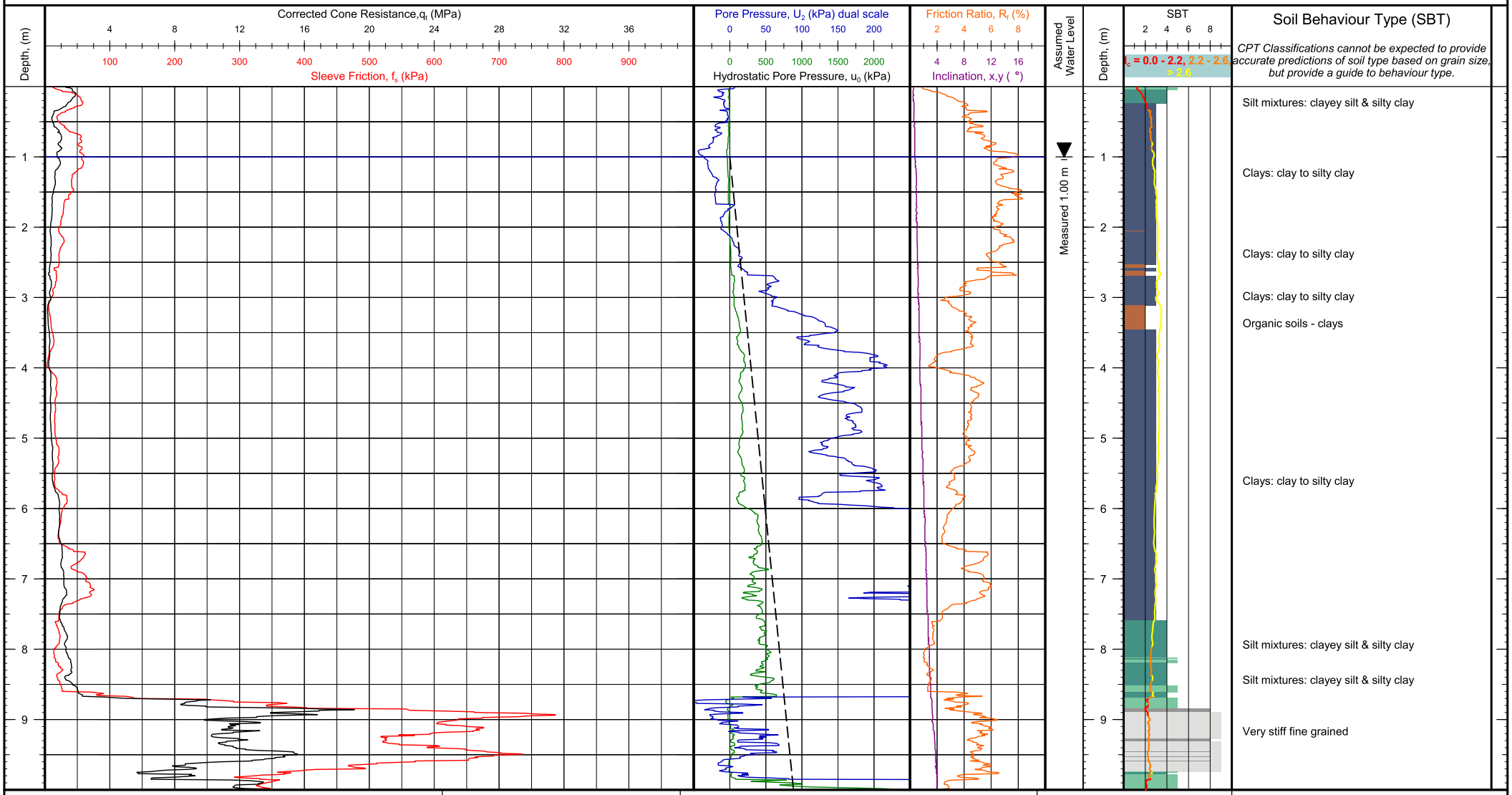
Appendix D: CPT Logs

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926555.13, 1743194.03	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing	**Cone Ref:**	MKJ325	**WGS84 (deg):**	-36.796009,174.605017	**Date of Test:**	3/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	10.57
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High friction resistance		

Project

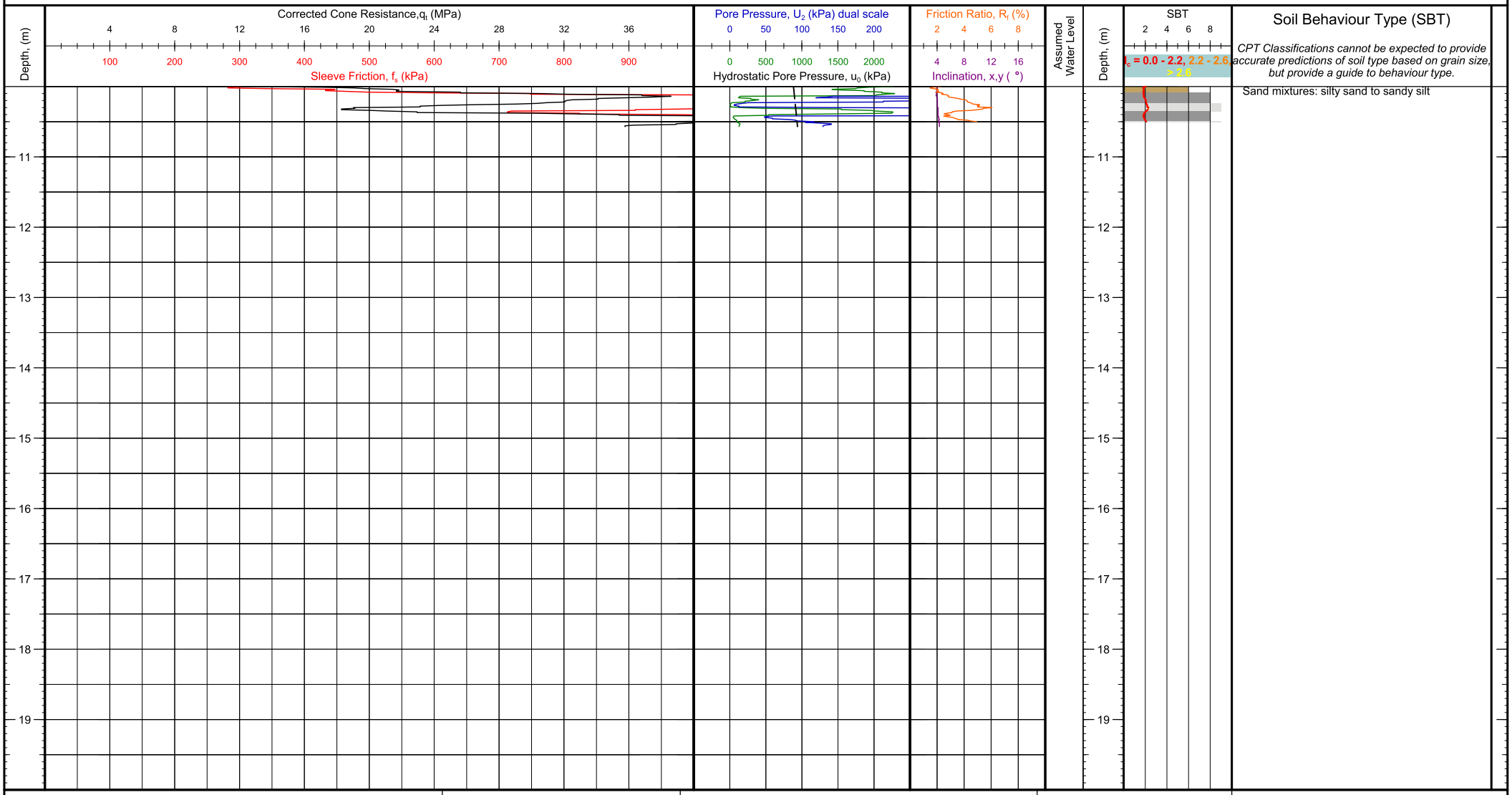
Client Reference:

Test Number: **CPT-02**

G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

Sand mixtures: silty sand to sandy silt

Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926555.13, 1743194.03	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ325	**WGS84 (deg):**	-36.796009,174.605017	**Date of Test:**	3/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	10.57
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High friction resistance		

Client Reference:

Test Number: **CPT-02**

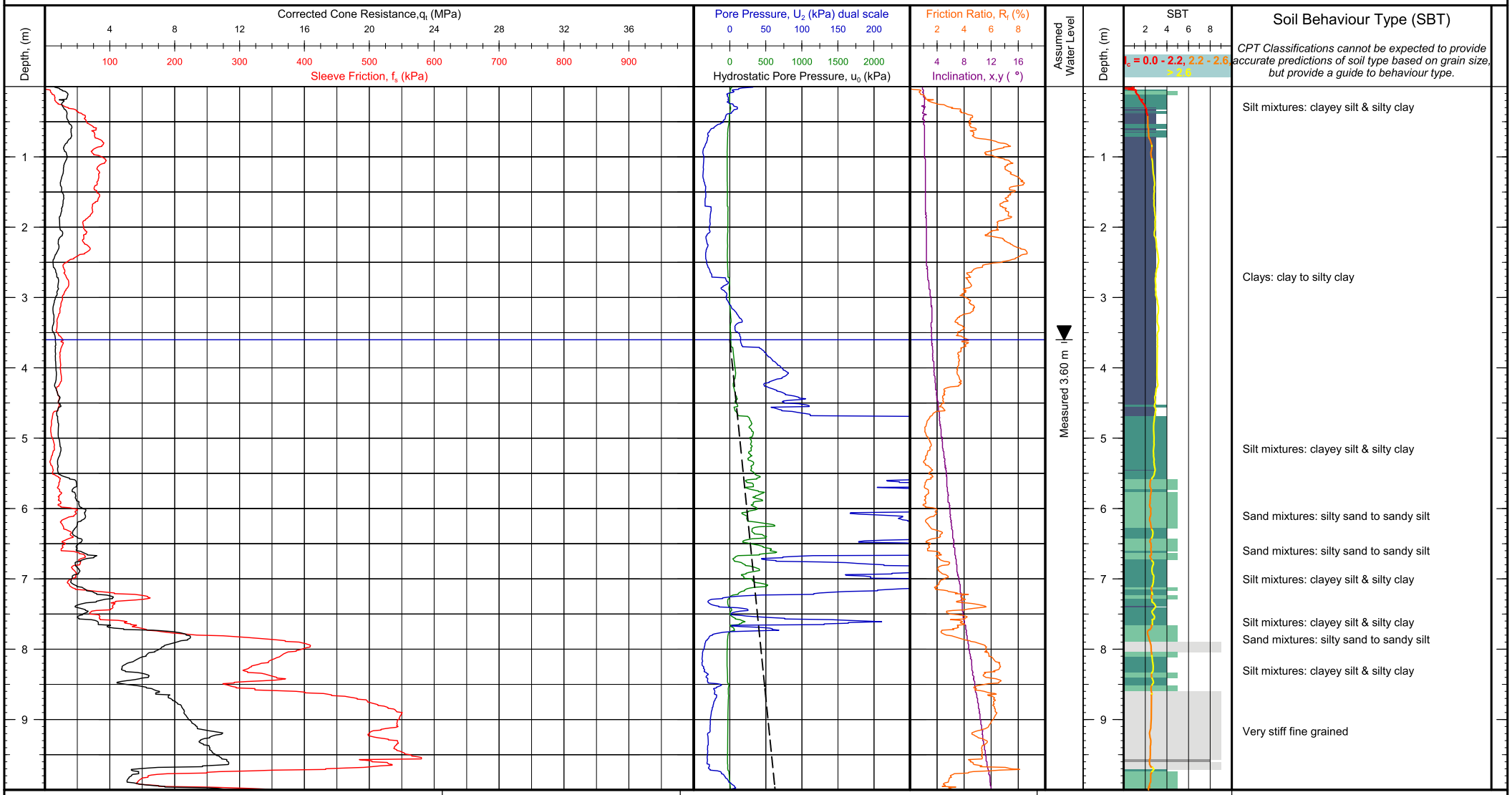
G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Silt mixtures: clayey silt & silty clay
- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Very stiff fine grained

Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926510.40, 1743188.37	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ309	**WGS84 (deg):**	-36.796413,174.604962	**Date of Test:**	3/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	11.23
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	Danger of buckling rods		

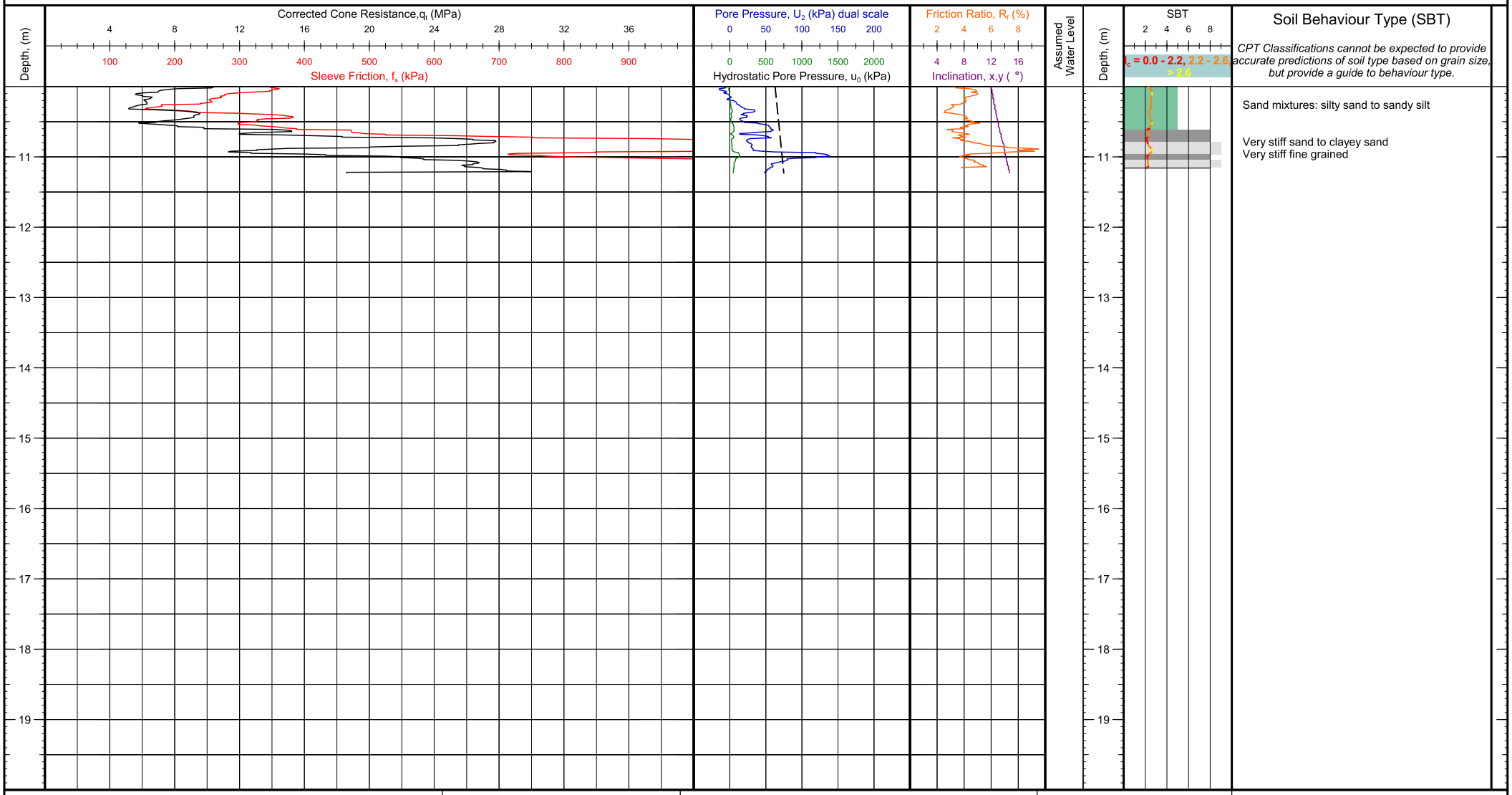
Client Reference:

Test Number: **CPT-03**

G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

Sand mixtures: silty sand to sandy silt

Very stiff sand to clayey sand
Very stiff fine grained

Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926510.40, 1743188.37	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ309	**WGS84 (deg):**	-36.796413,174.604962	**Date of Test:**	3/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	11.23
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	Danger of buckling rods		

Client Reference:

Test Number: **CPT-03**

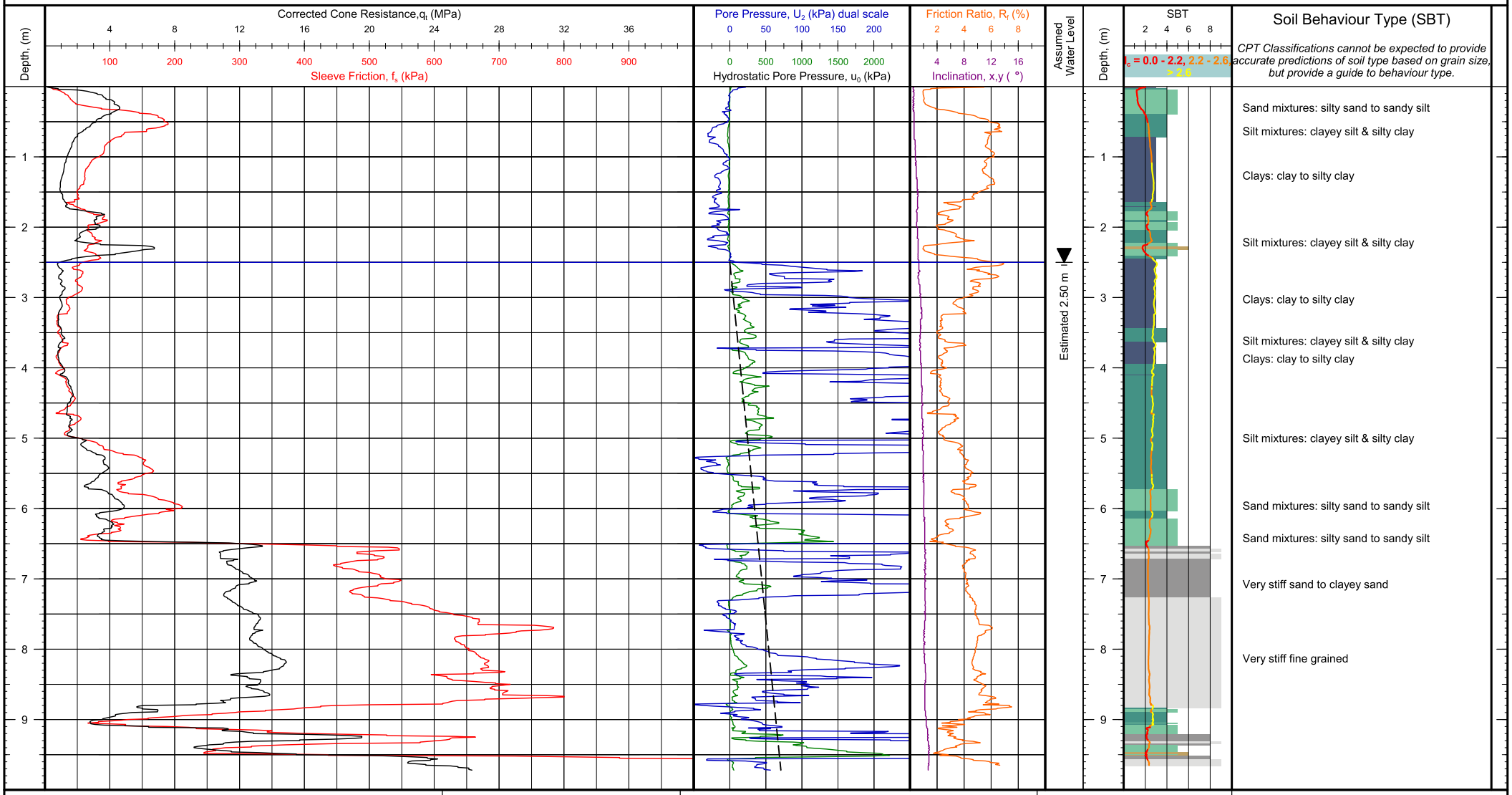
G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay
- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay
- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Very stiff sand to clayey sand
- Very stiff fine grained

Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926415.00, 1743205.87	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ325	**WGS84 (deg):**	-36.797270,174.605176	**Date of Test:**	3/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	9.72
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High friction resistance		

Client Reference:

Test Number: **CPT-04**

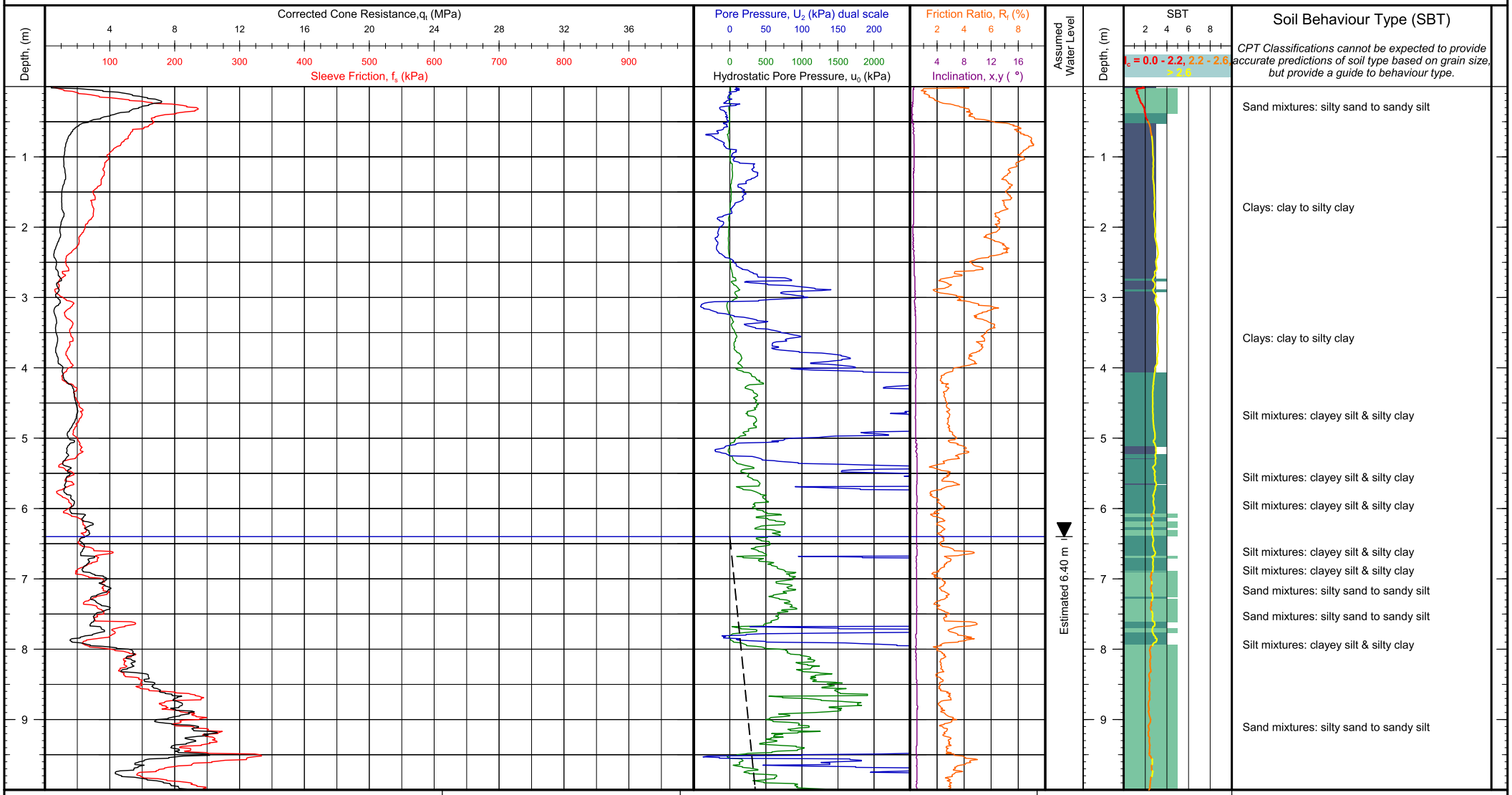
G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926270.32, 1743217.01	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ309	**WGS84 (deg):**	-36.798572,174.605328	**Date of Test:**	3/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	19.27
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High friction resistance		

Client Reference:

Test Number: **CPT-05**

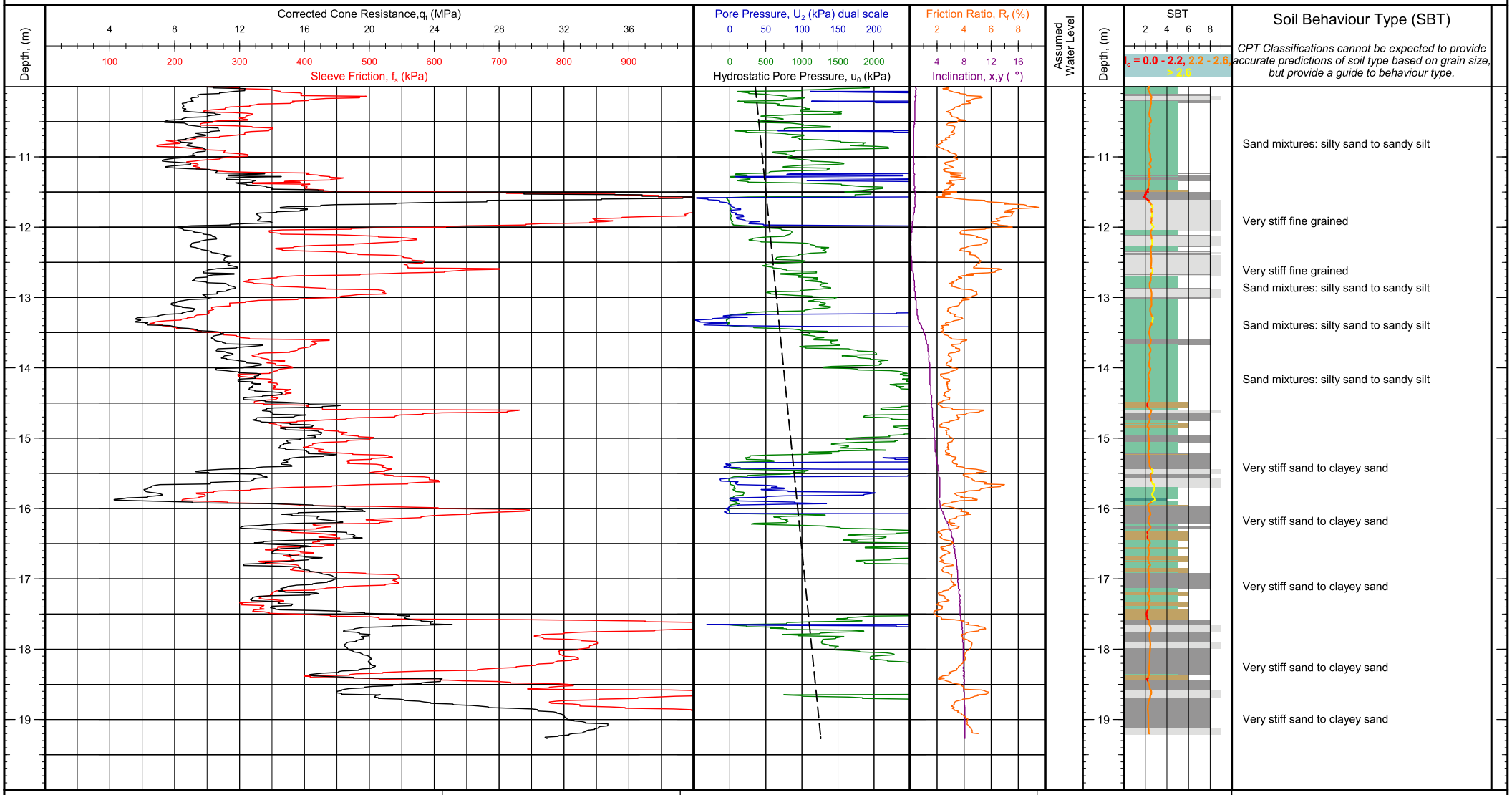
G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Sand mixtures: silty sand to sandy silt
- Very stiff fine grained
- Very stiff fine grained
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Very stiff sand to clayey sand
- Very stiff sand to clayey sand
- Very stiff sand to clayey sand
- Very stiff sand to clayey sand
- Very stiff sand to clayey sand

Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926270.32, 1743217.01	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing	**Cone Ref:**	MKJ309	**WGS84 (deg):**	-36.798572,174.605328	**Date of Test:**	3/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	19.27
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High friction resistance		

Project

Client Reference:

Test Number: **CPT-05**

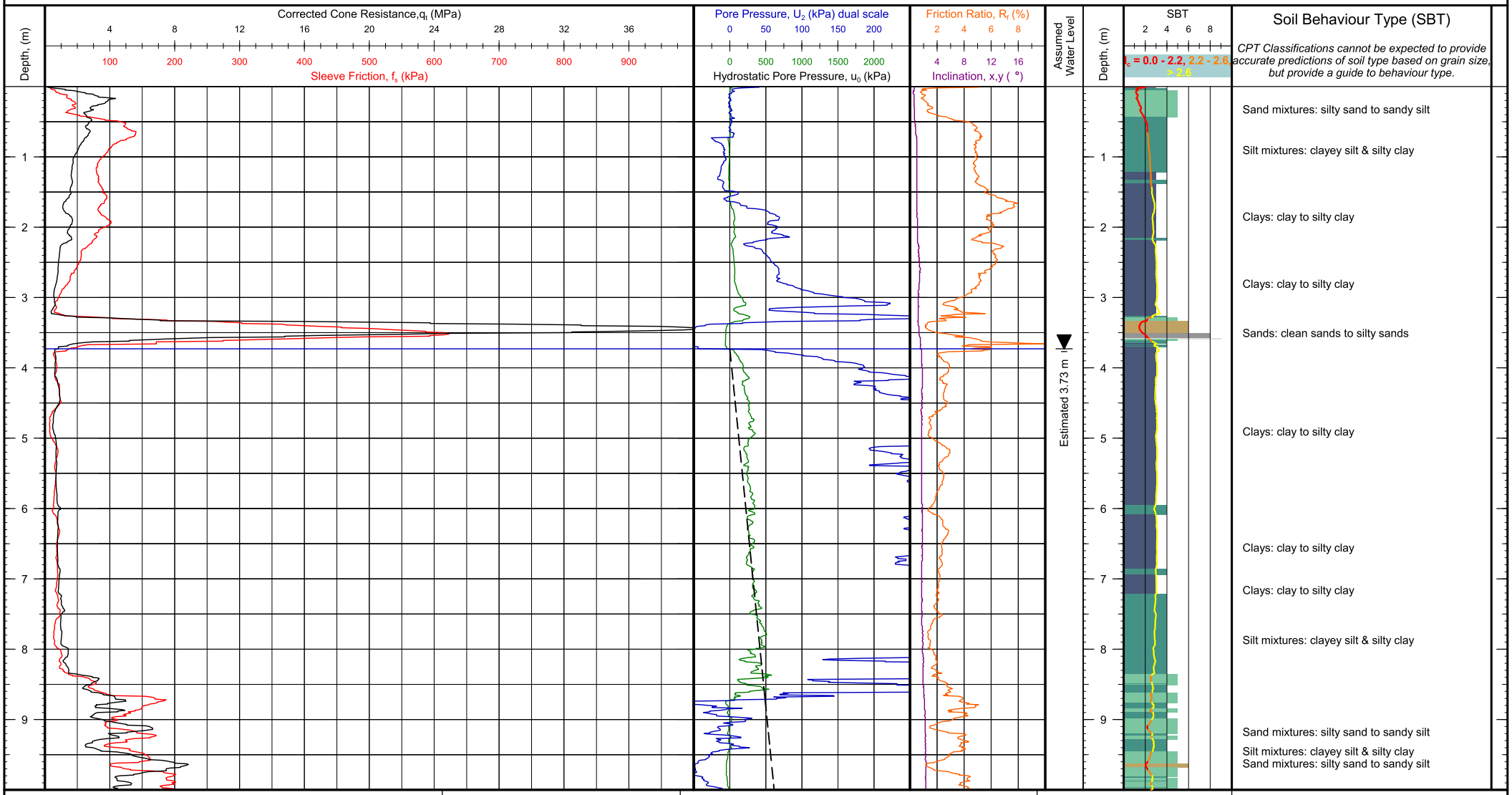
G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Clays: clay to silty clay
- Clays: clay to silty clay
- Sands: clean sands to silty sands
- Clays: clay to silty clay
- Clays: clay to silty clay
- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt

Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926158.21, 1743337.57	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ333	**WGS84 (deg):**	-36.799564,174.606700	**Date of Test:**	4/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	13.46
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	Inclination high or rapid increase		

