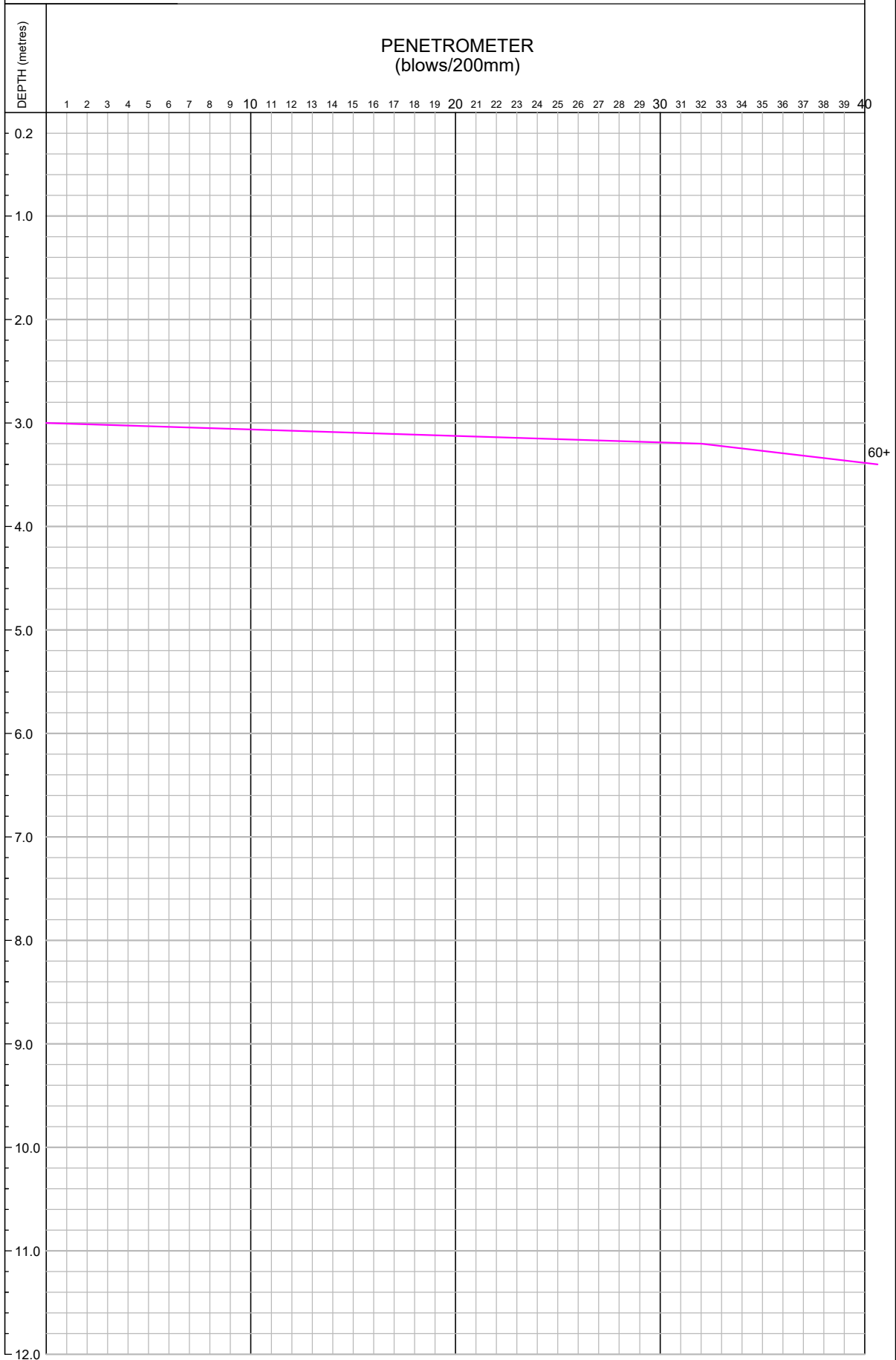
0800 248 451
www.civilassist.nz
admin@civilassist.nz
20 Grey Street, Gisborne

DPSH LOG

SHEET: 1 OF 1



Test No. CPT2



APPENDIX D – MACHINE BOREHOLE LOGS

GRAPHIC LOG	BOREHOLE 1 SOIL DESCRIPTION	DEPTH (metres)	GEOLOGY	TESTS		CORE		DRILLING			NOTES / OTHER TESTS	INSTALLATION DETAILS
				SPT 'N' VALUE Per 30 cm	SPT BLOW COUNTS OR SHEAR VALUE	CORE TYPE	TOTAL CORE RECOVERY (%)	RQD %	METHOD	CASING		
	SILT with minor clay; yellowish brown. Soft, moist, slightly plastic	1.0	Alluvial deposits - Holocene age	N= 3 1/1/1/1/0/1/1	RC1	87	Rotary cored 100mm PVC				2.30 - 2.60m Atterberg test 6.33m - 7.40m 30° joint, highly fractured, undulating rough, narrow. 7.70m - 9.0m 45° very closely to closely spaced, smooth planar, sub horizontal. 8.40 - 8.70m UCS test	
	CLAY with minor silt; yellowish brown. Soft, moist, highly plastic.	2.0			SPT1							
	SILT with minor clay; yellowish grey. Firm, moist, slightly plastic.	3.0			RC2	70						
	SILT, fine to medium grain sand with rock fragments; dark grey. Stiff, moist, low plastic. (Completely weathered rock).	4.0	Early Miocene (Tolaga Group)	N= 6 0/0/0/1/2/3	SPT2							
		5.0			RC3	73						
		6.0			SPT3							
	Highly to moderately weathered, dark grey, MUDSTONE. Weak. 5.85 - 6.0m Crushed zone	7.0		N= 50+/ 7.6cm	15/20//23 5/1mm Hammer Bouncing	RC4	83	7				
	8.0	SPT4										
Completely weathered, dark grey MUDSTONE, crushed. Moderately weathered to slightly weathered, dark grey MUDSTONE. Very weak.	9.0	RC5				77	0					
Completely weathered, dark grey, MUDSTONE, extremely weak to very weak.	10.0		N= 50+/ 17.5cm	12/14// 19/21/ 10-25mm	SPT5							
			N= 21	11/9//7/5/4/5	SPT6							
					RC7	100	0					

NOTES

- The stratification lines represent the approximate boundary between soil types and the transition may be gradual
- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.
- Grouting by Bentonite and cement mixture.

JOB NAME: <u>GDC</u>	DRILLED BY: <u>Griffiths</u>	INCLINATION: <u>Vertical</u>	LOGGED: <u>RR</u> PLOTTED: <u>ML</u>
JOB LOCATION: <u>Hikawai RD - Pauariki Bridge</u>	DATE START: <u>05/06/2023</u>	RIG: <u>Comacchio - HQ Tripple Tube</u>	DATE LOGGED: <u>29/06/2023</u>
JOB NUMBER: <u>001.110.03.08</u>	DATE END: <u>09/06/2023</u>	DRILLING FLUIDS USED: <u>Polymer</u>	CHECKED: <u>SM</u>

MBH 1	BRIDGE No. BR02	BOREHOLE LOG		0800 248 451 (0800 CIVIL1)	
LOCATION: Refer Site Plan RL (m): 48.80	COORDINATES: N: 850655.47 E: 432478.33			SHEET: 1 OF 3	www.civilassist.nz
					admin@civilassist.nz 20 Grey Street, Gisborne

GRAPHIC LOG	BOREHOLE 1	DEPTH (metres)	GEOLOGY	TESTS		CORE		DRILLING			NOTES / OTHER TESTS	INSTALLATION DETAILS
				SPT 'N' VALUE Per 30 cm	SPT BLOW COUNTS OR SHEAR VALUE	CORE TYPE	TOTAL CORE RECOVERY (%)	RQD %	METHOD	CASING		
<p>SOIL DESCRIPTION</p> <p>Completely weathered, dark grey, MUDSTONE, extremely weak to very weak.</p> <p>Moderately to slightly weathered, dark grey, MUDSTONE, sub horizontal, thinly laminated, weak.</p> <p>Slightly weathered, dark grey, MUDSTONE, sub vertical, laminated, weak, smooth planar.</p> <p>Moderately weathered, dark grey, MUDSTONE, bedded, sub horizontal, laminated, weak.</p> <p>Moderately weathered, dark grey, MUDSTONE, sub horizontal, laminated, weak.</p> <p>Moderately weathered, dark grey, MUDSTONE with minor calcite veinlets from 19.17m to 19.60m, calcite intrusion at 19.36m to 19.37m. weak.</p>												
	11.0	N= 50+/ 14.5cm	9/18//22/ 28-7cm	RC7	100	0	Rotary cored	100mm PVC	<p>10.78m - 10.83m crush zone</p> <p>10.83m - 11.36m 30° joint, very narrow, thick, smooth planar.</p> <p>11.34 - 11.54m Slaking test</p> <p>11.36m - 11.44m crush zone.</p> <p>11.44m - 12.0m sub horizontal, closely spaced, moderately narrow, smooth planar.</p> <p>12.13m - 12.33m 80° joint, rough undulating, narrow.</p> <p>12.33m - 12.50m crush zone.</p> <p>13.10m - 13.50m 30° joint, sub vertical, laminated.</p> <p>13.62m - 14.00m joint, sub horizontal, moderately thin, narrow.</p> <p>14.00m - 14.55m 30° sub vertical, smooth undulating, narrow, very closely spaced.</p> <p>14.55m - 14.60m crush zone, infill with silt and clay.</p> <p>15.15m - 15.25m crush zone, fine to coarse gravel and cobbles infill with clay.</p> <p>15.35m - 15.90m 30° joint, smooth planar, narrow, weak to medium strong.</p> <p>16.00m - 16.50m 30° joint, sub horizontal, closely spaced, narrow, smooth planar.</p> <p>16.75m - 18.00m 30° joint, closely spaced, narrow, smooth planar.</p> <p>17.20 - 17.38m Slaking test</p> <p>18.05m - 19.05m 30° joint, widely spaced, undulating.</p> <p>19.50m - 19.68m infill clay.</p>			
				SPT7								
	12.0	N= 50+/ 13.6cm	11/32-6cm 5 - 1mm Hammer bouncing Seating	RC8	90	32						
				SPT8								
	13.0			RC9	93	57						
				SPT9								
	14.0	N= 50+/ 12.6cm	14/33-5cm 5 - 1mm Hammer Bouncing Seating	RC10	97	8						
				SPT10								
	15.0	N= 50+/ 12.6cm	12/26-5cm 5 - 1mm Hammer Bouncing Seating	RC11	100	17						
				SPT11								
	16.0	N= 50+/ 7.6cm	28/5-1mm Hammer Bouncing Seating	RC12	100	53						
				SPT12								
	17.0			RC13	93	0						
			SPT13									
18.0	N= 50+/ 4.5cm	32-4.5cm Seating Hammer Bouncing	RC14	100	30							

NOTES

- The stratification lines represent the approximate boundary between soil types and the transition may be gradual
- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.
- Grouting by Bentonite and cement mixture.

JOB NAME: GDC
 JOB LOCATION: Hikawai Rd - Pauariki Bridge
 JOB NUMBER: 001.110.03.08

DRILLED BY: Griffiths
 DATE START: 05/06/2023
 DATE END: 09/06/2023

INCLINATION: Vertical
 RIG: Comacchio - HQ Tripple Tube
 DRILLING FLUIDS USED: Polymer

LOGGED: RR PLOTTED: ML
 DATE LOGGED: 29/06/2023
 CHECKED: SM

MBH 1 BRIDGE No. BR02
 LOCATION: Refer Site Plan RL (m): 48.80
 COORDINATES: N: 850655.47 E: 4432478.33

BOREHOLE LOG

SHEET: 2 OF 3



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 admin@civilassist.nz
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GRAPHIC LOG	BOREHOLE 1	DEPTH (metres)	GEOLOGY	TESTS		CORE			DRILLING			NOTES / OTHER TESTS	INSTALLATION DETAILS
				SPT 'N' VALUE Per 30 cm	SPT BLOW COUNTS OR SHEAR VALUE	CORE TYPE	TOTAL CORE RECOVERY (%)	RQD %	METHOD	CASING	BASE OF HOLE & WATER LEVEL		
	Moderately weathered, dark grey, MUDSTONE, weak, laminated, sub vertical, closely spaced.	21.0				RC14	100	30	Rotary cored	100mm PVC		19.68m - 20.70m 45° joint, narrow, sub horizontal, laminated, smooth planar, infill with clay.	
		22.0				RC15	100	27				21.00m - 21.15m crush zone, infill with clay and silt.	
	Slightly weathered, dark grey, MUDSTONE. Weak, laminated, sub horizontal, closely spaced, smooth planar.	23.0				RC16	100	50				21.64m - 22.50m 85° joint, very closely spaced, narrow, laminated, sub vertical.	
		24.0										22.50m - 23.10m widely spaced.	
	Slightly weathered, dark grey, MUDSTONE. Weak, laminated, very closely spaced, narrow, sub vertical.	25.0				RC17	100	90				23.10m - 24.00m 30° joint, very narrow, laminated, smooth planar.	
		26.0										23.30 - 23.60m Slaking test	
	Slightly weathered, dark grey, MUDSTONE. Weak, very closely spaced, narrow, sub vertical.	27.0				RC18	100	64				23.60 - 23.90m UCS test	
		28.0											
	Slightly weathered, dark grey, MUDSTONE. Weak, widely to closely spaced, narrow, sub horizontal, rough planar.	29.0				RC19	100	55				25.50m - 26.60m joint, narrow.	
		30.0										26.60m - 27.00m sub vertical, narrow, rough planar.	
												27.10m - 27.60m joint, narrow, laminated, sub horizontal.	
												27.60m - 27.94m joint, narrow, sub vertical, rough planar.	
												27.94m - 28.50m joint, sub horizontal, laminated.	
												28.73m - 28.82m infill with clay and silt.	
	END OF BOREHOLE AT 30.0m - As per WSP instructions	30.0				RC19	93	67					

NOTES

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- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.
- Grouting by Bentonite and cement mixture.

JOB NAME: <u>GDC</u>	DRILLED BY: <u>Griffiths</u>	INCLINATION: <u>Vertical</u>	LOGGED: <u>RR</u> PLOTTED: <u>ML</u>
JOB LOCATION: <u>Hikuwai Rd - Pauariki Bridge</u>	DATE START: <u>05/06/2023</u>	RIG: <u>Comacchio - HQ Tripple Tube</u>	DATE LOGGED: <u>29/06/2023</u>
JOB NUMBER: <u>001.110.03.08</u>	DATE END: <u>09/06/2023</u>	DRILLING FLUIDS USED: <u>Polymer</u>	CHECKED: <u>SM</u>

MBH 1 BRIDGE No. BR02
LOCATION: Refer Site Plan RL (m): 48.80
COORDINATES: N: 850655.47 E: 432478.33

BOREHOLE LOG

SHEET: 3 OF 3



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BOREHOLE 1

PHOTOGRAPHS

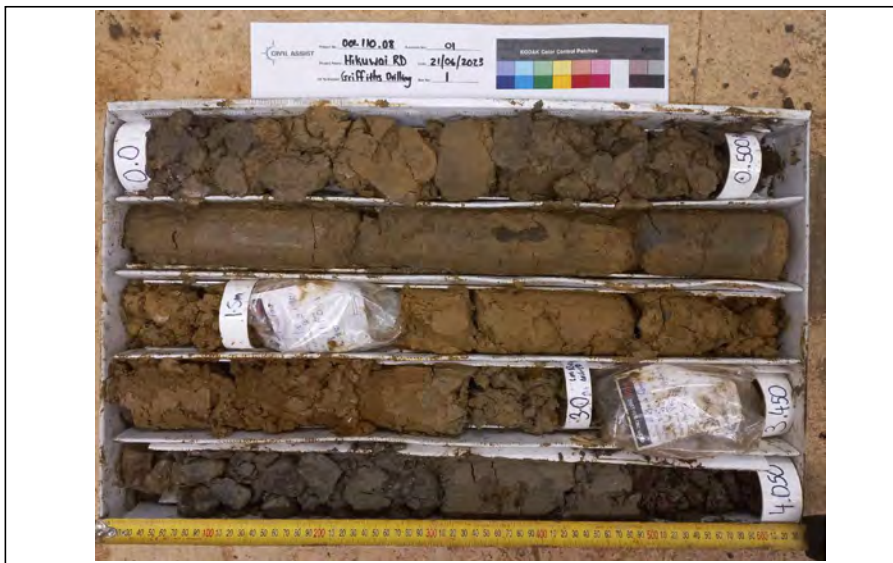


Photo MBH 01.1
00.00 - 04.05 m



Photo MBH 01.2
04.05 - 07.10 m

NOTES

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- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.

JOB NAME: GDC
 JOB LOCATION: Hikuwai Rd - Pauariki Bridge
 JOB NUMBER: 001.110.03.08

DRILLED BY: Griffiths
 DATE START: 05/06/2023
 DATE END: 09/06/2023

INCLINATION: Vertical
 RIG: Comacchio - HQ Tripple Tube
 DRILLING FLUIDS USED: Polymer

LOGGED: RR PLOTTED: ML
 DATE LOGGED: 22/06/2023
 CHECKED: SM

MBH 1 BRIDGE No. BR02
 LOCATION: Refer Site Plan RL (m): 48.80
 COORDINATES: N: 850655.47 E: 432478.33

BOREHOLE LOG

SHEET: 1 OF 6



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BOREHOLE 1

PHOTOGRAPHS



Photo MBH 01.3
07.10 - 09.80 m



Photo MBH 01.4
09.80 - 12.73 m

NOTES

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JOB NAME: GDC
 JOB LOCATION: Hikuwai Rd - Pauariki Bridge
 JOB NUMBER: 001.110.03.08

DRILLED BY: Griffiths
 DATE START: 05/06/2023
 DATE END: 09/06/2023

INCLINATION: Vertical
 RIG: Comacchio - HQ Tripple Tube
 DRILLING FLUIDS USED: Polymer

LOGGED: RR PLOTTED: ML
 DATE LOGGED: 22/06/2023
 CHECKED: SM

MBH 1 BRIDGE No. BR02
 LOCATION: Refer Site Plan RL (m): 48.80
 COORDINATES: N: 850655.47 E: 432478.33

BOREHOLE LOG

SHEET: 2 OF 6



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BOREHOLE 1

PHOTOGRAPHS



Photo MBH 01.5
12.73 - 15.47 m

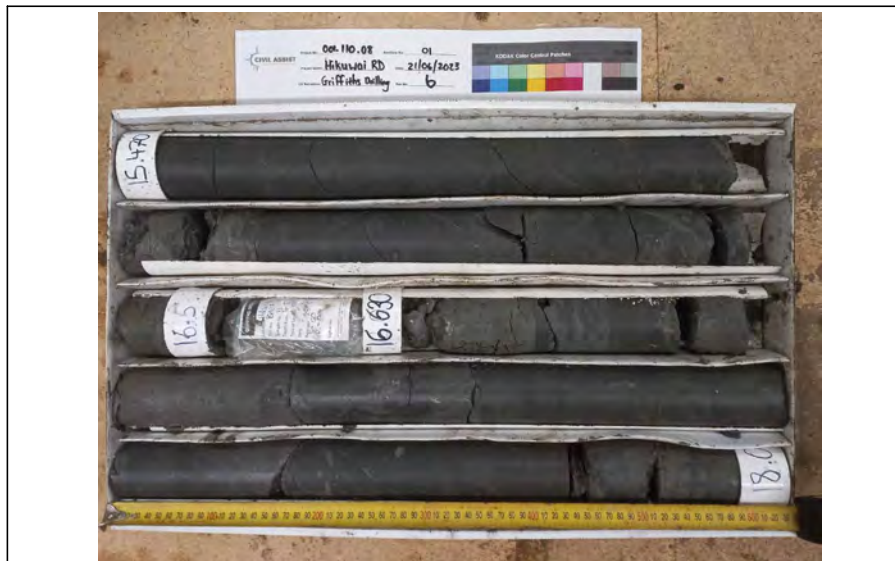


Photo MBH 01.6
15.47 - 18.00 m

NOTES

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- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.

JOB NAME: <u>GDC</u>	DRILLED BY: <u>Griffiths</u>	INCLINATION: <u>Vertical</u>	LOGGED: <u>RR</u> PLOTTED: <u>ML</u>
JOB LOCATION: <u>Hikuwai Rd - Pauariki Bridge</u>	DATE START: <u>05/06/2023</u>	RIG: <u>Comacchio - HQ Tripple Tube</u>	DATE LOGGED: <u>22/06/2023</u>
JOB NUMBER: <u>001.110.03.08</u>	DATE END: <u>09/06/2023</u>	DRILLING FLUIDS USED: <u>Polymer</u>	CHECKED: <u>SM</u>

MBH 1 BRIDGE No. BR02
LOCATION: Refer Site Plan RL (m): 48.80
COORDINATES: N: 850655.47 E: 432478.33

BOREHOLE LOG
SHEET: 3 OF 6



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BOREHOLE 1

PHOTOGRAPHS



Photo MBH 01.7
18.00 - 20.70 m



Photo MBH 01.8
20.70 - 23.60 m

NOTES

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- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.

JOB NAME: <u>GDC</u>	DRILLED BY: <u>Griffiths</u>	INCLINATION: <u>Vertical</u>	LOGGED: <u>RR</u> PLOTTED: <u>ML</u>
JOB LOCATION: <u>Hikuwai Rd - Pauariki Bridge</u>	DATE START: <u>05/06/2023</u>	RIG: <u>Comacchio - HQ Tripple Tube</u>	DATE LOGGED: <u>22/06/2023</u>
JOB NUMBER: <u>001.110.03.08</u>	DATE END: <u>09/06/2023</u>	DRILLING FLUIDS USED: <u>Polymer</u>	CHECKED: <u>SM</u>

MBH 1	BRIDGE No. BR02	BOREHOLE LOG	 ENGINEERING FOR LIFE	0800 248 451 (0800 CIVIL1)	
LOCATION: Refer Site Plan RL (m): 48.80	COORDINATES: N: 850655.47 E: 432478.33			SHEET: 4 OF 6	www.civilassist.nz
					admin@civilassist.nz
				20 Grey Street, Gisborne	

BOREHOLE 1

PHOTOGRAPHS



Photo MBH 01.9
23.60 - 26.60 m



Photo MBH 01.10
26.60 - 29.50 m

NOTES

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JOB NAME: GDC
 JOB LOCATION: Hikuwai Rd - Pauariki Bridge
 JOB NUMBER: 001.110.03.08

DRILLED BY: Griffiths
 DATE START: 05/06/2023
 DATE END: 09/06/2023

INCLINATION: Vertical
 RIG: Comacchio - HQ Tripple Tube
 DRILLING FLUIDS USED: Polymer

LOGGED: RR PLOTTED: ML
 DATE LOGGED: 22/06/2023
 CHECKED: SM

MBH 1 BRIDGE No. BR02
 LOCATION: Refer Site Plan RL (m): 48.80
 COORDINATES: N: 850655.47 E: 432478.33

BOREHOLE LOG

SHEET: 5 OF 6



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BOREHOLE 1

PHOTOGRAPHS



Photo MBH 01.11
29.50 - 30.00 m

NOTES

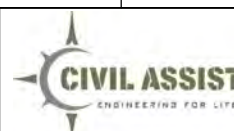
- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.

JOB NAME: <u>GDC</u>	DRILLED BY: <u>Griffiths</u>	INCLINATION: <u>Vertical</u>	LOGGED: <u>RR</u> PLOTTED: <u>ML</u>
JOB LOCATION: <u>Hikuwai Rd - Pauariki Bridge</u>	DATE START: <u>05/06/2023</u>	RIG: <u>Comacchio - HQ Tripple Tube</u>	DATE LOGGED: <u>22/06/2023</u>
JOB NUMBER: <u>001.110.03.08</u>	DATE END: <u>09/06/2023</u>	DRILLING FLUIDS USED: <u>Polymer</u>	CHECKED: <u>SM</u>

MBH 1 BRIDGE No. BR02
LOCATION: Refer Site Plan RL (m): 48.80
COORDINATES: N: 850655.47 E: 432478.33

BOREHOLE LOG

SHEET: 6 OF 6



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GRAPHIC LOG	BOREHOLE 2 SOIL DESCRIPTION	DEPTH (metres)	GEOLOGY	TESTS		CORE		DRILLING			NOTES / OTHER TESTS	INSTALLATION DETAILS
				SPT 'N' VALUE Per 30 cm	SPT BLOW COUNTS OR SHEAR VALUE	CORE TYPE	TOTAL CORE RECOVERY (%)	RQD %	METHOD	CASING		
	FILL: SILT with fine to coarse sand and minor gravel; yellowish grey. Firm, moist.		FILL									
	Silty CLAY with minor fine sand; yellow. Very soft, moist, highly plastic.	1.0	Alluvial deposits - Holocene age	N= 0 0/0/0/0/0/0 hammer weight	RC1	44			Rotary cored 100mm PVC	2.20 metres @ completion of borehole	1.95 - 2.30m Atterberg test	
		2.0			SPT1							
		3.0	Alluvial deposits - Holocene age	N= 1 0/1/0/0/1/0	RC2	100			Rotary cored 100mm PVC	2.20 metres @ completion of borehole	1.95 - 2.30m Atterberg test	
		4.0			SPT2							
	SILT with minor clay; dark grey. Very stiff, moist, slightly plastic.	4.0	Alluvial deposits - Holocene age	N= 21 1/1/1/1/2/17	RC3	90			Rotary cored 100mm PVC	2.20 metres @ completion of borehole	1.95 - 2.30m Atterberg test	
		5.0			SPT3							
	Completely to highly weathered, dark grey MUDSTONE with some silt, very weak.	5.0	Early Miocene (Tolaga Group)	N= 50+/ 14.5cm 21/29-7cm Seating	RC4	93	0		Rotary cored 100mm PVC	2.20 metres @ completion of borehole	1.95 - 2.30m Atterberg test	6.29m - 6.38m crushes zone.
		6.0			SPT4			6.38m - 6.58m highly fractured.				
	Highly to Moderately weathered, dark grey MUDSTONE, closed surface, smooth planar, weak.	7.0	Early Miocene (Tolaga Group)	N= 50+/ 14cm 25/25-6.5cm Hammer Bouncing Seating	RC5	100	25		Rotary cored 100mm PVC	2.20 metres @ completion of borehole	1.95 - 2.30m Atterberg test	6.77m - 6.95m crushed zone
		8.0			SPT5			6.95m - 7.35m 30° joint, narrow, laminated, smooth planar.				
		9.0	Early Miocene (Tolaga Group)	N= 50+/ 12cm 29/21-4.5cm Seating	RC6	94	38		Rotary cored 100mm PVC	2.20 metres @ completion of borehole	1.95 - 2.30m Atterberg test	6.90 - 7.30m Slaking test
		9.5			SPT6			7.35m - 7.50m joint, sub horizontal, widely spaced, infill with silt.				
	Slightly weathered, dark grey MUDSTONE, very closely spaced, very narrow, smooth planar, weak.	10.0	Early Miocene (Tolaga Group)	N= 50+/ 12cm 29/21-4.5cm Seating	RC7	90	71		Rotary cored 100mm PVC	2.20 metres @ completion of borehole	1.95 - 2.30m Atterberg test	7.70m - 8.10m very steeply inclined, very closely spaced, narrow, rough planar.
		10.0			SPT6			8.10m - 8.17m 85° joint, sub vertical.				
		10.0	Early Miocene (Tolaga Group)	N= 50+/ 12cm 29/21-4.5cm Seating	RC7	90	71		Rotary cored 100mm PVC	2.20 metres @ completion of borehole	1.95 - 2.30m Atterberg test	8.17m - 9.0m Closely spaced, moderately thin, smooth planar.
		10.0			SPT6			9.50 - 9.80m UCS test				

NOTES

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- Grouting by Bentonite and cement mixture.

JOB NAME: GDC
 JOB LOCATION: Hikuwai Rd - Pauariki Bridge
 JOB NUMBER: 001.110.03.08

DRILLED BY: Griffiths
 DATE START: 13/06/2023
 DATE END: 19/06/2023

INCLINATION: Vertical
 RIG: Comacchio - HQ Tripple Tube
 DRILLING FLUIDS USED: Polymer

LOGGED: RR PLOTTED: ML
 DATE LOGGED: 26/06/2023
 CHECKED: SM

MBH 2 BRIDGE No. BR02
 LOCATION: Refer Site Plan RL (m): 50.60
 COORDINATES: N: 850642.10 E: 432496.34

BOREHOLE LOG

SHEET: 1 OF 3




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GRAPHIC LOG	BOREHOLE 2	DEPTH (metres)	GEOLOGY	TESTS		CORE			DRILLING			NOTES / OTHER TESTS	INSTALLATION DETAILS
				SPT 'N' VALUE Per 30 cm	SPT BLOW COUNTS OR SHEAR VALUE	CORE TYPE	TOTAL CORE RECOVERY (%)	RQD %	METHOD	CASING	BASE OF HOLE & WATER LEVEL		
<p>Slightly weathered, dark grey, MUD STONE. Weak, very closely spaced, thick, very narrow, smooth planar.</p> <p>Highly to moderately weathered, dark grey, MUDSTONE. Weak, very thin bedded, moderately inclined.</p> <p>Highly to moderately weathered, dark grey, MUDSTONE. Weak, highly fractured, moderately to steeply inclined.</p> <p>Moderately weathered, dark grey MUDSTONE, weak, very thin bedded, laminated, smooth planar.</p>		11.0	N= 50+/ 12cm	30/20-4.5cm Hammer Bouncing Seating	RC7	90	71	Rotary cored	100mm PVC				
					SPT7								
						RC8	97	90					
			12.0	N= 50+/ 12cm	29/21-4.5cm Hammer Bouncing Seating	SPT8							12.25-12.48m- 30° joint, sub horizontal.
						RC9	100	75					13.90 -14.20m Slaking test
			14.0			RC10	100	95					15.00m - 15.22m crushed zone. 15.22m - 16.07m 30° joint, undulating, closely spaced, moderately inclined. 16.07m - 16.10m crushed zone, infill with clay and cobbles. 16.10m - 16.45m Closely spaced, narrow, smooth planar. 16.45m - 16.50m crushed zone. 16.50m - 16.82m crushed zone, highly fractured, infill with clay. 17.02m - 17.56m crushed zone, highly fractured, infill with clay. 17.56m - 18.00m 30° joint, laminated, narrow, moderately inclined. 18.55 -18.70m Slaking test
						RC11	100	33					
			16.0			RC12	100	26					
			17.0										
			18.0	N= 50+/ Seating 12cm	24/26-45mm	SPT9							
						RC13	100	72					
			19.0										19.20m - 19.23m widely spaced, infill with clay and cobbles.
			20.0			RC14	100	69					

NOTES

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- Grouting by Bentonite and cement mixture.

JOB NAME: <u>GDC</u>	DRILLED BY: <u>Griffiths</u>	INCLINATION: <u>Vertical</u>	LOGGED: <u>RR</u> PLOTTED: <u>ML</u>
JOB LOCATION: <u>Hikuwai Rd - Pauariki Bridge</u>	DATE START: <u>13/06/2023</u>	RIG: <u>Comacchio - HQ Tripple Tube</u>	DATE LOGGED: <u>26/06/2023</u>
JOB NUMBER: <u>001.110.03.08</u>	DATE END: <u>19/06/2023</u>	DRILLING FLUIDS USED: <u>Polymer</u>	CHECKED: <u>SM</u>

MBH 2	BRIDGE No. BR02	BOREHOLE LOG		0800 248 451 (0800 CIVIL1)
LOCATION: Refer Site Plan RL (m): 50.60				www.civilassist.nz
COORDINATES: N: 850642.10 E: 432496.34				admin@civilassist.nz
		SHEET: 2 OF 3		20 Grey Street, Gisborne

GRAPHIC LOG	BOREHOLE 2	DEPTH (metres)	GEOLOGY	TESTS		CORE			DRILLING			NOTES / OTHER TESTS	INSTALLATION DETAILS	
				SPT 'N' VALUE Per 30 cm	SPT BLOW COUNTS OR SHEAR VALUE	CORE TYPE	TOTAL CORE RECOVERY (%)	RQD %	METHOD	CASING	BASE OF HOLE & WATER LEVEL			
<p>Moderately weathered, dark grey, MUDSTONE. Weak, laminated, very narrow, smooth planar.</p> <p>Slightly weathered, dark grey, MUDSTONE. Weak, laminated, very narrow, smooth planar.</p>		21.0			RC14	100	69	Rotary cored 100mm PVC						
		22.0			RC15	97	80							
		23.0			RC16	93	83							
		24.0			RC17	100	90							
		25.0			RC18	93	48						24.72m 80° joint, very steeply inclined.	
		26.0			RC19	100	85							
Highly to moderately weathered, dark grey, MUDSTONE. Weak, widely to very widely spaced.		27.0			RC20	100	95							
Slightly weathered, dark grey, MUDSTONE. Weak, very closely spaced, very narrow, smooth planar.		28.0												
		29.0												
		30.0												
END OF BOREHOLE AT 30.0m - As per WSP instructions														

NOTES

- The stratification lines represent the approximate boundary between soil types and the transition may be gradual
- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.
- Grouting by Bentonite and cement mixture.