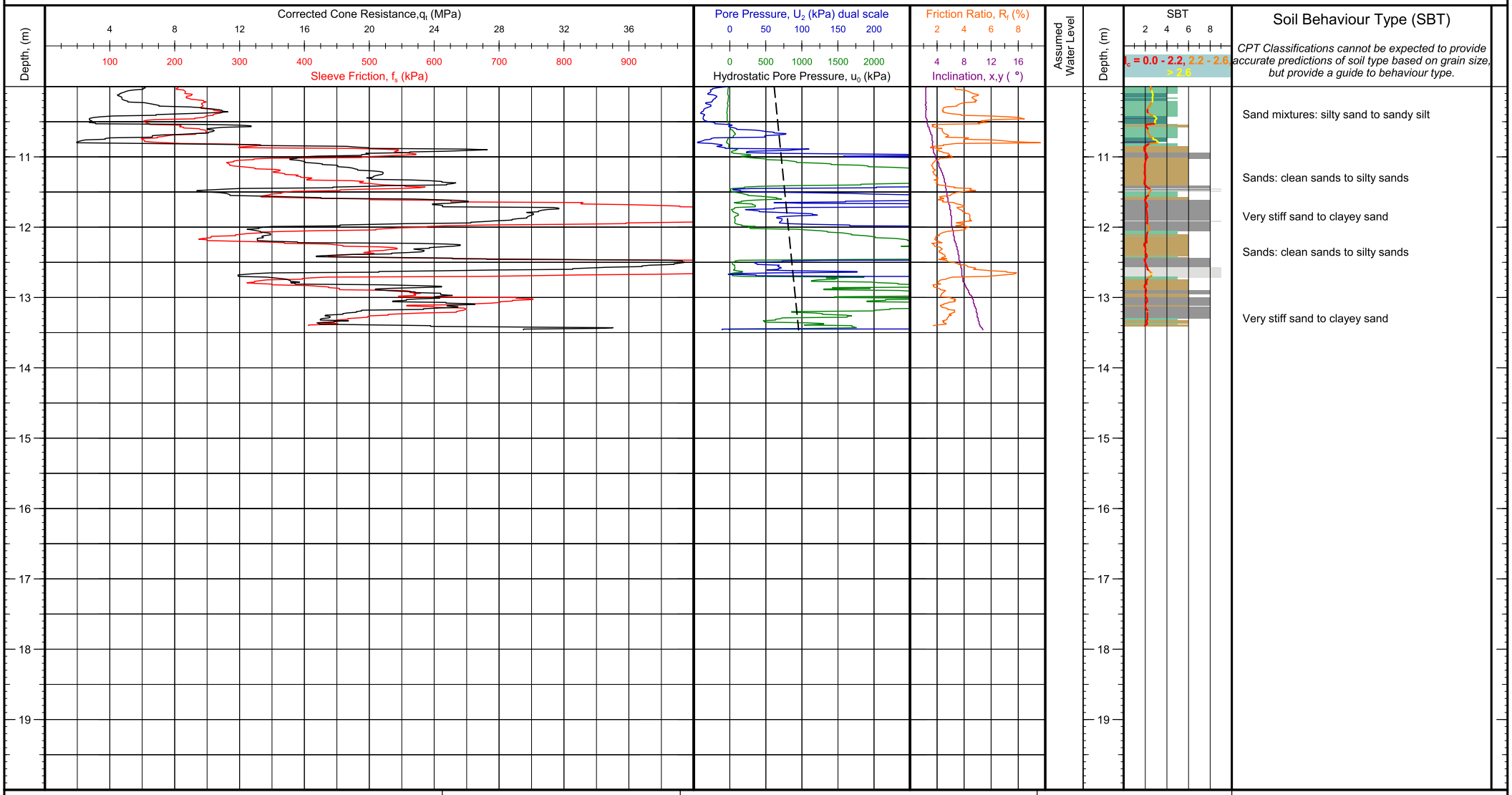
Client Reference:

Test Number: **CPT-06**

G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Sand mixtures: silty sand to sandy silt
- Sands: clean sands to silty sands
- Very stiff sand to clayey sand
- Sands: clean sands to silty sands
- Very stiff sand to clayey sand

Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926158.21, 1743337.57	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ333	**WGS84 (deg):**	-36.799564,174.606700	**Date of Test:**	4/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	13.46
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	Inclination high or rapid increase		

Client Reference:

Test Number: **CPT-06**

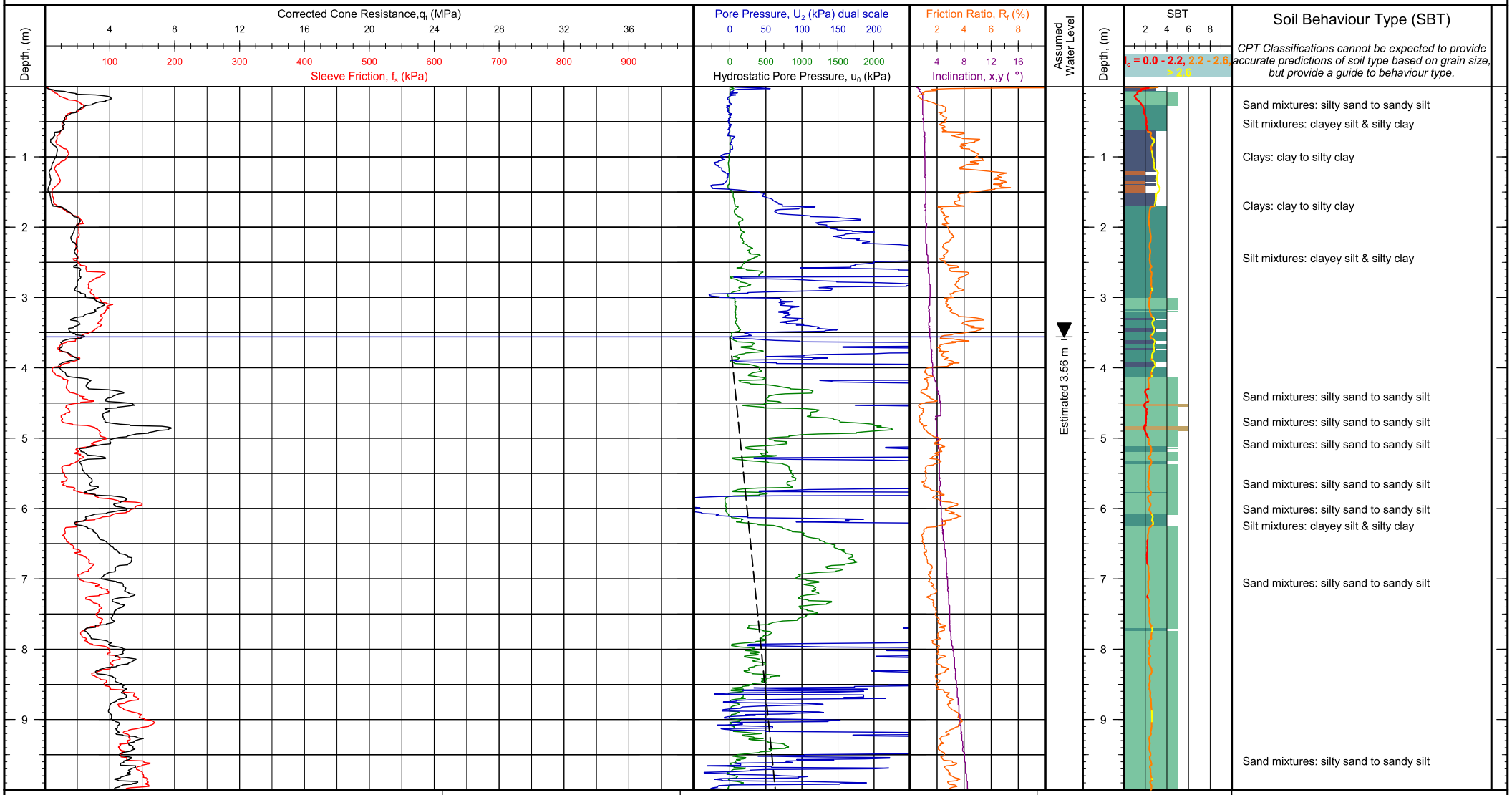
G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Clays: clay to silty clay
- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt

Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926057.82, 1743414.41	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ333	**WGS84 (deg):**	-36.800457,174.607580	**Date of Test:**	4/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	16.06
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	Inclination high or rapid increase		

Client Reference:

Test Number: **CPT-07**

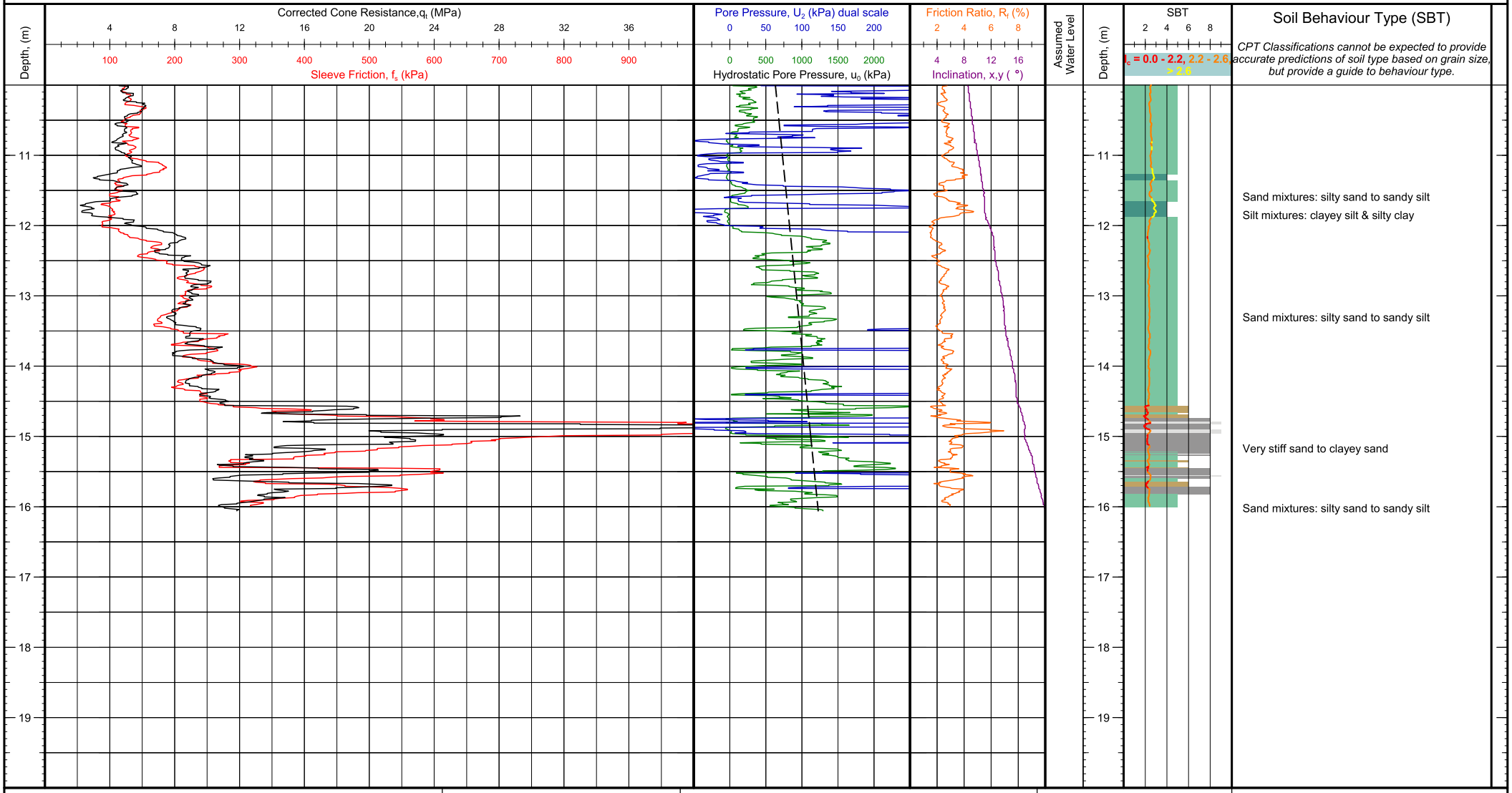
G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Very stiff sand to clayey sand
- Sand mixtures: silty sand to sandy silt

Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926057.82, 1743414.41	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ333	**WGS84 (deg):**	-36.800457,174.607580	**Date of Test:**	4/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	16.06
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	Inclination high or rapid increase		

Client Reference:

Test Number: **CPT-07**

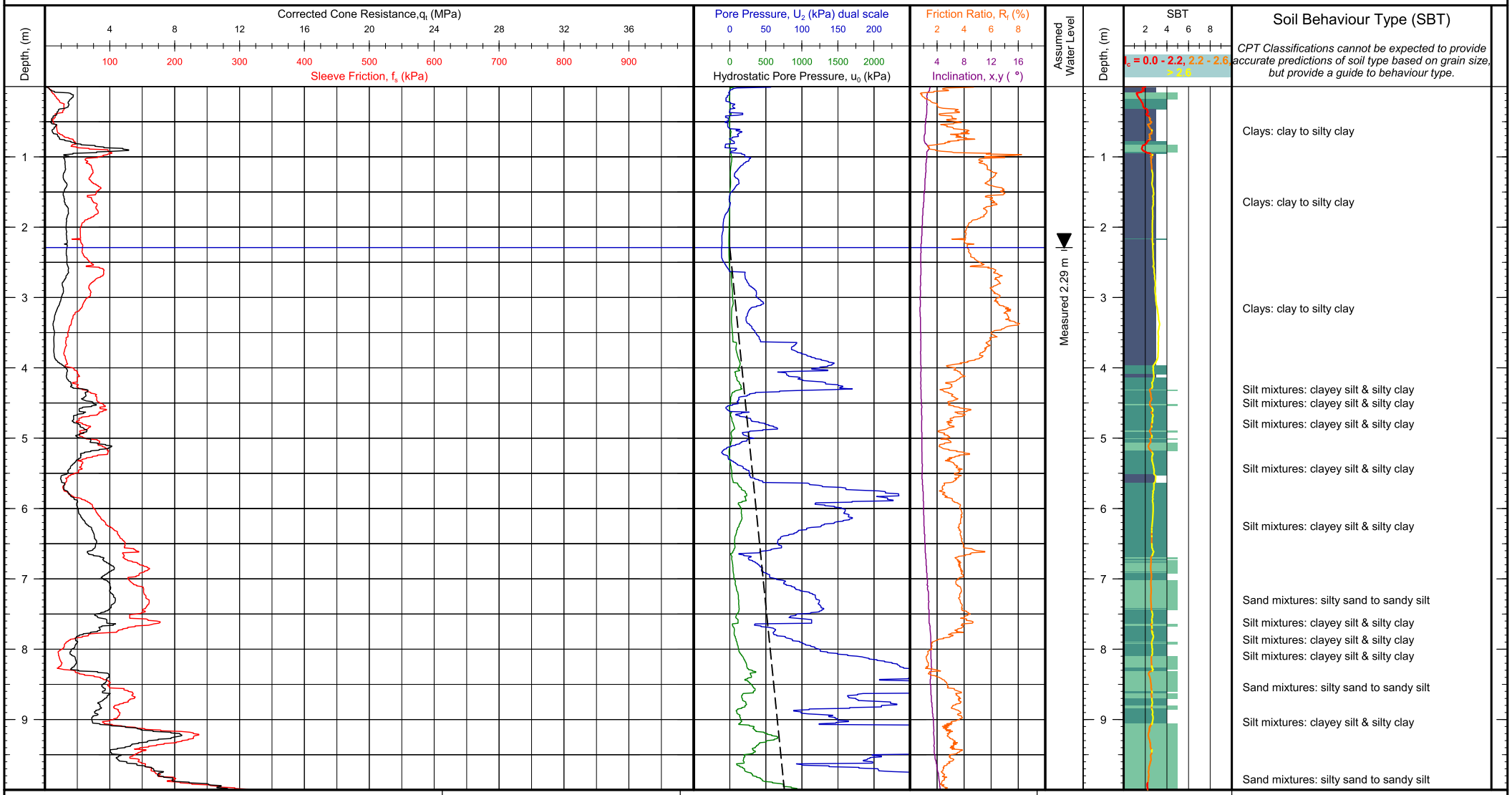
G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Clays: clay to silty clay
- Clays: clay to silty clay
- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt

Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5925758.53, 1744112.15	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ539	**WGS84 (deg):**	-36.803048,174.615455	**Date of Test:**	18/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	13.08
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High pore water pressure		

Client Reference:

Test Number: **CPT-08**

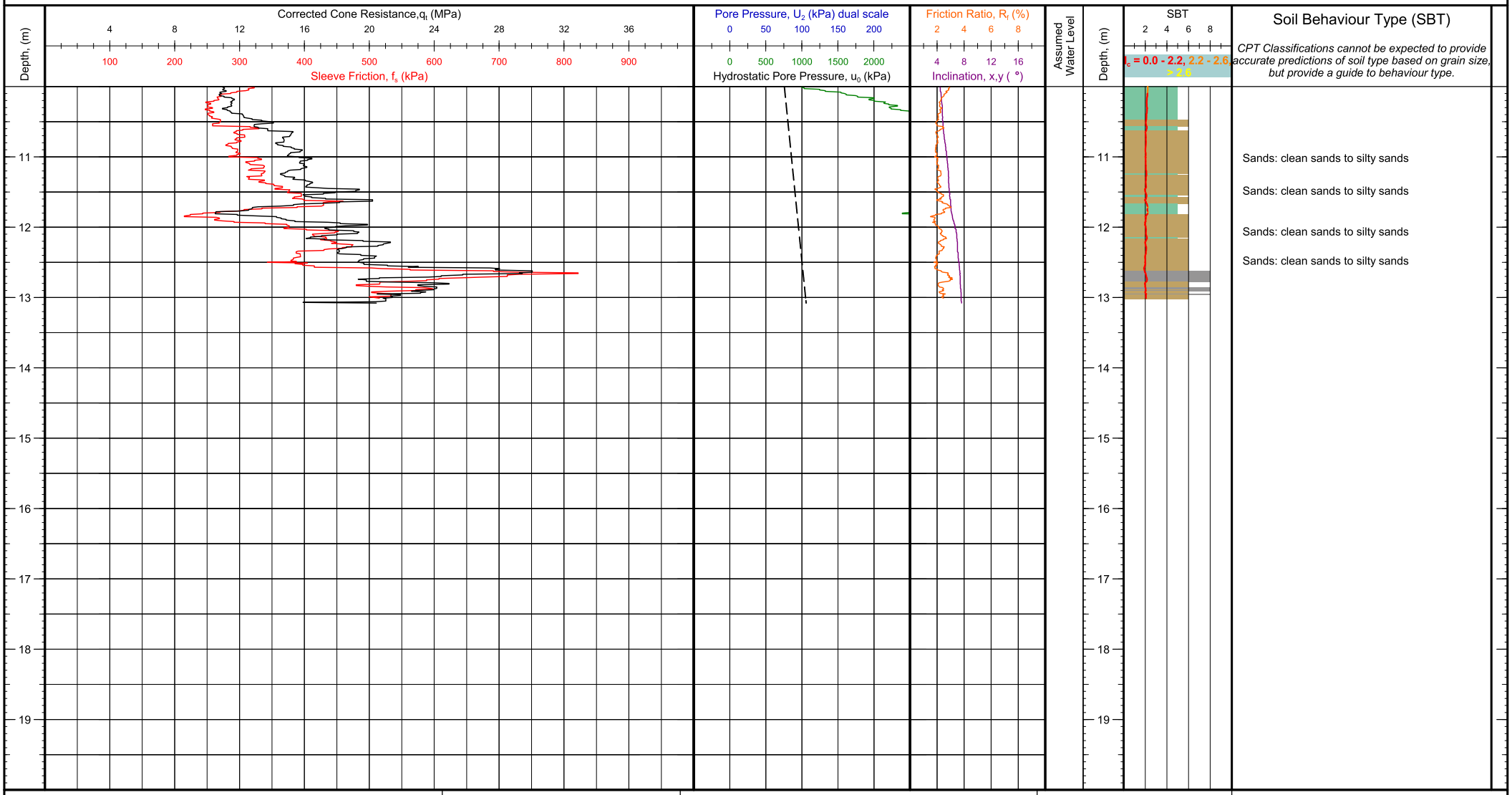
G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

Sands: clean sands to silty sands

Sands: clean sands to silty sands

Sands: clean sands to silty sands

Sands: clean sands to silty sands

Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5925758.53, 1744112.15	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ539	**WGS84 (deg):**	-36.803048,174.615455	**Date of Test:**	18/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	13.08
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High pore water pressure		

Client Reference:

Test Number: **CPT-08**

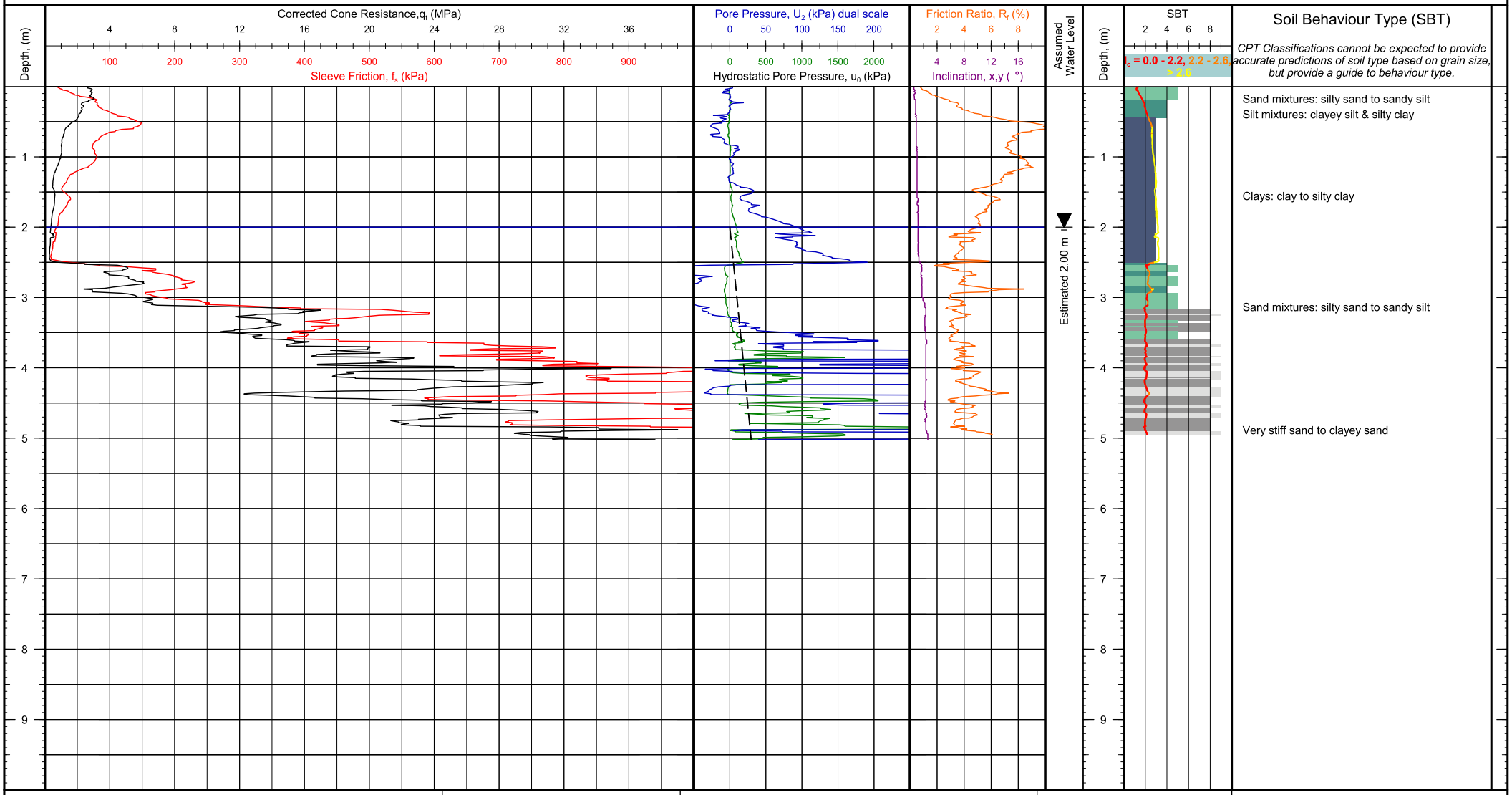
G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

Sand mixtures: silty sand to sandy silt
Silt mixtures: clayey silt & silty clay

Clays: clay to silty clay

Sand mixtures: silty sand to sandy silt

Very stiff sand to clayey sand

Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926630.28, 1743073.91	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ309	**WGS84 (deg):**	-36.795350,174.603657	**Date of Test:**	3/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	5.02
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High friction resistance		

Client Reference:

Test Number: **CPT-111**

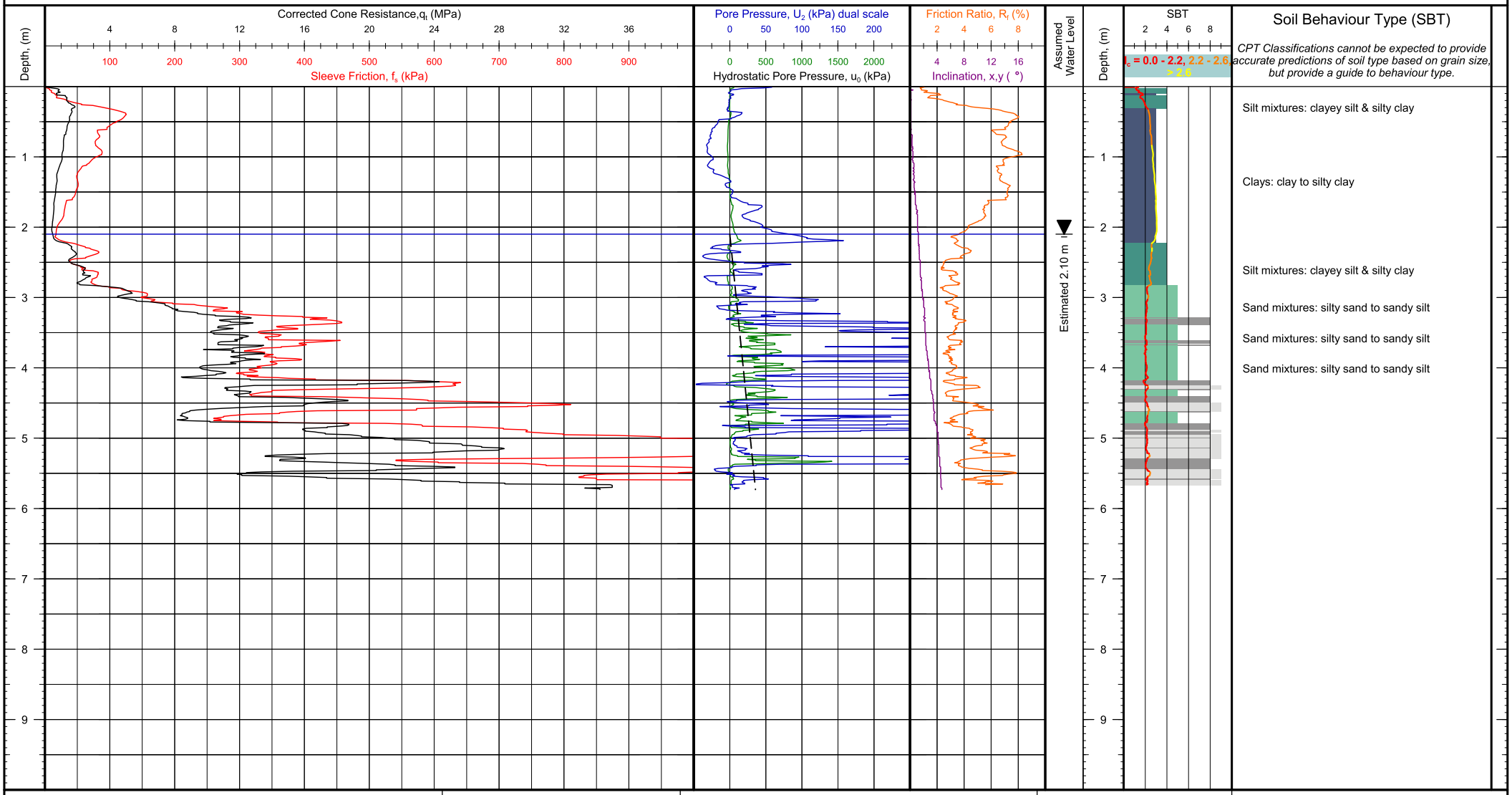
G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Silt mixtures: clayey silt & silty clay
- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt

Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926598.39, 1743076.23	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ325	**WGS84 (deg):**	-36.795637,174.603689	**Date of Test:**	3/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	5.73
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High friction resistance		

Client Reference:

Test Number: **CPT-112**

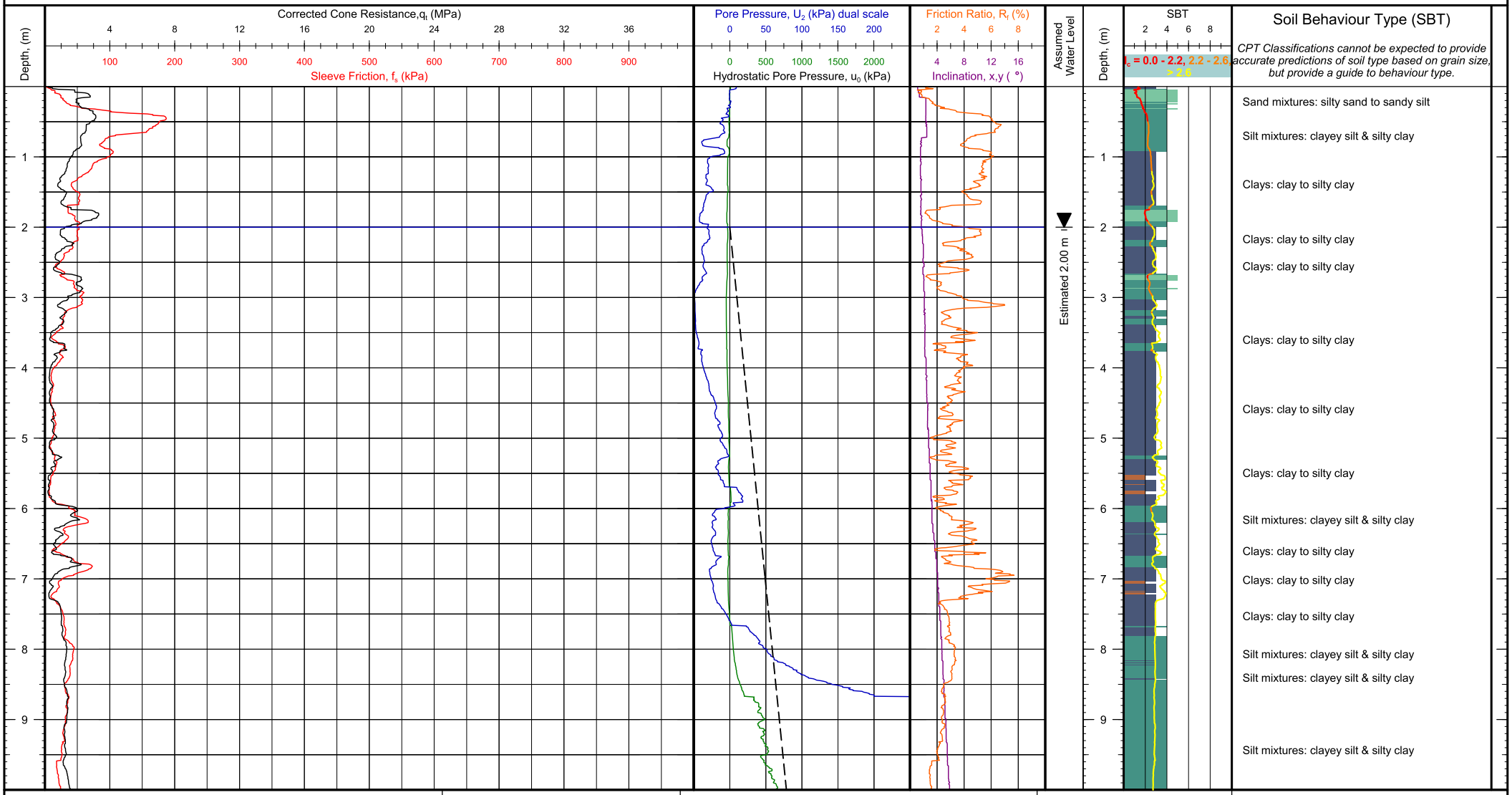
G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Clays: clay to silty clay
- Clays: clay to silty clay
- Clays: clay to silty clay
- Clays: clay to silty clay
- Clays: clay to silty clay
- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay
- Clays: clay to silty clay
- Clays: clay to silty clay
- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay

Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5927036.96, 1743360.27	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ325	**WGS84 (deg):**	-36.791642,174.606789	**Date of Test:**	2/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	18.00
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High cone end resistance		

Client Reference:

Test Number: **CPT-117**

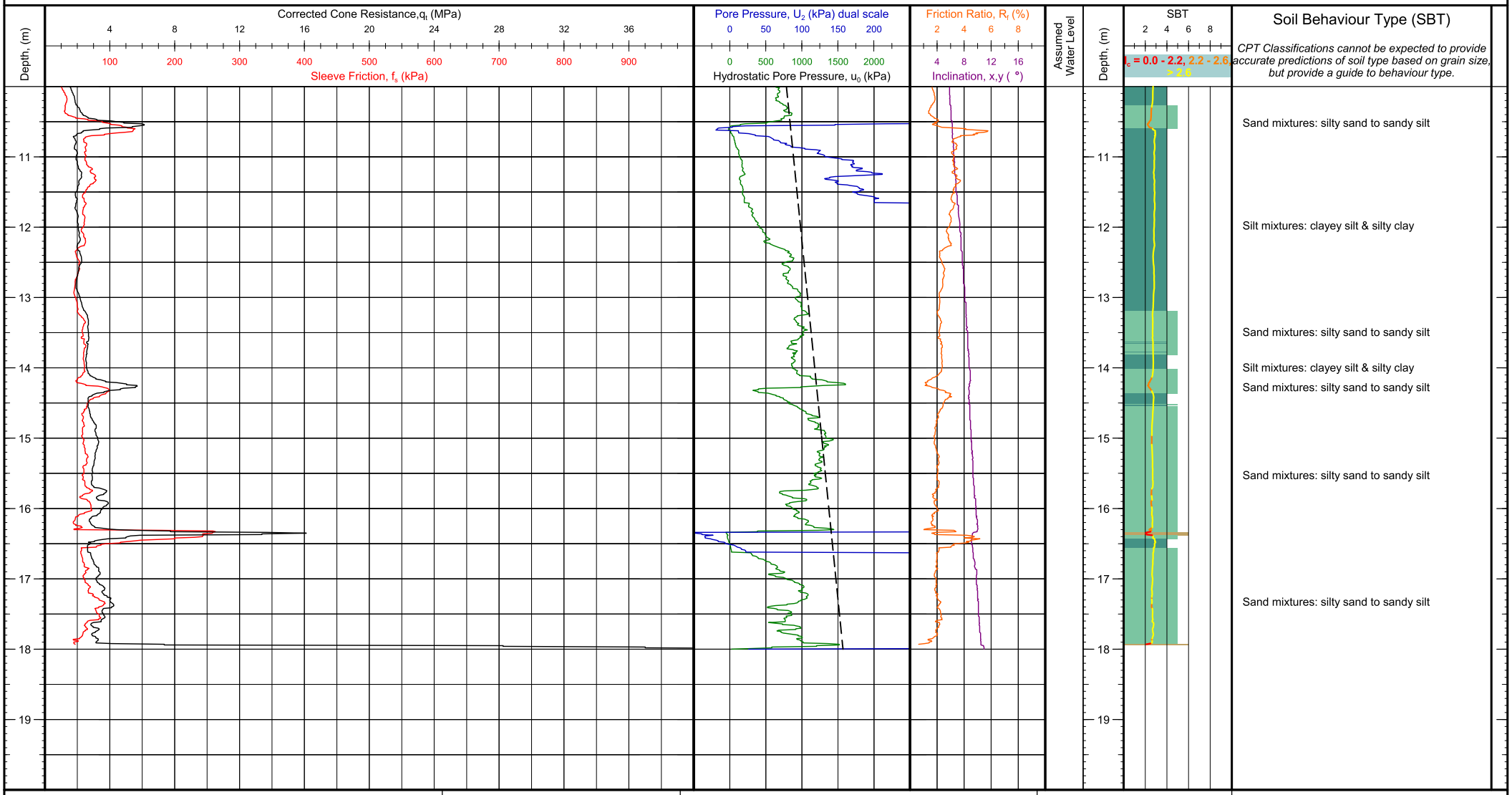
G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt

Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5927036.96, 1743360.27	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing	**Cone Ref:**	MKJ325	**WGS84 (deg):**	-36.791642,174.606789	**Date of Test:**	2/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	18.00
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High cone end resistance		

Project

Client Reference:

Test Number: **CPT-117**

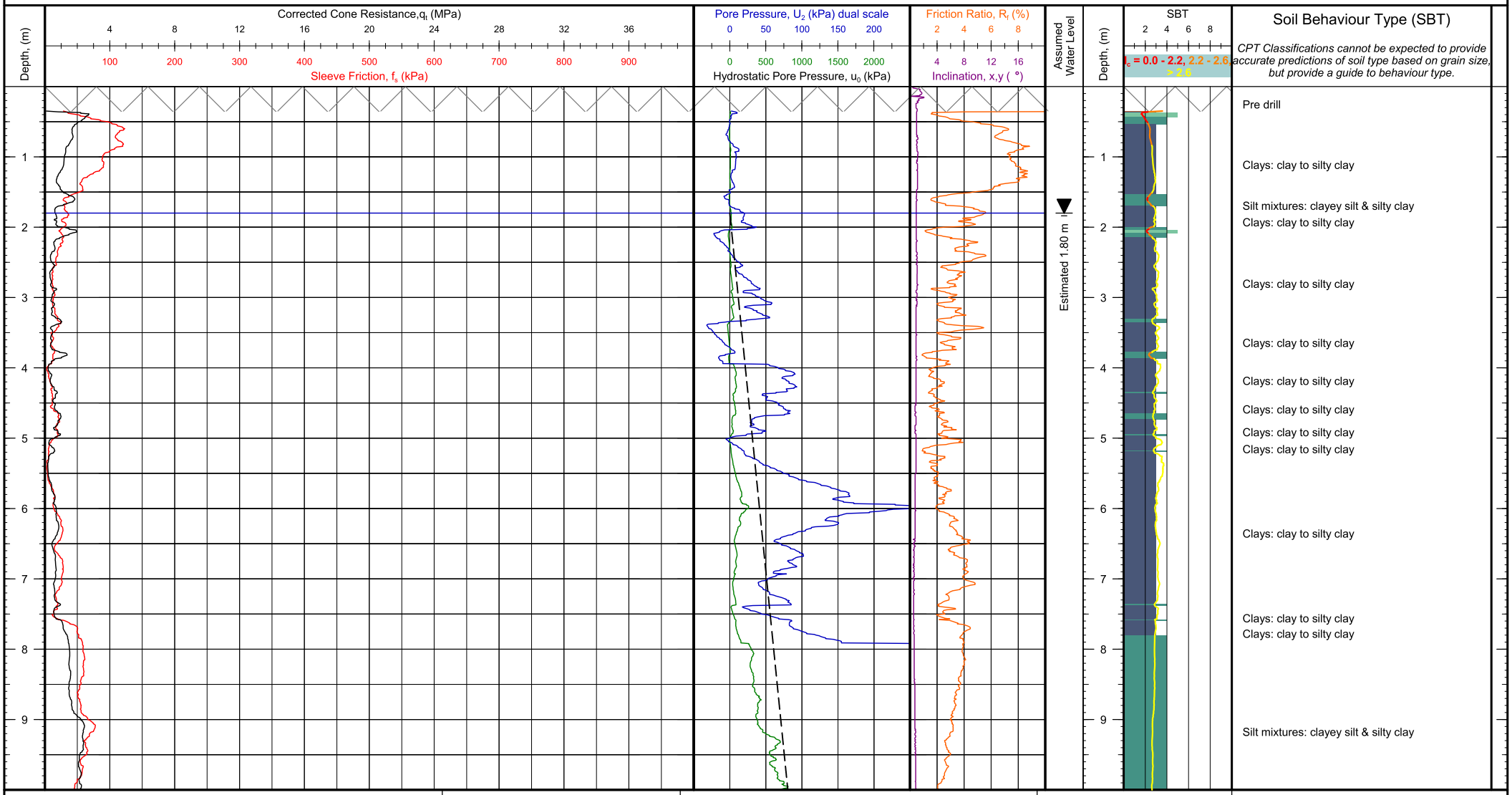
G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926965.38, 1743234.65	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ309	**WGS84 (deg):**	-36.792306,174.605395	**Date of Test:**	2/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	13.22
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	0.34 m
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High total load	**G.I. Job Ref:**	200824

Client Reference:

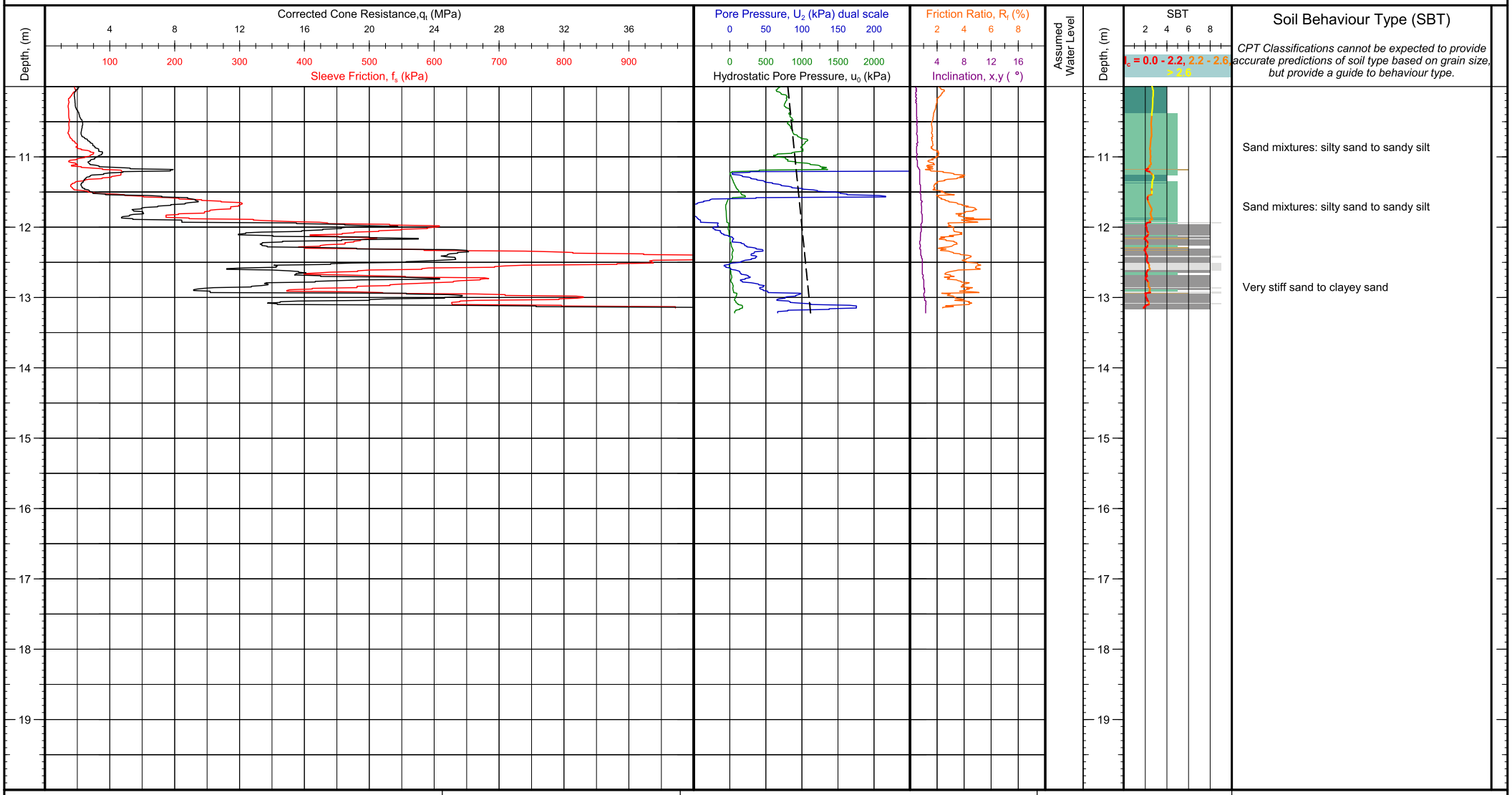
Test Number: **CPT-121**

Comments:

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

Sand mixtures: silty sand to sandy silt

Sand mixtures: silty sand to sandy silt

Very stiff sand to clayey sand

Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926965.38, 1743234.65	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ309	**WGS84 (deg):**	-36.792306,174.605395	**Date of Test:**	2/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	13.22
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	0.34 m
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High total load		

Client Reference:

Test Number: **CPT-121**

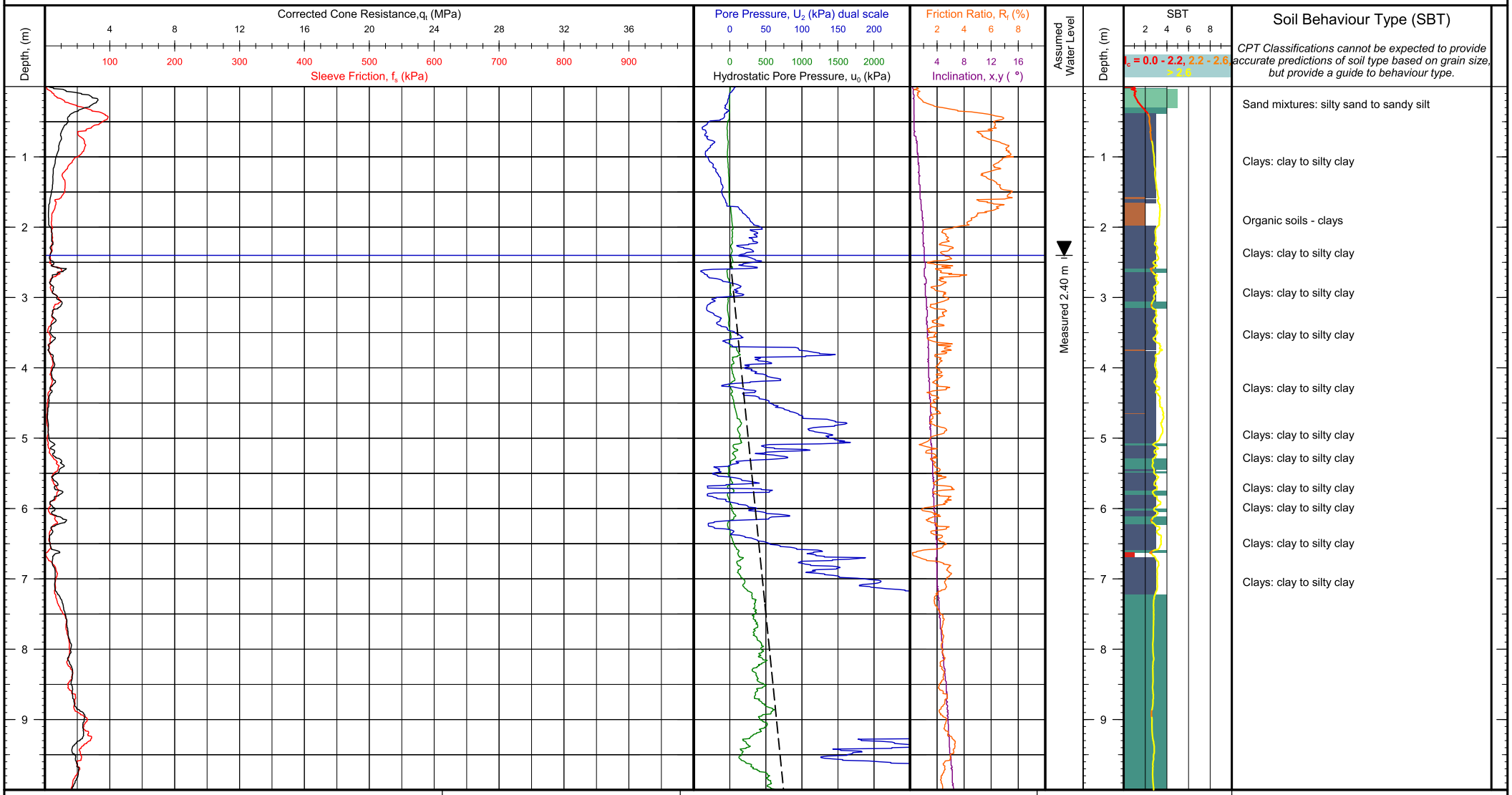
G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926924.83, 1743237.45	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ325	**WGS84 (deg):**	-36.792671,174.605434	**Date of Test:**	2/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	17.54
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	Limit of reaction force		

Client Reference:

Test Number: **CPT-126**

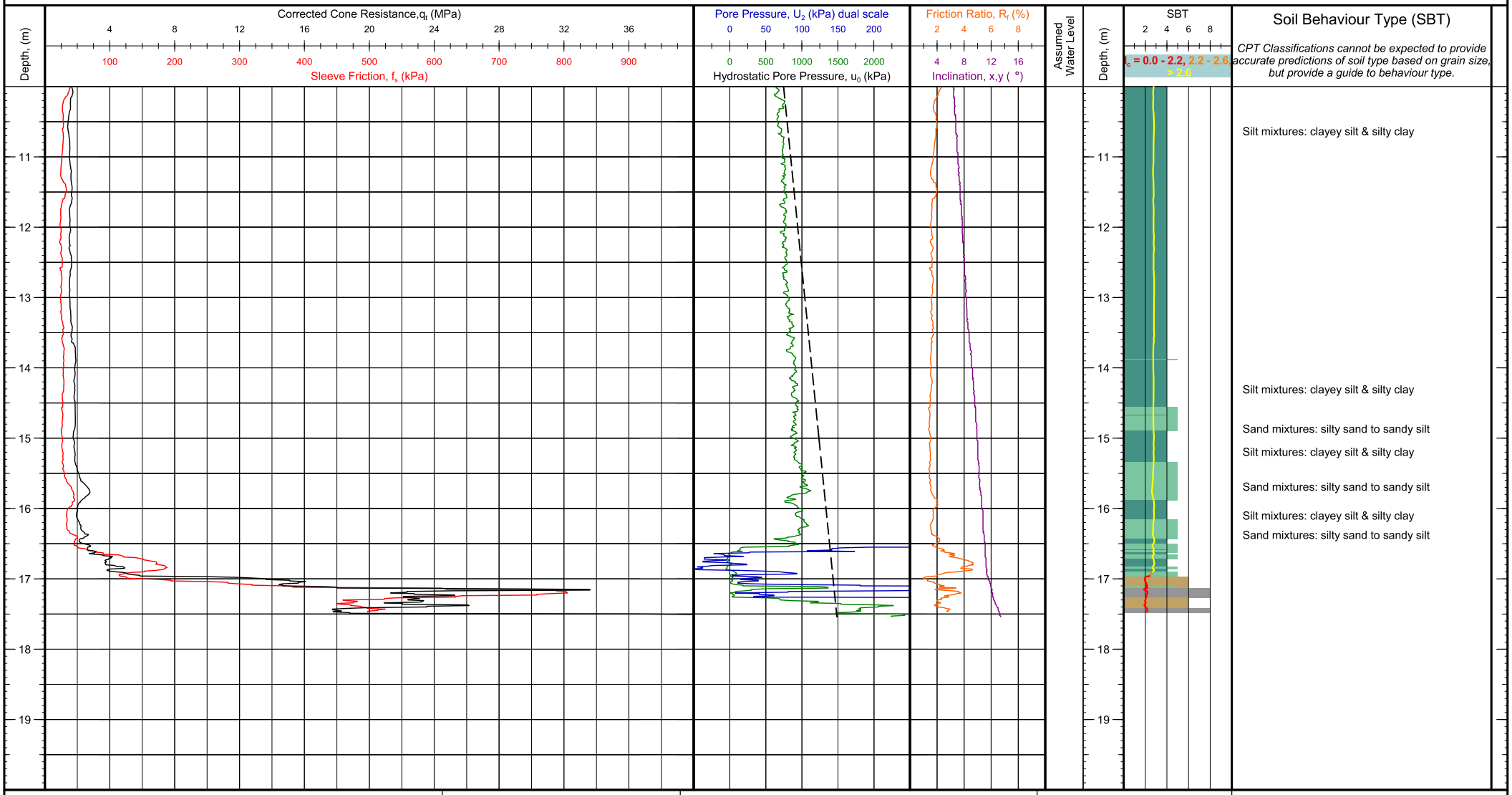
G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt

Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926924.83, 1743237.45	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ325	**WGS84 (deg):**	-36.792671,174.605434	**Date of Test:**	2/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	17.54
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	Limit of reaction force		

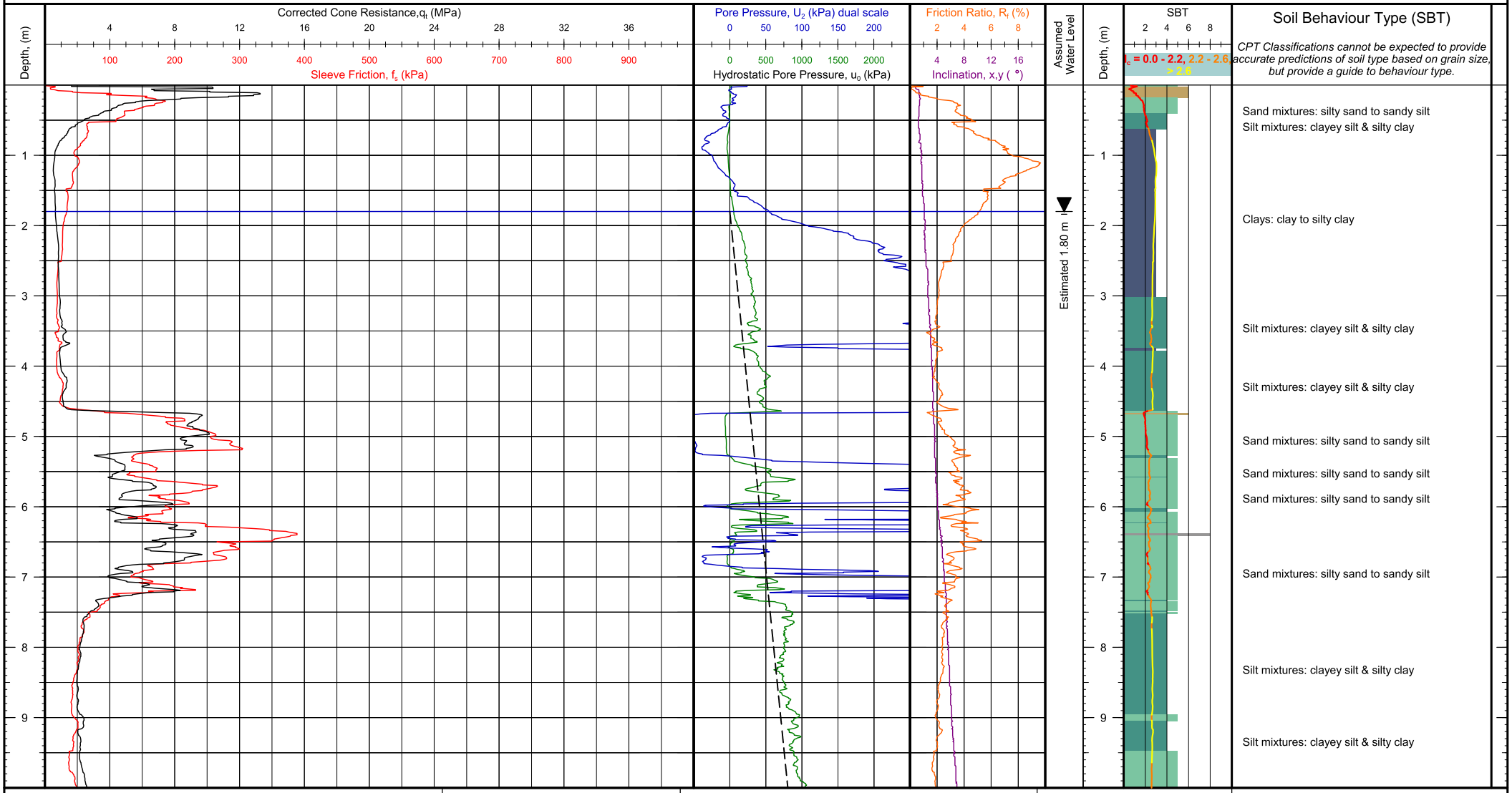
Client Reference:

Test Number: **CPT-126**

G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG



Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926740.32, 1743076.38	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ325	**WGS84 (deg):**	-36.794358,174.603664	**Date of Test:**	2/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	16.05
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High total load		

Client Reference:

Test Number: **CPT-128**

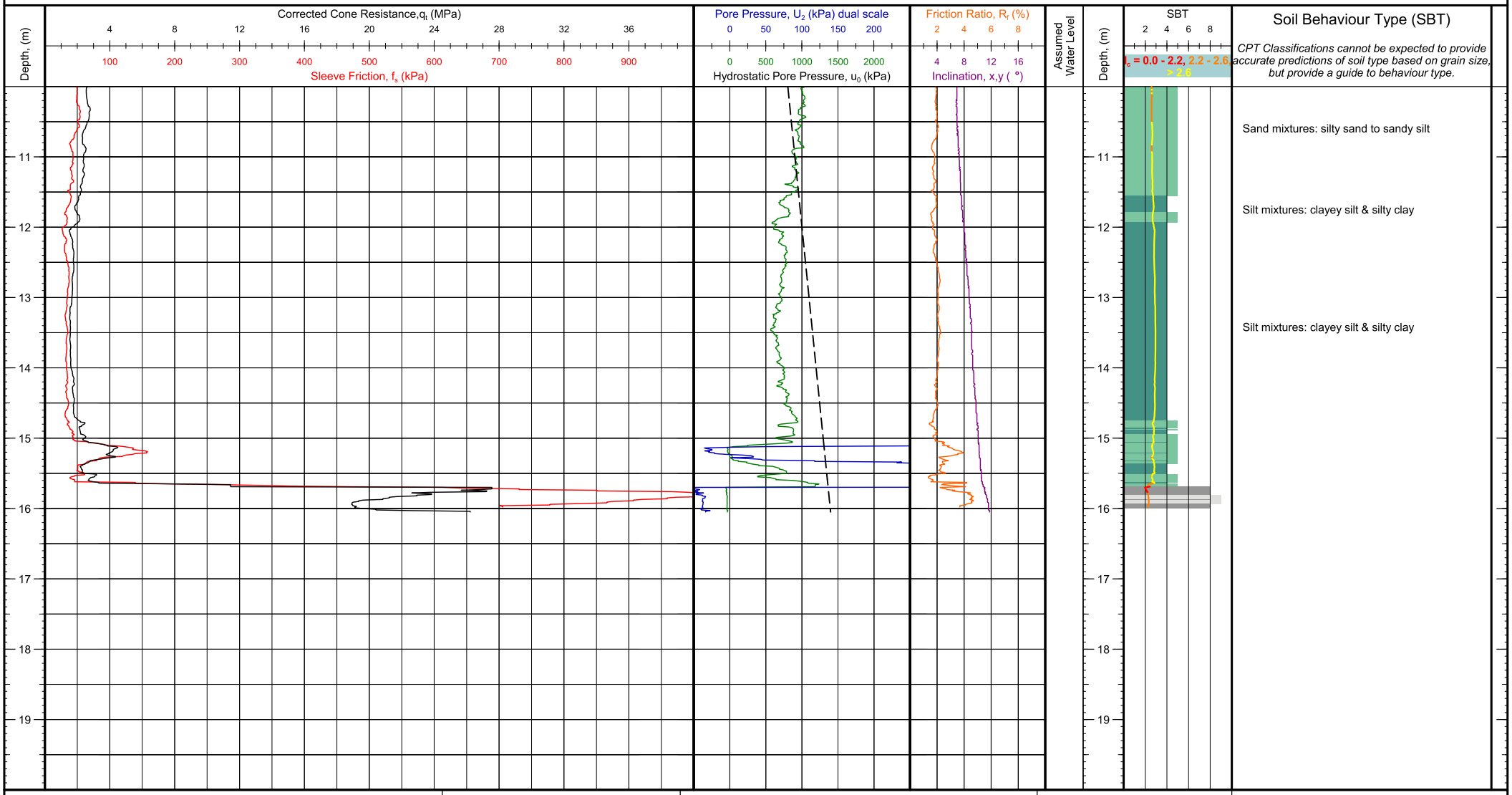
G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

Sand mixtures: silty sand to sandy silt

Silt mixtures: clayey silt & silty clay

Silt mixtures: clayey silt & silty clay

Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926740.32, 1743076.38	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ325	**WGS84 (deg):**	-36.794358,174.603664	**Date of Test:**	2/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	16.05
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High total load		

Client Reference:

Test Number: **CPT-128**

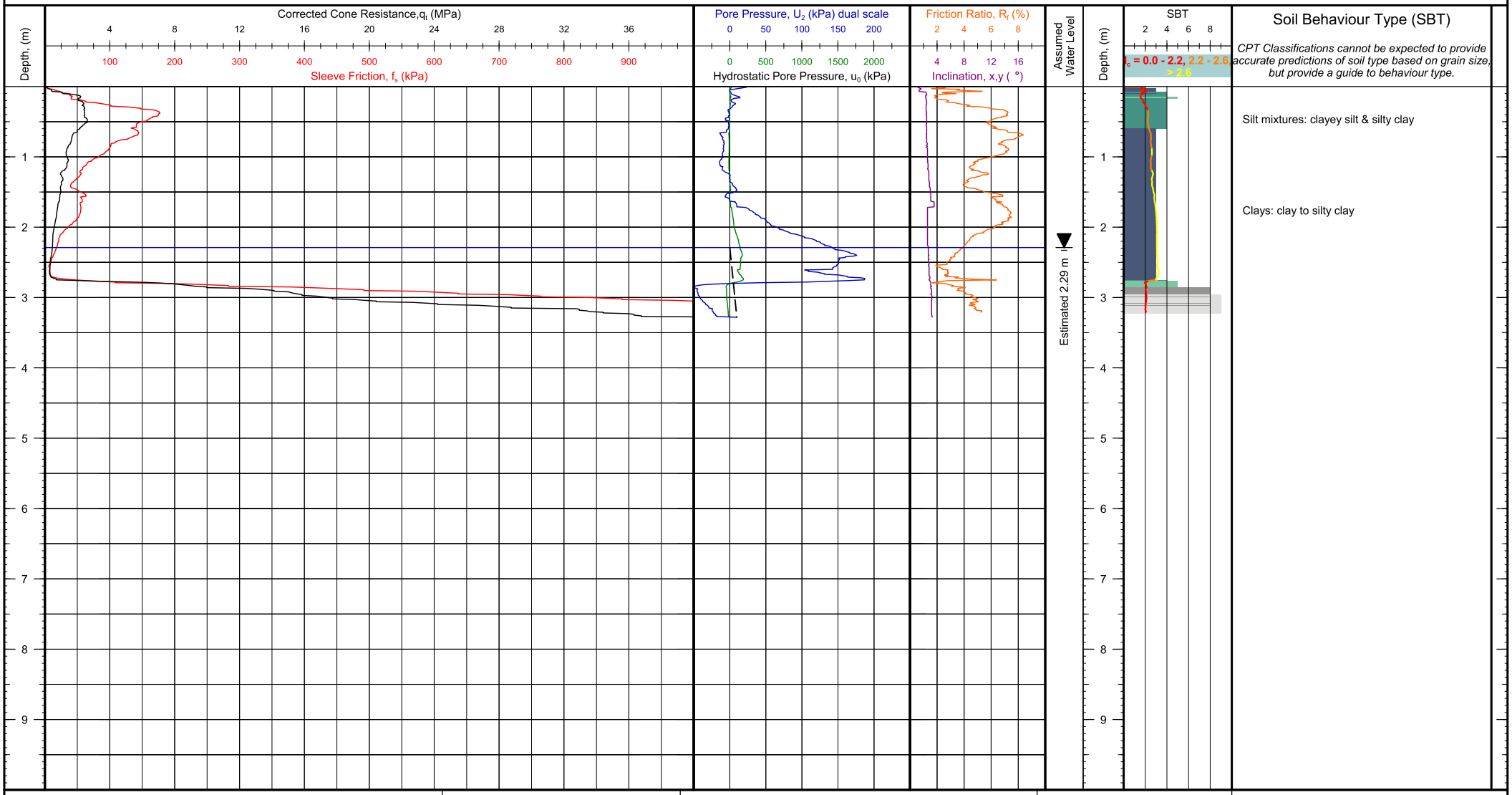
G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

Silt mixtures: clayey silt & silty clay

Clays: clay to silty clay

Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926650.80, 1743015.08	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ309	**WGS84 (deg):**	-36.795174,174.602994	**Date of Test:**	3/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	3.28
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High friction resistance		