JOB NAME: <u>GDC</u>	DRILLED BY: <u>Griffiths</u>	INCLINATION: <u>Vertical</u>	LOGGED: <u>RR</u> PLOTTED: <u>ML</u>
JOB LOCATION: <u>Hikuwai Rd - Pauariki Bridge</u>	DATE START: <u>13/06/2023</u>	RIG: <u>Comacchio - HQ Tripple Tube</u>	DATE LOGGED: <u>26/06/2023</u>
JOB NUMBER: <u>001.110.03.08</u>	DATE END: <u>19/06/2023</u>	DRILLING FLUIDS USED: <u>Polymer</u>	CHECKED: <u>SM</u>

MBH 2 BRIDGE No. BR02
 LOCATION: Refer Site Plan RL (m): 50.60
 COORDINATES: N: 850642.10 E: 432496.34

BOREHOLE LOG

SHEET: 3 OF 3



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 20 Grey Street, Gisborne

BOREHOLE 2

PHOTOGRAPHS



Photo MBH 02.1
00.00 - 04.40 m



Photo MBH 02.2
04.40m - 07.35 m

NOTES

- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.

JOB NAME: GDC
 JOB LOCATION: Hikuwai Rd - Pauariki Bridge
 JOB NUMBER: 001.110.03.08

DRILLED BY: Griffiths
 DATE START: 13/06/2023
 DATE END: 19/06/2023

INCLINATION: Vertical
 RIG: Comacchio - HQ Tripple Tube
 DRILLING FLUIDS USED: Polymer

LOGGED: RR PLOTTED: ML
 DATE LOGGED: 26/06/2023
 CHECKED: SM

MBH 2 BRIDGE No. BR02
 LOCATION: Refer Site Plan RL (m): 50.60
 COORDINATES: N: 850642.10 E: 432496.34

BOREHOLE LOG

SHEET: 1 OF 5



0800 248 451 (0800 CIVIL1)
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 20 Grey Street, Gisborne

BOREHOLE 2

PHOTOGRAPHS




Photo MBH 2.3
07.35m - 10.10 m



Photo MBH 02.4
10.10m - 12.90 m

NOTES

- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.

JOB NAME: <u>GDC</u>	DRILLED BY: <u>Griffiths</u>	INCLINATION: <u>Vertical</u>	LOGGED: <u>RR</u> PLOTTED: <u>ML</u>	
JOB LOCATION: <u>Hikuwai Rd - Pauariki Bridge</u>	DATE START: <u>13/06/2023</u>	RIG: <u>Comacchio - HQ Tripple Tube</u>	DATE LOGGED: <u>26/06/2023</u>	
JOB NUMBER: <u>001.110.03.08</u>	DATE END: <u>19/06/2023</u>	DRILLING FLUIDS USED: <u>Polymer</u>	CHECKED: <u>SM</u>	
MBH 2	BRIDGE No. BR02	BOREHOLE LOG		
LOCATION: Refer Site Plan RL (m): 50.60				0800 248 451 (0800 CIVIL1)
COORDINATES: N: 850642.10 E: 432496.34				www.civilassist.nz admin@civilassist.nz 20 Grey Street, Gisborne
		SHEET: 2 OF 5		

BOREHOLE 2

PHOTOGRAPHS




Photo MBH 02.5
12.90 - 15.86 m



Photo MBH 02.6
15.86 - 18.55 m

NOTES

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JOB NAME: <u>GDC</u>	DRILLED BY: <u>Griffiths</u>	INCLINATION: <u>Vertical</u>	LOGGED: <u>RR</u> PLOTTED: <u>ML</u>	
JOB LOCATION: <u>Hikuwai Rd - Pauariki Bridge</u>	DATE START: <u>13/06/2023</u>	RIG: <u>Comacchio - HQ Tripple Tube</u>	DATE LOGGED: <u>26/06/2023</u>	
JOB NUMBER: <u>001.110.03.08</u>	DATE END: <u>19/06/2023</u>	DRILLING FLUIDS USED: <u>Polymer</u>	CHECKED: <u>SM</u>	
MBH 2	BRIDGE No. BR02	BOREHOLE LOG		
LOCATION: Refer Site Plan RL (m): 50.60				0800 248 451 (0800 CIVIL1)
COORDINATES: N: 850642.10 E: 432496.34	SHEET: 3 OF 5			www.civilassist.nz admin@civilassist.nz 20 Grey Street, Gisborne

BOREHOLE 2

PHOTOGRAPHS



Photo MBH 02.7
18.55m - 21.50m



Photo MBH 02.8
21.50m - 24.55m

NOTES

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JOB NAME: GDC
 JOB LOCATION: Hikuwai Rd - Pauariki Bridge
 JOB NUMBER: 001.110.03.08

DRILLED BY: Griffiths
 DATE START: 13/06/2023
 DATE END: 19/06/2023

INCLINATION: Vertical
 RIG: Comacchio - HQ Tripple Tube
 DRILLING FLUIDS USED: Polymer

LOGGED: RR PLOTTED: ML
 DATE LOGGED: 26/06/2023
 CHECKED: SM

MBH 2 BRIDGE No. BR02
 LOCATION: Refer Site Plan RL (m): 50.60
 COORDINATES: N: 850642.10 E: 432496.34

BOREHOLE LOG

SHEET: 4 OF 5



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BOREHOLE 2

PHOTOGRAPHS



Photo MBH 02.09
24.55m - 27.48m



Photo MBH 02.10
27.48m - 30.00m

NOTES

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- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.

JOB NAME: <u>GDC</u>	DRILLED BY: <u>Griffiths</u>	INCLINATION: <u>Vertical</u>	LOGGED: <u>RR</u> PLOTTED: <u>ML</u>
JOB LOCATION: <u>Hikuwai Rd - Pauariki Bridge</u>	DATE START: <u>13/06/2023</u>	RIG: <u>Comacchio - HQ Tripple Tube</u>	DATE LOGGED: <u>26/06/2023</u>
JOB NUMBER: <u>001.110.03.08</u>	DATE END: <u>19/06/2023</u>	DRILLING FLUIDS USED: <u>Polymer</u>	CHECKED: <u>SM</u>

MBH 2 BRIDGE No. BR02
 LOCATION: Refer Site Plan RL (m): 50.60
 COORDINATES: N: 850642.10 E: 432496.34

BOREHOLE LOG

SHEET: 5 OF 5



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GRAPHIC LOG	BOREHOLE 3	DEPTH (metres)	GEOLOGY	TESTS		CORE		DRILLING			NOTES / OTHER TESTS	INSTALLATION DETAILS
				SPT 'N' VALUE Per 30 cm	SPT BLOW COUNTS OR SHEAR VALUE	CORE TYPE	TOTAL CORE RECOVERY (%)	RQD %	METHOD	CASING		
	Silty DEBRIS, fine to medium grained sand, minor clay; brownish grey. Firm, moist, slightly plastic.	1.0	Debris and Fill material - platform created	N= 5	0/1/1/1/1/1/2	RC1	100	Rotary cored	100mm PVC			
		2.0				DEBRIS - Wood	SPT1					
	Fine to coarse SAND with cobbles and gravel, trace of silt; grey mottled brown. Very loose. River deposits.	3.0	Alluvial deposits - Holocene age	N= 1	1/0/0/0/0/1	SPT2					3.00 - 3.50m Atterberg test	
		4.0				Fine to coarse grained sandy COBBLES; grey. Loose. River deposits.	RC3					
	Unweathered, dark grey, SILTSTONE. Weak, very narrow, thinly laminated, moderately to steeply inclined, smooth planar. 6.62 - 7.50; 7.81 - 8.00; 8.70 - 8.92m calcite veins.	5.0	Alluvial deposits - Holocene age	N= 6	1/2/0/1/1/4	SPT3					2.75 metres @ completion of borehole	
		6.0					RC4					
	Unweathered, dark grey, SILTSTONE. Weak, very narrow, thinly laminated, moderately to steeply inclined, smooth planar. 6.62 - 7.50; 7.81 - 8.00; 8.70 - 8.92m calcite veins.	7.0	Early Miocene (Tolaga Group)	N= 50+/ 7cm	8/50+ Seating	SPT4					7.60m 30° joint.	
		8.0					RC5					
	Unweathered, dark grey, SILTSTONE. Weak, very narrow, thinly laminated, moderately to steeply inclined, smooth planar. 6.62 - 7.50; 7.81 - 8.00; 8.70 - 8.92m calcite veins.	9.0	Early Miocene (Tolaga Group)	N= 50+/ 5cm	50+/5cm Seating	SPT5					8.20m 30° joint	
		10.0					RC6					
	Unweathered, dark grey, SILTSTONE. Weak, very narrow, thinly laminated, moderately to steeply inclined, smooth planar. 6.62 - 7.50; 7.81 - 8.00; 8.70 - 8.92m calcite veins.	9.0	Early Miocene (Tolaga Group)	N= 50+/ 3cm	50+/3cm Seating	SPT6					8.40 - 8.70m UCS test	
		10.0					RC7					

NOTES

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- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.
- Standpipe Piezometer installed.

JOB NAME: <u>GDC</u>	DRILLED BY: <u>Civil Assist</u>	INCLINATION: <u>Vertical</u>	LOGGED: <u>RR</u> PLOTTED: <u>ML</u>
JOB LOCATION: <u>Hikawai RD - Pauariki Bridge</u>	DATE START: <u>10/10/2023</u>	RIG: <u>Hanjin 8D - HQ Tripple Tube</u>	DATE LOGGED: <u>16/10/2023</u>
JOB NUMBER: <u>001.110.03.08</u>	DATE END: <u>13/10/2023</u>	DRILLING FLUIDS USED: <u>Ultra Vis</u>	CHECKED: <u>SM</u>

MBH 3	BRIDGE No. BR02	BOREHOLE LOG		0800 248 451 (0800 CIVIL1)	
LOCATION: Refer Site Plan RL (m): 39.15	COORDINATES: N: 850684.38 E: 432434.82			SHEET: 1 OF 3	www.civilassist.nz
					admin@civilassist.nz
				20 Grey Street, Gisborne	

GRAPHIC LOG	BOREHOLE 3	DEPTH (metres)	GEOLOGY	TESTS		CORE			DRILLING			NOTES / OTHER TESTS	INSTALLATION DETAILS	
				SPT 'N' VALUE Per 30 cm	SPT BLOW COUNTS OR SHEAR VALUE	CORE TYPE	TOTAL CORE RECOVERY (%)	RQD %	METHOD	CASING	BASE OF HOLE & WATER LEVEL			
+	SOIL DESCRIPTION													
		Unweathered, dark grey, SILTSTONE. Weak, very narrow, thinly laminated, moderately to steeply inclined, smooth planar. Calcite veins at various depths. Minor macrofossils.												
		11.70 - 12.06m fractured.	11.0				RC7	100	90	Rotary cored 100mm PVC		11.10 - 11.70m Crushed zone.	Standpipe Piezometer - filter @ 9 - 15 m and 23 - 27 m.	
							RC8	100	65			11.90 - 30° joint.		
			12.0	N= 50+/ 1cm	50+/ 1cm Seating	SPT7								
							RC9	100	95					
			13.0											
							RC10	100	75					
			14.0											
			15.0	N= 50+/ 2cm	50+/ 2cm Seating	SPT8								
							RC11	100	95			15.90 - 16.20m Crushed zone.		
			16.0											
	17.0				RC12	100	85		16.86 - 17.03m Slaking test					
	18.0	N= 50+/ 3cm	50+/ 3cm Seating	SPT9										
					RC13	100	98		19.40 - 19.50 joint, infill with clay.					
	19.0													
					RC14	100	65							
	20.0													

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- Standpipe Piezometer installed.

JOB NAME: GDC
 JOB LOCATION: Hikuwai Rd - Pauariki Bridge
 JOB NUMBER: 001.110.03.08

DRILLED BY: Civil Assist
 DATE START: 10/10/2023
 DATE END: 13/10/2023

INCLINATION: Vertical
 RIG: Hanjin 8D - HQ Tripple Tube
 DRILLING FLUIDS USED: Ultra Vis

LOGGED: RR PLOTTED: ML
 DATE LOGGED: 16/10/2023
 CHECKED: SM


MBH 3 BRIDGE No. BR02
 LOCATION: Refer Site Plan RL (m): 39.15
 COORDINATES: N: 850684.38 E: 432434.82

BOREHOLE LOG

SHEET: 2 OF 3



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GRAPHIC LOG	BOREHOLE 3	DEPTH (metres)	GEOLOGY	TESTS		CORE			DRILLING			NOTES / OTHER TESTS	INSTALLATION DETAILS		
				SPT 'N' VALUE Per 30 cm	SPT BLOW COUNTS OR SHEAR VALUE	CORE TYPE	TOTAL CORE RECOVERY (%)	RQD %	METHOD	CASING	BASE OF HOLE & WATER LEVEL				
	Unweathered, dark grey, SILTSTONE. Weak, very narrow, thinly laminated, moderately to steeply inclined, smooth planar.														
	21.00 - 21.25m Highly fractured	21.0		N= 50+/ 4cm	50+/ 4cm Seating	RC14	100	65	Rotary cored	100mm PVC	20.60m - 21.00m Crushed zone, highly fractured.				
	21.25 - 21.50m Sedimentary rock bed.					SPT10									
						RC15	100	70							
			22.0									22.63 - 22.70 joint, clay and calcite.			
	23.42 - 23.70m Fractured.	23.0				RC16	100	75							
			24.0		N= 50+/ 2cm	50+/ 2cm Seating	SPT11								
							RC17	100	95						
			25.0												
	26.50m Sedimentary rock bed.	26.0				RC18	100	60				26.00m joint, infill with clay.			
			27.0		N= 50+/ 2cm	50+/ 2cm Seating	SPT12								
							RC19	100	95						
			28.0												
		29.0				RC19	100	85				28.63 - 28.77 Calcite vein.			
		30.0		N= 50+/ 1cm	50+/ 1cm Seating	SPT13						29.40 - 30.00m Vertical fracture. Clay infill, 29.88m horizontal clay infill			
END OF BOREHOLE AT 30.0m - As per GAIA instructions															

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JOB NAME: GDC
 JOB LOCATION: Hikuwai Rd - Pauariki Bridge
 JOB NUMBER: 001.110.03.08

DRILLED BY: Civil Assist
 DATE START: 10/10/2023
 DATE END: 13/10/2023

INCLINATION: Vertical
 RIG: Hanjin 8D - HQ Tripple Tube
 DRILLING FLUIDS USED: Ultra Vis

LOGGED: RR PLOTTED: ML
 DATE LOGGED: 16/10/2023
 CHECKED: SM

MBH 3 BRIDGE No. BR02
 LOCATION: Refer Site Plan RL (m): 39.15
 COORDINATES: N: 850684.38 E: 432434.82

BOREHOLE LOG

SHEET: 3 OF 3



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 20 Grey Street, Gisborne

BOREHOLE 3

PHOTOGRAPHS



Photo MBH 03.1
00.00 - 03.00 m



Photo MBH 03.2
03.00 - 06.90 m

NOTES

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JOB NAME: GDC
 JOB LOCATION: Hikuwai Rd - Pauariki Bridge
 JOB NUMBER: 001.110.03.08

DRILLED BY: Civil Assist
 DATE START: 10/10/2023
 DATE END: 13/10/2023

INCLINATION: Vertical
 RIG: Hanjin 8D - HQ Tripple Tube
 DRILLING FLUIDS USED: Ultra Vis

LOGGED: RR PLOTTED: ML
 DATE LOGGED: 16/10/2023
 CHECKED: SM

MBH 3 BRIDGE No. BR02
 LOCATION: Refer Site Plan RL (m): 39.15
 COORDINATES: N: 850684.38 E: 432434.82

BOREHOLE LOG

SHEET: 1 OF 5



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BOREHOLE 3

PHOTOGRAPHS



Photo MBH 03.3
06.90 - 09.90 m



Photo MBH 03.4
09.90 - 12.90 m

NOTES

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JOB NAME: GDC
 JOB LOCATION: Hikuwai Rd - Pauariki Bridge
 JOB NUMBER: 001.110.03.08

DRILLED BY: Civil Assist
 DATE START: 10/10/2023
 DATE END: 13/10/2023

INCLINATION: Vertical
 RIG: Hanjin 8D - HQ Tripple Tube
 DRILLING FLUIDS USED: Ultra Vis

LOGGED: RR PLOTTED: ML
 DATE LOGGED: 16/10/2023
 CHECKED: SM

MBH 3 BRIDGE No. BR02
 LOCATION: Refer Site Plan RL (m): 39.15
 COORDINATES: N: 850684.38 E: 432434.82

BOREHOLE LOG
 SHEET: 2 OF 5



0800 248 451 (0800 CIVIL1)
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BOREHOLE 3

PHOTOGRAPHS




Photo MBH 03.5
12.90 - 15.90 m



Photo MBH 03.6
15.90 - 18.90 m

NOTES

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JOB NAME: <u>GDC</u>	DRILLED BY: <u>Civil Assist</u>	INCLINATION: <u>Vertical</u>	LOGGED: <u>RR</u> PLOTTED: <u>ML</u>
JOB LOCATION: <u>Hikuwai Rd - Pauariki Bridge</u>	DATE START: <u>10/10/2023</u>	RIG: <u>Hanjin 8D - HQ Tripple Tube</u>	DATE LOGGED: <u>16/10/2023</u>
JOB NUMBER: <u>001.110.03.08</u>	DATE END: <u>13/10/2023</u>	DRILLING FLUIDS USED: <u>Ultra Vis</u>	CHECKED: <u>SM</u>
MBH 3 LOCATION: Refer Site Plan RL (m): 39.15 COORDINATES: N: 850684.38 E: 432434.82	BRIDGE No. BR02	BOREHOLE LOG SHEET: 3 OF 5	 0800 248 451 (0800 CIVIL1) www.civilassist.nz admin@civilassist.nz 20 Grey Street, Gisborne

BOREHOLE 3

PHOTOGRAPHS




Photo MBH 03.7
18.90 - 21.90 m



Photo MBH 03.8
21.90 - 24.90 m

NOTES

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JOB NAME: <u>GDC</u>	DRILLED BY: <u>Civil Assist</u>	INCLINATION: <u>Vertical</u>	LOGGED: <u>RR</u> PLOTTED: <u>ML</u>
JOB LOCATION: <u>Hikuwai Rd - Pauariki Bridge</u>	DATE START: <u>10/10/2023</u>	RIG: <u>Hanjin 8D - HQ Tripple Tube</u>	DATE LOGGED: <u>16/10/2023</u>
JOB NUMBER: <u>001.110.03.08</u>	DATE END: <u>13/10/2023</u>	DRILLING FLUIDS USED: <u>Ultra Vis</u>	CHECKED: <u>SM</u>
MBH 3 LOCATION: Refer Site Plan RL (m): 39.15 COORDINATES: N: 850684.38 E: 432434.82	BRIDGE No. BR02	BOREHOLE LOG SHEET: 4 OF 5	 0800 248 451 (0800 CIVIL1) www.civilassist.nz admin@civilassist.nz 20 Grey Street, Gisborne

BOREHOLE 3

PHOTOGRAPHS



Photo MBH 03.9
24.90 - 27.90 m



Photo MBH 03.10
27.90 - 30.00 m

NOTES

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JOB NAME: <u>GDC</u>	DRILLED BY: <u>Civil Assist</u>	INCLINATION: <u>Vertical</u>	LOGGED: <u>RR</u> PLOTTED: <u>ML</u>
JOB LOCATION: <u>Hikuwai Rd - Pauariki Bridge</u>	DATE START: <u>10/10/2023</u>	RIG: <u>Hanjin 8D - HQ Tripple Tube</u>	DATE LOGGED: <u>16/10/2023</u>
JOB NUMBER: <u>001.110.03.08</u>	DATE END: <u>13/10/2023</u>	DRILLING FLUIDS USED: <u>Ultra Vis</u>	CHECKED: <u>SM</u>


MBH 3	BRIDGE No. BR02	BOREHOLE LOG	 CIVIL ASSIST ENGINEERING FOR LIFE	0800 248 451 (0800 CIVIL1)
LOCATION: Refer Site Plan RL (m): 39.15	COORDINATES: N: 850684.38 E: 432434.82			SHEET: 5 OF 5


GRAPHIC LOG	BOREHOLE 4	DEPTH (metres)	GEOLOGY	TESTS		CORE		DRILLING			NOTES / OTHER TESTS	INSTALLATION DETAILS
				SPT 'N' VALUE Per 30 cm	SPT BLOW COUNTS OR SHEAR VALUE	CORE TYPE	TOTAL CORE RECOVERY (%)	RQD %	METHOD	CASING		
	Fine to coarse SAND, with cobbles and gravel, trace of silt; brownish yellow. Loose	1.0	Alluvial deposits - Holocene age	N= 5 0/1/1/1/1/1/2		RC1	98	Rotary cored HWT @ 15m			3.00m Shear Vane 62/15. 3.00 - 3.40m Atterberg test	Standpipe Piezometer - filter @ 8 - 13 m and 18 - 24 m.
x x	SILT with some fine to medium sand; yellow with grey. Firm, moist, slightly plastic, moderately iron stained.	2.0				SPT1						
x x	SILT, trace of fine sand; yellow. Soft to firm, moist, slightly plastic.	3.0				RC2	80					
x x		4.0				PS1	75					
x x	Core wash-out 3.85 - 4.50m. SPT used to retrieve some sample	4.0				N= 6 0/1/1/1/1/2/2	SPT2					
x x	Completely to highly weathered, grey, SILTSTONE. Extremely weak to very weak.	5.0	Early Miocene (Tolaga Group)	N= 2 0/1/0/1/0/1		RC3	75	3.10 metres @ completion of borehole		6.00m Shear Vane 112/31. 6.00 - 6.40m Atterberg test		
x x		6.0				PS1	75					
x x	SILT with clay; grey. Very stiff, moist, slightly plastic. Completely weathered rock.	7.0	N= 28 2/4/5/5/8/10	SPT4		RC4	100	0				
x x	Completely to highly weathered, grey, SILTSTONE. Extremely weak to very weak.	7.0	N= 44 7/9/10/11/11/12			RC5	90	0				
x x	Unweathered to slightly weathered, dark grey, SILTSTONE, thinly laminated, moderately inclined, rough undulating, very weak.	8.0				SPT5		RC6	100	50		8.40 - 9.00m Sub-vertical, infill with clay and calcite.
x x		9.0				SPT6		RC7	100	60		9.30 - 9.70m UCS test 9.40 - 9.60m Sub-vertical, infill with clay. 9.70 - 9.90m Slaking test
	Slightly to unweathered, dark grey, SILTSTONE, laminated, tight, moderately inclined, undulating. Very weak to weak.	10.0	N= 20 3/4/1/4/5/5/6									

NOTES

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- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.
- Standpipe Piezometer installed.
- A calibration factor from Geotechnics Vane 3841 of 1.619 was applied to in field readings, these readings may not be accurate due to disturbance from drilling. Reading performed on core still in split triple - tube barrel.

JOB NAME: <u>GDC</u>	DRILLED BY: <u>Civil Assist</u>	INCLINATION: <u>Vertical</u>	LOGGED: <u>RR</u> PLOTTED: <u>ML</u>
JOB LOCATION: <u>Hikuwai Rd - Pauariki Bridge</u>	DATE START: <u>20/09/2023</u>	RIG: <u>Hanjin 8D - HQ Tripple Tube</u>	DATE LOGGED: <u>09/10/2023</u>
JOB NUMBER: <u>001.110.03.08</u>	DATE END: <u>05/10/2023</u>	DRILLING FLUIDS USED: <u>Ultra Vis</u>	CHECKED: <u>SM</u>


MBH 4	BRIDGE No. BR02	BOREHOLE LOG		0800 248 451 (0800 CIVIL1)	
LOCATION: Refer Site Plan RL (m): 47.68	COORDINATES: N: 850699.70 E: 432421.39			SHEET: 1 OF 4	www.civilassist.nz
					admin@civilassist.nz 20 Grey Street, Gisborne

GRAPHIC LOG	BOREHOLE 4	DEPTH (metres)	GEOLOGY	TESTS		CORE			DRILLING			NOTES / OTHER TESTS	INSTALLATION DETAILS
				SPT 'N' VALUE Per 30 cm	SPT BLOW COUNTS OR SHEAR VALUE	CORE TYPE	TOTAL CORE RECOVERY (%)	RQD %	METHOD	CASING	BASE OF HOLE & WATER LEVEL		
	Slightly to unweathered, dark grey, SILTSTONE, laminated, tight, moderately inclined, undulating. Weak. Minor macrofossils.	11.0	N= 50+/ 10cm	8/12//23/27	RC7	100	60	Rotary cored	100mm PVC		10.10m - joint infill with clay.	Standpipe Piezometer - filter @ 8 - 13 m and 18 - 24 m.	
					SPT7								
						RC8	100	50					11.80 - 12.00m - joint steeply inclined.
			12.0	N= 50+/ 11cm	8/12//23/27	SPT8							
		Highly to moderately weathered, dark grey, SILTSTONE. Very weak, very widely spaced, highly fractured, undulating, various joints, infill with clay. Some calcite veins.						RC9	100	0			
			13.0	N= 50+/ 10cm	38/12-2.5cm Seating	SPT9							
								RC10	100	0			
			14.0										
			15.0										
			16.0										
	16.52 - 16.70m sedimentary rock.	16.0	N= 50+/ 2cm	50+/2cm Seating	SPT10						16.25 - 16.46m Slaking test		
		17.0											
	17.50m sedimentary rock, joint, infill with clay.												
		18.0											
	Moderately to slightly weathered, dark grey MUDSTONE, very weak, highly fractured, steeply inclined, undulating.	18.0											
		19.0											
		20.0	N= 50+/ 10cm	38/12-2.5cm Seating	SPT11								
							RC14	100	0				

NOTES

- The stratification lines represent the approximate boundary between soil types and the transition may be gradual
- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.
- Standpipe Piezometer installed.

JOB NAME: <u>GDC</u>	DRILLED BY: <u>Civil Assist</u>	INCLINATION: <u>Vertical</u>	LOGGED: <u>RR</u> PLOTTED: <u>ML</u>
JOB LOCATION: <u>Hikuwai Rd - Pauariki Bridge</u>	DATE START: <u>20/09/2023</u>	RIG: <u>Hanjin 8D - HQ Tripple Tube</u>	DATE LOGGED: <u>09/10/2023</u>
JOB NUMBER: <u>001.110.03.08</u>	DATE END: <u>05/10/2023</u>	DRILLING FLUIDS USED: <u>Ultra Vis</u>	CHECKED: <u>SM</u>


MBH 4	BRIDGE No. BR02	BOREHOLE LOG		0800 248 451 (0800 CIVIL1)
LOCATION: Refer Site Plan RL (m): 47.68				www.civilassist.nz
COORDINATES: N: 850699.70 E: 432421.39	SHEET: 2 OF 4			admin@civilassist.nz
				20 Grey Street, Gisborne

GRAPHIC LOG	BOREHOLE 4	DEPTH (metres)	GEOLOGY	TESTS		CORE			DRILLING			NOTES / OTHER TESTS	INSTALLATION DETAILS
				SPT 'N' VALUE Per 30 cm	SPT BLOW COUNTS OR SHEAR VALUE	CORE TYPE	TOTAL CORE RECOVERY (%)	RQD %	METHOD	CASING	BASE OF HOLE & WATER LEVEL		
<p>Moderately to slightly weathered, dark grey MUDSTONE, very weak, highly fractured, steeply inclined, undulating. 20.25 - 20.30m calcite veins.</p> <p>21.00 - 22.50m various joints, infill with clay.</p> <p>Slightly to unweathered, dark grey, MUDSTONE. Very weak to weak, thinly laminated, steeply inclined, rough planar. Highly fractured.</p> <p>Moderately to slightly weathered, dark grey, MUDSTONE. Very weak to weak, thinly laminated, steeply inclined, undulating.</p>													

NOTES

- The stratification lines represent the approximate boundary between soil types and the transition may be gradual
- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.
- Standpipe Piezometer installed.

JOB NAME: <u>GDC</u>	DRILLED BY: <u>Civil Assist</u>	INCLINATION: <u>Vertical</u>	LOGGED: <u>RR</u> PLOTTED: <u>ML</u>
JOB LOCATION: <u>Hikuwai Rd - Pauariki Bridge</u>	DATE START: <u>20/09/2023</u>	RIG: <u>Hanjin 8D - HQ Tripple Tube</u>	DATE LOGGED: <u>09/10/2023</u>
JOB NUMBER: <u>001.110.03.08</u>	DATE END: <u>05/10/2023</u>	DRILLING FLUIDS USED: <u>Ultra Vis</u>	CHECKED: <u>SM</u>

MBH 4	BRIDGE No. BR02	BOREHOLE LOG		0800 248 451 (0800 CIVIL1)	
LOCATION: Refer Site Plan RL (m): 47.68	COORDINATES: N: 850699.70 E: 432421.39			SHEET: 3 OF 4	www.civilassist.nz
					admin@civilassist.nz

20 Grey Street, Gisborne

GRAPHIC LOG	BOREHOLE 4	DEPTH (metres)	GEOLOGY	TESTS		CORE			DRILLING			NOTES / OTHER TESTS	INSTALLATION DETAILS	
				SPT 'N' VALUE Per 30 cm	SPT BLOW COUNTS OR SHEAR VALUE	CORE TYPE	TOTAL CORE RECOVERY (%)	RQD %	METHOD	CASING	BASE OF HOLE & WATER LEVEL			
<p>Moderately to slightly weathered, dark grey, MUDSTONE. Very weak to weak, thinly laminated, steeply inclined, undulating. Highly fracture to fractured core.</p>		31.0			RC21	100	0	Rotary cored 100mm PVC						
		32.0		N= 50+/ 2cm 50+/ 2cm Seating	SPT15									
		33.0			RC23	100	0							
		34.0			RC24	98	60							
		35.0		N= 50+/ 1cm 50+/ 1cm Seating	SPT16									
	END OF BOREHOLE AT 35.0m - As per GAIA instructions	35.0												
		36.0												
		37.0												
		38.0												
		39.0												
		40.0												

NOTES

- The stratification lines represent the approximate boundary between soil types and the transition may be gradual
- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.
- Standpipe Piezometer installed.

JOB NAME: GDC
 JOB LOCATION: Hikuwai Rd - Pauariki Bridge
 JOB NUMBER: 001.110.03.08

DRILLED BY: Civil Assist
 DATE START: 20/09/2023
 DATE END: 05/10/2023

INCLINATION: Vertical
 RIG: Hanjin 8D - HQ Tripple Tube
 DRILLING FLUIDS USED: Ultra Vis

LOGGED: RR PLOTTED: ML
 DATE LOGGED: 09/10/2023
 CHECKED: SM

MBH 4 BRIDGE No. BR02
 LOCATION: Refer Site Plan RL (m): 47.68
 COORDINATES: N: 850699.70 E: 432421.39

BOREHOLE LOG

SHEET: 4 OF 4



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BOREHOLE 4

PHOTOGRAPHS



Photo MBH 04.1
00.00 - 04.50 m

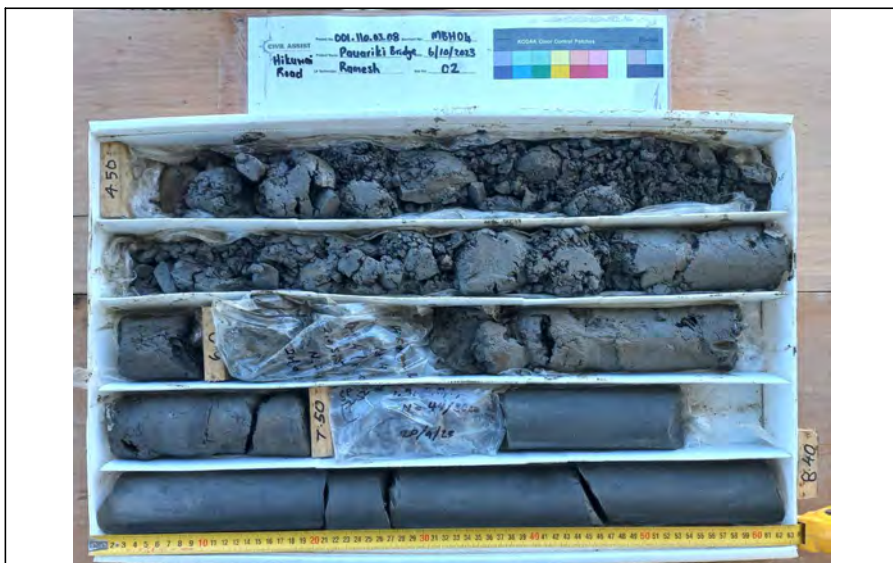


Photo MBH 04.2
04.50m - 08.40 m

NOTES

- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.