Client Reference:

Test Number: **CPT-129**

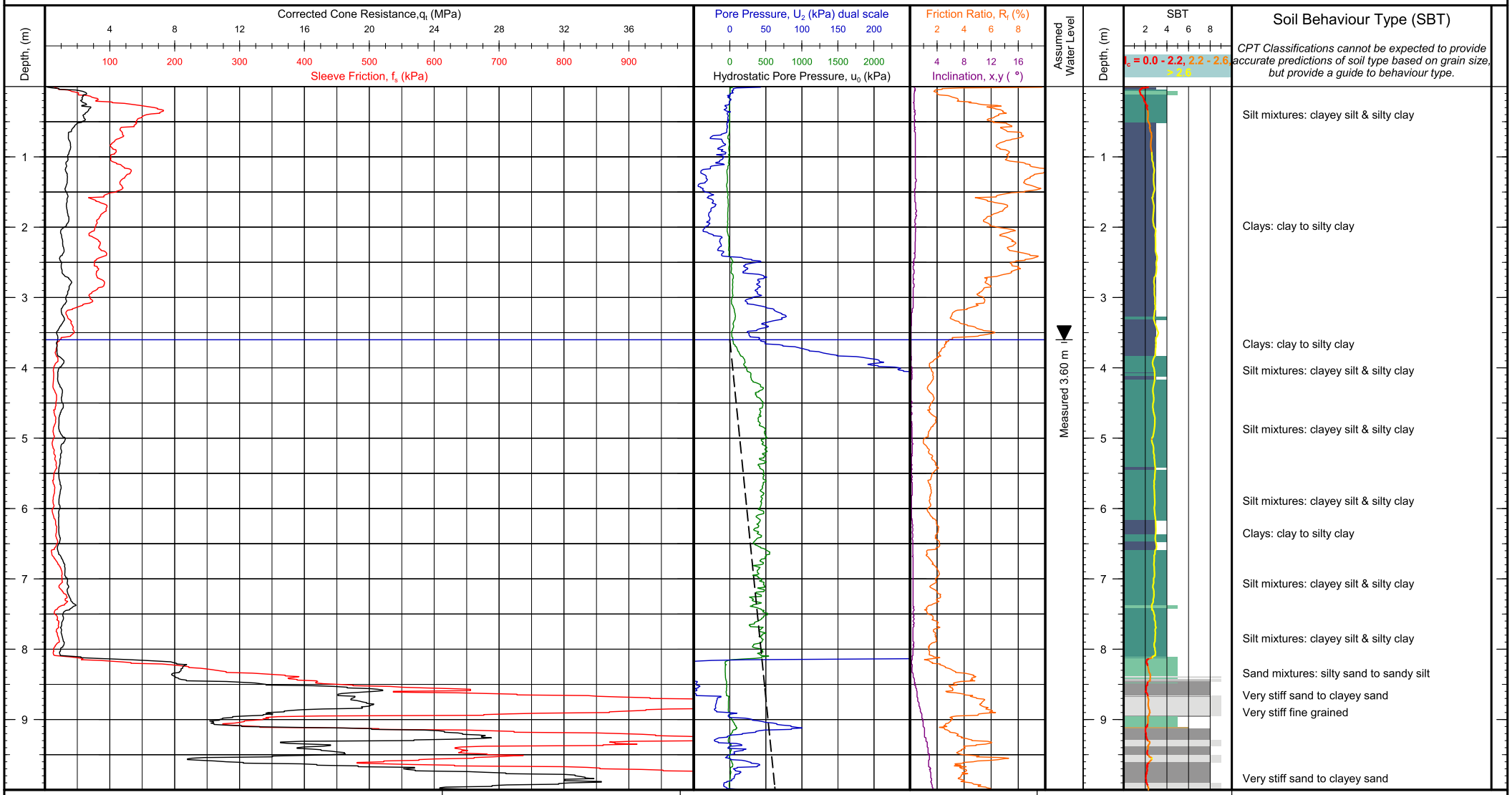
G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Silt mixtures: clayey silt & silty clay
- Clays: clay to silty clay
- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay
- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Very stiff sand to clayey sand
- Very stiff fine grained
- Very stiff sand to clayey sand

Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926584.78, 1743106.98	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ309	**WGS84 (deg):**	-36.795755,174.604036	**Date of Test:**	3/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	11.29
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High friction resistance		

Client Reference:

Test Number: **CPT-131**

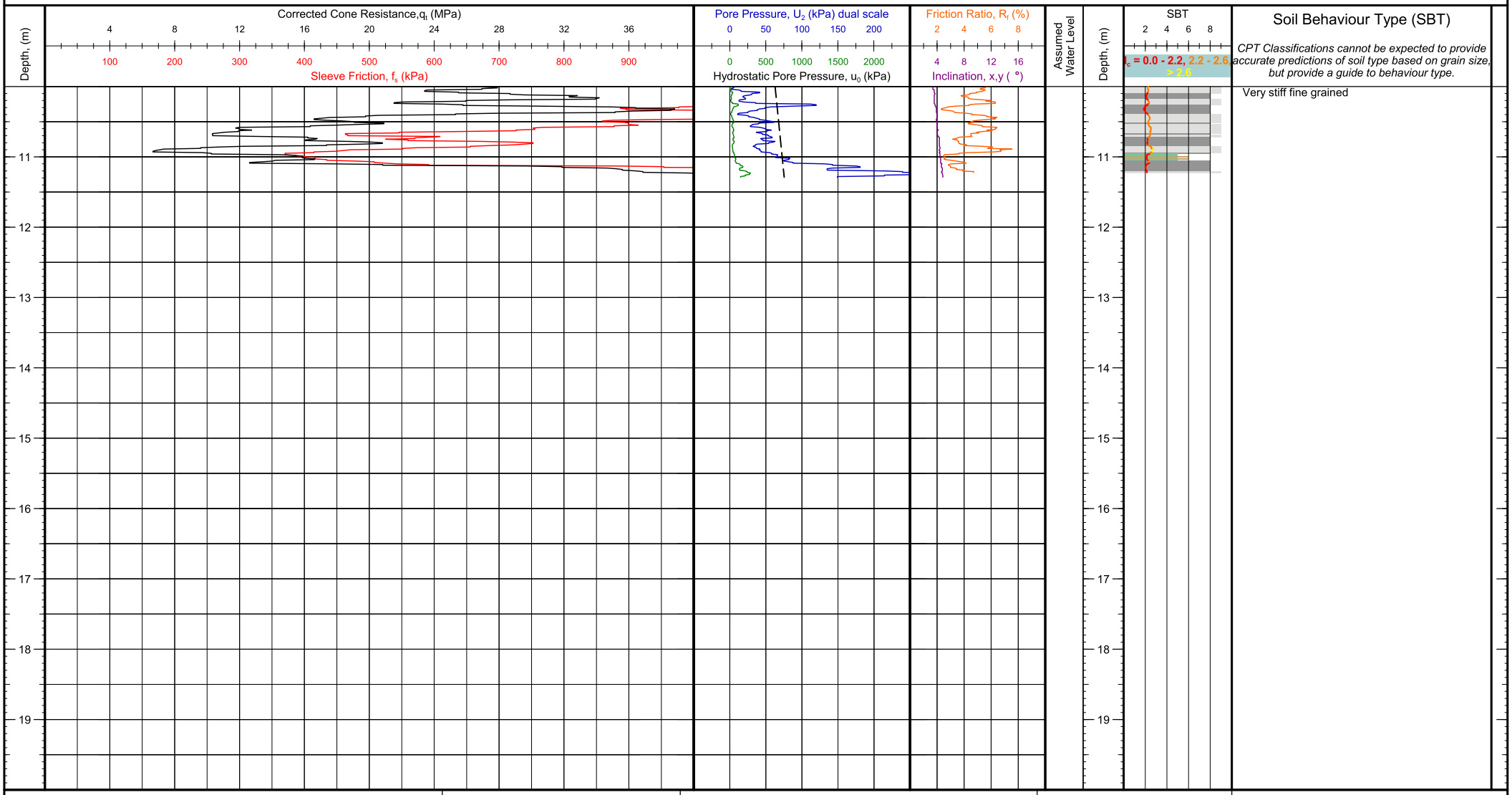
G.I. Job Ref: 200824

Comments:

CONE PENETRATION TEST (CPT) LOG

Tonkin+Taylor

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

Very stiff fine grained

Client:	Tonkin + Taylor	**Operator:**	Ben Thom	**NZTM 2000 N, E (m):**	5926584.78, 1743106.98	**Elevation (m):**	Unknown
Project:	Whenuapai-Redhills Wastewater Servicing Project	**Cone Ref:**	MKJ309	**WGS84 (deg):**	-36.795755,174.604036	**Date of Test:**	3/11/2020
Location:	Trig Road to Tamiro Road, Auckland	**Cone Type:**	10cm^2 Compression	**Location Method:**	Handheld GPS	**Depth (m):**	11.29
Engineer:	Benjamin Westgate	**Area Ratio:**	0.80	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High friction resistance		

Client Reference:

Test Number: **CPT-131**

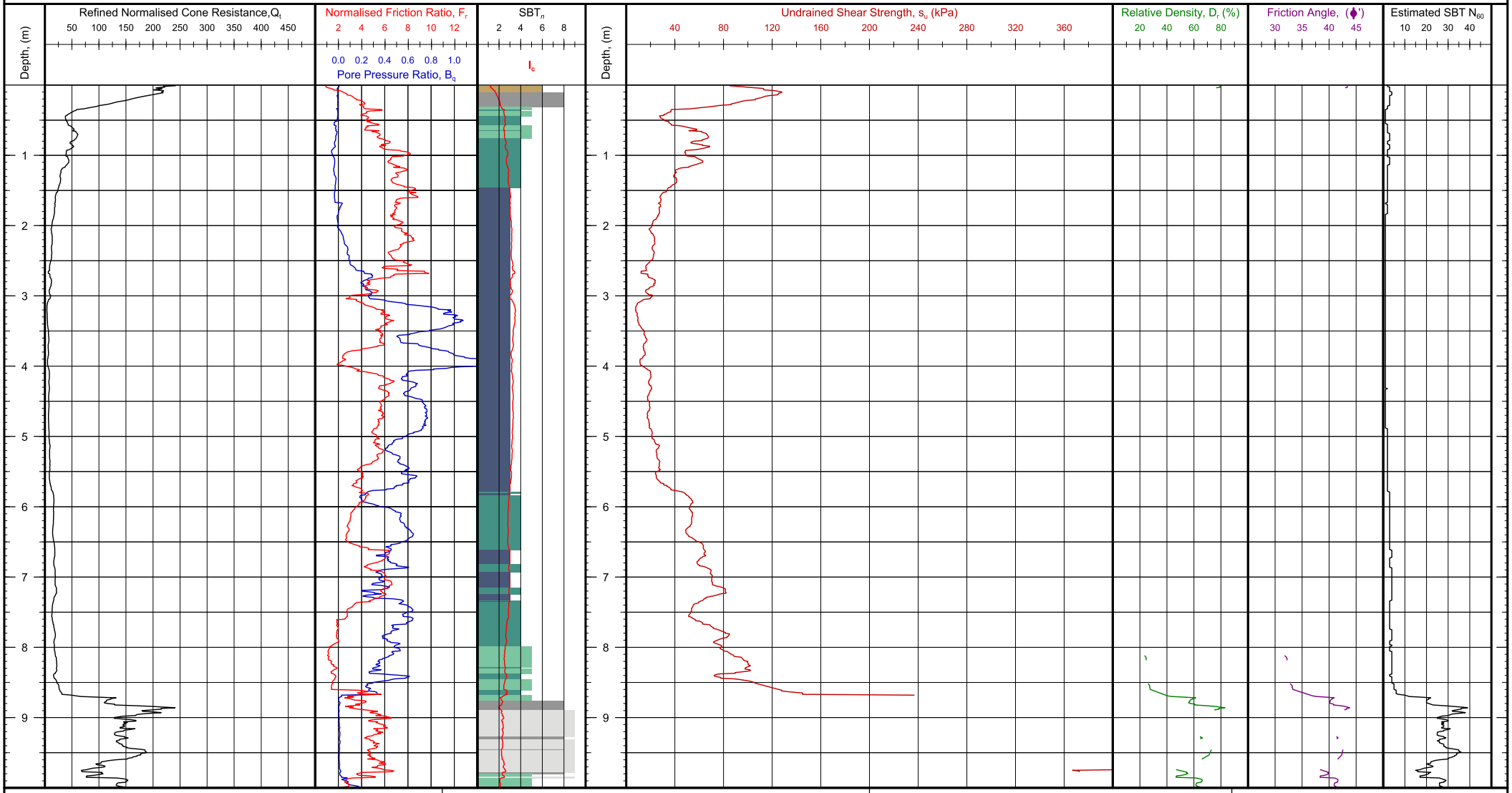
G.I. Job Ref: 200824

Comments:

CPT PARAMETER LOG

Tonkin+Taylor

GROUND INVESTIGATION



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing Project

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0 Undefined	5 Sand mixtures: silty sand to sandy silt
1 Sensitive fine grained	6 Sands: clean sands to silty sands
2 Organic: Organic clay/silt, peat	7 Dense sand to gravelly sand
3 Clay: clay to silty clay	8 Stiff sand to clayey sand
4 Silt mixtures: clayey silt & silty clay	9 Stiff silt/clay

Notes and Limitations:

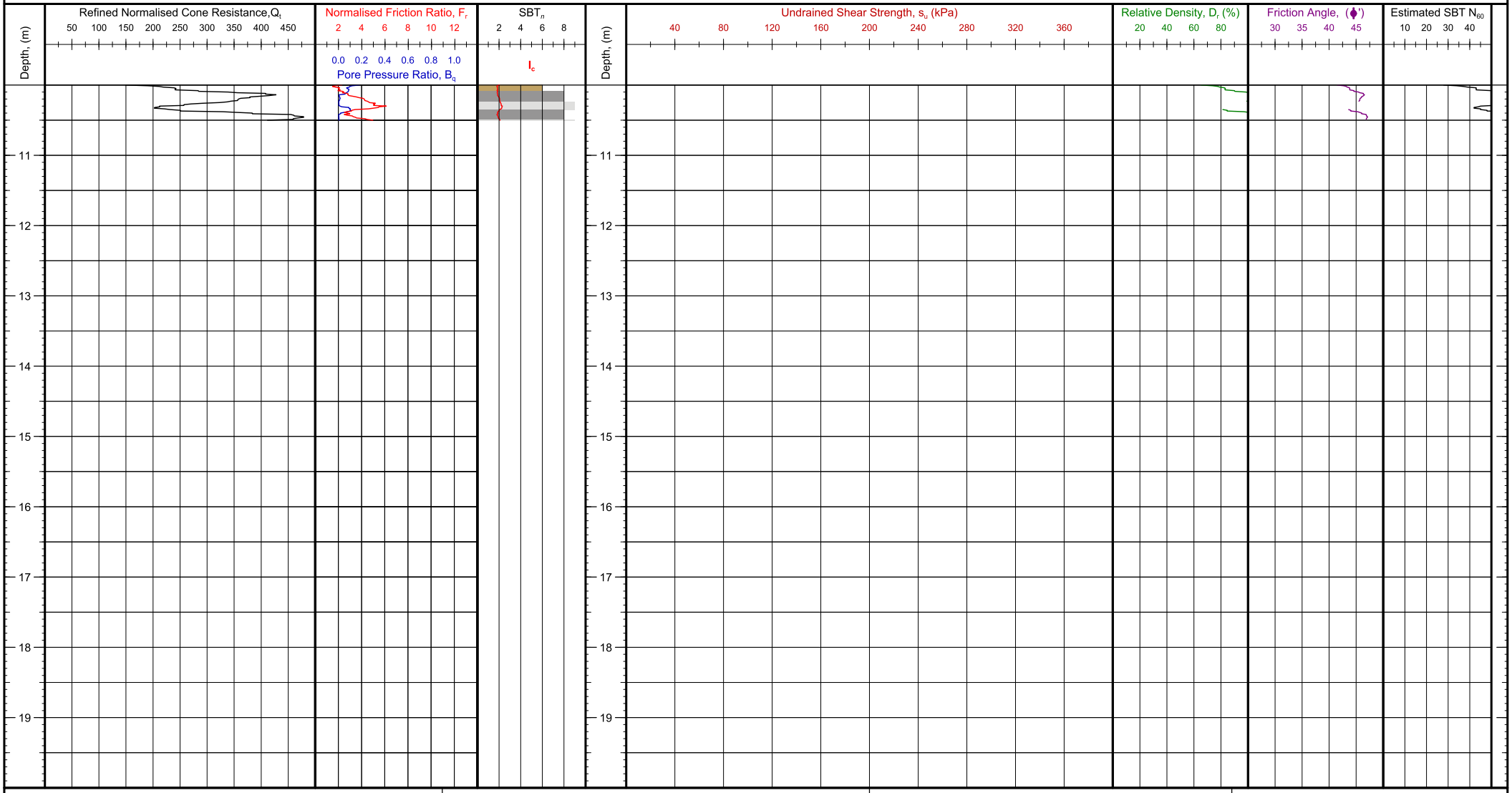
Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

Test Number: **CPT-02**

G.I. Job Ref: 200824

CPT PARAMETER LOG



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

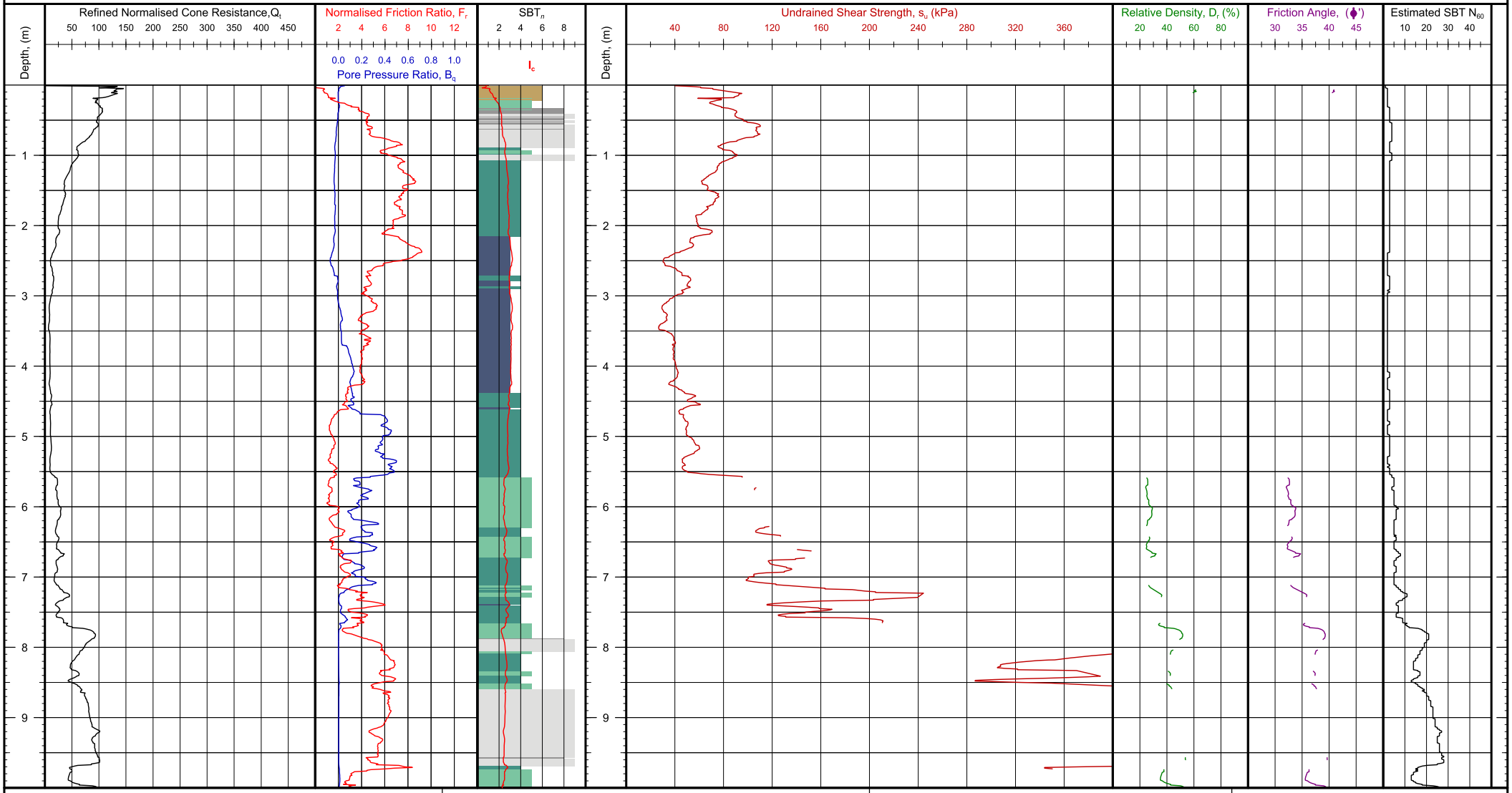
Test Number: **CPT-02**

G.I. Job Ref: 200824

CPT PARAMETER LOG

Tonkin+Taylor

GROUND INVESTIGATION



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

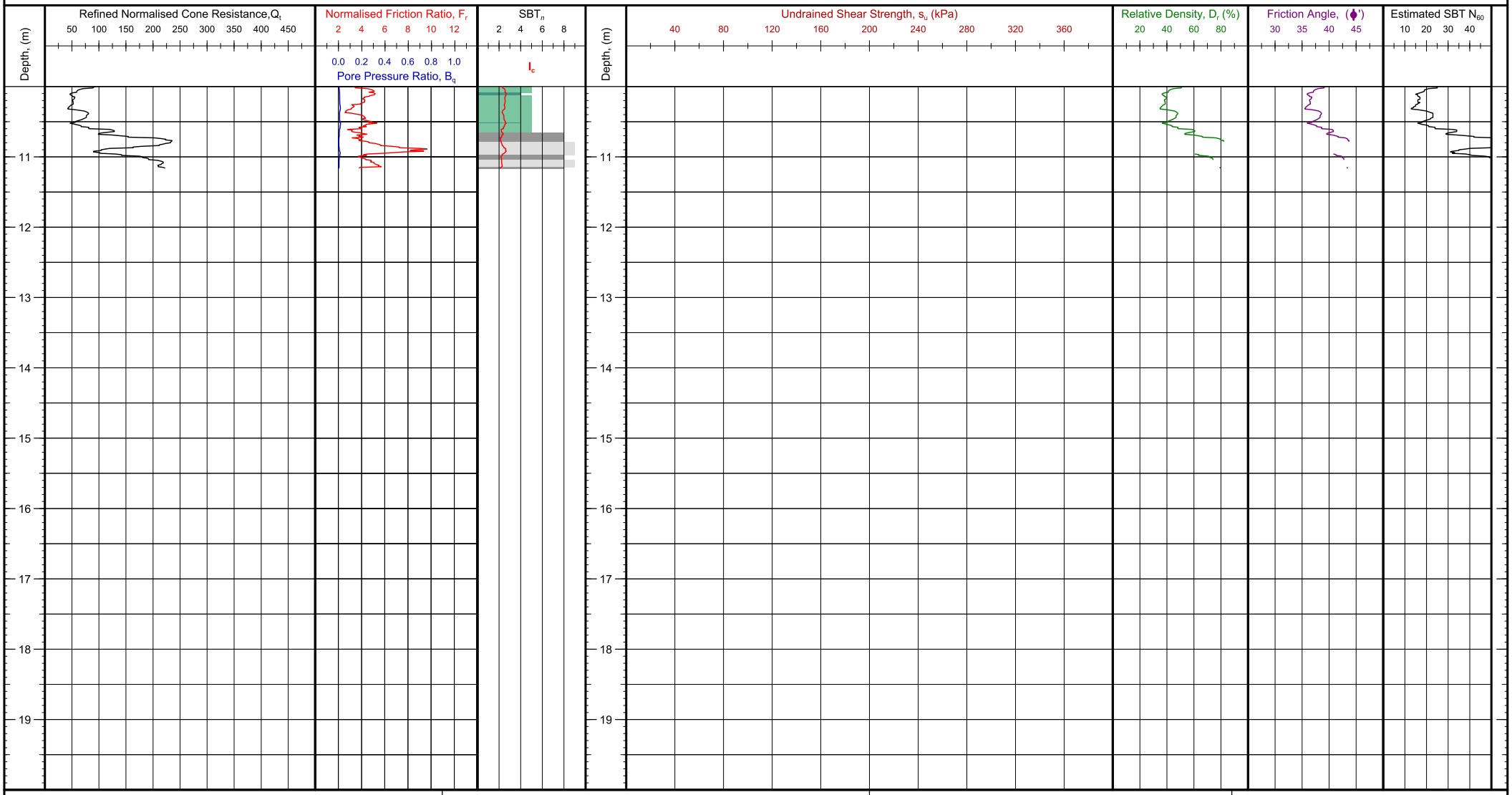
Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

Test Number: **CPT-03**

G.I. Job Ref: 200824

CPT PARAMETER LOG



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

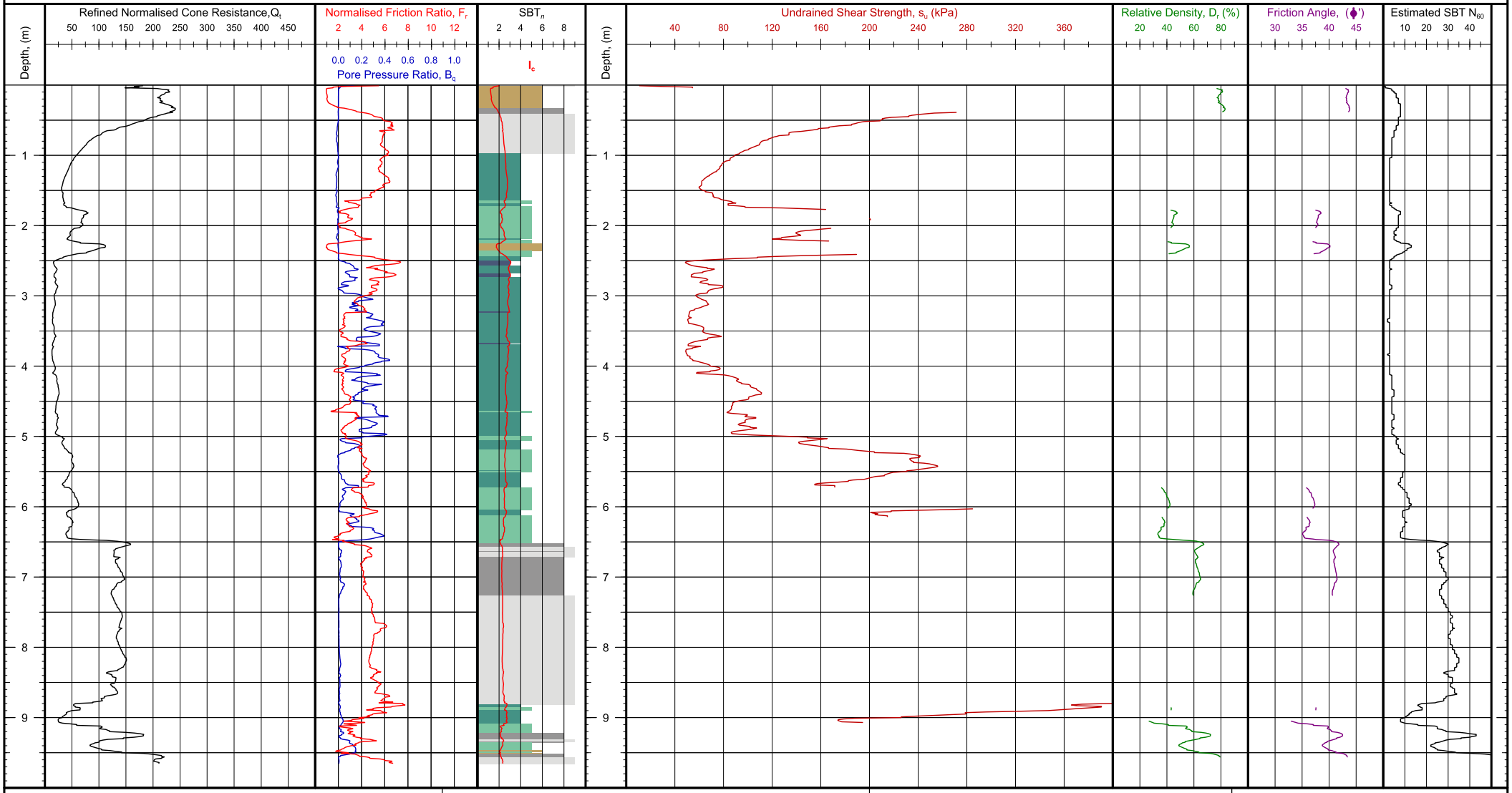
Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

Test Number: **CPT-03**

G.I. Job Ref: 200824

CPT PARAMETER LOG



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing Project

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

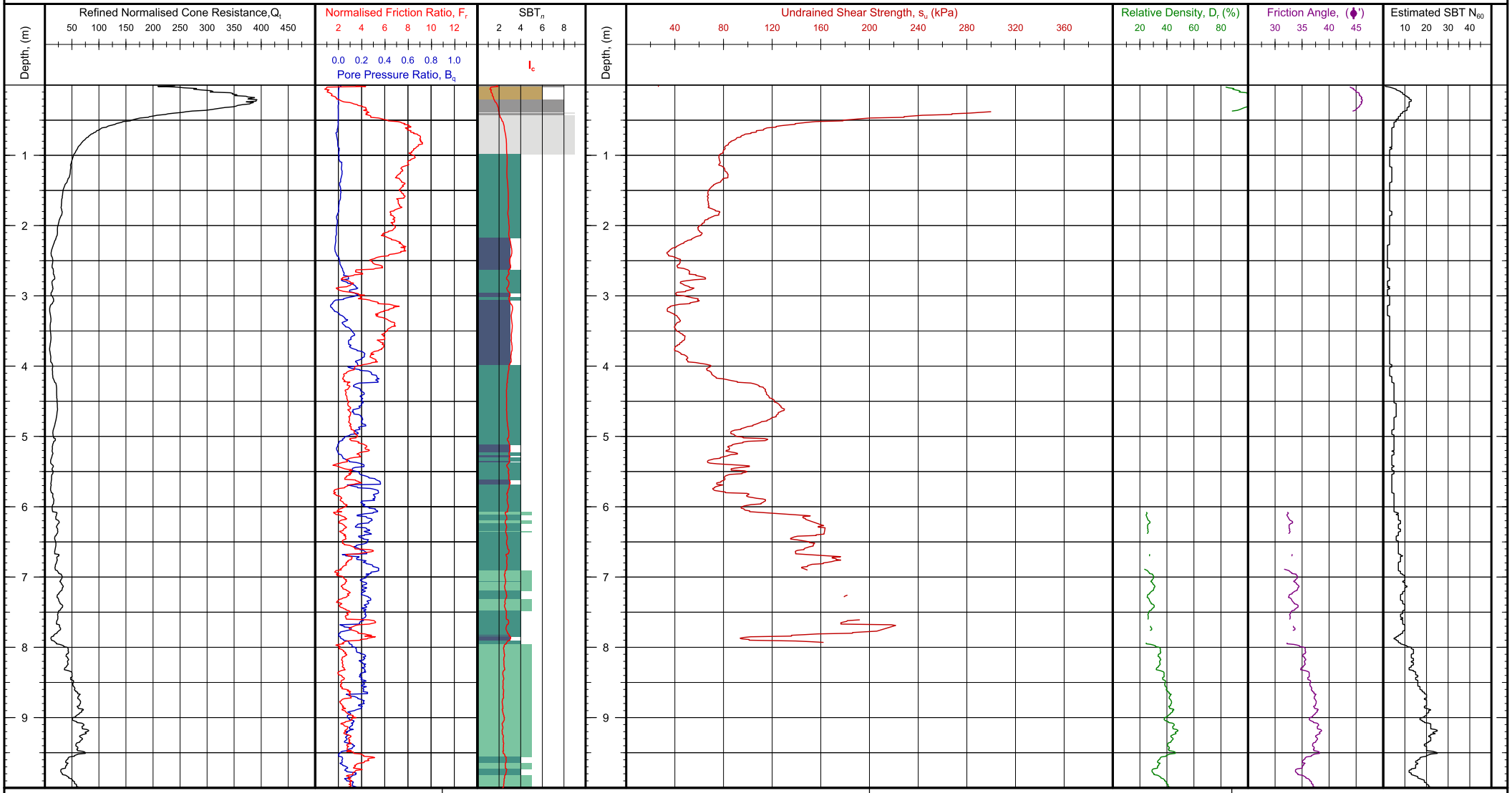
Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