JOB NAME: GDC
 JOB LOCATION: Hikuwai Rd - Pauariki Bridge
 JOB NUMBER: 001.110.03.08

DRILLED BY: Civil Assist
 DATE START: 20/09/2023
 DATE END: 05/10/2023

INCLINATION: Vertical
 RIG: Hanjin 8D - HQ Tripple Tube
 DRILLING FLUIDS USED: Ultra Vis

LOGGED: RR PLOTTED: ML
 DATE LOGGED: 09/10/2023
 CHECKED: SM

MBH 4 BRIDGE No. BR02
 LOCATION: Refer Site Plan RL (m): 47.68
 COORDINATES: N: 850699.70 E: 432421.39

BOREHOLE LOG

SHEET: 1 OF 7



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BOREHOLE 4

PHOTOGRAPHS



Photo MBH 4.3
08.40m - 11.10 m

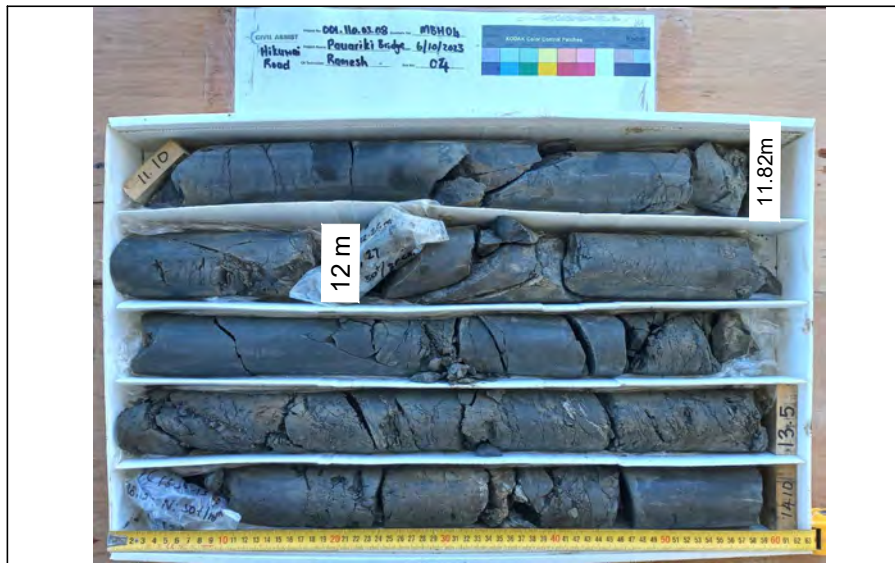


Photo MBH 04.4
11.10m - 14.10 m

NOTES

- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.

JOB NAME: <u>GDC</u>	DRILLED BY: <u>Civil Assist</u>	INCLINATION: <u>Vertical</u>	LOGGED:RR <u>ML</u>
JOB LOCATION: <u>Hikuwai Rd - Pauariki Bridge</u>	DATE START: <u>20/09/2023</u>	RIG: <u>Hanjin 8D - HQ Tripple Tube</u>	DATE LOGGED: <u>09/10/2023</u>
JOB NUMBER: <u>001.110.03.08</u>	DATE END: <u>05/10/2023</u>	DRILLING FLUIDS USED: <u>Ultra Vis</u>	CHECKED: <u>SM</u>

MBH 4	BRIDGE No. BR02	BOREHOLE LOG	 CIVIL ASSIST ENGINEERING FOR LIFE
LOCATION: Refer Site Plan RL (m): 47.68			
COORDINATES: N: 850699.70 E: 432421.39	SHEET: 2 OF 7		
		0800 248 451 (0800 CIVIL1) www.civilassist.nz admin@civilassist.nz 20 Grey Street, Gisborne	

BOREHOLE 4

PHOTOGRAPHS



Photo MBH 04.5
14.10 - 17.10 m



Photo MBH 04.6
17.10 - 20.10 m

NOTES

- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.

JOB NAME: GDC
 JOB LOCATION: Hikuwai Rd - Pauariki Bridge
 JOB NUMBER: 001.110.03.08

DRILLED BY: Civil Assis
 DATE START: 20/09/2023
 DATE END: 05/10/2023

INCLINATION: Vertical
 RIG: Hanjin 8D - HQ Tripple Tube
 DRILLING FLUIDS USED: Ultra Vis

LOGGED: RR PLOTTED: ML
 DATE LOGGED: 09/10/2023
 CHECKED: SM

MBH 4 BRIDGE No. BR02
 LOCATION: Refer Site Plan RL (m): 47.68
 COORDINATES: N: 850699.70 E: 432421.39

BOREHOLE LOG

SHEET: 3 OF 7



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BOREHOLE 4

PHOTOGRAPHS



Photo MBH 04.7
20.10m - 23.10m



Photo MBH 04.8
23.10m - 26.10m

NOTES

- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.

JOB NAME: GDC
 JOB LOCATION: Hikuwai Rd - Pauariki Bridge
 JOB NUMBER: 001.110.03.08

DRILLED BY: Civil Assist
 DATE START: 20/09/2023
 DATE END: 05/10/2023

INCLINATION: Vertical
 RIG: Hanjin 8D - HQ Tripple Tube
 DRILLING FLUIDS USED: Ultra Vis

LOGGED: RR PLOTTED: ML
 DATE LOGGED: 09/10/2023
 CHECKED: SM

MBH 4 BRIDGE No. BR02
 LOCATION: Refer Site Plan RL (m): 47.68
 COORDINATES: N: 850699.70 E: 432421.39

BOREHOLE LOG

SHEET: 4 OF 7



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BOREHOLE 4

PHOTOGRAPHS



Photo MBH 04.09
26.10m - 29.10m



Photo MBH 04.10
29.10m - 32.10m

NOTES

- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.

JOB NAME: <u>GDC</u>	DRILLED BY: <u>Civil Assist</u>	INCLINATION: <u>Vertical</u>	LOGGED: <u>RR</u> PLOTTED: <u>ML</u>
JOB LOCATION: <u>Hikuwai Rd - Pauariki Bridge</u>	DATE START: <u>20/09/2023</u>	RIG: <u>Hanjin 8D - HQ Tripple Tube</u>	DATE LOGGED: <u>09/10/2023</u>
JOB NUMBER: <u>001.110.03.08</u>	DATE END: <u>05/10/2023</u>	DRILLING FLUIDS USED: <u>Ultra Vis</u>	CHECKED: <u>SM</u>

MBH 4	BRIDGE No. BR02	BOREHOLE LOG		0800 248 451 (0800 CIVIL1)
LOCATION: Refer Site Plan RL (m): 47.68	COORDINATES: N: 850699.70 E: 432421.39			www.civilassist.nz
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		SHEET: 5 OF 7		20 Grey Street, Gisborne

BOREHOLE 4

PHOTOGRAPHS



Photo MBH 04.11
32.10m - 35.00m




Photo MBH 04.12
Push tube samples

NOTES

- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.

JOB NAME: <u>GDC</u>	DRILLED BY: <u>Civil Assist</u>	INCLINATION: <u>Vertical</u>	LOGGED: <u>RR</u> PLOTTED: <u>ML</u>
JOB LOCATION: <u>Hikuwai Rd - Pauariki Bridge</u>	DATE START: <u>20/09/2023</u>	RIG: <u>Hanjin 8D - HQ Tripple Tube</u>	DATE LOGGED: <u>09/10/2023</u>
JOB NUMBER: <u>001.110.03.08</u>	DATE END: <u>05/10/2023</u>	DRILLING FLUIDS USED: <u>Ultra Vis</u>	CHECKED: <u>SM</u>

MBH 4	BRIDGE No. BR02	BOREHOLE LOG		0800 248 451 (0800 CIVIL1)	
LOCATION: Refer Site Plan RL (m): 47.68	COORDINATES: N: 850699.70 E: 432421.39			SHEET: 6 OF 7	www.civilassist.nz
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BOREHOLE 4

PHOTOGRAPHS



Photo MBH 04.13
Push tube sample
depths

NOTES

- The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
- Core loss assumed to be at end of runs. Core logged post drilling, moisture levels and strength indicative at time of logging.

JOB NAME: <u>GDC</u>	DRILLED BY: <u>Civil Assist</u>	INCLINATION: <u>Vertical</u>	LOGGED: <u>RR</u> PLOTTED: <u>ML</u>
JOB LOCATION: <u>Hikuwai Rd - Pauariki Bridge</u>	DATE START: <u>20/09/2023</u>	RIG: <u>Hanjin 8D - HQ Tripple Tube</u>	DATE LOGGED: <u>09/10/2023</u>
JOB NUMBER: <u>001.110.03.08</u>	DATE END: <u>05/10/2023</u>	DRILLING FLUIDS USED: <u>Ultra Vis</u>	CHECKED: <u>SM</u>

MBH 4 BRIDGE No. BR02
LOCATION: Refer Site Plan RL (m): 47.68
COORDINATES: N: 850699.70 E: 432421.39

BOREHOLE LOG

SHEET: 7 OF 7



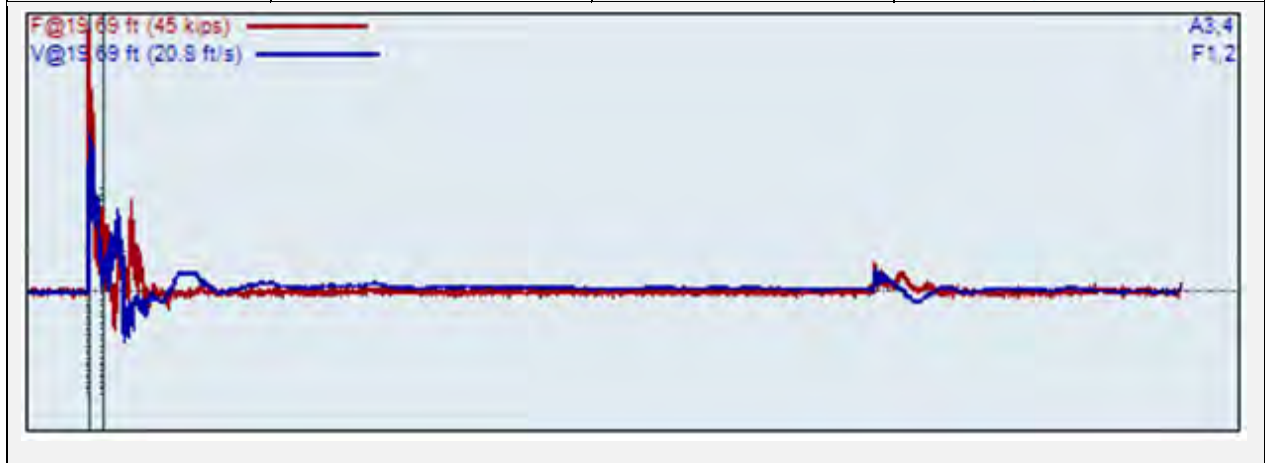
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admin@civilassist.nz
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APPENDIX E - SPT CALIBRATION REPORTS
MBH01 & MBH02 - COMMACHIO - GRIFFITHS
DRILLING
MBH03 & MBH04 - MCCULLOCHS
MANUFACTURING.



MBH 01 & MBH02- Calibration Certificate

Griffiths Drilling (NZ) Ltd SPT Hammer Calibration Report			
SPT Hammer:	Commachio MC450P Auto	Date Tested:	27/2/23
Location:	GD Yard	Calibration Equipment:	Pile Dynamics Inc. SPT Analyzer
Average ETR %	83.5%	Standard Deviation:	2.4%
Test Completed by:	N Abbott	Test Reviewed by:	M Griffiths
Signed:		Signed:	





TP900

**AUSTRALIAN
CALIBRATING
SERVICES (A'SIA) PTY. LTD.**
A.B.N. 33 623 153 736

126 Oxford Street, Collingwood
P.O. Box 1174, Collingwood, Vic. 3066, Australia
Phone: +61 3 9417 5688, Fax: +61 3 9417 1578
File Number: V.AC/10153-A-1
Date of Issue: 11 August 2014
Page 1 of 1

**CALIBRATION REPORT
AUTOMATIC HAMMER**

FOR: W McCULLOCH & SON PTY LTD
207 MIDLAND HIGHWAY
EPSOM VIC 3551

TEST DATE: 4 August 2014

LOCATION: ACS Laboratory / Melbourne Site No. 1232

EQUIPMENT DETAILS:
 Manufacturer: McCullochs Manufacturing
 Serial Number:
 Model Number: SPT Hammer
 Range: -

TEST DETAILS: Specification: See Table
 The device was calibrated using equipment traceable to the National Standards.

- The ambient temperature was 20°C ±2°C.
- Reference equipment used: V.AC/100-3W, 5D, 21C.

COMMENTS: Prior to final measurement, the Hammer weight was adjusted.

RESULTS:

Specification	Measured Value	Uncertainty
Drop Height 760mm ±15mm	760mm	± 3mm
Plunger Weight 63.5 ± 1kgf	63.5 kgf	± 0.3 kgf

UNCERTAINTY: Uncertainty = ± Refer Table of Results, Confidence Level = 95%, k=2.

Signed.....
 A. TIEDEMANN
 Approved Signatory

AUSTRALIAN CALIBRATING SERVICES (A'SIA) PTY LTD



NATA Accredited Laboratory Number 1239. Accredited for compliance with ISO/IEC 17025.
 The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National Standards.
 This Report shall not be reproduced except in full.

APPENDIX F – LABORATORY RESULTS
UCS RESULTS, ATTERBERG RESULTS,
SLAKING TEST RESULTS

**UNCONFINED COMPRESSIVE STRENGTH
WITH YOUNG'S MODULUS**



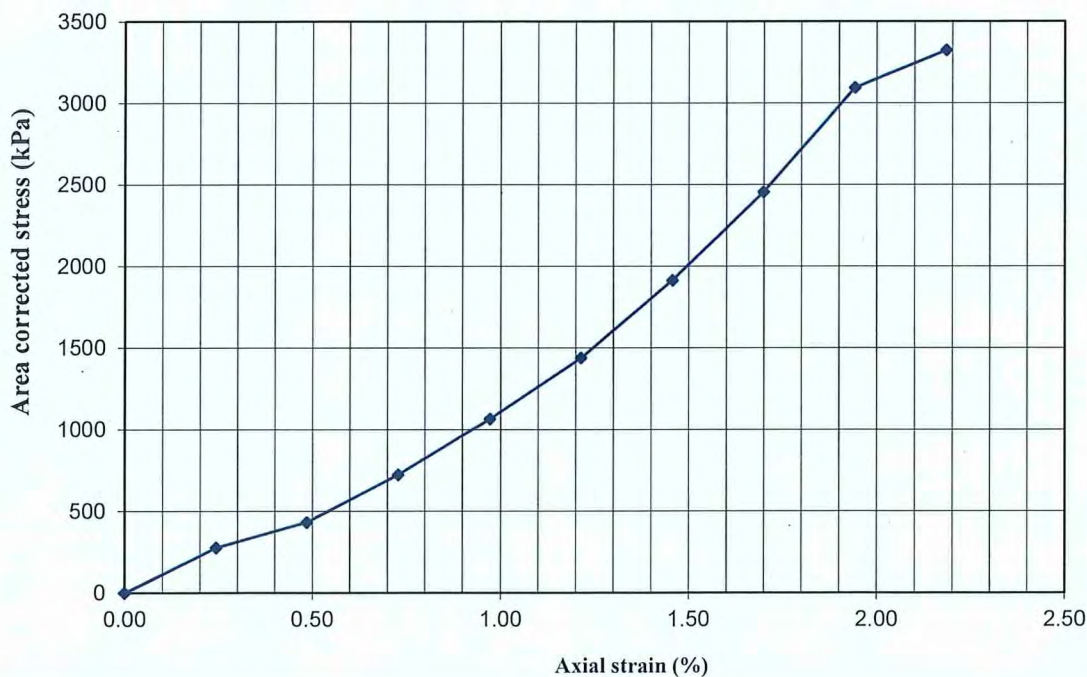
Project: Pauariki Bridge
 Location: Hikuwai Road
 Client: Civil Assist
 Contractor: Not Known
 Sampled by: Civil Assist
 Sampling method: Not Known
 Sample description: Cored Mudstone
 Sample condition: As Received
 Source: MBH01 8.40 - 8.70m

Date sampled: Not Known

Project number:	2-GISLB.Z5
Lab ref number:	GS2438-UCS1
Client ref number:	CA 001.110.03.08

Test results			
Bulk density (t/m ³)	2.33	Initial sample diameter (mm)	60.6
Water content (%)	Not Tested	Initial sample length (mm)	103.0
Dry density (t/m ³)	Not tested	Initial sample area (mm ²)	2884.3
Maximum stress (kPa)	3324	Initial Length:Diameter ratio	1.7:1
Strain at failure (%)	2.2	Young's modulus (MPa)	183
Mode of failure:	Vertical Shear	For strain range	0.49 - 1.94%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1	-Sample Descriptions are not covered by IANZ accreditation. -The strain rate for this test was kept constant at 1.0mm/min. -Test method requires approx. 2:1 (L:D) ratio. This test deviates from that.

Date Tested 21/11/2023

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Date Reported 21/11/2023
 Pete Carlyle Senior Technician

LAF 019 (01/20)

Page 1 of 1

Pauariki Bridge MBH01 8.40 - 8.70m
GS2438-UCS1



**UNCONFINED COMPRESSIVE STRENGTH
WITH YOUNG'S MODULUS**



Project: Pauariki Bridge
 Location: Hikuwai Road
 Client: Civil Assist
 Contractor: Not Known
 Sampled by: Civil Assist
 Sampling method: Not Known
 Sample description: Cored Mudstone
 Sample condition: As Received
 Source: MBH01 23.60 - 23.90m

Date sampled: Not Known

Project number: 2-GISLB.Z5
 Lab ref number: GS2438-UCS2
 Client ref number: CA 001.110.03.08

Test results			
Bulk density (t/m ³)	2.39	Initial sample diameter (mm)	60.6
Water content (%)	Not Tested	Initial sample length (mm)	119.2
Dry density (t/m ³)	Not tested	Initial sample area (mm ²)	2884.3
Maximum stress (kPa)	10261	Initial Length:Diameter ratio	1.97:1
Strain at failure (%)	1.7	Young's modulus (MPa)	804
Mode of failure:	Vertical Shear	For strain range	0.63 - 1.47%

Area corrected Stress (kPa) Vs Axial strain (%)

Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1	-Sample Descriptions are not covered by IANZ accreditation. -The strain rate for this test was kept constant at 1.0mm/min.

Date Tested 22/11/2023

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Date Reported 22/11/2023
 Pete Carlyle Senior Technician

LAF 019 (01/20)

Page 1 of 1

Pauariki Bridge MBH01 23.60 - 23.90
GS2438-UCS2



**UNCONFINED COMPRESSIVE STRENGTH
WITH YOUNG'S MODULUS**



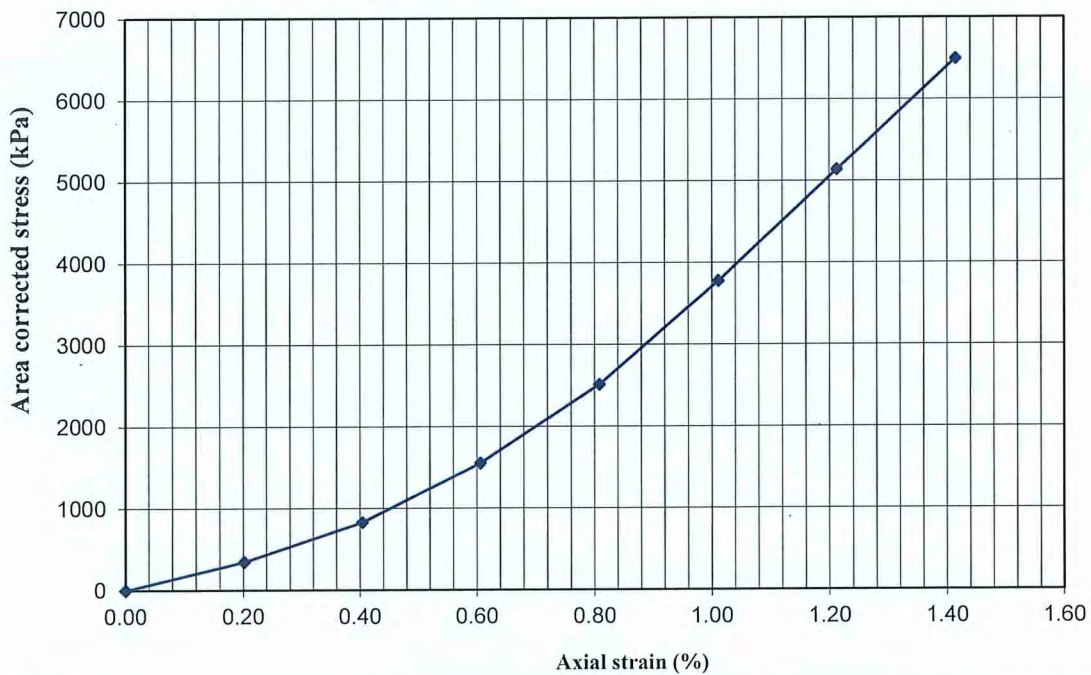
Project: Pauariki Bridge
 Location: Hikuwai Road
 Client: Civil Assist
 Contractor: Not Known
 Sampled by: Civil Assist
 Sampling method: Not Known
 Sample description: Cored Mudstone
 Sample condition: As Received
 Source: MBH02 9.50 - 9.80m

Date sampled: Not Known

Project number: 2-GISLB.Z5
 Lab ref number: GS2438-UCS3
 Client ref number: CA 001.110.03.08

Test results			
Bulk density (t/m ³)	2.36	Initial sample diameter (mm)	60.6
Water content (%)	Not Tested	Initial sample length (mm)	123.7
Dry density (t/m ³)	Not tested	Initial sample area (mm ²)	2884.3
Maximum stress (kPa)	6494	Initial Length:Diameter ratio	2.04:1
Strain at failure (%)	1.4	Young's modulus (MPa)	611
Mode of failure:	Vertical Shear	For strain range	0.61 - 1.42%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402:1986: Test 6.3.1	-Sample Descriptions are not covered by IANZ accreditation. -The strain rate for this test was kept constant at 1.0mm/min.

Date Tested 22/11/2023

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Date Reported 22/11/2023
 Pete Carlyle Senior Technician

LAF 019 (01/20)

Page 1 of 1

Pauariki Bridge MBH02 9.50 - 9.80m
GS2438-UCS3



**UNCONFINED COMPRESSIVE STRENGTH
WITH YOUNG'S MODULUS**



Project: Pauariki Bridge
 Location: Hikuwai Road
 Client: Civil Assist
 Contractor: Not Known
 Sampled by: Civil Assist
 Sampling method: Not Known
 Sample description: Cored Mudstone
 Sample condition: As Received
 Source: MBH03 8.40 - 8.70mm

Date sampled: Not Known

Project number: 2-GISLB.Z5
 Lab ref number: GS2438-UCS4
 Client ref number: CA 001.110.03.08

Test results			
Bulk density (t/m ³)	2.46	Initial sample diameter (mm)	60.0
Water content (%)	Not Tested	Initial sample length (mm)	119.8
Dry density (t/m ³)	Not tested	Initial sample area (mm ²)	2827.4
Maximum stress (kPa)	9092	Initial Length:Diameter ratio	2:1
Strain at failure (%)	1.9	Young's modulus (MPa)	642
Mode of failure:	Vertical Shear	For strain range	0.63 - 1.67%

Area corrected Stress (kPa) Vs Axial strain (%)

Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1	-Sample Descriptions are not covered by IANZ accreditation. -The strain rate for this test was kept constant at 1.0mm/min.

Date Tested: 24/11/2023
 Date Reported: 24/11/2023
 Pete Carlyle: *Senior Technician*

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LAF 019 (01/20)

Page 1 of 1

Pauariki Bridge MBH03 8.40 - 8.70m
GS2438-UCS4



**UNCONFINED COMPRESSIVE STRENGTH
WITH YOUNG'S MODULUS**



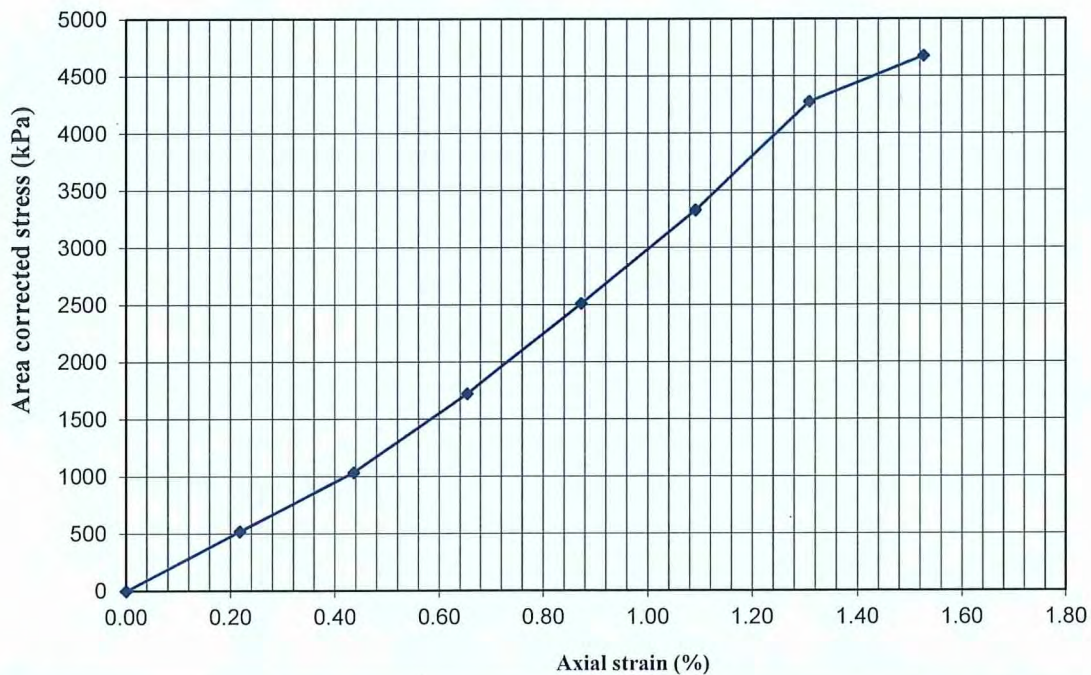
Project: Pauariki Bridge
 Location: Hikuwai Road
 Client: Civil Assist
 Contractor: Not Known
 Sampled by: Civil Assist
 Sampling method: Not Known
 Sample description: Cored Mudstone
 Sample condition: As Received
 Source: MBH04 9.30 - 9.70mm

Date sampled: Not Known

Project number: 2-GISLB.Z5
 Lab ref number: GS2438-UCS5
 Client ref number: CA 001.110.03.08

Test results			
Bulk density (t/m ³)	2.29	Initial sample diameter (mm)	60.6
Water content (%)	Not Tested	Initial sample length (mm)	114.6
Dry density (t/m ³)	Not tested	Initial sample area (mm ²)	2884.3
Maximum stress (kPa)	4677	Initial Length:Diameter ratio	1.89:1
Strain at failure (%)	1.5	Young's modulus (MPa)	371
Mode of failure:	Vertical Shear	For strain range	0.44 - 1.31%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1	-Sample Descriptions are not covered by IANZ accreditation. -The strain rate for this test was kept constant at 1.0mm/min.

Date Tested: 24/11/2023
 Date Reported: 24/11/2023
 Pete Carlyle:  Senior Technician

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LAF 019 (01/20)

Page 1 of 1

Pauariki Bridge MBH04 9.30 - 9.70m
GS2438-UCS5



PLASTICITY INDEX FOR SOILS
TEST REPORT



Project : GDC - Black Bridge BR #02
 Location : Hikuwai Road - Pauariki Bridge
 Client : Civil Assist
 Contractor : Civil Assist
 Sampled by : Civil Assist
 Date sampled : Not Stated
 Sampling method : Not Known
 Sample description : CLAY/Silt
 Sample condition : As Received
 Sample reference : MBH01
 Sample depth : 2.3 - 2.6

Project No : 2-GISLB.Z5
 Lab Ref No : GS2438-1
 Client Ref No : CA 001.110.03.08

Test Results	
Liquid Limit :	45
Plastic Limit :	24
Plasticity Index :	21
Natural Water Content :	33.8

Test Methods	Notes
Liquid Limit	NZS 4402 : 1986, Test 2.2
Plastic Limit	NZS 4402 : 1986, Test 2.3
Plasticity Index	NZS 4402 : 1986, Test 2.4
Water Content	NZS 4402 : 1986, Test 2.1

Date tested : 22/11/23
 Date reported : 22/11/23

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Approved

Designation : Senior Technician

Date : 22/11/23

PLASTICITY INDEX FOR SOILS
TEST REPORT



Project : GDC - Black Bridge BR #02
 Location : Hikuwai Road - Pauariki Bridge
 Client : Civil Assist
 Contractor : Civil Assist
 Sampled by : Civil Assist
 Date sampled : Not Stated
 Sampling method : Not Known
 Sample description : CLAY/Silt
 Sample condition : As Received
 Sample reference: MBH02
 Sample depth: 1.95 - 2.3

Project No : 2-GISLB.Z5
 Lab Ref No : GS2438-2
 Client Ref No : CA 001.110.03.08

Test Results	
Liquid Limit :	39
Plastic Limit :	21
Plasticity Index :	18
Natural Water Content :	34.4

Test Methods	Notes
Liquid Limit NZS 4402 : 1986, Test 2.2	Materials used: Passing 0.425 Sieve
Plastic Limit NZS 4402 : 1986, Test 2.3	
Plasticity Index NZS 4402 : 1986, Test 2.4	
Water Content NZS 4402 : 1986, Test 2.1	

Date tested : 14/11/23
 Date reported : 14/11/23

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Approved

Designation : Senior Technician
 Date : 14/11/23

PLASTICITY INDEX FOR SOILS
TEST REPORT



Project : GDC - Black Bridge BR #02
 Location : Hikuwai Road - Pauariki Bridge
 Client : Civil Assist
 Contractor : Civil Assist
 Sampled by : Civil Assist
 Date sampled : Not Stated
 Sampling method : Not Known
 Sample description : CLAY/Silt
 Sample condition : As Received
 Sample reference: MBH03
 Sample depth: 3.0 - 3.5

Project No : 2-GISLB.Z5
 Lab Ref No : GS2438-3
 Client Ref No : CA 001.110.03.08

Test Results	
Liquid Limit :	
Plastic Limit :	
Plasticity Index :	Non Plastic
Natural Water Content :	10.0

Test Methods	Notes
Liquid Limit	Materials used: Passing 0.425 Sieve
Plastic Limit	
Plasticity Index	
Water Content	

Date tested : 28/11/23
 Date reported : 28/11/23

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Approved

Designation : Senior Technician
 Date : 28/11/23

PLASTICITY INDEX FOR SOILS
TEST REPORT



Project : GDC - Black Bridge BR #02
 Location : Hikuwai Road - Pauariki Bridge
 Client : Civil Assist
 Contractor : Civil Assist
 Sampled by : Civil Assist
 Date sampled : Not Stated
 Sampling method : Not Known
 Sample description : CLAY/Silt
 Sample condition : As Received
 Sample reference: MBH04
 Sample depth: 3.0 - 3.4 PS1

Project No :	2-GISLB.Z5
Lab Ref No :	GS2438-4
Client Ref No :	CA 001.110.03.08

Test Results	
Liquid Limit :	37
Plastic Limit :	24
Plasticity Index :	13
Natural Water Content :	Not Tested

Test Methods	Notes
Liquid Limit NZS 4402 : 1986, Test 2.2	Materials used: Passing 0.425 Sieve
Plastic Limit NZS 4402 : 1986, Test 2.3	
Plasticity Index NZS 4402 : 1986, Test 2.4	
Water Content NZS 4402 : 1986, Test 2.1	

Date tested : 28/11/23
 Date reported : 28/11/23

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Approved 
 Designation : *Senior Technician*
 Date : 28/11/23

PLASTICITY INDEX FOR SOILS
TEST REPORT



Project : GDC - Black Bridge BR #02
 Location : Hikuwai Road - Pauariki Bridge
 Client : Civil Assist
 Contractor : Civil Assist
 Sampled by : Civil Assist
 Date sampled : Not Stated
 Sampling method : Not Known
 Sample description : CLAY/Silt
 Sample condition : As Received
 Sample reference: MBH04
 Sample depth: 6.0 - 6.4 PS2

Project No : 2-GISLB.Z5
 Lab Ref No : GS2438-5
 Client Ref No : CA 001.110.03.08

Test Results	
Liquid Limit :	32
Plastic Limit :	20
Plasticity Index :	12
Natural Water Content :	Not Tested

Test Methods	Notes
Liquid Limit NZS 4402 : 1986, Test 2.2	Materials used: Passing 0.425 Sieve
Plastic Limit NZS 4402 : 1986, Test 2.3	
Plasticity Index NZS 4402 : 1986, Test 2.4	
Water Content NZS 4402 : 1986, Test 2.1	