Test Number: **CPT-04**

G.I. Job Ref: 200824

CPT PARAMETER LOG



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing Project

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

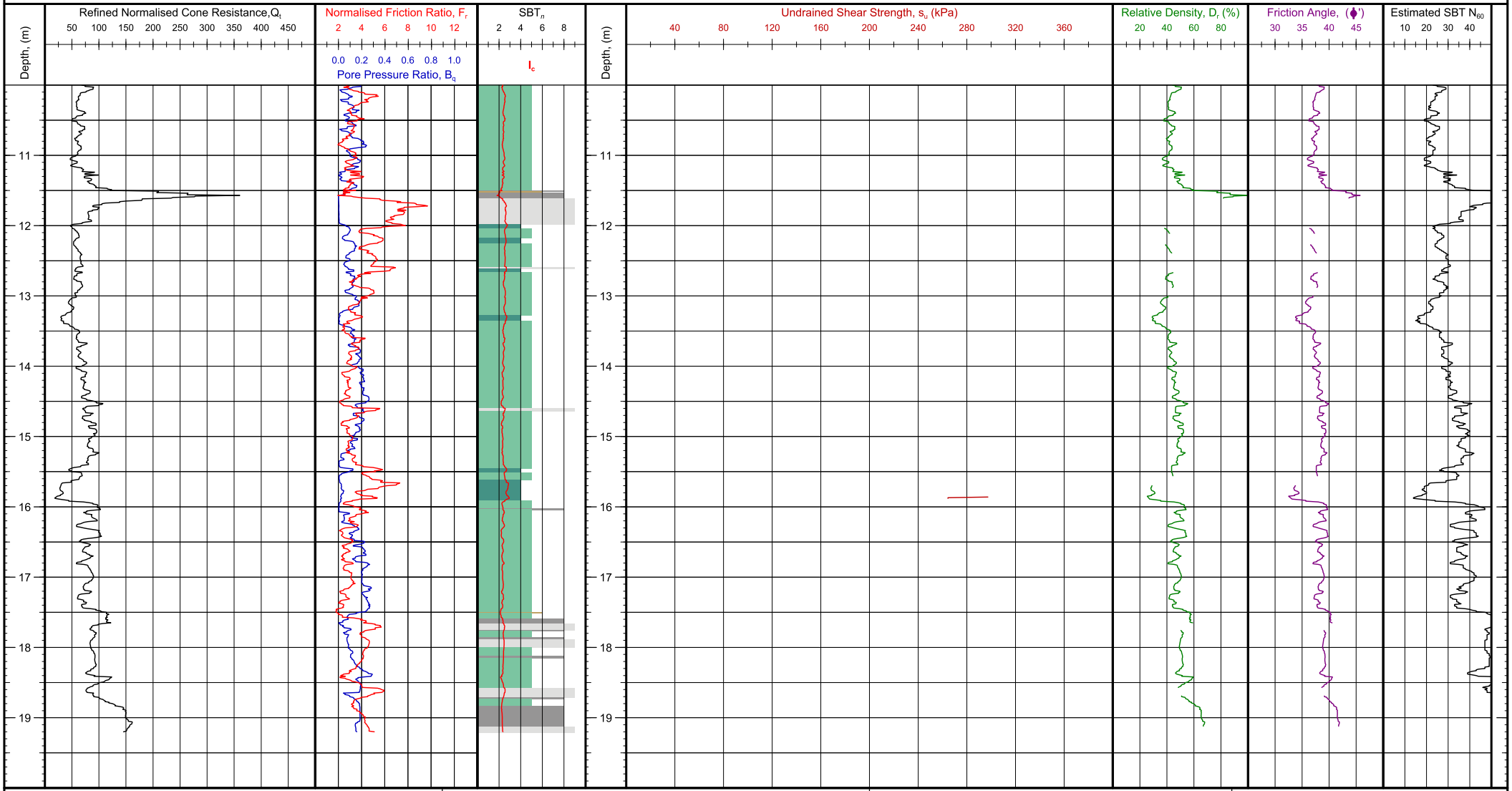
Test Number: **CPT-05**

G.I. Job Ref: 200824

CPT PARAMETER LOG

Tonkin+Taylor

GROUND INVESTIGATION



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing Project

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

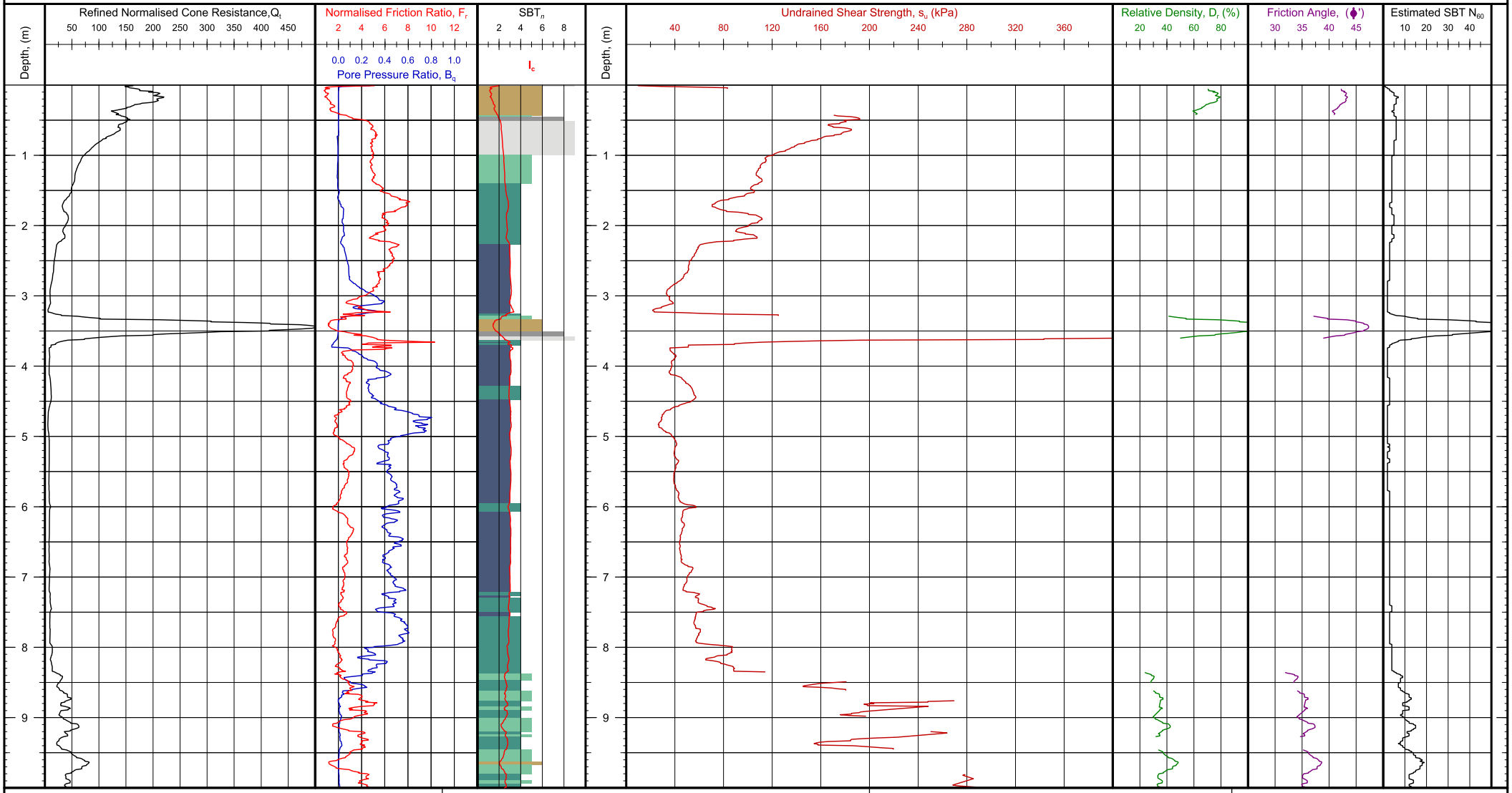
Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

Test Number: **CPT-05**

G.I. Job Ref: 200824

CPT PARAMETER LOG



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing Project

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

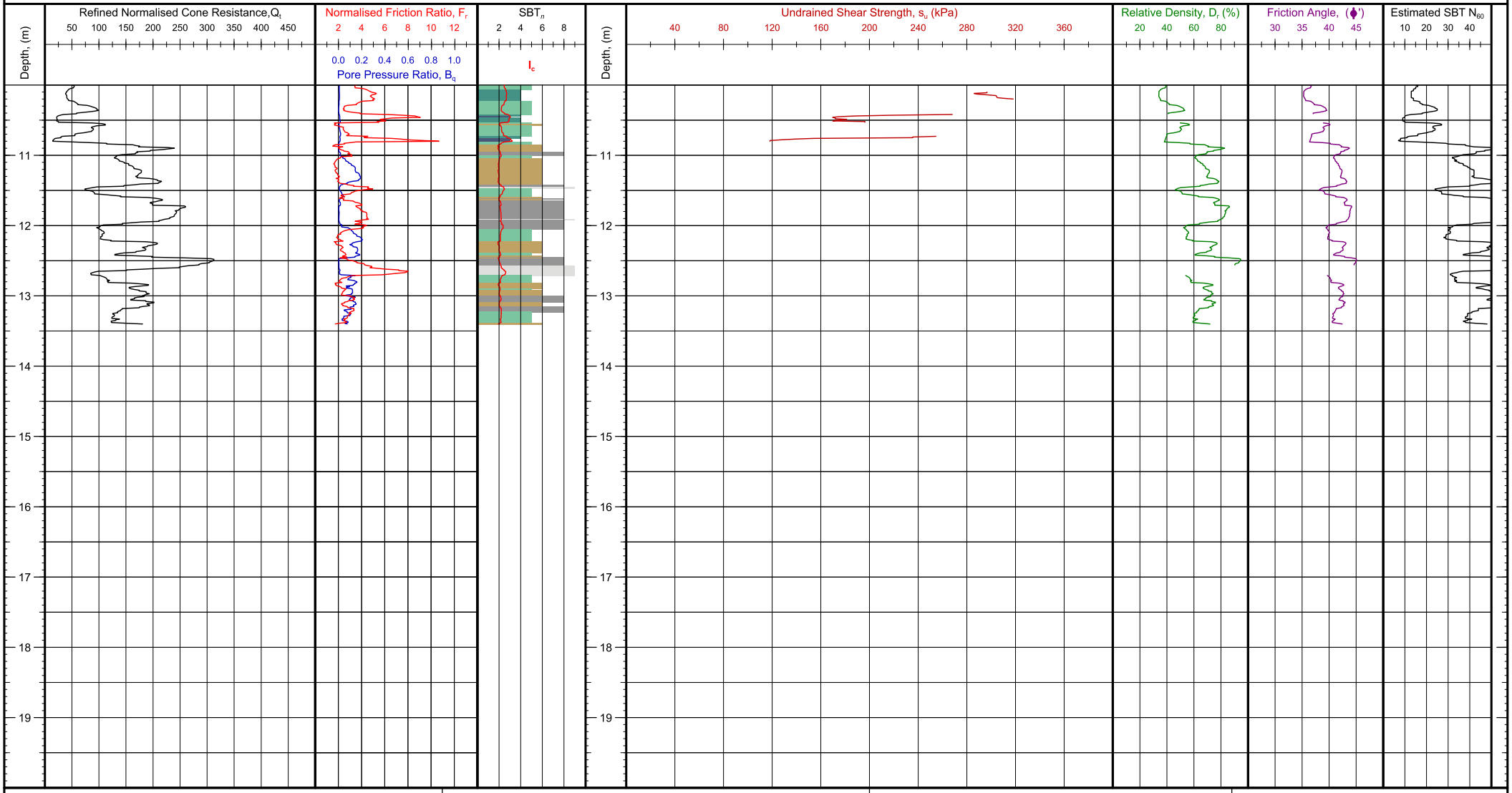
Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

Test Number: **CPT-06**

G.I. Job Ref: 200824

CPT PARAMETER LOG



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing Project

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0 Undefined	5 Sand mixtures: silty sand to sandy silt
1 Sensitive fine grained	6 Sands: clean sands to silty sands
2 Organic: Organic clay/silt, peat	7 Dense sand to gravelly sand
3 Clay: clay to silty clay	8 Stiff sand to clayey sand
4 Silt mixtures: clayey silt & silty clay	9 Stiff silt/clay

Notes and Limitations:

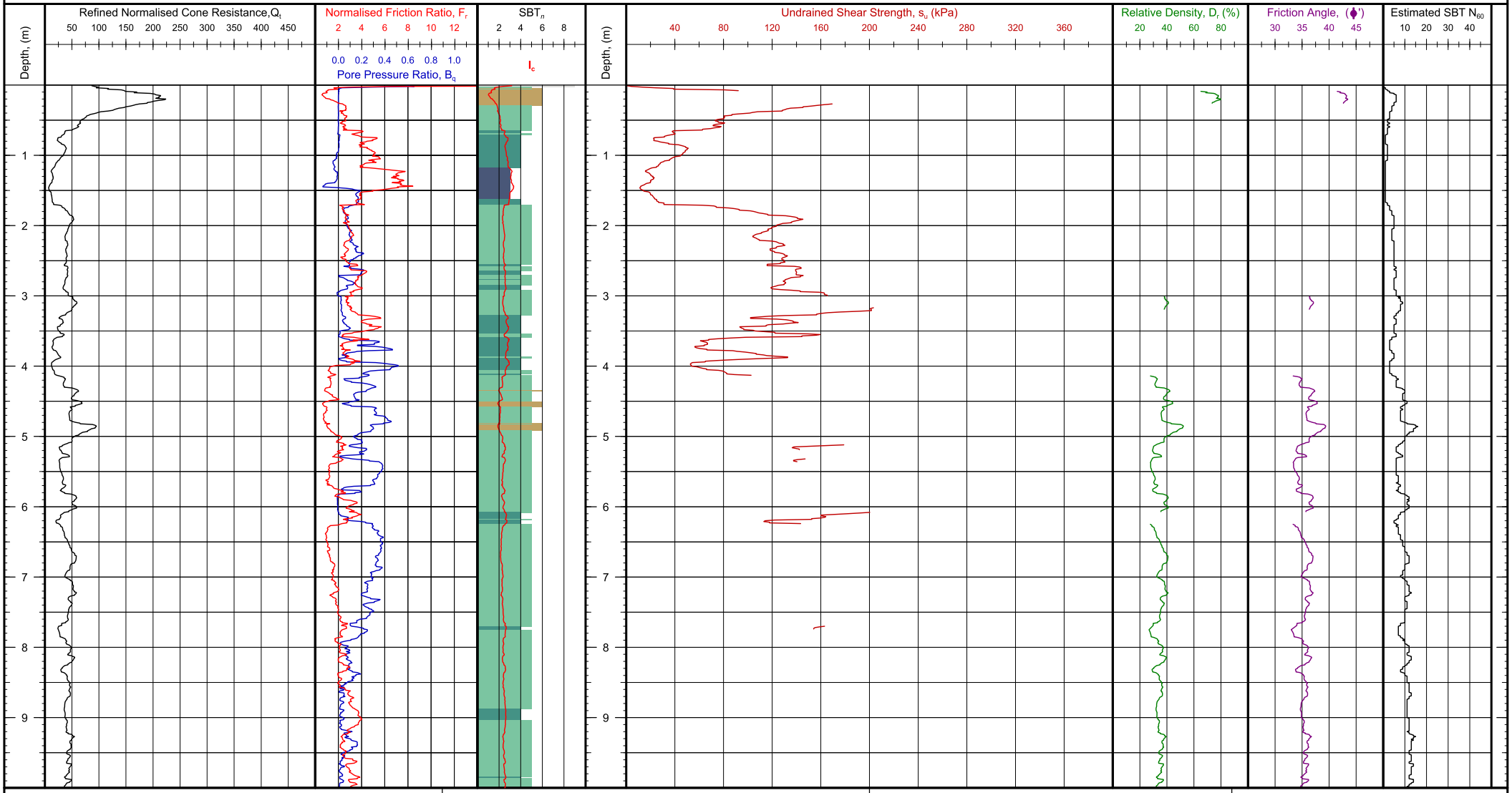
Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

Test Number: **CPT-06**

G.I. Job Ref: 200824

CPT PARAMETER LOG



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing Project

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

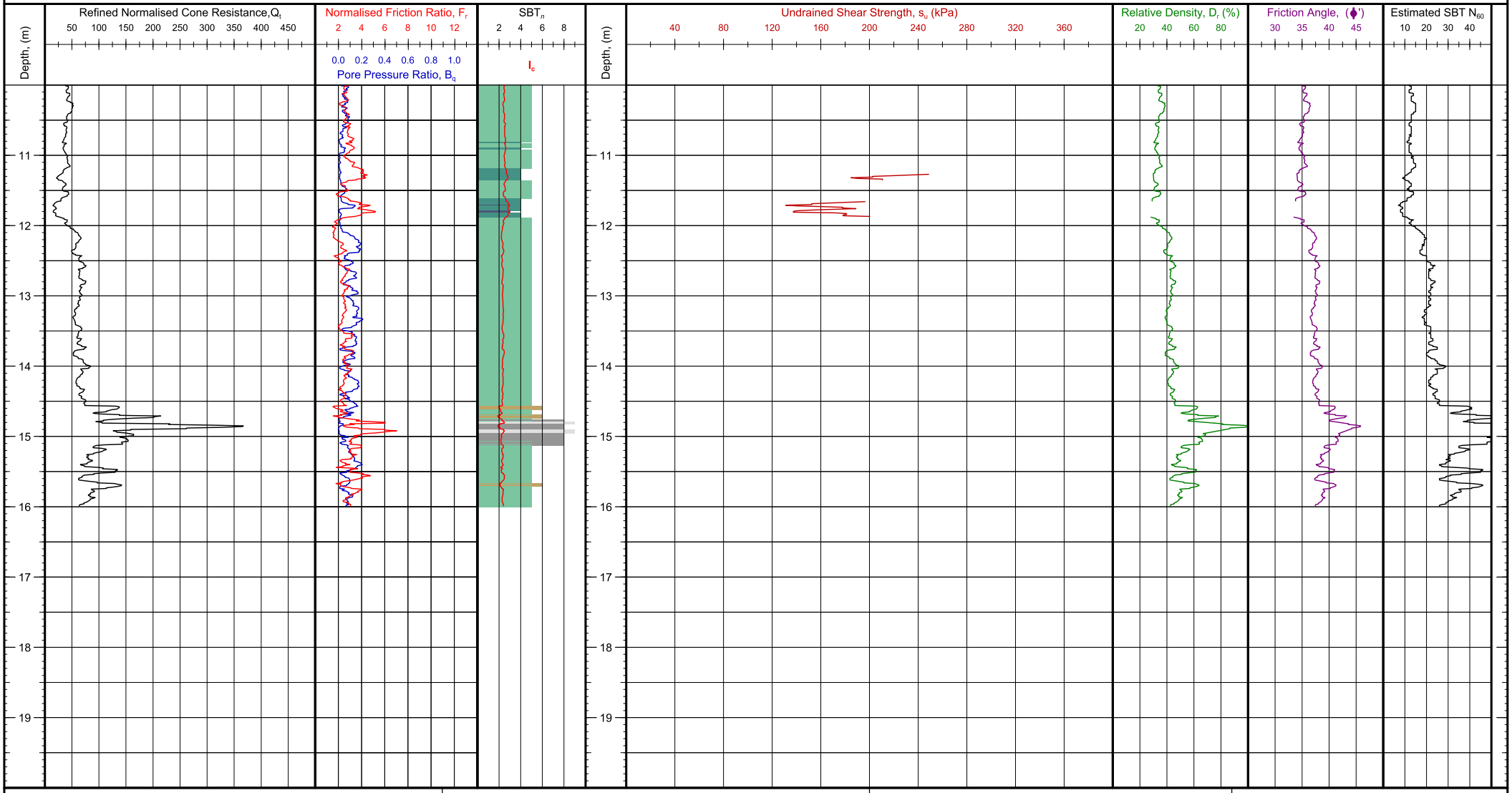
Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

Test Number: **CPT-07**

G.I. Job Ref: 200824

CPT PARAMETER LOG



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing Project

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

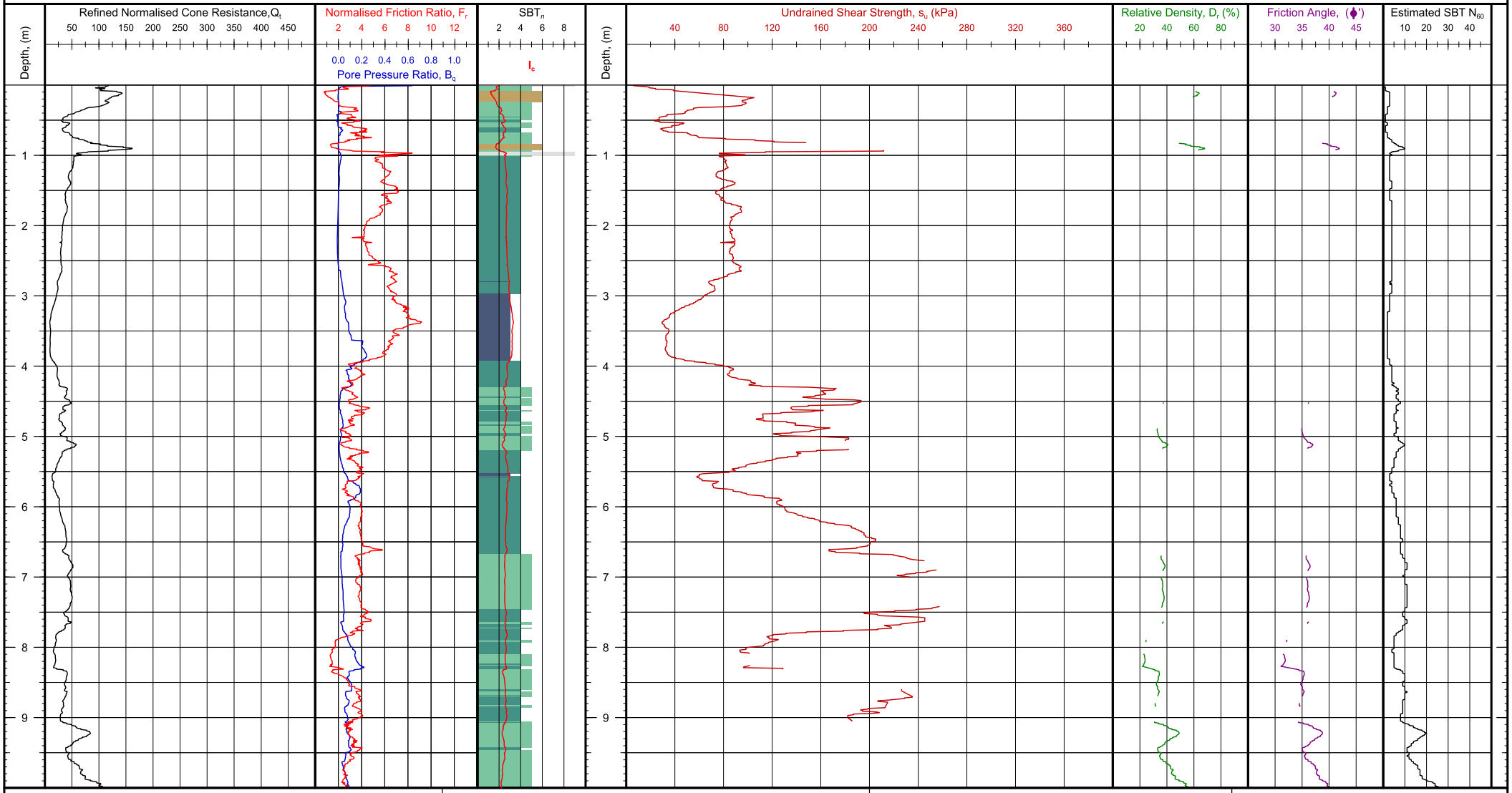
Test Number: CPT-07

G.I. Job Ref: 200824

CPT PARAMETER LOG

Tonkin+Taylor

GROUND INVESTIGATION



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

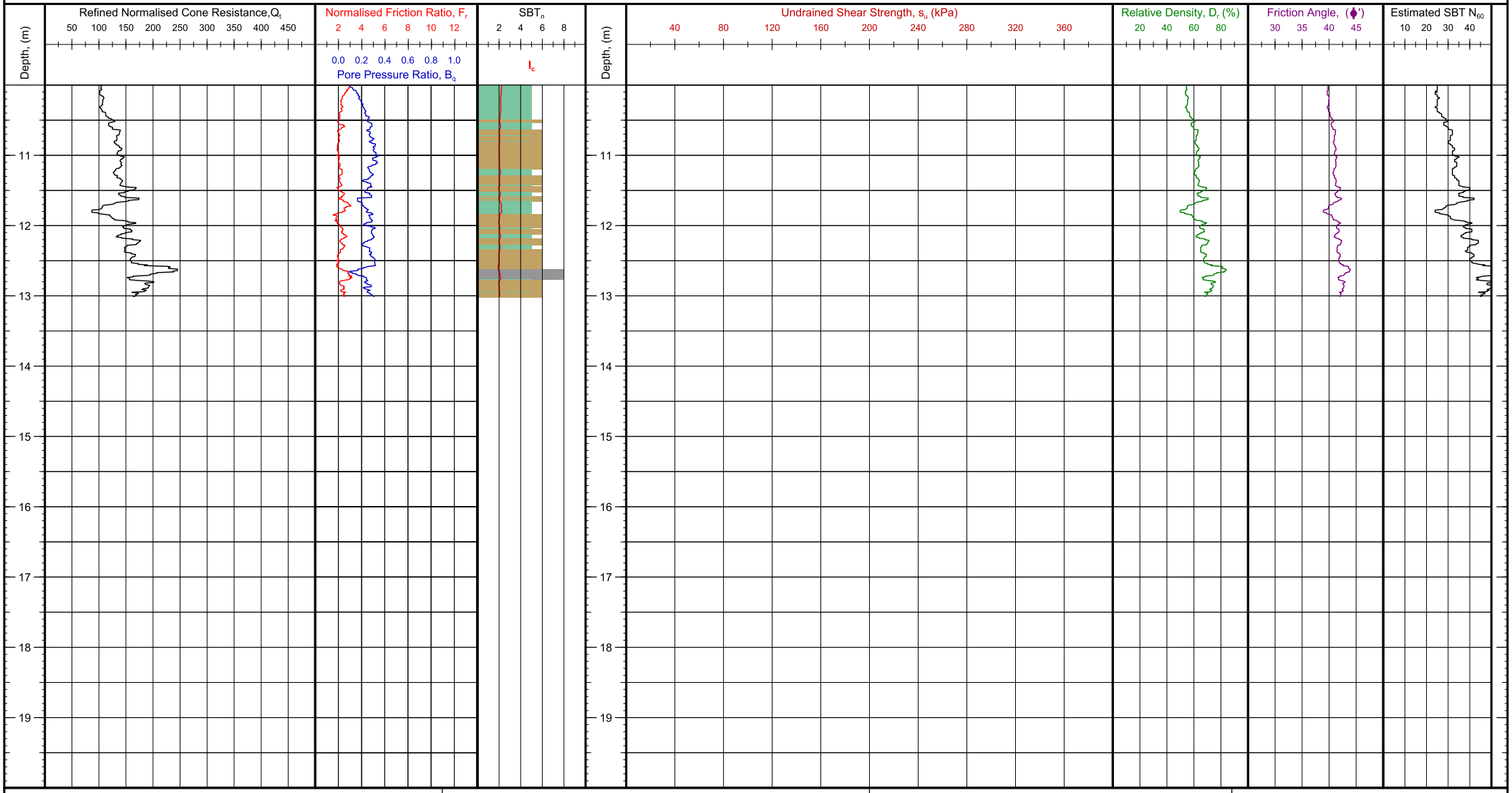
Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

Test Number: **CPT-08**

G.I. Job Ref: 200824

CPT PARAMETER LOG



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing Project

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

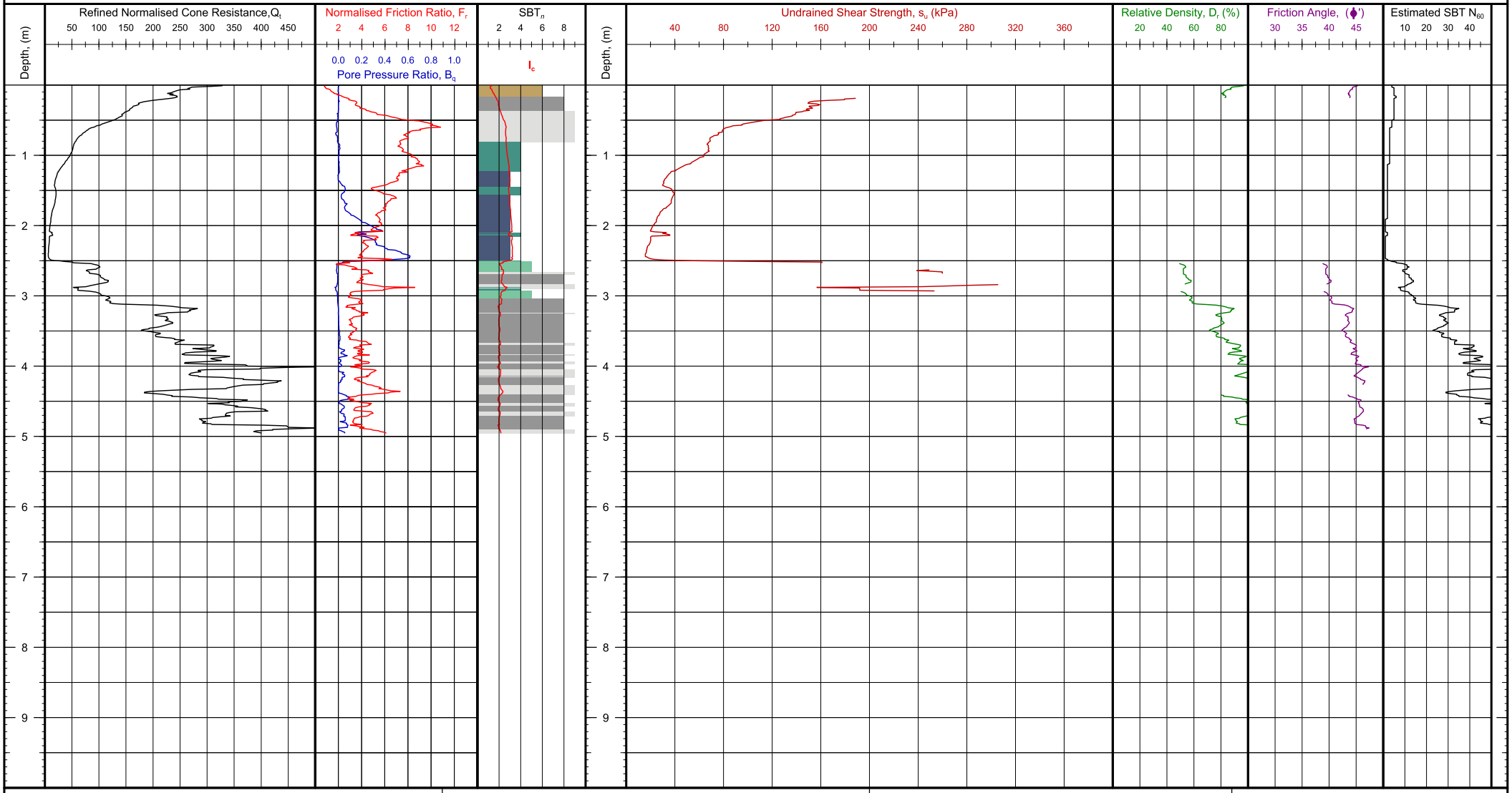
Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