Date tested : 27/11/23
 Date reported : 29/11/23

This report may only be reproduced in full

Approved

Designation : Senior Technician
 Date : 29/11/23



LABORATORY TEST

1. MODIFIED SLAKING TEST

JOB NAME : GDC Black Bridges - Bridge # 02	TESTED BY : ML
LOCATION : Pauariki Bridge	DATE OF TEST : 21/11/2023 - 25/11/2023
LOCATION : Hikuwai Road	CHECKED BY : NI
JOB NO. : CA001.110.03.08	DATE : 27/11/2023

TEST DETAILS :

1. Prepare a suitable sized water bath and fill to 100mm water depth
2. Measure the diameter 'd' of the core at the water level point, 100mm above the nominated bottom of the sample.
3. Place the nominated core sample into the water bath and record the time (t₀)
4. Measure the diameter 'd' according to the "d Measurement Schedule". All measurements of 'd' shall be to 0.1mm accuracy
5. Record photographs at each measurement of 'd'

Note: Ensure the core sample is returned to the water bath in the same orientation as to ensure that 'd' stays at the same water depth

SAMPLE NO : BH01 11.34 - 11.54m - MW-SW Mudstone, weak, thinly laminated

Test 1 Initial sample of 8.15 - 8.4 broke while preparing, Solid core used

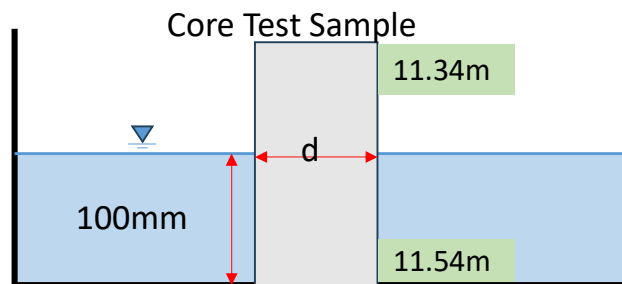
Time (hr)	Diameter (mm)	Diameter (mm)	Diameter (mm) Average	Depth (mm)	Comments:
0	60.40	60.47	60.44	100	
2	60.40	60.47	60.44	100	Bottom crumbling
4	60.41	60.46	60.44	100	Cracks form on dry portion
6	60.41	60.46	60.44	100	
8	60.41	60.46	60.44	100	
24	60.41	60.46	60.44	100	
48	60.41	60.46	60.44	100	
72	60.41	60.46	60.44	100	
96	60.41	60.45	60.43	100	
	0.01	-0.02	-0.01		

Start sample Average Dia (mm) = 60.44

End sample Average Dia (mm) = 60.43

Difference Average Dia @ 0hr and 96hrs (mm) = -0.01

Figure 1: Modified Slaking Test



0 hrs



2 hrs



4 hrs



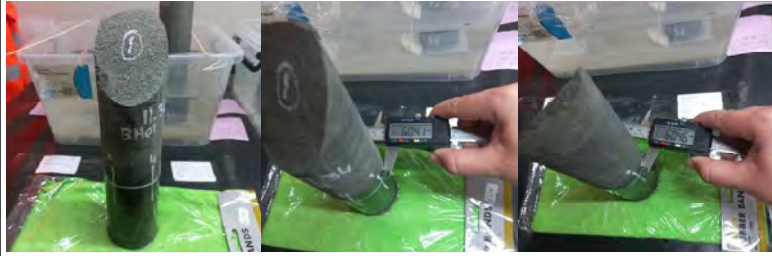
6 hrs



8 hrs



24 hrs



48 hrs



72 hrs



96 hrs





LABORATORY TEST

1. MODIFIED SLAKING TEST

JOB NAME : GDC Black Bridges - Bridge # 02	TESTED BY : ML
LOCATION : Pauariki Bridge	DATE OF TEST : 21/11/2023 - 25/11/2023
LOCATION : Hikuwai Road	CHECKED BY : NI
JOB NO. : CA001.110.03.08	DATE : 27/11/2023

TEST DETAILS :

1. Prepare a suitable sized water bath and fill to 100mm water depth
2. Measure the diameter 'd' of the core at the water level point, 100mm above the nominated bottom of the sample.
3. Place the nominated core sample into the water bath and record the time (t₀)
4. Measure the diameter 'd' according to the "d Measurement Schedule". All measurements of 'd' shall be to 0.1mm accuracy
5. Record photographs at each measurement of 'd'

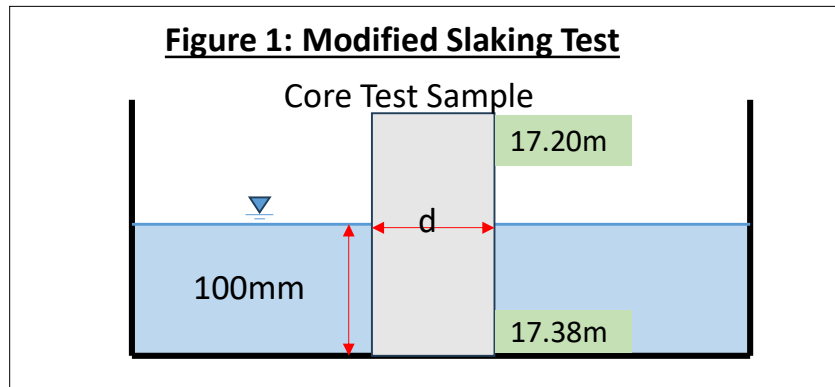
Note: Ensure the core sample is returned to the water bath in the same orientation as to ensure that 'd' stays at the same water depth

SAMPLE NO : BH01 17.2 - 17.38m - MW Mudstone, weak,

Test 2 Solid core

Time (hr)	Diameter (mm)	Diameter (mm)	Diameter (mm) Average	Depth (mm)	Comments:
0	60.61	60.60	60.61	100	
2	60.61	60.60	60.61	100	
4	60.61	60.60	60.61	100	Cracks form on dry portion
6	60.61	60.60	60.61	100	
8	60.61	60.60	60.61	100	
24	60.61	60.60	60.61	100	
48	60.61	60.59	60.60	100	
72	60.61	60.59	60.60	100	
96	60.61	60.59	60.60	100	
	0.00	-0.01	-0.01		

Start sample Average Dia (mm) = 60.61
 End sample Average Dia (mm) = 60.60
 Difference Average Dia @ 0hr and 96hrs (mm) = -0.01



0 hrs



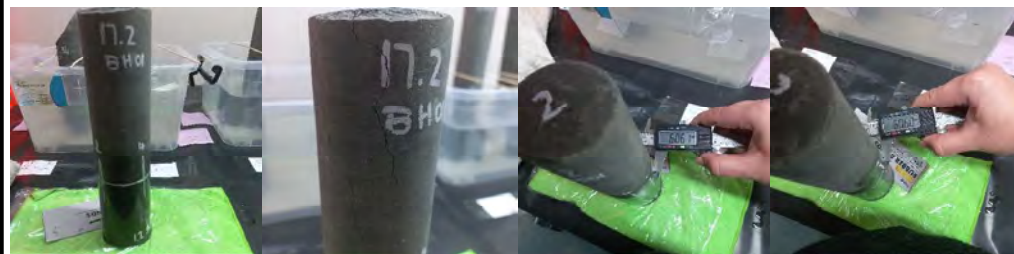
2 hrs



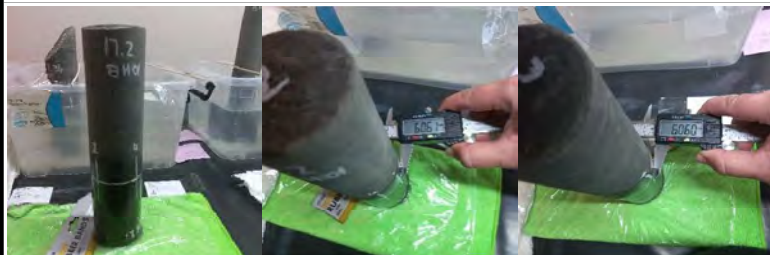
4 hrs



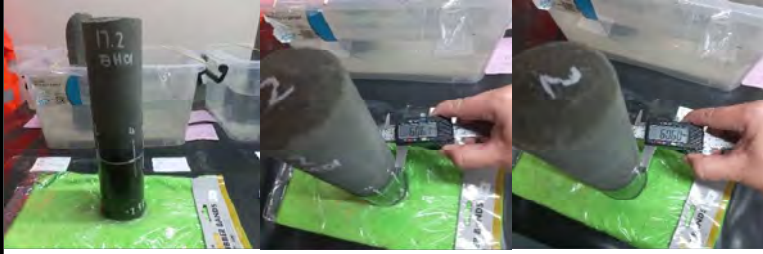
6 hrs



8 hrs



24 hrs



48 hrs



72 hrs



96 hrs





LABORATORY TEST

1. MODIFIED SLAKING TEST

JOB NAME : GDC Black Bridges - Bridge # 02	TESTED BY : ML
LOCATION : Pauariki Bridge	DATE OF TEST : 21/11/2023 - 25/11/2023
LOCATION : Hikuwai Road	CHECKED BY : NI
JOB NO. : CA001.110.03.08	DATE : 27/11/2023

TEST DETAILS :

1. Prepare a suitable sized water bath and fill to 100mm water depth
2. Measure the diameter 'd' of the core at the water level point, 100mm above the nominated bottom of the sample.
3. Place the nominated core sample into the water bath and record the time (t₀)
4. Measure the diameter 'd' according to the "d Measurement Schedule". All measurements of 'd' shall be to 0.1mm accuracy
5. Record photographs at each measurement of 'd'

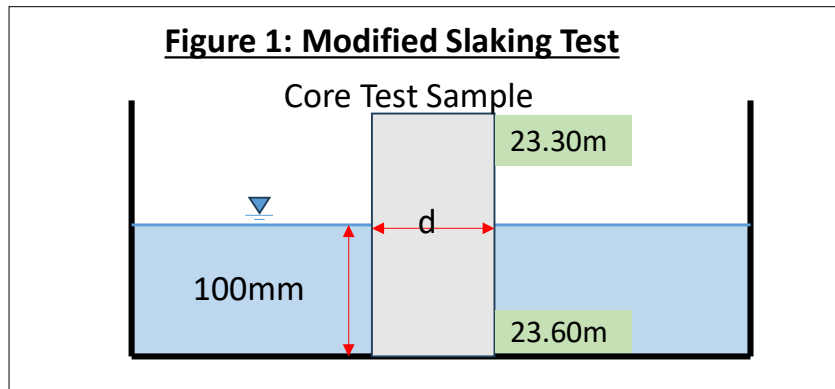
Note: Ensure the core sample is returned to the water bath in the same orientation as to ensure that 'd' stays at the same water depth

SAMPLE NO : BH01 23.30 - 23.60m - SW Mudstone, weak, 30° close

Test 3 Solid core

Time (hr)	Diameter (mm)	Diameter (mm)	Diameter (mm) Average	Depth (mm)	Comments:
0	60.35	60.41	60.38	100	
2	60.35	60.41	60.38	100	
4	60.35	60.41	60.38	100	
6	60.35	60.41	60.38	100	
8	60.35	60.41	60.38	100	
24	60.35	60.41	60.38	100	
48	60.35	60.41	60.38	100	
72	60.35	60.41	60.38	100	
96	60.35	60.41	60.38	100	
	0.00	0	0.00		

Start sample Average Dia (mm) = 60.38
 End sample Average Dia (mm) = 60.38
 Difference Average Dia @ 0hr and 96hrs (mm) = 0.00



0 hrs



2 hrs



4 hrs



6 hrs



8 hrs



24 hrs



48 hrs



72 hrs



96 hrs





LABORATORY TEST

1. MODIFIED SLAKING TEST

JOB NAME : GDC Black Bridges - Bridge # 02	TESTED BY : ML
LOCATION : Pauariki Bridge	DATE OF TEST : 21/11/2023 - 25/11/2023
LOCATION : Hikuwai Road	CHECKED BY : NI
JOB NO. : CA001.110.03.08	DATE : 27/11/2023

TEST DETAILS :

1. Prepare a suitable sized water bath and fill to 100mm water depth
2. Measure the diameter 'd' of the core at the water level point, 100mm above the nominated bottom of the sample.
3. Place the nominated core sample into the water bath and record the time (t₀)
4. Measure the diameter 'd' according to the "d Measurement Schedule". All measurements of 'd' shall be to 0.1mm accuracy
5. Record photographs at each measurement of 'd'

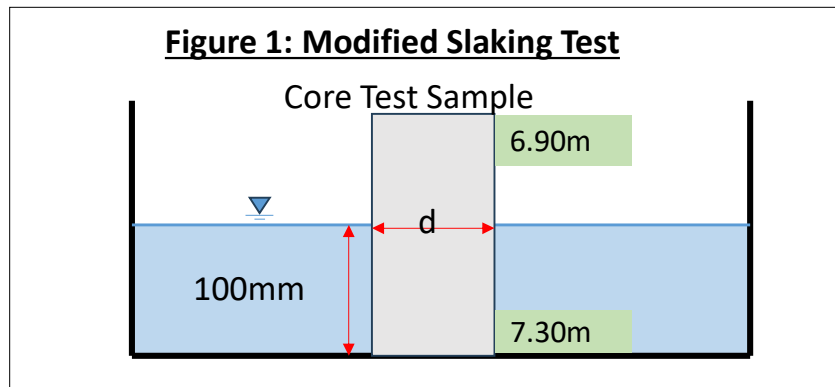
Note: Ensure the core sample is returned to the water bath in the same orientation as to ensure that 'd' stays at the same water depth

SAMPLE NO : BH02 6.90 - 7.30m - HW -MW Mudstone, weak, narrow

Test 4 Solid core

Time (hr)	Diameter (mm)	Diameter (mm)	Diameter (mm) Average	Depth (mm)	Comments:
0	60.51	60.51	60.51	100	
2	60.51	60.51	60.51	100	
4	60.51	60.51	60.51	100	
6	60.51	60.51	60.51	100	
8	60.51	60.51	60.51	100	Cracks form on dry portion
24	60.51	60.51	60.51	100	
48	60.51	60.51	60.51	100	
72	60.51	60.51	60.51	100	
96	60.51	60.51	60.51	100	
	0.00	0.00	0.00		

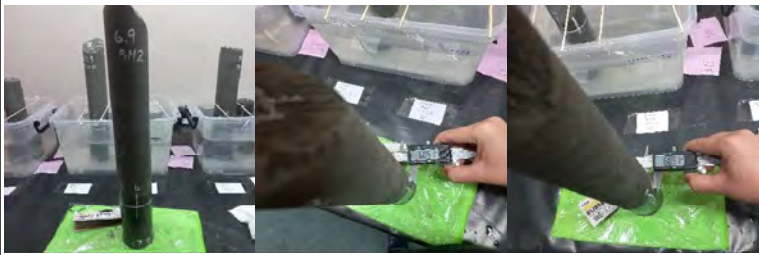
Start sample Average Dia (mm) = 60.51
 End sample Average Dia (mm) = 60.51
 Difference Average Dia @ 0hr and 96hrs (mm) = 0.00



0 hrs



2 hrs



4 hrs



6 hrs



8 hrs



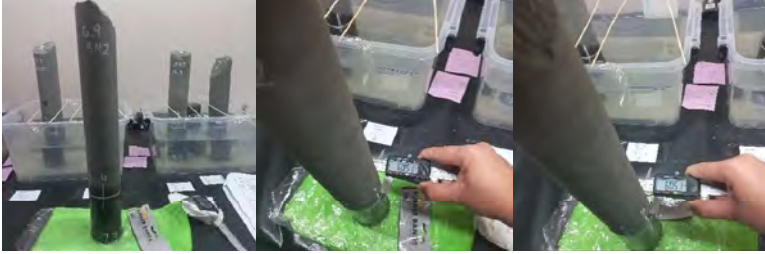
24 hrs



48 hrs



72 hrs



96 hrs





LABORATORY TEST

1. MODIFIED SLAKING TEST

JOB NAME : GDC Black Bridges - Bridge # 02	TESTED BY : ML
LOCATION : Pauariki Bridge	DATE OF TEST : 21/11/2023 - 25/11/2023
LOCATION : Hikuwai Road	CHECKED BY : NI
JOB NO. : CA001.110.03.08	DATE : 27/11/2023

TEST DETAILS :

1. Prepare a suitable sized water bath and fill to 100mm water depth
2. Measure the diameter 'd' of the core at the water level point, 100mm above the nominated bottom of the sample.
3. Place the nominated core sample into the water bath and record the time (t₀)
4. Measure the diameter 'd' according to the "d Measurement Schedule". All measurements of 'd' shall be to 0.1mm accuracy
5. Record photographs at each measurement of 'd'

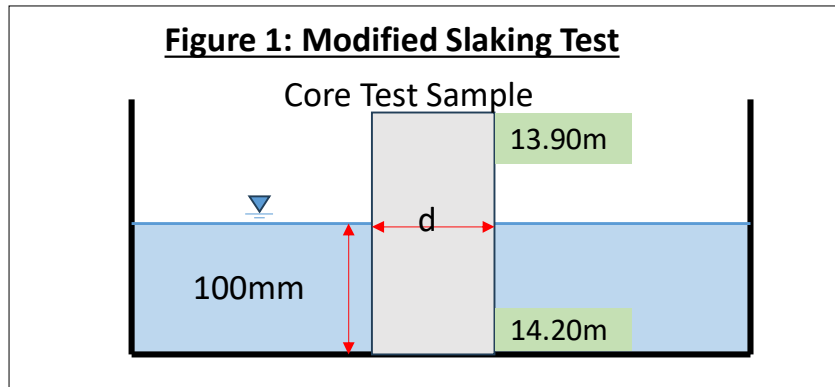
Note: Ensure the core sample is returned to the water bath in the same orientation as to ensure that 'd' stays at the same water depth

SAMPLE NO : BH02 13.9_14.2m - SW Mudstone, weak, closely spaced

Test 5 Solid core

Time (hr)	Diameter (mm)	Diameter (mm)	Diameter (mm) Average	Depth (mm)	Comments:
0	60.51	60.50	60.51	100	
2	60.51	60.50	60.51	100	
4	60.51	60.50	60.51	100	
6	60.51	60.49	60.50	100	
8	60.51	60.49	60.50	100	
24	60.51	60.49	60.50	100	
48	60.51	60.49	60.50	100	
72	60.51	60.49	60.50	100	
96	60.51	60.49	60.50	100	
	0.00	-0.01	0.00		

Start sample Average Dia (mm) = 60.51
 End sample Average Dia (mm) = 60.50
 Difference Average Dia @ 0hr and 96hrs (mm) = 0.00



0 hrs



2 hrs



4 hrs



6 hrs



8 hrs



24 hrs



48 hrs



72 hrs



96 hrs





LABORATORY TEST

1. MODIFIED SLAKING TEST

JOB NAME : GDC Black Bridges - Bridge # 02	TESTED BY : ML
LOCATION : Pauariki Bridge	DATE OF TEST : 21/11/2023 - 25/11/2023
LOCATION : Hikuwai Road	CHECKED BY : NI
JOB NO. : CA001.110.03.08	DATE : 27/11/2023

TEST DETAILS :

1. Prepare a suitable sized water bath and fill to 100mm water depth
2. Measure the diameter 'd' of the core at the water level point, 100mm above the nominated bottom of the sample.
3. Place the nominated core sample into the water bath and record the time (t₀)
4. Measure the diameter 'd' according to the "d Measurement Schedule". All measurements of 'd' shall be to 0.1mm accuracy
5. Record photographs at each measurement of 'd'

Note: Ensure the core sample is returned to the water bath in the same orientation as to ensure that 'd' stays at the same water depth

SAMPLE NO : BH02 18.55_18.70m - MW Mudstone, weak, thinly bedded

Test 6 Broken could not use 18.55 - 19.95

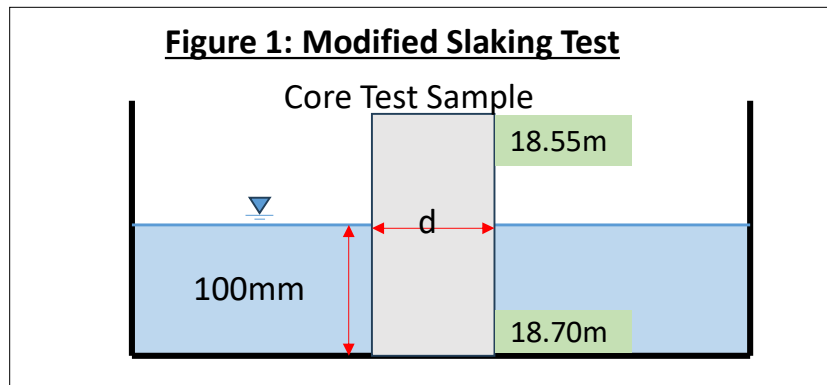
Time (hr)	Diameter (mm)	Diameter (mm)	Diameter (mm) Average	Depth (mm)	Comments:
0	60.59	60.60	60.60	100	
2	60.59	60.60	60.60	100	
4	60.58	60.60	60.59	100	
6	60.58	60.60	60.59	100	
8	60.58	60.60	60.59	100	
24	60.58	60.60	60.59	100	
48	60.58	60.60	60.59	100	
72	60.58	60.60	60.59	100	
96	60.58	60.60	60.59	100	
	-0.01	0.00	0.00		

Start sample Average Dia (mm) = 60.60

End sample Average Dia (mm) = 60.59

Difference Average Dia @ 0hr and 96hrs (mm) = 0.00

Figure 1: Modified Slaking Test



0 hrs



2 hrs



4 hrs



6 hrs



8 hrs



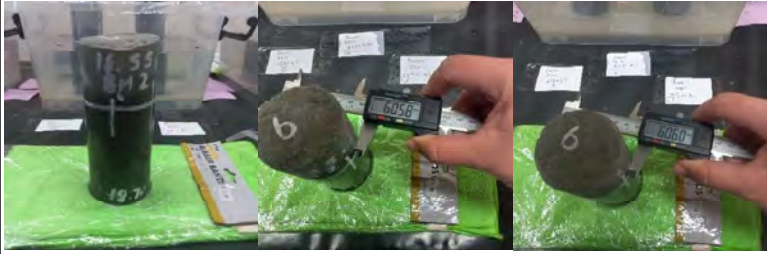
24 hrs



48 hrs



72 hrs



96 hrs





LABORATORY TEST

1. MODIFIED SLAKING TEST

JOB NAME : GDC Black Bridges - Bridge # 02	TESTED BY : ML
LOCATION : Pauariki Bridge	DATE OF TEST : 21/11/2023 - 25/11/2023
LOCATION : Hikuwai Road	CHECKED BY : NI
JOB NO. : CA001.110.03.08	DATE : 27/11/2023

TEST DETAILS :

1. Prepare a suitable sized water bath and fill to 100mm water depth
2. Measure the diameter 'd' of the core at the water level point, 100mm above the nominated bottom of the sample.
3. Place the nominated core sample into the water bath and record the time (t₀)
4. Measure the diameter 'd' according to the "d Measurement Schedule". All measurements of 'd' shall be to 0.1mm accuracy
5. Record photographs at each measurement of 'd'

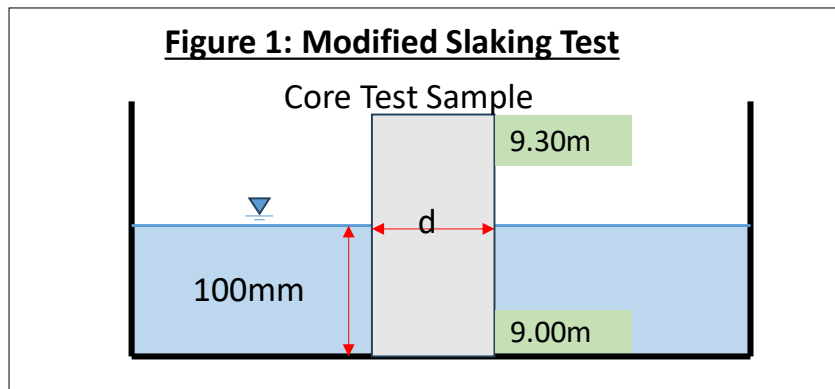
Note: Ensure the core sample is returned to the water bath in the same orientation as to ensure that 'd' stays at the same water depth

SAMPLE NO : BH03 9.00 - 9.30m - UW Siltstone, weak, laminated

Test 7

Time (hr)	Diameter (mm)	Diameter (mm)	Diameter (mm) Average	Depth (mm)	Comments:
0	58.87	58.86	58.87	100	
2	58.87	58.87	58.87	100	
4	58.87	58.87	58.87	100	
6	58.87	58.87	58.87	100	
8	58.87	58.87	58.87	100	
24	58.87	58.87	58.87	100	
48	58.87	58.87	58.87	100	
72	58.87	58.87	58.87	100	Core tipped over during night and broke off above 100mm
96	58.87	58.87	58.87	100	
	0.00	0.01	0.01		

Start sample Average Dia (mm) = 58.87
 End sample Average Dia (mm) = 58.87
 Difference Average Dia @ 0hr and 96hrs (mm) = 0.01



0 hrs



2 hrs



4 hrs



6 hrs



8 hrs



24 hrs



48 hrs



72 hrs



96 hrs





LABORATORY TEST

1. MODIFIED SLAKING TEST

JOB NAME : GDC Black Bridges - Bridge # 02	TESTED BY : ML
LOCATION : Pauariki Bridge	DATE OF TEST : 21/11/2023 - 25/11/2023
LOCATION : Hikuwai Road	CHECKED BY : NI
JOB NO. : CA001.110.03.08	DATE : 27/11/2023

TEST DETAILS :

1. Prepare a suitable sized water bath and fill to 100mm water depth
2. Measure the diameter 'd' of the core at the water level point, 100mm above the nominated bottom of the sample.
3. Place the nominated core sample into the water bath and record the time (t₀)
4. Measure the diameter 'd' according to the "d Measurement Schedule". All measurements of 'd' shall be to 0.1mm accuracy
5. Record photographs at each measurement of 'd'

Note: Ensure the core sample is returned to the water bath in the same orientation as to ensure that 'd' stays at the same water depth

SAMPLE NO : BH03 16.86 - 17.03m - UW Siltstone, weak, thinly laminated

Test 8 Sample 16.3-16.5 broken, Solid core used

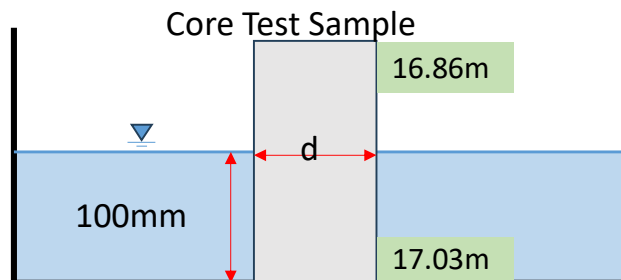
Time (hr)	Diameter (mm)	Diameter (mm)	Diameter (mm) Average	Depth (mm)	Comments:
0	60.71	60.71	60.71	100	
2	60.71	60.71	60.71	100	
4	60.71	60.71	60.71	100	
6	60.71	60.71	60.71	100	
8	60.71	60.71	60.71	100	
24	60.71	60.71	60.71	100	
48	60.71	60.71	60.71	100	
72	60.71	60.71	60.71	100	
96	60.71	60.71	60.71	100	
	0.00	0.00	0.00		

Start sample Average Dia (mm) = 60.71

End sample Average Dia (mm) = 60.71

Difference Average Dia @ 0hr and 96hrs (mm) = 0.00

Figure 1: Modified Slaking Test



0 hrs



2 hrs



4 hrs



6 hrs



8 hrs



24 hrs



48 hrs



72 hrs



96 hrs





LABORATORY TEST

1. MODIFIED SLAKING TEST

JOB NAME : GDC Black Bridges - Bridge # 02	TESTED BY : ML
LOCATION : Pauariki Bridge	DATE OF TEST : 21/11/2023 - 25/11/2023
LOCATION : Hikuwai Road	CHECKED BY : NI
JOB NO. : CA001.110.03.08	DATE : 27/11/2023

TEST DETAILS :

1. Prepare a suitable sized water bath and fill to 100mm water depth
2. Measure the diameter 'd' of the core at the water level point, 100mm above the nominated bottom of the sample.
3. Place the nominated core sample into the water bath and record the time (t₀)
4. Measure the diameter 'd' according to the "d Measurement Schedule". All measurements of 'd' shall be to 0.1mm accuracy
5. Record photographs at each measurement of 'd'

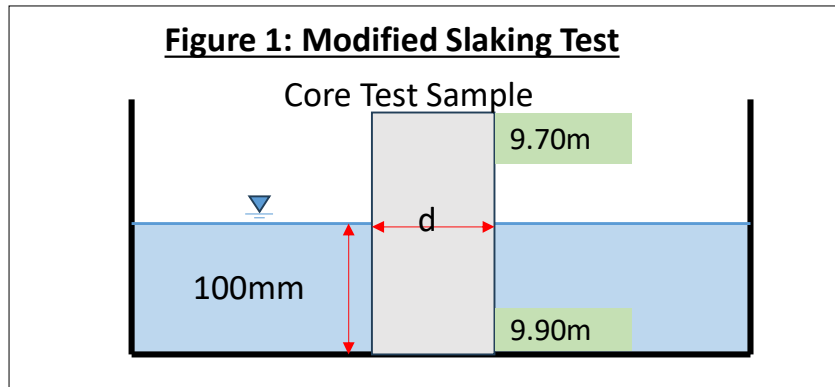
Note: Ensure the core sample is returned to the water bath in the same orientation as to ensure that 'd' stays at the same water depth

SAMPLE NO : BH04 9.70 - 9.90m - SW Siltstone, weak, laminated

Test 9 Horizontal cuts on core. Some fractures

Time (hr)	Diameter (mm)	Diameter (mm)	Diameter (mm) Average	Depth (mm)	Comments:
0	60.38	60.34	60.36	100	
2	60.34	60.33	60.34	100	
4	60.33	60.33	60.33	100	Cracks form on dry portion
6	60.33	60.33	60.33	100	
8	60.33	60.33	60.33	100	
24	60.33	60.33	60.33	100	
48	60.33	60.33	60.33	100	
72	60.33	60.33	60.33	100	
96	60.33	60.33	60.33	100	
	-0.05	-0.01	-0.03		

Start sample Average Dia (mm) = 60.36
 End sample Average Dia (mm) = 60.33
 Difference Average Dia @ 0hr and 96hrs (mm) = -0.03



0 hrs



2 hrs



4 hrs



6 hrs



8 hrs



24 hrs



48 hrs



72 hrs



96 hrs





LABORATORY TEST

1. MODIFIED SLAKING TEST

JOB NAME :	GDC Black Bridges - Bridge # 02	TESTED BY :	ML
LOCATION :	Pauariki Bridge	DATE OF TEST :	21/11/2023 - 21/11/2023
LOCATION :	Hikuwai Road	CHECKED BY :	NI
JOB NO. :	CA001.110.03.08	DATE :	27/11/2023

TEST DETAILS :

1. Prepare a suitable sized water bath and fill to 100mm water depth
2. Measure the diameter 'd' of the core at the water level point, 100mm above the nominated bottom of the sample.
3. Place the nominated core sample into the water bath and record the time (t₀)
4. Measure the diameter 'd' according to the "d Measurement Schedule". All measurements of 'd' shall be to 0.1mm accuracy
5. Record photographs at each measurement of 'd'

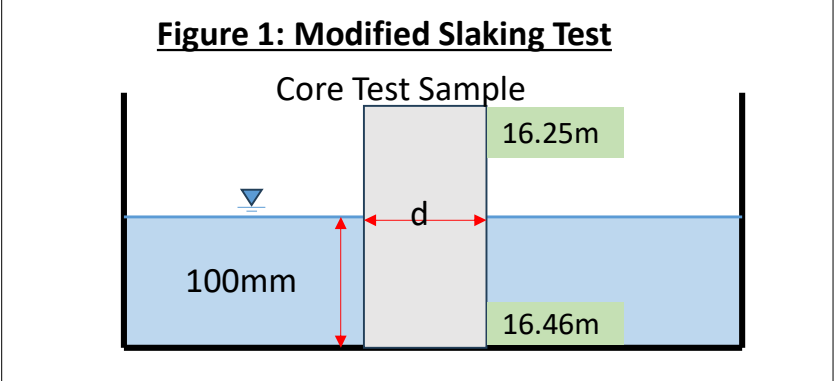
Note: Ensure the core sample is returned to the water bath in the same orientation as to ensure that 'd' stays at the same water depth

SAMPLE NO : BH04 16.25 - 16.46m - HW-MW Siltstone,V weak, shear zone - brittle

Test 10 Sample 16.0-16.25 broken. Could not clean sample very brittle

Time (hr)	Diameter (mm)	Diameter (mm)	Diameter (mm) Average	Depth (mm)	Comments:
0	60.54	61.00	60.77	100	
2			0.00	100	Collapsed just before 2 hours
4			0.00	100	
6			0.00	100	
8			0.00	100	
24			0.00	100	
48			0.00	100	
72			0.00	100	
96			0.00	100	

Start sample Average Dia (mm) =
 End sample Average Dia (mm) =
 Difference Average Dia @ 0hr and 96hrs (mm) =



0 hrs



2 hrs