Test Number: **CPT-08**

G.I. Job Ref: 200824

CPT PARAMETER LOG



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing Project

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

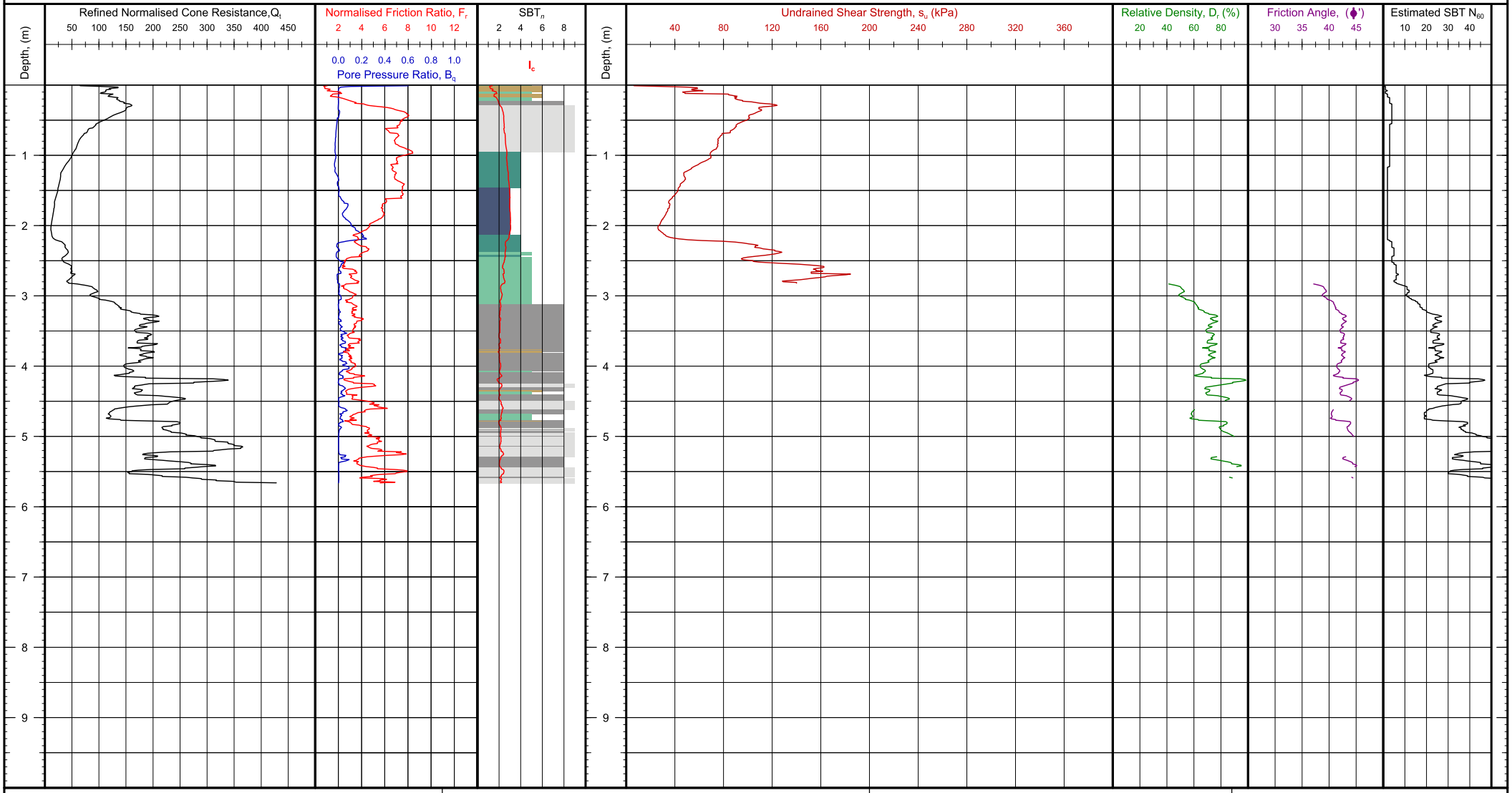
Test Number: CPT-111

G.I. Job Ref: 200824

CPT PARAMETER LOG

Tonkin+Taylor

GROUND INVESTIGATION



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing Project

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

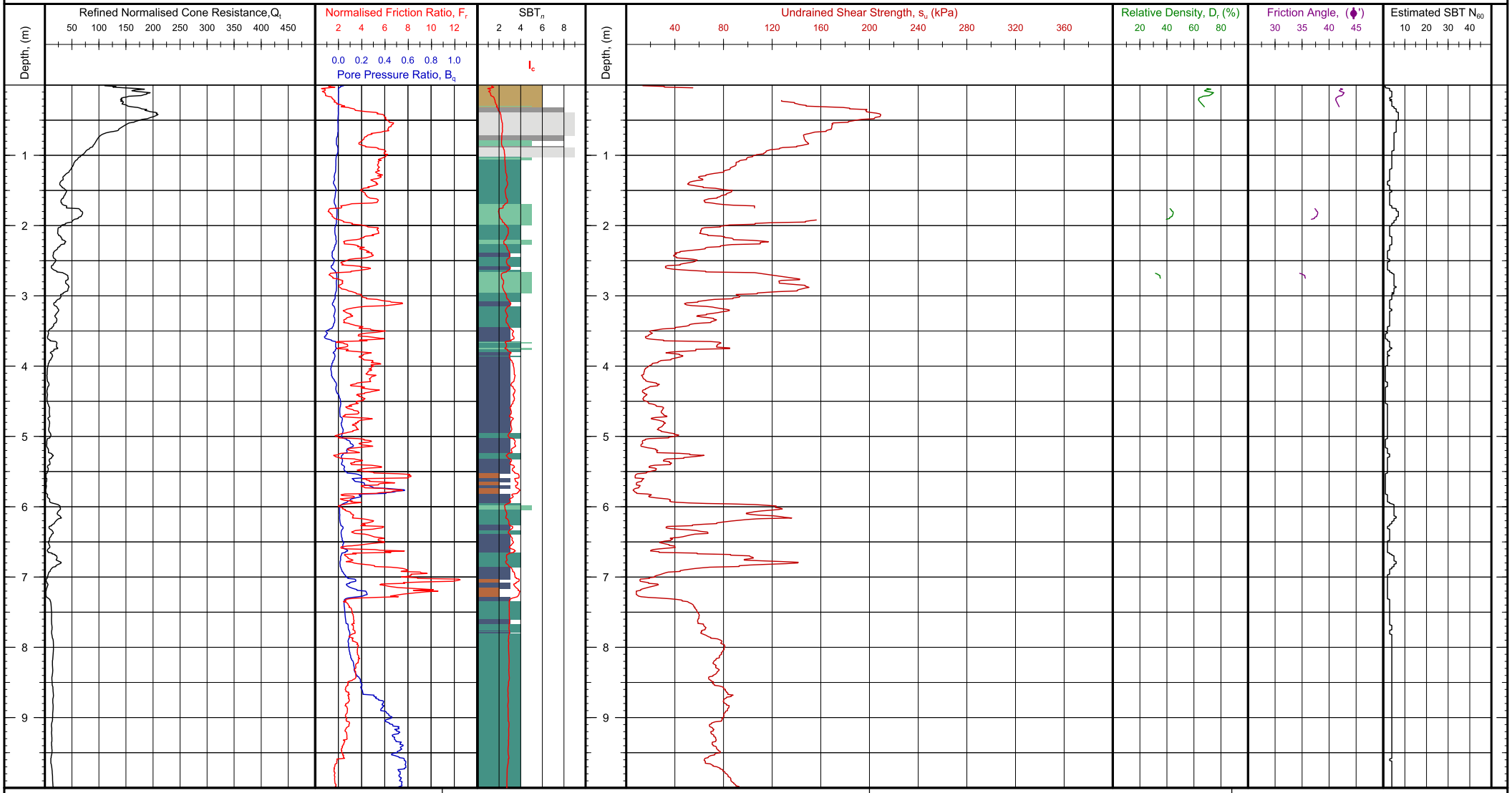
Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

Test Number: **CPT-112**

G.I. Job Ref: 200824

CPT PARAMETER LOG



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing

Location: Project Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

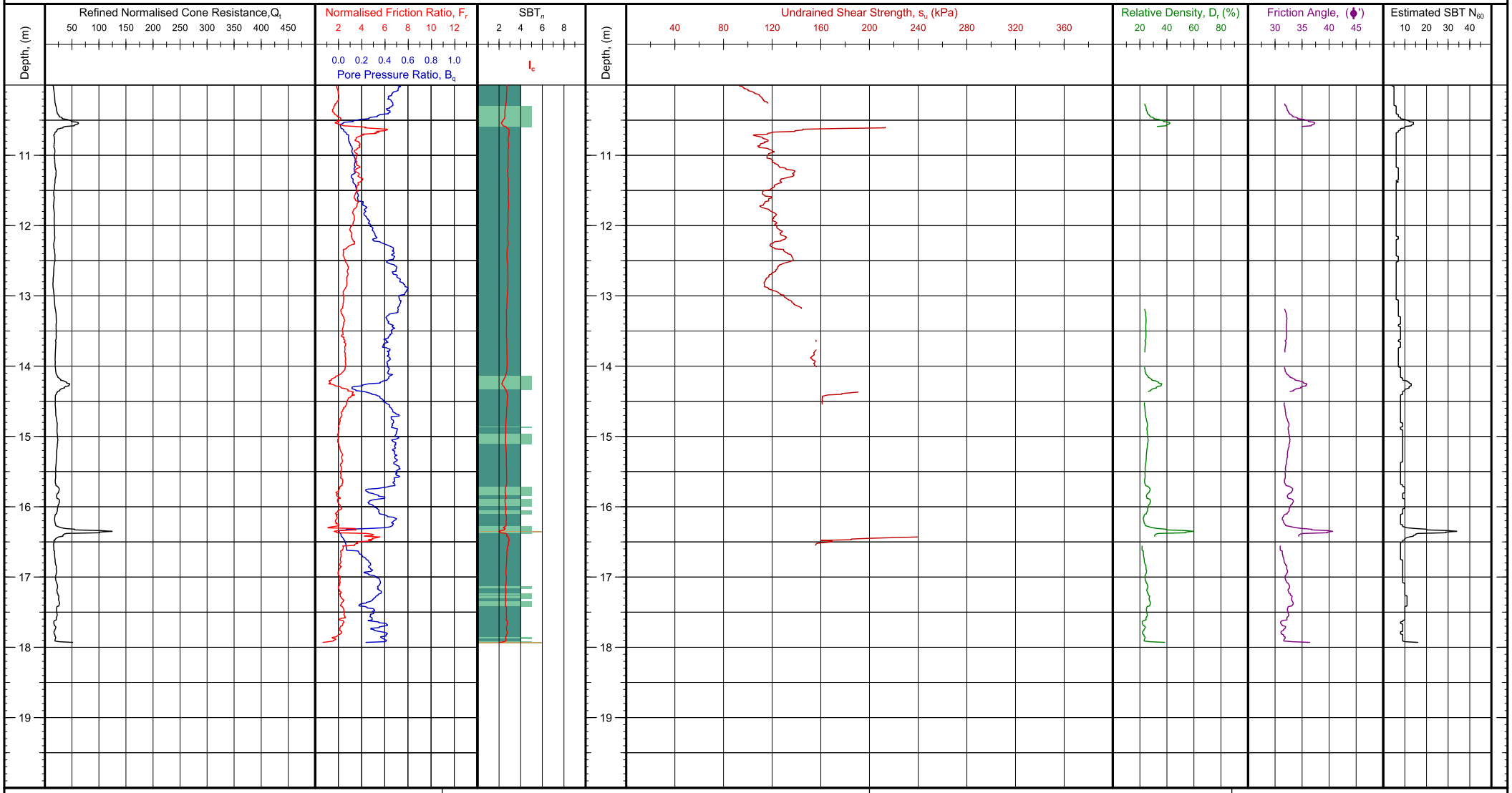
Test Number: CPT-117

G.I. Job Ref: 200824

CPT PARAMETER LOG

Tonkin+Taylor

GROUND INVESTIGATION



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing Project

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

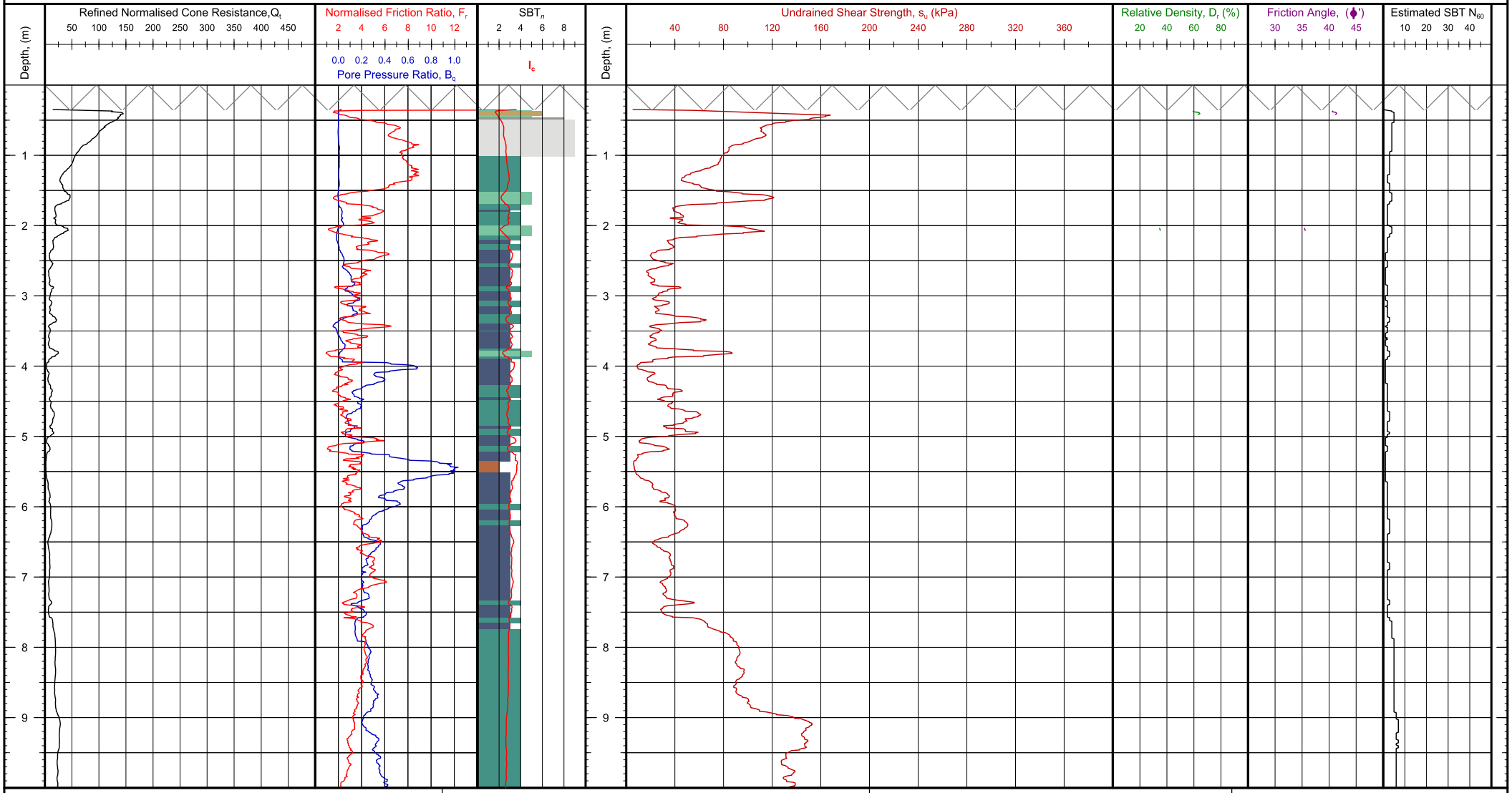
Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

Test Number: **CPT-117**

G.I. Job Ref: 200824

CPT PARAMETER LOG



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing Project

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

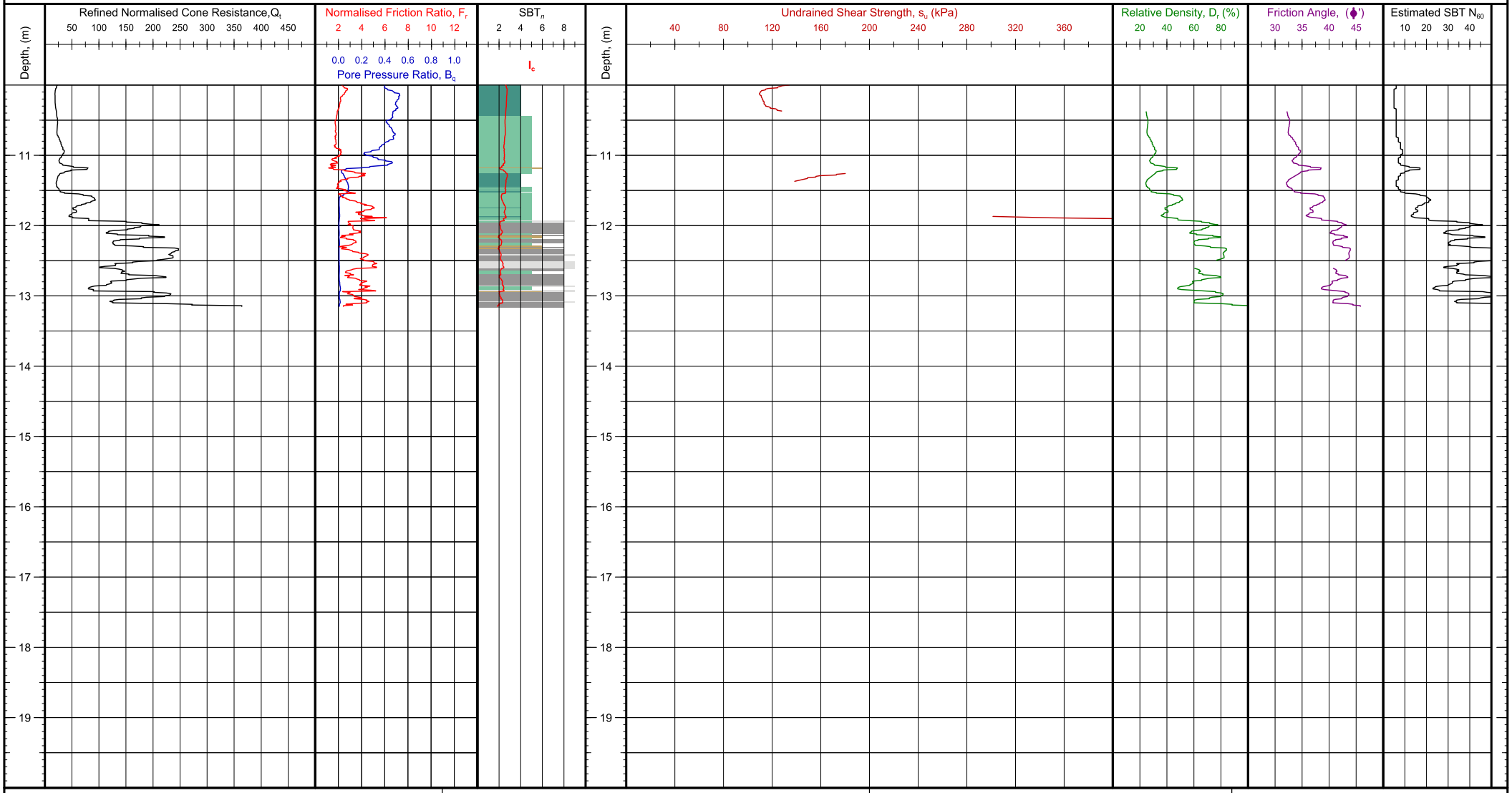
Test Number: CPT-121

G.I. Job Ref: 200824

CPT PARAMETER LOG

Tonkin+Taylor

GROUND INVESTIGATION



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing Project

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

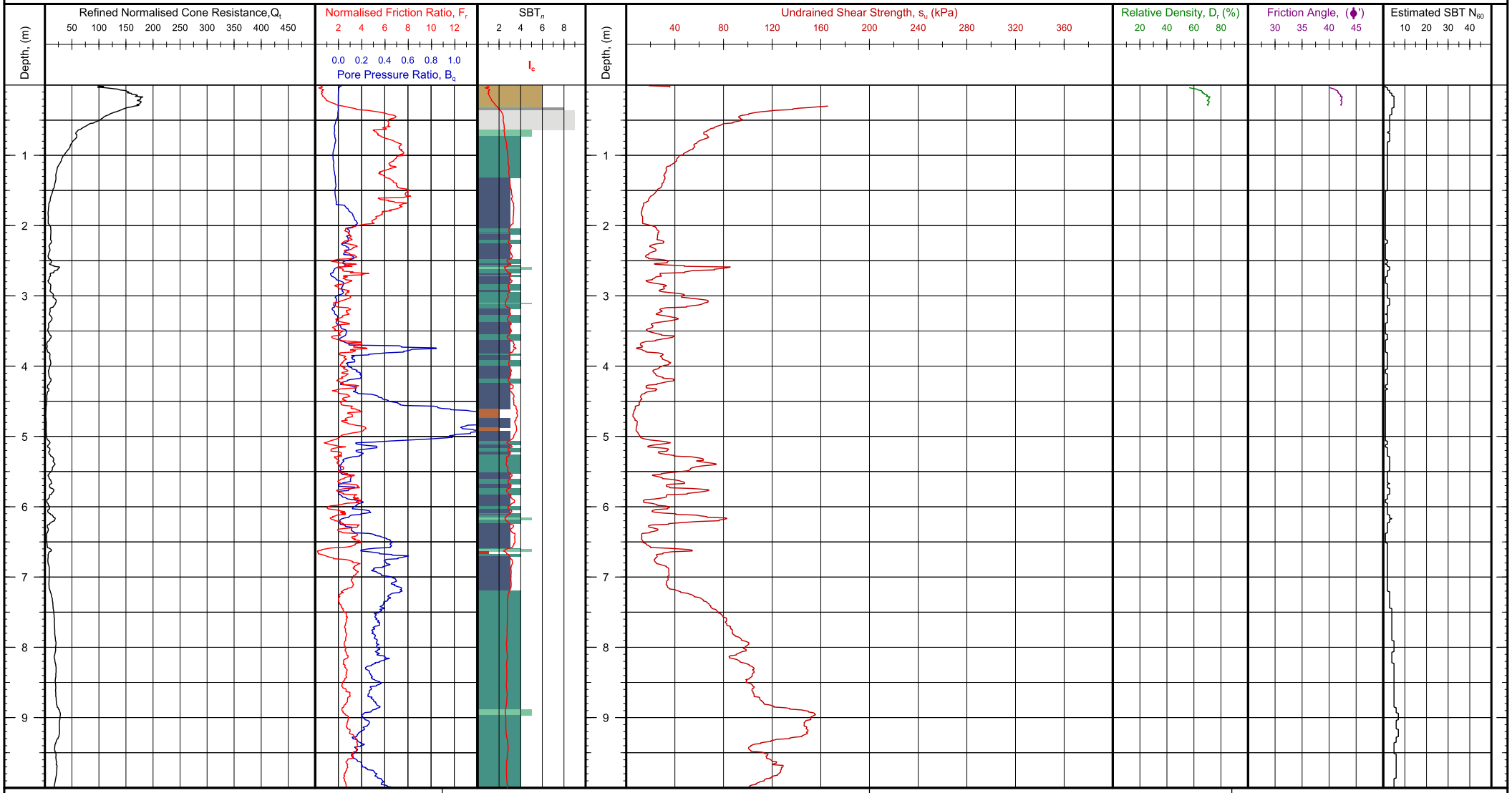
Test Number: **CPT-121**

G.I. Job Ref: 200824

CPT PARAMETER LOG

Tonkin+Taylor

GROUND INVESTIGATION



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing

Project **Location:** Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0 Undefined	5 Sand mixtures: silty sand to sandy silt
1 Sensitive fine grained	6 Sands: clean sands to silty sands
2 Organic: Organic clay/silt, peat	7 Dense sand to gravelly sand
3 Clay: clay to silty clay	8 Stiff sand to clayey sand
4 Silt mixtures: clayey silt & silty clay	9 Stiff silt/clay

Notes and Limitations:

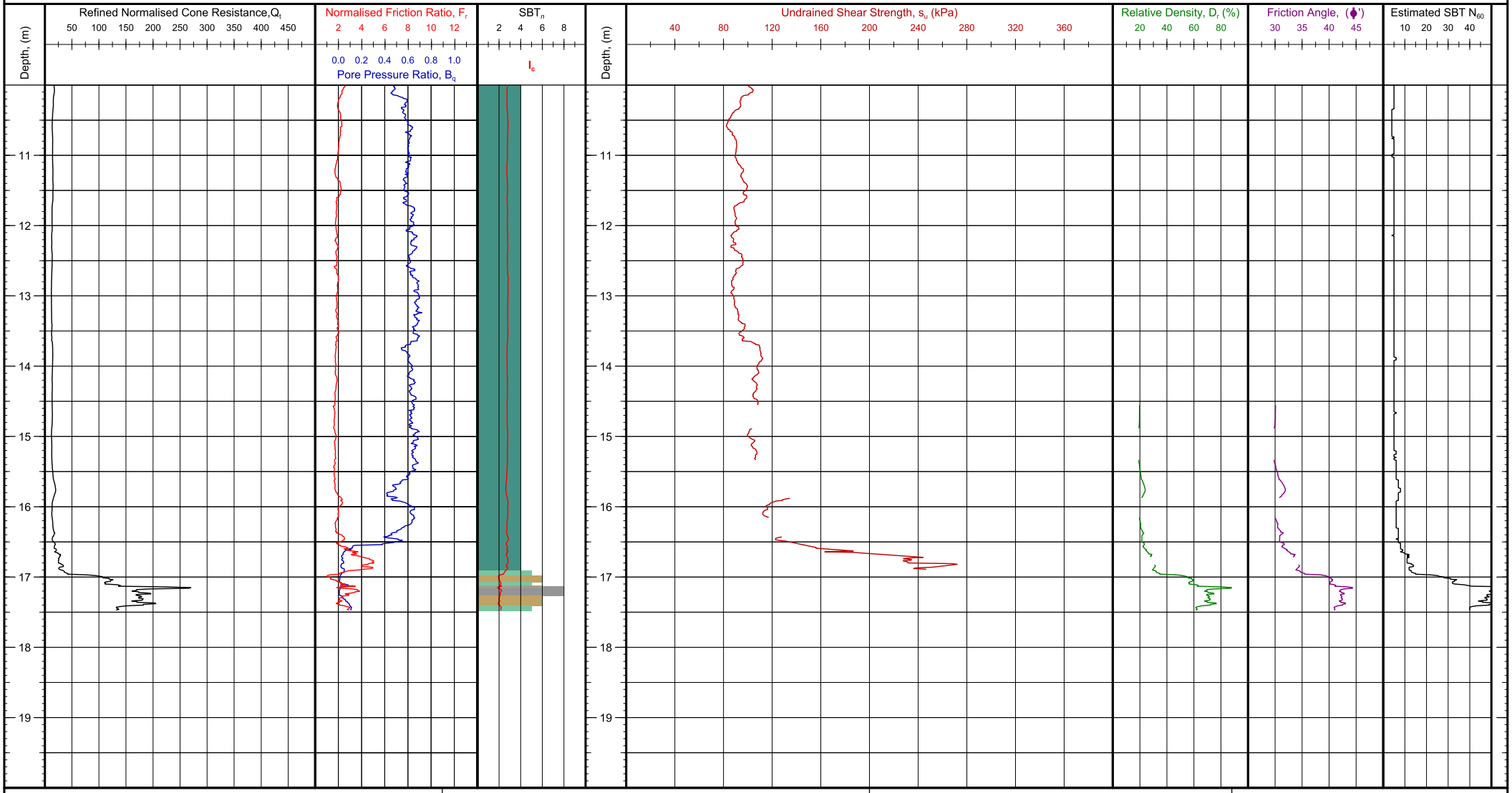
Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

Test Number: **CPT-126**

G.I. Job Ref: 200824

CPT PARAMETER LOG



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing Project

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

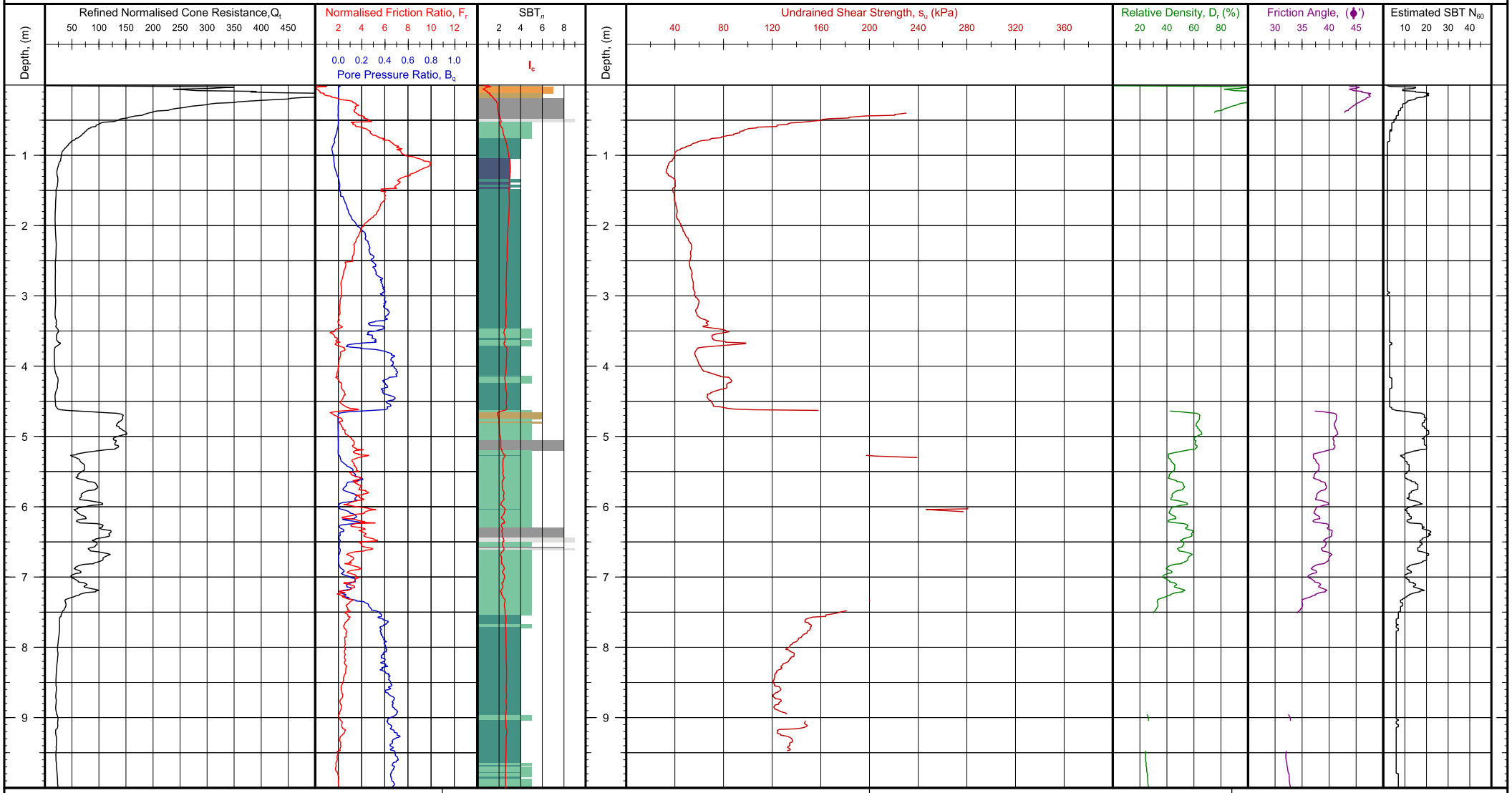
Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

Test Number: **CPT-126**

G.I. Job Ref: 200824

CPT PARAMETER LOG



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing Project

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

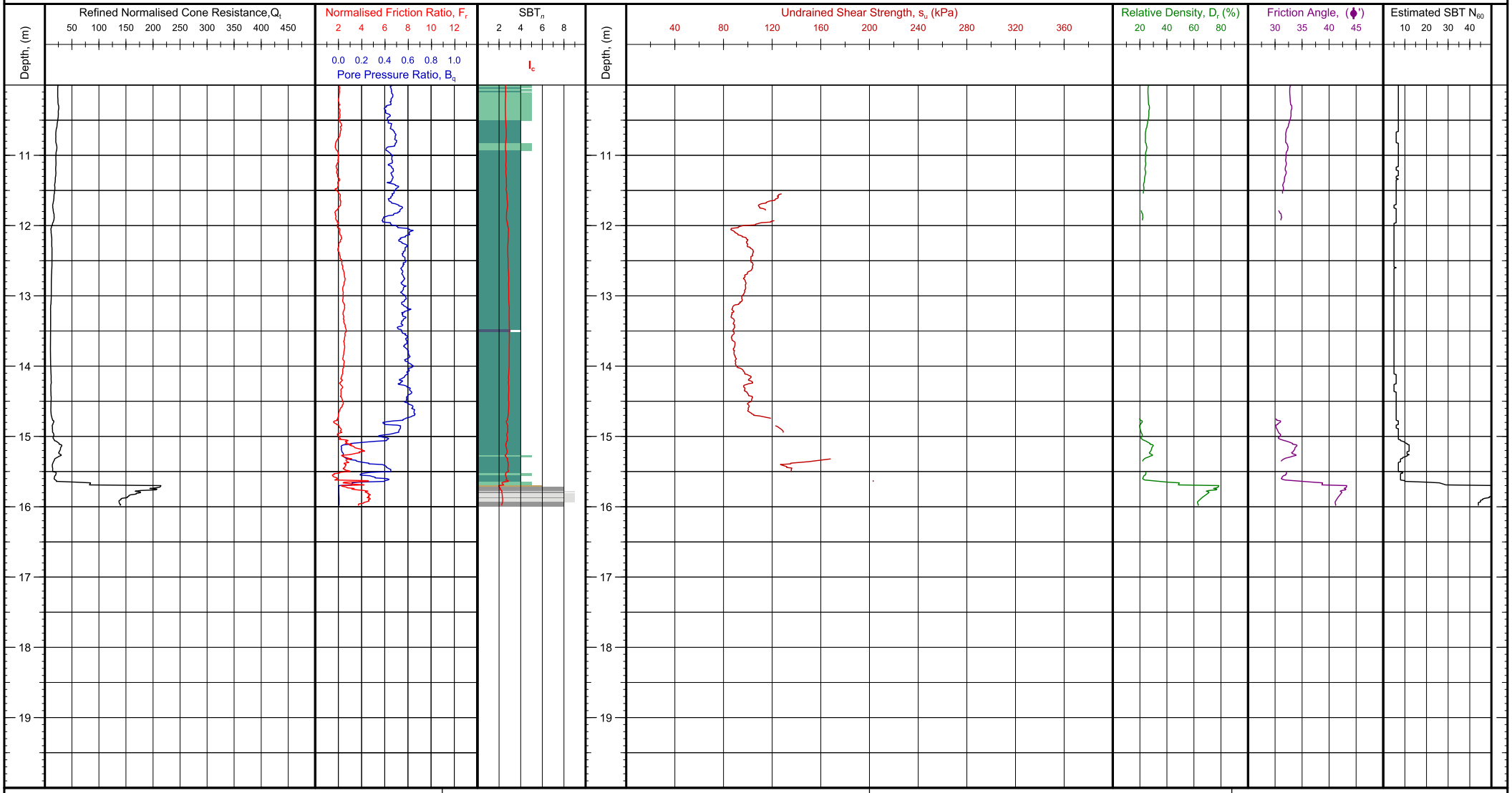
Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

Test Number: **CPT-128**

G.I. Job Ref: 200824

CPT PARAMETER LOG



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing Project

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

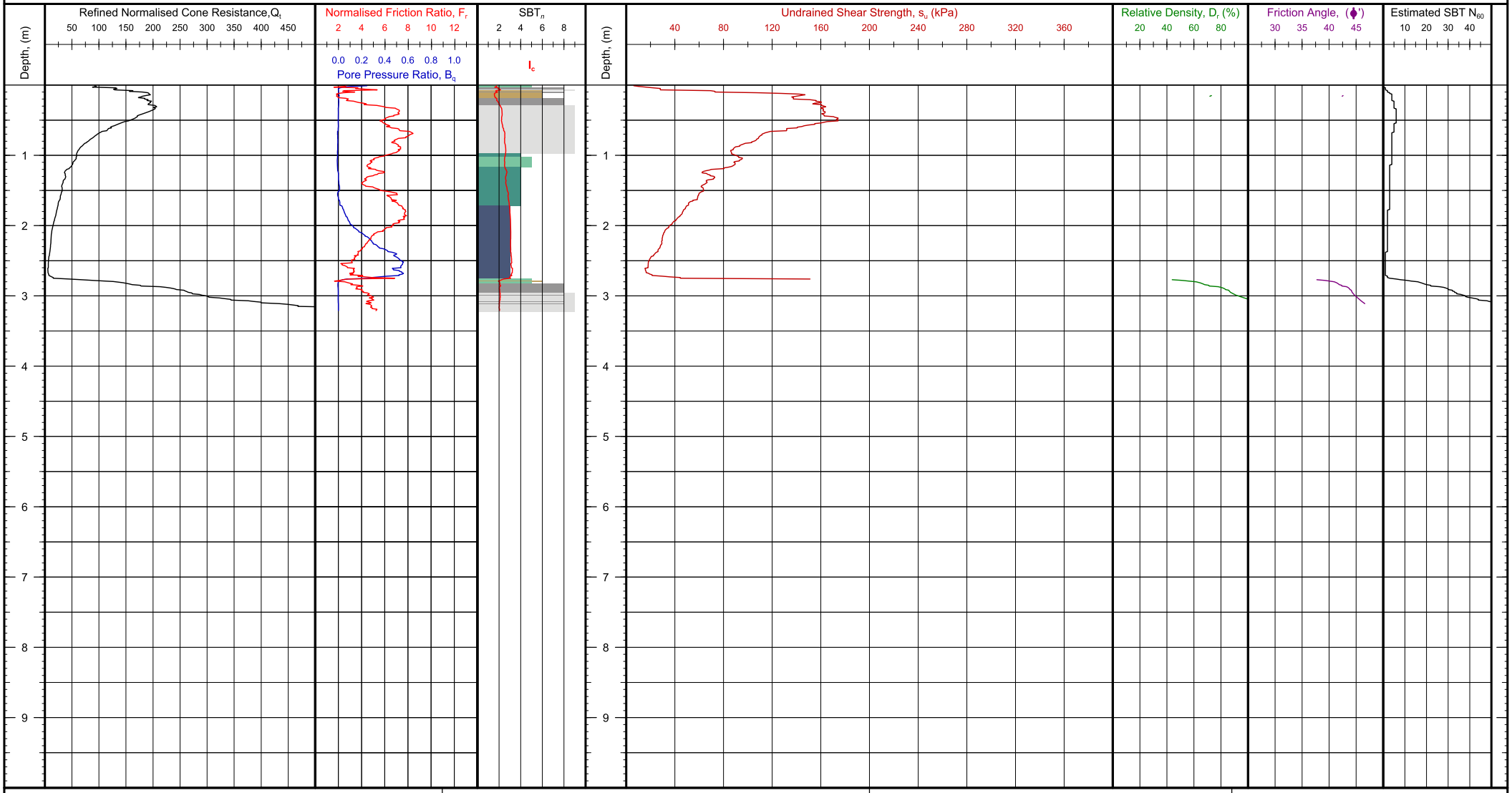
Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

Test Number: **CPT-128**

G.I. Job Ref: 200824

CPT PARAMETER LOG



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing

Project **Location:** Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

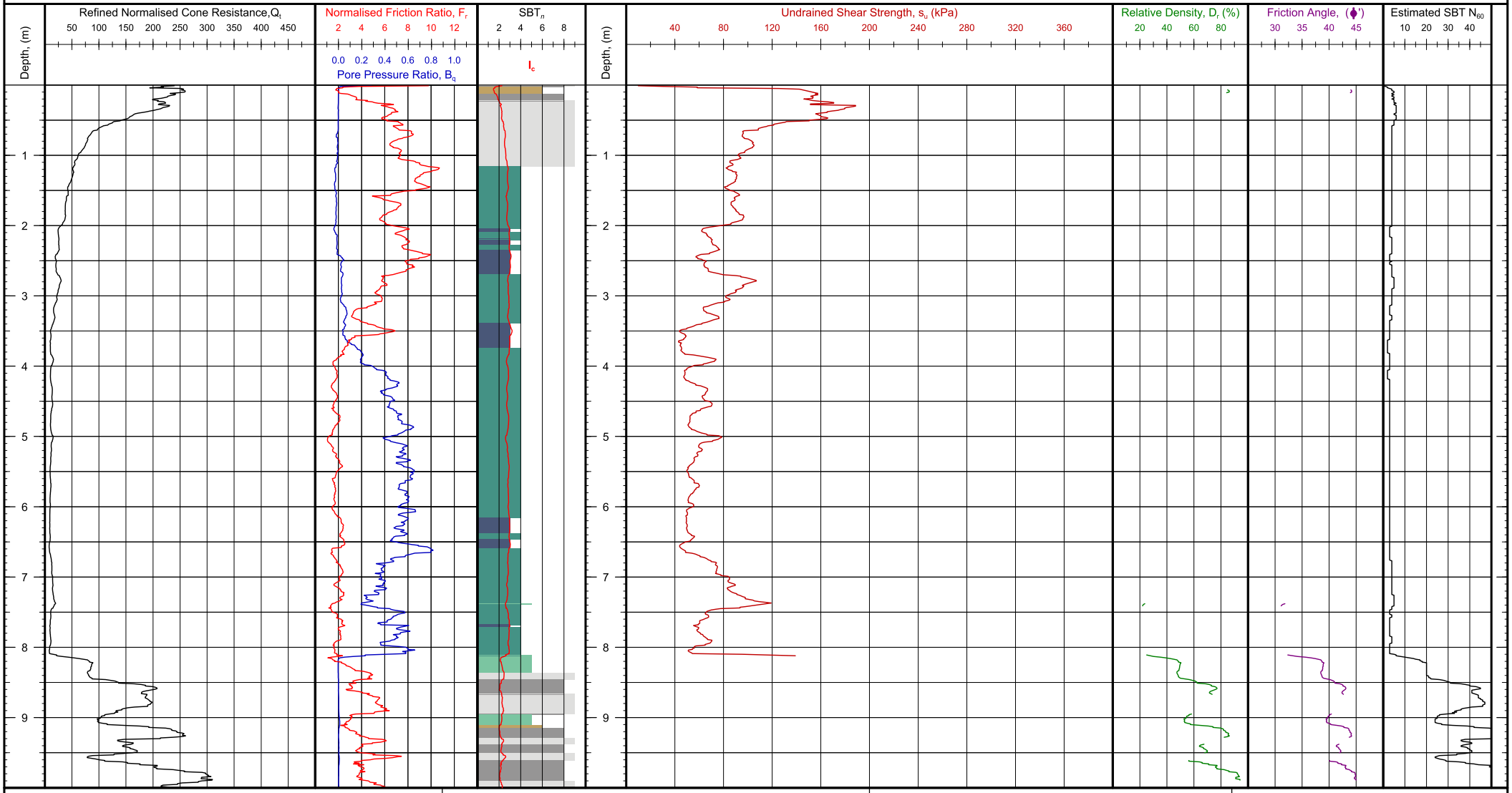
Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

Test Number: **CPT-129**

G.I. Job Ref: 200824

CPT PARAMETER LOG



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing Project

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

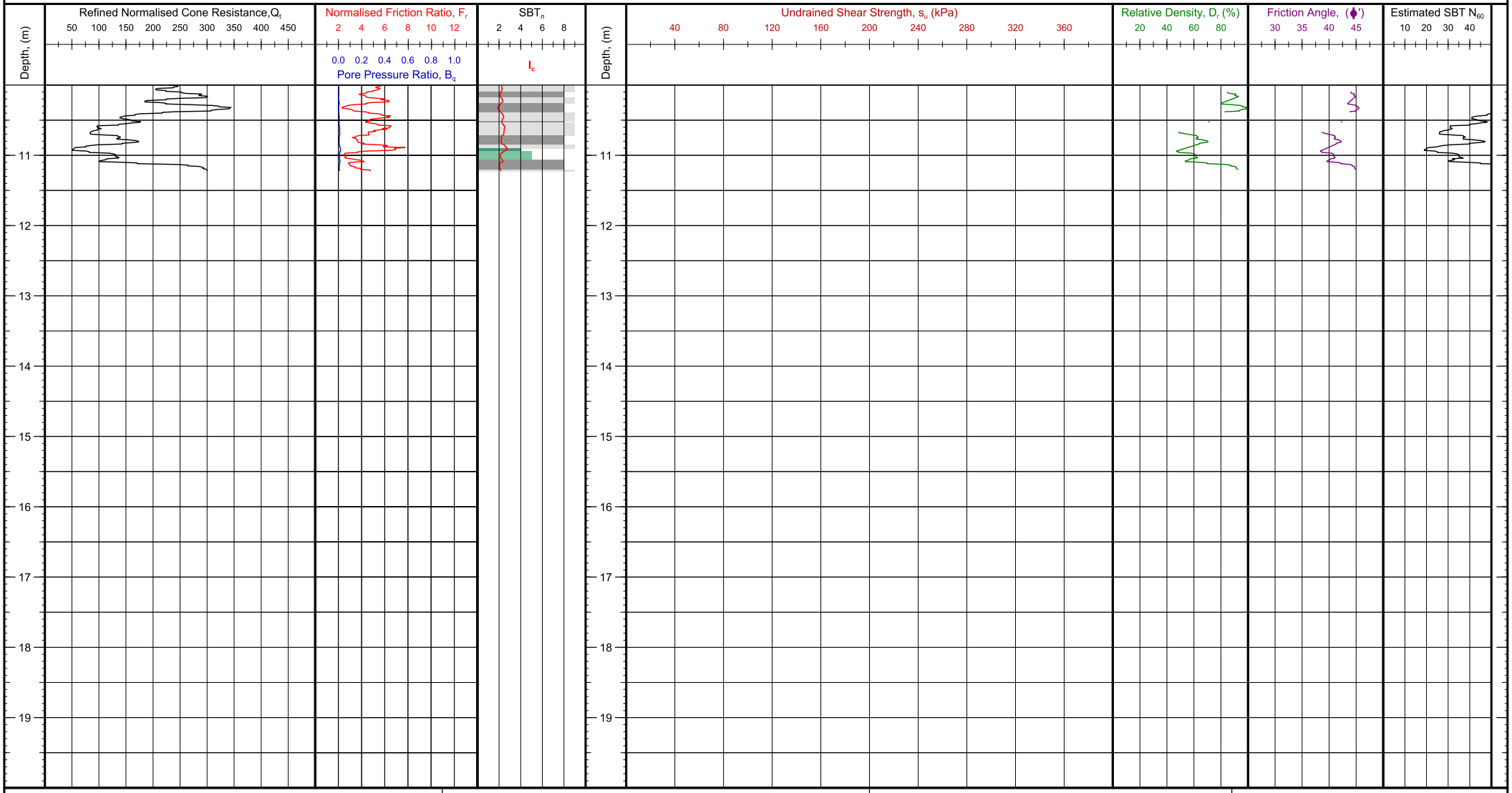
Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

Test Number: **CPT-131**

G.I. Job Ref: 200824

CPT PARAMETER LOG



Client: Tonkin + Taylor

Project: Whenuapai-Redhills Wastewater Servicing

Location: Trig Road to Tamiro Road, Auckland

Engineer: Benjamin Westgate

Contractor: Ground Investigation Ltd

Soil Behaviour Type SBT_n - Robertson et al. 1990

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine grained	6	Sands: clean sands to silty sands
2	Organic: Organic clay/silt, peat	7	Dense sand to gravelly sand
3	Clay: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff silt/clay

Notes and Limitations:

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P.K. Robertson and K.L. Cabel (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed by the user. Ground Investigation Ltd. does not warrant the correctness or applicability of any of the geotechnical soil and design parameter shown and does not assume any liability for any use of the results in any design or review. The used should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

Client Reference:

Test Number: **CPT-131**

G.I. Job Ref: 200824

Tonkin+Taylor

CPT ZEROS AND DRIFT

GROUND INVESTIGATION

G.I. Job Ref: 200824

Cone Reference	CPT Name	Push Number	Tip Resistance			Local Friction			Pore Pressure		
			Initial (MPa)	Final (MPa)	Difference (kPa)	Initial (MPa)	Final (MPa)	Difference (kPa)	Initial (MPa)	Final (MPa)	Difference (kPa)
MKJ325	CPT-02	1	24.048	23.931	-117.3	0.2954	0.2954	0.0	2.7970	2.7994	2.4
MKJ309	CPT-03	1	9.804	9.762	-41.7	0.1323	0.1322	-0.1	1.4208	1.4215	0.7
MKJ325	CPT-04	1	24.091	24.027	-64.0	0.2951	0.2955	0.4	2.8024	2.8040	1.6
MKJ309	CPT-05	1	9.835	9.736	-99.0	0.1337	0.1324	-1.3	1.4195	1.4218	2.3
MKJ333	CPT-06	1	9.470	9.470	0.0	0.1200	0.1207	0.7	0.9416	0.9423	0.7
MKJ333	CPT-07	1	9.470	9.470	0.0	0.1215	0.1205	-1.0	0.9407	0.9426	1.9
MKJ539	CPT-08	1	20.626	20.611	-15.5	0.2498	0.2498	0.0	2.8176	2.8176	0.0
MKJ309	CPT-111	1	9.820	9.814	-5.3	0.1330	0.1331	0.1	1.4205	1.4213	0.8
MKJ325	CPT-112	1	23.995	23.974	-21.3	0.2940	0.2948	0.8	2.7981	2.7988	0.7
MKJ325	CPT-117	1	24.144	24.006	-138.6	0.2954	0.2952	-0.2	2.8047	2.8083	3.6
MKJ309	CPT-121	1	9.830	9.741	-88.6	0.1343	0.1315	-2.8	1.4169	1.4194	2.5
MKJ325	CPT-126	1	24.123	23.984	-138.6	0.2956	0.2954	-0.2	2.8048	2.8069	2.1
MKJ325	CPT-128	1	24.064	24.022	-42.6	0.2947	0.2951	0.4	2.8065	2.8067	0.2
MKJ309	CPT-129	1	9.783	9.773	-10.5	0.1315	0.1318	0.3	1.4210	1.4219	0.9

Client: Tonkin + Taylor
Project: Whenuapai-Redhills Wastewater Servicing Project

Location: Trig Road to Tamiro Road, Auckland
Engineer: Benjamin Westgate

Note: Zero difference colour-coded based on application classes following ISO 22476-1:2012. Blue indicates Class 1, green Class 2, orange Class 3 and red Class 4. Grey represents if a test is below Class 4.

CPT ZEROS AND DRIFT

G.I. Job Ref: 200824

Cone Reference	CPT Name	Push Number	Tip Resistance			Local Friction			Pore Pressure		
			Initial (MPa)	Final (MPa)	Difference (kPa)	Initial (MPa)	Final (MPa)	Difference (kPa)	Initial (MPa)	Final (MPa)	Difference (kPa)
MKJ309	CPT-131	1	9.866	9.767	-99.1	0.1340	0.1322	-1.8	1.4200	1.4219	1.9

Client: Tonkin + Taylor
Project: Whenuapai-Redhills Wastewater Servicing Project

Location: Trig Road to Tamiro Road, Auckland
Engineer: Benjamin Westgate

Note: Zero difference colour-coded based on application classes following ISO 22476-1:2012. Blue indicates Class 1, green Class 2, orange Class 3 and red Class 4. Grey represents if a test is below Class 4.

Appendix E: Hand Auger Logs

HAND AUGER LOG

HOLE Id: **ENVR-HA03**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5925787.00 mN 1744024.40 mE	DRILL TYPE: 50 mm HA	HOLE STARTED: 10/11/2020
	DRILL METHOD: HA	HOLE FINISHED: 10/11/2020
R.L.: 36.70m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: RVDK CHECKED: CBM

GEOLOGICAL

ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Tauranga Group Box 1, 0.0-1.0m					ENVR-HA03 -0.0-0.1 @ 0.00m ENVR-HA03 -0.5 @ 0.50m ENVR-HA03 -1.0 @ 0.90m		36 35 34 33 32	0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5					Clayey SILT; dark brown trace orange mottle. Very stiff, moist, non-plastic. 0.5m: PID=0.0PPM SILT; grey. Very stiff, dry. Silty CLAY; grey. Very stiff, moist, medium plasticity. 1.0m: PID=0.0PPM 1m: Target depth

COMMENTS:

Hole Depth 1m

Scale 1:25

Rev.: A

CORE PHOTOS

BOREHOLE No.: **ENVR-HA03**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5925787.00 mN 1744024.40 mE	DRILL TYPE: 50 mm HA DRILL METHOD: HA	HOLE STARTED: 10/11/2020 HOLE FINISHED: 10/11/2020 DRILLED BY: Tonkin + Taylor Ltd
R.L.:	36.70m		
DATUM:	NZVD2016		LOGGED BY: RVDK CHECKED: CBM

0.00-1.00m

HAND AUGER LOG

HOLE Id: **ENVR-HA04**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5925759.80 mN 1744104.70 mE	DRILL TYPE: 50 mm HA	HOLE STARTED: 10/11/2020
	DRILL METHOD: HA	HOLE FINISHED: 10/11/2020
R.L.: 39.50m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: RVDK CHECKED: CBM

GEOLOGICAL													ENGINEERING DESCRIPTION
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Tauranga Group Box 1, 0.0-1.0m					ENVR-HA04 -0.0-0.1m @ 0.00m ENVR-HA04 -0.5 @ 0.50m ENVR-HA04 -1.0 @ 0.90m		39 38 37 36 35	0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5					SILT, some organics; dark brown. Very stiff, moist, non-plastic; organics, rootlets. Clayey SILT, trace sand; greyish brown. Very stiff, moist, non-plastic. 0.5m: PID=0.0PPM Clayey SILT; dark brown minor black mottle. Very stiff, moist, non-plastic. 1.0m: PID=0.0PPM 1m: Target depth

COMMENTS:

Hole Depth 1m

Scale 1:25

Rev.: A

CORE PHOTOS

BOREHOLE No.: **ENVR-HA04**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5925759.80 mN 1744104.70 mE R.L.: 39.50m DATUM: NZVD2016	DRILL TYPE: 50 mm HA DRILL METHOD: HA	HOLE STARTED: 10/11/2020 HOLE FINISHED: 10/11/2020 DRILLED BY: Tonkin + Taylor Ltd LOGGED BY: RVDK CHECKED: CBM

0.00-1.00m

HAND AUGER LOG

HOLE Id: **ENVR-HA05**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5925739.90 mN 1744151.80 mE	DRILL TYPE: 50 mm HA	HOLE STARTED: 10/11/2020
	DRILL METHOD: HA	HOLE FINISHED: 10/11/2020
R.L.: 41.00m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: RVDK CHECKED: CBM

GEOLOGICAL												ENGINEERING DESCRIPTION
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Tauranga Group Box 1, 0.0-1.0m					ENVR-HA05 -0.0-0.1m @ 0.00m ENVR-HA05 -0.5 @ 0.50m ENVR-HA05 -1.0 @ 0.90m		40 39 38 37	0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5					Clayey SILT; dark brown. Very stiff, moist, non-plastic. SILT, trace sand; light grey. Very stiff, moist, non-plastic. 0.5m: PID=0.0PPM Clayey SILT; dark brown minor black mottle. Very stiff, moist, non-plastic. 1.0m: PID=0.0PPM 1m: Target depth

COMMENTS:

Hole Depth 1m

Scale 1:25

Rev.: A

HandAugerLog - 21/12/2020 10:17:34 AM - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **ENVR-HA05**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5925739.90 mN (NZTM2000) 1744151.80 mE R.L.: 41.00m DATUM: NZVD2016	DRILL TYPE: 50 mm HA DRILL METHOD: HA	HOLE STARTED: 10/11/2020 HOLE FINISHED: 10/11/2020 DRILLED BY: Tonkin + Taylor Ltd LOGGED BY: RVDK CHECKED: CBM

0.00-1.00m

HAND AUGER LOG

HOLE Id: **ENVR-HA101**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926989.60 mN 1743340.30 mE	DRILL TYPE: 50 mm HA	HOLE STARTED: 04/11/2020
		DRILL METHOD: HA	HOLE FINISHED: 04/11/2020
R.L.:	12.80m		DRILLED BY: Tonkin + Taylor Ltd
DATUM:	NZVD2016		LOGGED BY: RVDK CHECKED: CBM

GEOLOGICAL										ENGINEERING DESCRIPTION				
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Tauranga Group Box 1, 0.0-2.0m	04/11/2020				ENVR-HA 101-0.0-0.1m @ 0.00m ENVR-HA 101-0.5-0.6m @ 0.50m ENVR-HA 101-1.6-1.8m @ 1.60m		12 11 10 9 8	0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5					Clayey SILT; greyish brown. Stiff, dry, non-plastic. Clayey SILT; brown, minor black streaking. Stiff, dry, low plasticity. 0.5m: PID= 0.0ppm Clayey SILT; brownish grey with orange mottle. Stiff, moist, medium plasticity. 1.0m: PID= 0.0ppm SILT, trace sand; light greyish brown with orange mottle. Stiff, moist, non-plastic. 2m: Target depth

COMMENTS:

Hole Depth 2m

Scale 1:25

Rev.: A

CORE PHOTOS

BOREHOLE No.: **ENVR-HA101**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5926989.60 mN (NZTM2000) 1743340.30 mE R.L.: 12.80m DATUM: NZVD2016	DRILL TYPE: 50 mm HA DRILL METHOD: HA	HOLE STARTED: 04/11/2020 HOLE FINISHED: 04/11/2020 DRILLED BY: Tonkin + Taylor Ltd LOGGED BY: RVDK CHECKED: CBM

0.00-2.00m

HAND AUGER LOG

HOLE Id: **HA03**

SHEET: 1 OF 2

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926343.50 mN 1743214.30 mE	DRILL TYPE: 75 and 50 mm Hand auger	HOLE STARTED: 02/12/2020
		DRILL METHOD: HA+DCP	HOLE FINISHED: 02/12/2020
R.L.:	19.40m		DRILLED BY: GEOTECHNICS
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: CBM

GEOLOGICAL													ENGINEERING DESCRIPTION
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Topsoil					asb/gl/split @ 0.00m		19	0	TS	M			SILT; brown. Moist, non-plastic.
					● 186/56 kPa						VSt		SILT; friable. Very stiff, moist, non-plastic.
					asb/gl @ 0.40m PID, 0.0ppm @ 0.50m			0.5					Silty CLAY; light greyish white mottled orange brown. Very stiff, moist, high plasticity.
					● 121/48 kPa								0.5m: mottled yellowish brown
					● 180/77 kPa			1.0					
					asb/gl @ 0.90m PID, 0.0ppm								
					● 171/48 kPa		18						
					● 104/54 kPa			1.5					
					att/psd @ 1.45m								
					● 114/60 kPa								
					asb/gl @ 1.90m			2.0					
					● 162/77 kPa								2.1m: light greyish white, low plasticity
					● 122/66 kPa		17	2.5					
Tauranga Group					● 119/72 kPa								
					asb/gl @ 2.80m								
					● 175/74 kPa			3.0					Sandy SILT; light whitish grey. Moist to wet, non-plastic.
					● 122/85 kPa						St-VSt		SILT; light greyish white mottled yellowish brown. Very stiff, moist, non-plastic.
					att/psd @ 3.45m		16						Clayey SILT; light whitish grey mottled yellowish brown and brown. Very stiff to stiff, moist, low plasticity.
					● 186/85 kPa			3.5					
					● 122/82 kPa								3.7m: Light brown with black mottles. Medium plasticity.
					asb/gl @ 3.80m			4.0					
					● 123/77 kPa								
					● 147/101 kPa		15	4.5					
					● 96/32 kPa								4.7m: Dark brown, organic stained.
					asb/gl @						St		Peaty clayey SILT; black. Stiff, moist, low

COMMENTS: Farmland end Spedding Rd

Hole Depth 6.45m

Scale 1:25

Rev.: A

HAND AUGER LOG

HOLE Id: **HA03**

SHEET: 2 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5926343.50 mN 1743214.30 mE	DRILL TYPE: 75 and 50 mm Hand auger	HOLE STARTED: 02/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 02/12/2020
R.L.: 19.40m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Box 1, 0.0-5.2m Tauranga Group	trace water			1 2 1 2 2 2 2 2 3 3 6 7 9 10 6 7 6 7 9 9 10 10 10 11	4.80m ● 104/21 kPa		14 13 12 11 10	5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5		M	VSt		plasticity. Organic clayey SILT; dark brown. Very stiff, moist, medium plasticity; organics, amorphous. End of handauger 5.2m. Scala (blows per 100mm): 3,3,4,4,6,13,19,13 13,18,20,21 Organic clayey silt, dark brown, adhering to lowest rod on withdrawal 6.45m: Refusal

COMMENTS: Farmland end Spedding Rd

Hole Depth 6.45m

Scale 1:25

Rev.: A

CORE PHOTOS

BOREHOLE No.: **HA03**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5926343.50 mN (NZTM2000) 1743214.30 mE R.L.: 19.40m DATUM: NZVD2016	DRILL TYPE: 75 and 50 mm Hand auger DRILL METHOD: HA+DCP	HOLE STARTED: 02/12/2020 HOLE FINISHED: 02/12/2020 DRILLED BY: GEOTECHNICS LOGGED BY: RBE CHECKED: CBM

0.00-5.20m

HAND AUGER LOG

HOLE Id: **HA04**

SHEET: 1 OF 2

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926082.10 mN 1743388.90 mE	DRILL TYPE: 75 and 50 mm Hand auger	HOLE STARTED: 02/12/2020
		DRILL METHOD: HA+DCP	HOLE FINISHED: 02/12/2020
R.L.:	21.20m		DRILLED BY: GEOTECHNICS
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm)	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Observations
Topsoil					asb/gI/dupB @ 0.00m		21	0	TS	M	St		SILT; dark brown. Stiff, moist, non-plastic; inclusion of agricultural plastic sheet.
					● >186 kPa asb/gI @ 0.40m						VSt		Sandy SILT; light whitish brown. Very stiff, moist, non-plastic.
					PID, 0.0ppm @ 0.50m ● 179/50 kPa			0.5			St-VSt		Silty CLAY; light greyish white mottled yellowish brown. Very stiff to stiff, moist, high plasticity.
					● 159/61 kPa asb/gI @ 0.90m PID, 0.1ppm @ 1.00m			1.0					1.0m: light grey mottled yellowish brown
					● 122/54 kPa		20						
					● 109/44 kPa att/psd @ 1.45m			1.5					1.8m: some sand, light brownish white
					● 90/35 kPa asb/gI @ 1.90m			2.0					
					● 127/46 kPa		19				VSt		Clayey SILT; light brown. Very stiff, moist, low plasticity.
	02/12/2020 W/L +2hrs				att/psd @ 2.45m			2.5		M-W			Silty SAND; white. Moist to wet; sand, fine to medium; well packed.
Tauranga Group				6 7 11 11 11 11 10 10 9 9	asb/gI @ 2.80m								2.5m: Scala (blows per 100mm): 13,22,22,20,18
	02/12/2020							3.0					3.0m: light brown
				2 3 3 3 4 4			18			M	St		SILT; light brown. Stiff, moist, non-plastic; Scala (blows per 100mm): 5,6,8.
													Clayey SILT; grey. Stiff, moist, low plasticity.
					● 97/45 kPa asb/gI @ 3.80m			3.5					
					● 90/32 kPa			4.0		W			Silty SAND; greyish brown. Wet; sand, fine to medium.
					● 101/28 kPa		17			M	VSt		SILT; brown and grey. Very stiff, moist, non-plastic.
					● 159/32 kPa			4.5					4.4m: abundant organics and inclusions of decomposed wood
					● 117/33 kPa asb/gI @								Clayey SILT; light grey. Very stiff, moist, low plasticity.

COMMENTS: Farmland end Spedding Rd

Hole Depth 6.85m

Scale 1:25

Rev.: A

HAND AUGER LOG

HOLE Id: **HA04**

SHEET: 2 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5926082.10 mN 1743388.90 mE	DRILL TYPE: 75 and 50 mm Hand auger	HOLE STARTED: 02/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 02/12/2020
R.L.: 21.20m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: CBM

GEOLOGICAL											ENGINEERING DESCRIPTION
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Box 1, 0.0-5.2m Tauranga Group					4.80m ● 117/42 kPa		16 15 14 13 12	5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5					[CONT] Clayey SILT; light grey. Very stiff, moist, low plasticity. 5.15m: brown with some organics End of handauger 5.2m. Scala (blows per 100mm): 3,4,5,6,7,8,11,12,11,12, 14,15,16,16,21,24 6.85m: Refusal

COMMENTS: Farmland end Spedding Rd

Hole Depth 6.85m

Scale 1:25

Rev.: A

CORE PHOTOS

BOREHOLE No.: **HA04**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5926082.10 mN (NZTM2000) 1743388.90 mE R.L.: 21.20m DATUM: NZVD2016	DRILL TYPE: 75 and 50 mm Hand auger DRILL METHOD: HA+DCP	HOLE STARTED: 02/12/2020 HOLE FINISHED: 02/12/2020 DRILLED BY: GEOTECHNICS LOGGED BY: RBE CHECKED: CBM

0.00-5.20m

HAND AUGER LOG

HOLE Id: **HA05**

SHEET: 1 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5925977.70 mN 1743549.70 mE	DRILL TYPE: 75 and 50mm Hand auger	HOLE STARTED: 01/12/2020
R.L.: 27.20m	DRILL METHOD: HA+DCP	HOLE FINISHED: 01/12/2020
DATUM: NZVD2016		DRILLED BY: GEOTECHNICS
		LOGGED BY: RBE CHECKED: CBM

GEOLOGICAL / ENGINEERING DESCRIPTION

Column headings: GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION | WATER | CORE RECOVERY (%) | METHOD | SCALA PENETROMETER (Blows/100mm) 0 2 4 6 8 10 12 14 16 18 | TESTS | SAMPLES | RL (m) | DEPTH (m) | GRAPHIC LOG | MOISTURE CONDITION / WEATHERING | STRENGTH/DENSITY CLASSIFICATION | SHEAR STRENGTH (kPa) 10 25 50 100 200 | Description and Additional Observations

Water: 01/12/2020 W/L on completion (approx. 1.35m); 01/12/2020 (approx. 2.0m)

Geological unit	Depth (m)	Tests	Moisture	Strength	Description
Fill	0.0	asb/gl/split @ 0.00m	M		SILT; dark brown. Moist, non-plastic; inclusions of gravel, black plastic twine.
Tauranga Group	0.3	130/32 kPa; asb/gl @ 0.40m; PID, 0.1ppm @ 0.50m; 88/29 kPa; 82/32 kPa; asb/gl @ 0.90m; PID, 0.1ppm @ 1.00m; 108/35 kPa; 80/33 kPa; att/psd @ 1.45m; 96/41 kPa; asb/gl @ 1.90m		St-VSt	Silty CLAY; light grey. Stiff to very stiff, moist, high plasticity. 1.8m: light greyish brown. Low plasticity
	2.0		W	St	Sandy SILT; light greyish brown. Stiff, wet, non-plastic.
	2.2	56/19 kPa; att/psd2 @ 2.45m; 37/20 kPa; asb/gl @ 2.70m	M	F-St	Clayey SILT, trace sand; light brown. Stiff to firm, moist, low plasticity.
	2.9	41/21 kPa; 40/24 kPa; 35/16 kPa; asb/gl @ 3.70m; 35/13 kPa; 35/13 kPa; 41/21 kPa; 45/21 kPa; asb/gl @		F	Silty CLAY; light grey. Firm, moist, high plasticity. 4.0m: brown 4.2m: blackish brown 4.5m: brown
	4.9			St	

RL (m): 27, 26, 25, 24, 23

COMMENTS: Spedding Road

Hole Depth 7.25m

Scale 1:25

Rev.: A

HAND AUGER LOG

HOLE Id: **HA05**

SHEET: 2 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5925977.70 mN 1743549.70 mE	DRILL TYPE: 75 and 50mm Hand auger	HOLE STARTED: 01/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 01/12/2020
R.L.: 27.20m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: CBM

GEOLOGICAL											ENGINEERING DESCRIPTION				
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Box 1, 0.0-5.2m Tauranga Group					4.70m ● 77/31 kPa		22 21 20 19 18	5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5		M	St		Clayey SILT, some organics; light brown. Stiff, moist, medium plasticity; amorphous. End of handauger 5.2m Scala only (blows per 100mm) 1,3,3,3,3,4,4,5 5,5,6,6,6,8,6,6,6,7 6,8 7.25m: Target depth

COMMENTS: Spedding Road

Hole Depth 7.25m

Scale 1:25

Rev.: A

CORE PHOTOS

BOREHOLE No.: **HA05**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5925977.70 mN (NZTM2000) 1743549.70 mE R.L.: 27.20m DATUM: NZVD2016	DRILL TYPE: 75 and 50mm Hand auger DRILL METHOD: HA+DCP	HOLE STARTED: 01/12/2020 HOLE FINISHED: 01/12/2020 DRILLED BY: GEOTECHNICS LOGGED BY: RBE CHECKED: CBM

0.00-5.20m

HAND AUGER LOG

HOLE Id: **HA06**

SHEET: 1 OF 2

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5925924.30 mN 1743672.80 mE	DRILL TYPE: 75 and 50 mm Hand auger	HOLE STARTED: 01/12/2020
		DRILL METHOD: HA+DCP	HOLE FINISHED: 01/12/2020
R.L.:	30.70m		DRILLED BY: GEOTECHNICS
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Tauranga Group	01/12/2020 W/L on completion 01/12/2020				asb/gI/dupA @ 0.00m 157/66 kPa 122/56 kPa asb/gI @ 0.40m PID, 0.2ppm @ 0.50m 106/48 kPa asb/gI @ 0.90m PID, 0.3ppm @ 1.00m 98/44 kPa 119/42 kPa att/psd @ 1.45m 108/73 kPa asb/gI @ 1.90m 141/82 kPa 129/84 kPa 86/66 kPa asb/gI/att/psd @ 2.70m 58/37 kPa 69/37 kPa 61/31 kPa asb/gI @ 3.70m 66/29 kPa 74/21 kPa 64/42 kPa 64/31 kPa asb/gI @		30 29 28 27 26	0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5	TS				SILT; dark brown. Moist, non-plastic; friable. SILT; light yellowish brown. Very stiff, moist, non-plastic. Clayey SILT; yellowish brown. Stiff to very stiff, moist; low to medium plasticity. Silty CLAY; light brownish grey. Very stiff, moist, high plasticity. Clayey SILT; light brown. Stiff to very stiff, moist, medium plasticity. Sandy SILT; grey. Stiff, moist, low plasticity; sand, fine.

COMMENTS: Spedding Road

Hole Depth 7.25m

Scale 1:25

Rev.: A

HAND AUGER LOG

HOLE Id: **HA06**

SHEET: 2 OF 2

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5925924.30 mN 1743672.80 mE	DRILL TYPE: 75 and 50 mm Hand auger	HOLE STARTED: 01/12/2020
		DRILL METHOD: HA+DCP	HOLE FINISHED: 01/12/2020
R.L.:	30.70m		DRILLED BY: GEOTECHNICS
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm)	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Observations
Box 1, 0.0-5.2m Tauranga Group				0 2 4 6 8 10 12 14 16 18	4.70m ● 96/32 kPa		25	5.5				10 25 50 100 200	[CONT] Sandy SILT; grey. Stiff, moist, low plasticity; sand, fine.
				3,4,4,5,6,8,9,9,10,13,11,11,13,14,15,16,16,16,16,17			24	6.0 6.5 7.0					End of hand auger 5.2m. Scala only (blows per 100mm) 3,4,4,5,6,8,9,9 10,13,11,11,13,14,15,16,16,16, 16,17
							23	7.5 8.0					7.25m: Target depth
							22	8.5 9.0					
							21	9.5					

COMMENTS: Spedding Road

Hole Depth 7.25m

Scale 1:25

Rev.: A

Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **HA06**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5925924.30 mN (NZTM2000) 1743672.80 mE R.L.: 30.70m DATUM: NZVD2016	DRILL TYPE: 75 and 50 mm Hand auger DRILL METHOD: HA+DCP	HOLE STARTED: 01/12/2020 HOLE FINISHED: 01/12/2020 DRILLED BY: GEOTECHNICS LOGGED BY: RBE CHECKED: CBM

0.00-5.20m

HAND AUGER LOG

HOLE Id: **HA07**

SHEET: 1 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5925859.50 mN 1743823.00 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 01/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 01/12/2020
R.L.: 32.90m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Topsoil					asb/gl @ 0.10m				TS	M	F		Sandy SILT; dark brown. Firm, moist, low plasticity; sand, fine.
Tauranga Group	01/12/2020	100	HA		85/22 kPa PID, 0.1ppm @ 0.50m asb/gl @ 0.50m att/psd @ 0.80m 82/47 kPa PID, 0.2ppm @ 1.00m asb/gl & att/psd @ 1.00m 69/37 kPa corrosivity @ 1.80m 63/33 kPa asb/gl @ 2.00m corrosivity @ 2.40m 90/47 kPa 87/31 kPa asb/gl @ 3.00m 131/31 kPa >218 kPa asb/gl @ 4.00m UTP UTP		32 31 30 29 28	0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5			St D-VD		Sandy SILT, trace organics; brown, mottled orange. Stiff, moist, low plasticity; sand, fine; organics, rootlets. 0.5m: Light brown, mottled orange. PID test, 0.1ppm. Clayey SILT, minor sand, trace organics; light brown. Stiff, moist, medium plasticity; sand, fine; organics, rootlets. 1.0m: PID test, 0.2ppm SILT, some clay, minor sand; light brown, mottled orange. Stiff, moist, medium plasticity; sand, fine. SILT, some clay and sand; light brown, mottled orange and brown. Stiff, moist, medium plasticity; sand, fine. Sandy SILT, trace organics and clay; light brown, mottled orange. Stiff, moist, low plasticity; sand, fine; organics, rootlets. 2.5m: Grey and orange. Sandy SILT, trace organics; light brown, mottled orange. Stiff to very stiff, moist, low plasticity; sand, fine; organics, rootlets. 3.4m: Light brown, mottled orange. 3.5m: Grey. Silty SAND, trace organics; light brown mottled orange. Dense to very dense, moist, poorly graded; sand, fine to medium; organics, rootlets.

Box 1, 0.0-3.0m

Box 2, 3.0-5.0m

COMMENTS:

Hole Depth 5.9m

Scale 1:25

Rev.: A

HAND AUGER LOG

HOLE Id: **HA07**

SHEET: 2 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5925859.50 mN 1743823.00 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 01/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 01/12/2020
R.L.: 32.90m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm)	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Observations
		0	DCP	2,3,5,6,5,5,6,6,9,9,9,9,11,12,13,13,12,13	asb/gl @ 5.00m		27.5	5.5		M	St		5.9m: END OF HAND AUGER. Scala only to 5.9 m (blows per 50 mm): 2,3,5,6,5,5,6,6,9,9,9,9,11,12,13,13,12,13
							27	6.0					5.9m: END OF INVESTIGATION
								6.5					
							26	7.0					
								7.5					
							25	8.0					
								8.5					
							24	9.0					
								9.5					
							23						

COMMENTS:

Hole Depth 5.9m

Scale 1:25

Rev.: A

CORE PHOTOS

BOREHOLE No.: **HA07**

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5925859.50 mN (NZTM2000) 1743823.00 mE R.L.: 32.90m DATUM: NZVD2016	DRILL TYPE: 50 mm Hand auger DRILL METHOD: HA+DCP	HOLE STARTED: 01/12/2020 HOLE FINISHED: 01/12/2020 DRILLED BY: Tonkin + Taylor Ltd LOGGED BY: ROM CHECKED: CBM

0.00-3.00m

3.00-5.00m

HAND AUGER LOG

HOLE Id: **HA07a**

SHEET: 1 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5925813.70 mN 1743968.70 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 25/11/2020
		HOLE FINISHED: 25/11/2020
R.L.: 35.60m	DRILL METHOD: HA+DCP	DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Topsoil					asb @ 0.10m				TS	M			Sandy SILT, trace organics; dark brown. Firm, moist, low plasticity; sand, fine; organics, rootlets.
Tauranga Group		100	HA+DCP		● >218 kPa asb @ 0.50m PID, 0.0ppm @ 0.51m		35	0.5			VSt-H		SILT, some sand, minor clay, trace organics; orange, mottled brown-red and brown. Very stiff, moist, low plasticity. Organics, rootlets.
													Grades to: clayey SILT, minor sand, trace organics; grey and brown mottled orange. Very stiff to hard, moist, medium plasticity. Sand, fine; organics, rootlets.
					● 174/62 kPa asb @ 1.00m PID, 0.8ppm @ 1.01m corrosivity @ 1.20m			1.0					
					● 187/75 kPa		34	1.5			VSt		Sandy SILT, some clay, trace organics; grey mottled orange and brown. Very stiff, moist, low to medium plasticity. Organics, rootlets.
					● 159/87 kPa asb @ 2.00m			2.0					2.1m: trace clay; grey, mottled orange.
					geo @ 2.20m								
					geo @ 2.40m			2.5					Silty CLAY; grey, mottled orange and pink. Very stiff, moist, high plasticity.
					● 188/73 kPa		33						Sandy SILT, some clay, trace organics; grey mottled orange and brown. Very stiff, moist, low to medium plasticity. 2.8 - 2.9m: orange, mottled grey.
					● 199/84 kPa asb @ 3.00m			3.0					
					● >218 kPa			3.5			VSt-H		Sandy SILT; grey, speckled white. Very stiff to hard, moist, low plasticity; sand, fine to coarse.
							32				VD		Grades to: Silty, fine to coarse SAND; grey, speckled white. Very dense, moist, well graded.
					● UTP asb @ 4.00m			4.0			VSt-H		Sandy SILT; grey, speckled white. Very stiff to hard, moist, low plasticity; sand, fine to coarse.
					● UTP			4.5					4.6m: minor fine, rounded gravel.
					● UTP		31				H		

Box 1, 0.0-3.0m

Box 2, 3.0-5.0m

COMMENTS:

Hole Depth 5.85m

Scale 1:25

Rev.: A

HAND AUGER LOG

HOLE Id: **HA07a**

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5925813.70 mN 1743968.70 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 25/11/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 25/11/2020
R.L.: 35.60m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
				5 5 6 7 8 5 7 8 11 10 11 10 11 10 10 11 11	asb @ 5.00m		30	5.5		M			Silty CLAY; grey. Hard, moist, high plasticity. 5.0 m: END OF HAND AUGER. Scala only to 5.85 m (blows per 50 mm): 5,5,6,7,8,5,7,8,11,10,11,10,11,10,10,11,11
							29	6.0 6.5 7.0					5.85m: END OF INVESTIGATION
							28	7.5 8.0					
							27	8.5 9.0					
							26	9.5					

COMMENTS:

Hole Depth 5.85m

Scale 1:25

Rev.: A

CORE PHOTOS

BOREHOLE No.: **HA07a**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5925813.70 mN (NZTM2000) 1743968.70 mE R.L.: 35.60m DATUM: NZVD2016	DRILL TYPE: 50 mm Hand auger DRILL METHOD: HA+DCP	HOLE STARTED: 25/11/2020 HOLE FINISHED: 25/11/2020 DRILLED BY: Tonkin + Taylor Ltd LOGGED BY: ROM CHECKED: CBM

0.00-3.00m

3.00-5.00m

HAND AUGER LOG

HOLE Id: **HA08**

SHEET: 1 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5925683.60 mN (NZTM2000) 1744277.50 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 24/11/2020
		HOLE FINISHED: 24/11/2020
R.L.: 49.10m	DRILL METHOD: HA+DCP	DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Topsoil					Env @ 0.10m		49	0	TS	M	F		Sandy SILT, trace organics; brown. Firm, moist, low plasticity; sand, fine. Organics, rootlets
Tauranga Group	24/11/2020	94	HA+DCP		48/16 kPa Env @ 0.50m PID, 1.8ppm @ 0.50m			0.5					Sandy SILT, minor organics; grey-brown, moittled orange. Firm, moist, low plasticity; sand, fine; organics, rootlets.
					57/11 kPa Env @ 1.00m PID, 2.5ppm @ 1.00m		48	1.0					1.2-1.5m: CORE LOSS
					82/6 kPa			1.5			St		SILT, some sand, mior clay, trace organics; grey-brown, speckled black. Stiff, moist, high plasticity; sand, fine; organics, rootlets.
					>200 kPa Env @ 2.00m		47	2.0			VSt-H		Grades to: Silty CLAY, minor sand, trace organics; brown, mottled orange, speckled brown. Very stiff to hard, moist, high plasticity; sand, fine; organics, rootlets.
					>200 kPa			2.5					2.4m: dark brown.
					>200 kPa Env @ 3.00m		46	3.0					Sandy SILT, minor clay, trace organics; brown, spotted brown. Very stiff to hard, moist, low plasticity; sand, fine ; organics, rootlets.
													Sandy, clayey SILT, trace organics; brown, spotted brown. Very stiff to hard, moist, low plasticity; sand, fine; organics, rootlets.
					135/73 kPa			3.5			VSt		Sandy, silty CLAY, trace organics; brown, spotted dark brown. Very stiff, moist, medium plasticity; sand, fine; organics, rootlets.
											VSt-H		Grades to: Sandy, SILT, minor clay, trace organics; brown, spotted brown. Very stiff to hard, moist, low plasticity; sand, fine; organics, rootlets.
					149/72 kPa Env @ 4.00m		45	4.0			VSt		Grades to: Sandy SILT; brown, mottled orange, spotted black and dark brown. Very stiff, moist, low plasticity; sand, fine; organics, rootlets.
					129/56 kPa			4.5					4.2m: light grey-brown, spotted black.
					>200 kPa						H		4.9m: hard.

Box 1, 0.0-3.0m

Box 2, 3.0-5.0m

COMMENTS:

Hole Depth 5.85m

Scale 1:25

Rev.: A

HandAugerLog - 22/12/2020 3:03:38 PM - Produced with Core-GS by GeRoc

HAND AUGER LOG

HOLE Id: **HA08**

SHEET: 2 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5925683.60 mN 1744277.50 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 24/11/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 24/11/2020
R.L.: 49.10m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
				4 5 5 6 6 7 9 8 14 8 8 9 10 10 11 11 12	Env @ 5.00m		44	5.5					5.0m: END OF HAND AUGER. Scala only to 5.85m(blows per 50mm): 4,5,5,6,6,7,9,8,14,8,8,9,10,10,11,11,12
							43	6.0 6.5 7.0					5.85m: END OF INVESTIGATION
							42	7.5 8.0					
							41	8.5 9.0					
							40	9.5					

COMMENTS:

Hole Depth 5.85m

Scale 1:25

Rev.: A

Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **HA08**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5925683.60 mN (NZTM2000) 1744277.50 mE R.L.: 49.10m DATUM: NZVD2016	DRILL TYPE: 50 mm Hand auger DRILL METHOD: HA+DCP	HOLE STARTED: 24/11/2020 HOLE FINISHED: 24/11/2020 DRILLED BY: Tonkin + Taylor Ltd LOGGED BY: ROM CHECKED: CBM

0.00-3.00m

3.00-5.00m

HAND AUGER LOG

HOLE Id: **HA08a**

SHEET: 1 OF 2

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5925734.60 mN 1744164.50 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 24/11/2020
		DRILL METHOD: HA+DCP	HOLE FINISHED: 24/11/2020
R.L.:	41.80m		DRILLED BY: Tonkin + Taylor Ltd
DATUM:	NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Topsoil					asb/gl @ 0.10m 1 x Glass Jar 1x plastic Jar			0.0	TS	M	F		Sandy SILT, trace organics; dark brown. Firm, moist, low plasticity; sand, fine; organics, rootlets.
					● >218 kPa asb/gl @ 0.50m 1 x Glass Jar 1x plastic Jar PID - 27.3ppm @ 0.51m		41	0.5					0.55m: Rootlet
					PID - 27.3ppm ● 130/44 kPa asb/gl @ 1.00m 1 x Glass Jar 1x plastic Jar PID - 17.2ppm @ 1.01m			1.0			VSt		Silty CLAY, minor sand, trace organics; light brown mottled orange. Very stiff, moist, high plasticity; sand, fine; organics, rootlets.
					PID - 17.2ppm ● 184/93 kPa Corrosivity @ 1.20m 1 x plastic jar			1.5					Clayey SILT, some sand, trace organics; light brown & brown. Very stiff, moist, medium plasticity; sand, fine; organics, rootlets.
Tauranga Group	24/11/2020						40	2.0					Sandy SILT, some clay, trace organics; light brown & brown. Very stiff, moist, low plasticity; sand, fine; organics, rootlets.
Box 1, 0.0-3.0m					● 181/83 kPa asb/gl @ 2.00m 1 x Glass Jar 1x plastic Jar								
					● 171/78 kPa att/psd @ 2.70m Atterberg/PSD		39	2.5					
					● 106/53 kPa asb/gl @ 3.00m 1 x Glass Jar 1x plastic Jar			3.0		W			Sandy SILT, trace organics; light brown. Very stiff, wet, low plasticity; sand, fine; organics, rootlets.
					● 131/59 kPa Corrosivity @ 3.50m 1 x plastic jar		38	3.5					
					● 149/62 kPa asb/gl @ 4.00m 1 x Glass Jar 1x plastic Jar			4.0					
					● 188/62 kPa			4.5					
Box 2, 3.0-5.0m				2 2 3 2 4 5 4	● 177/84 kPa		37						

COMMENTS:

Hole Depth 6.2m

Scale 1:25

Rev.: A

HAND AUGER LOG

HOLE Id: **HA08a**

SHEET: 2 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5925734.60 mN 1744164.50 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 24/11/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 24/11/2020
R.L.: 41.80m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
				5 4 4 4 7 5 5 7 7 7 7 8 9 8 7 9 10 10 10 12 12	asb/gl @ 5.00m 1 x Glass Jar 1x plastic Jar		36 35 34 33 32	5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5					5.0m: END OF HAND AUGER. Scala only to 6.2 m (blows per 50 mm): 2,2,3,2,4,5,4,5,4,4,4,7,5,5,7,7,7,7,8,9,8,7,9,10,10 ,9,10,10,10,12,12

COMMENTS:

Hole Depth 6.2m

Scale 1:25

Rev.: A

CORE PHOTOS

BOREHOLE No.: **HA08a**

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5925734.60 mN (NZTM2000) 1744164.50 mE R.L.: 41.80m DATUM: NZVD2016	DRILL TYPE: 50 mm Hand auger DRILL METHOD: HA+DCP	HOLE STARTED: 24/11/2020 HOLE FINISHED: 24/11/2020 DRILLED BY: Tonkin + Taylor Ltd LOGGED BY: ROM CHECKED: CBM

0.00-3.00m

3.00-5.00m

HAND AUGER LOG

HOLE Id: **HA107a**

SHEET: 1 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5926927.60 mN 1743320.80 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 03/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 03/12/2020
R.L.: 13.50m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Topsoil					Env @ 0.10m				TS	M	L		Silty SAND, trace organics; brown. Loose, moist, poorly graded; sand, fine; organics, rootlets.
					● 202/47 kPa Env @ 0.50m PID - 0.0ppm @ 0.51m		13	0.5			VSt-H		Silty CLAY, minor sand, trace organics; brown mottled orange and dark brown, speckled white. Very stiff to hard, moist, high plasticity; sand, fine; organics, rootlets.
					● 137/31 kPa Env @ 1.00m PID 0.0ppm @ 1.01m			1.0					
					● 81/31 kPa		12	1.5			St		Clayey SILT, minor sand; grey and grey brown mottled orange speckled black. Stiff, moist, high plasticity; sand, fine.
					● 67/31 kPa Env @ 2.00m			2.0					Sandy SILT, minor clay, trace organics; brown mottled orange, speckled white. Stiff, moist, low plasticity; sand, fine; organics, rootlets.
Tauranga Group	▼ 03/12/2020	100	HA+DCP		att/psd//corrosivity @ 2.20m ● 38/16 kPa		11	2.5					Sandy SILT, trace organics; grey & brown motled orange. Stiff, moist, low plasticity; sand, fine; organics, rootlets.
Box 1, 0.0-3.0m					● 31/22 kPa			3.0					
					● 68/28 kPa corrosivity @ 3.50m		10	3.5		W	L		Silty SAND, trace organics; grey. Loose, wet, poorly graded; sand, fine; organics, rootlets.
					● 87/34 kPa			4.0		M	St		Sandy SILT, trace organics; grey and brown speckled black. Stiff, moist, low plasticity; sand, fine; organics, rootlets.
					● 72/30 kPa		9	4.5					SILT, some clay and sand, trace organics; brown speckled dark brown. Stiff, moist, low plasticity; sand, fine; organics, rootlets.
Box 2, 3.0-5.0m				2 1 2 2 2 1	● 100/31 kPa								

COMMENTS:

Hole Depth 6.65m

Scale 1:25

Rev.: A

HAND AUGER LOG

HOLE Id: **HA107a**

SHEET: 2 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5926927.60 mN 1743320.80 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 03/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 03/12/2020
R.L.: 13.50m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
				2 4 3 3 3 4 5 4 3 4 4 4 5 6 5 5 7 7 6 7 6 7 10 9 11 10 10 8 8 9 8 8			8	5.5					5.0 m: END OF HAND AUGER. Scala only to 6.65 m (blows per 50 mm): 1,2,2,2,1,2,4,3,3,3,4,5,4,3,4,4,4,5,6,5,5,7,7,6,7,6, 7,10,9,11,10,10,8,8,9,8,8
							7	6.0					
								6.5					6.65m: END OF INVESTIGATION
							6	7.0					
								7.5					
							5	8.0					
								8.5					
							4	9.0					
								9.5					

COMMENTS:

Hole Depth 6.65m

Scale 1:25

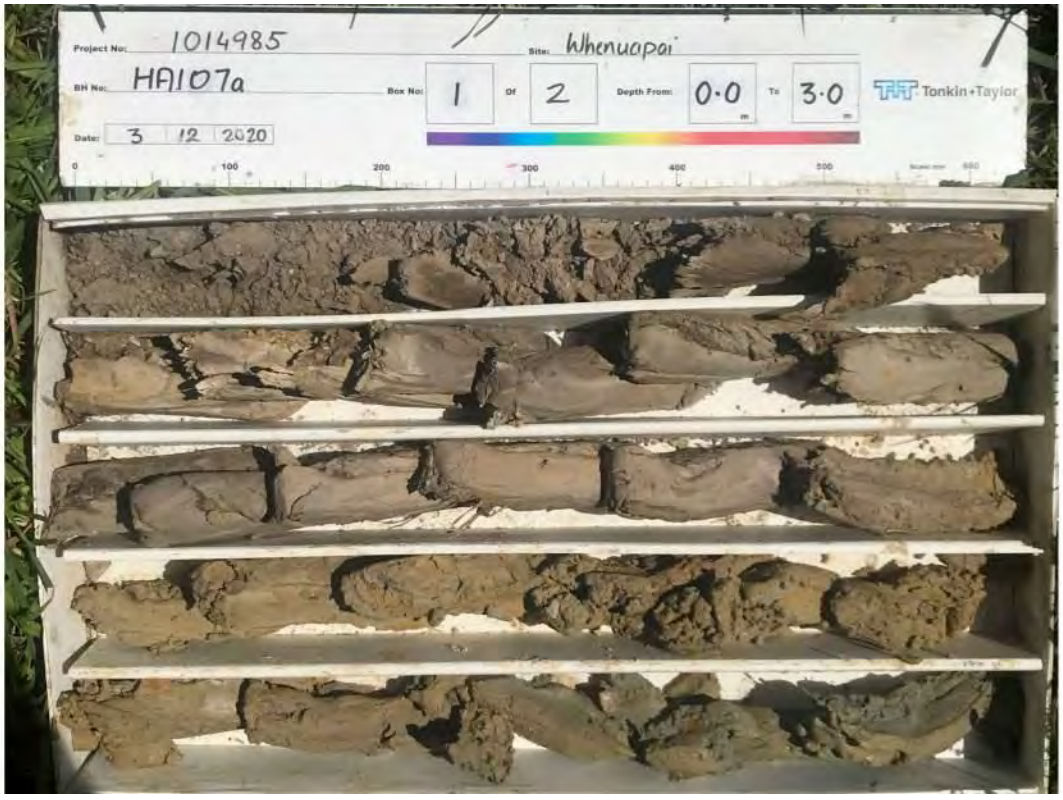
Rev.: A

CORE PHOTOS

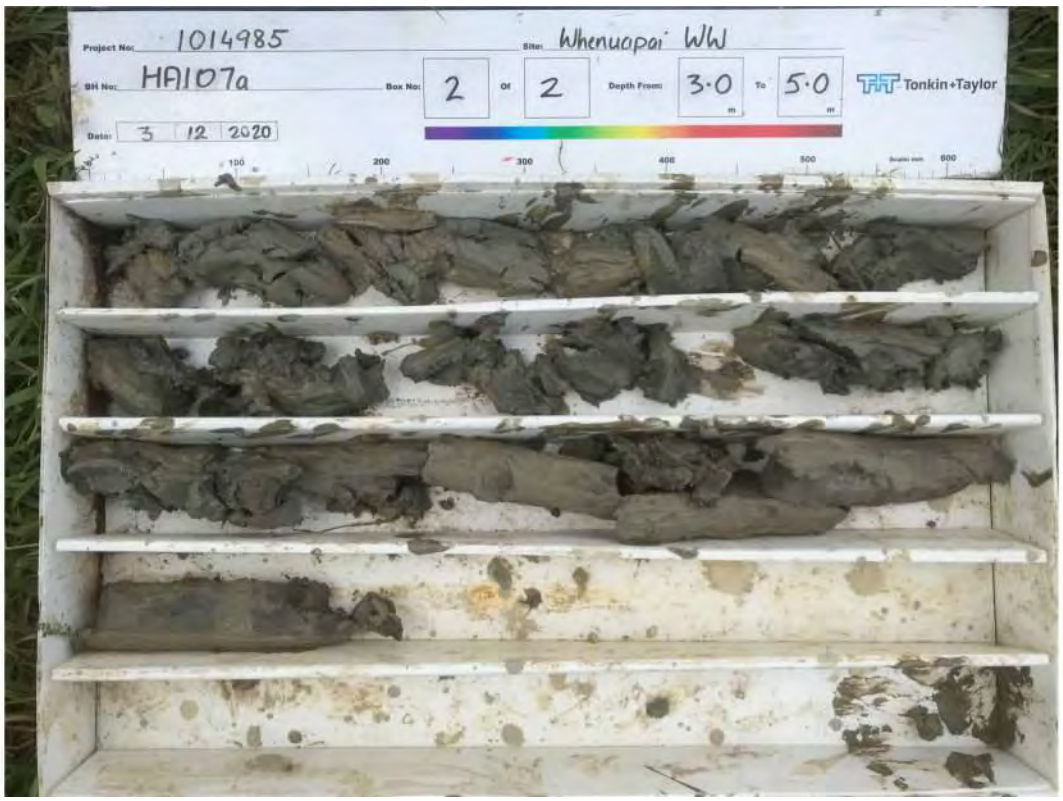
BOREHOLE No.: **HA107a**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5926927.60 mN (NZTM2000) 1743320.80 mE R.L.: 13.50m DATUM: NZVD2016	DRILL TYPE: 50 mm Hand auger DRILL METHOD: HA+DCP	HOLE STARTED: 03/12/2020 HOLE FINISHED: 03/12/2020 DRILLED BY: Tonkin + Taylor Ltd LOGGED BY: ROM CHECKED: CBM



0.00-3.00m



3.00-5.00m

HAND AUGER LOG

HOLE Id: **HA107b**

SHEET: 1 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5926922.30 mN 1743265.20 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 04/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 04/12/2020
R.L.: 12.30m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Topsoil					Env @ 0.10m				TS	D-M	F		Sandy SILT, trace organics; brown. Firm, dry to moist, low plasticity; sand, fine; organics, rootlets.
Fill					● 124/31 kPa Env @ 0.50m PID 0.5ppm @ 0.51m		12	0.5		D	VSt		Sandy SILT, trace organics; light brown and orange brown. Very stiff, dry to moist, low plasticity; sand, fine; organics, rootlets.
					● 152/34 kPa Env @ 1.00m PID 0.1ppm @ 1.01m corrosivity @ 1.20m			1.0		M	St		Sandy SILT, trace organics and clay; grey-brown mottled orange speckled white and black. Stiff, moist, low plasticity; sand, fine; organics, rootlets.
					● 93/53 kPa		11	1.5					
					● 35/16 kPa Env @ 2.00m			2.0			F		SILT, some sand, trace organics; dark brown speckled black. Firm, moist, low plasticity; sand, fine; organics, rootlets.
											VSt		Sandy SILT, trace organics; grey mottled orange speckled white. Very stiff, low plasticity; sand, fine; organics, rootlets.
					● 82/22 kPa		10	2.5					Silty SAND; grey mottled orange speckled white. Very stiff, moist, poorly graded; sand, fine.
					corrosivity @ 2.70m								
Box 1, 0.0-3.0m Tauranga Group		100	HA+DCP		● 51/19 kPa			3.0		M-W	F		Sandy SILT, trace organics; grey mottled orange. Firm, moist to wet, low plasticity; sand, fine; organics, rootlets.
					● 75/20 kPa		9	3.5		M			SILT, some sand, minor clay, trace organics; grey mottled brown. Firm, moist, low plasticity; organics, rootlets.
										M-W	L-MD		Silty SAND, trace organics; grey mottled brown. Loose to medium dense, moist to wet, poorly graded; sand, fine; organics, rootlets.
					● 45/28 kPa			4.0					
					● 59/34 kPa		8	4.5					4.3 - 4.45m: SILT, some sand, minor clay, trace rootlets; grey. Stiff, moist, high plasticity; sand, fine.
Box 2, 3.0-5.0m					● 62/32 kPa								

COMMENTS:

Hole Depth 6.85m

Scale 1:25

Rev.: A

HandAugerLog - 22/12/2020 3:13:28 PM - Produced with Core-GS by GeRoc

HAND AUGER LOG

HOLE Id: **HA107b**

SHEET: 2 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5926922.30 mN 1743265.20 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 04/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 04/12/2020
R.L.: 12.30m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
				1 1 1 2 2 2 2 2 4 4 3 4 4 4 5 4 7 6 6 7 6 9 8 6 8 8 11 10 10 9 10 9 8 9 9 9			7 6 5 4 3	5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5					5.0 m: END OF HAND AUGER. Scala only to 6.85 m (blows per 50 mm): 1,1,1,2,2,2,2,4,4,3,4,4,4,5,4,7,6,6,7,6,9,8,6,8,8,1 1,10,10,9,10,11,10,9,8,9,9,9 6.85m: END OF INVESTIGATION

COMMENTS:

Hole Depth 6.85m

Scale 1:25

Rev.: A

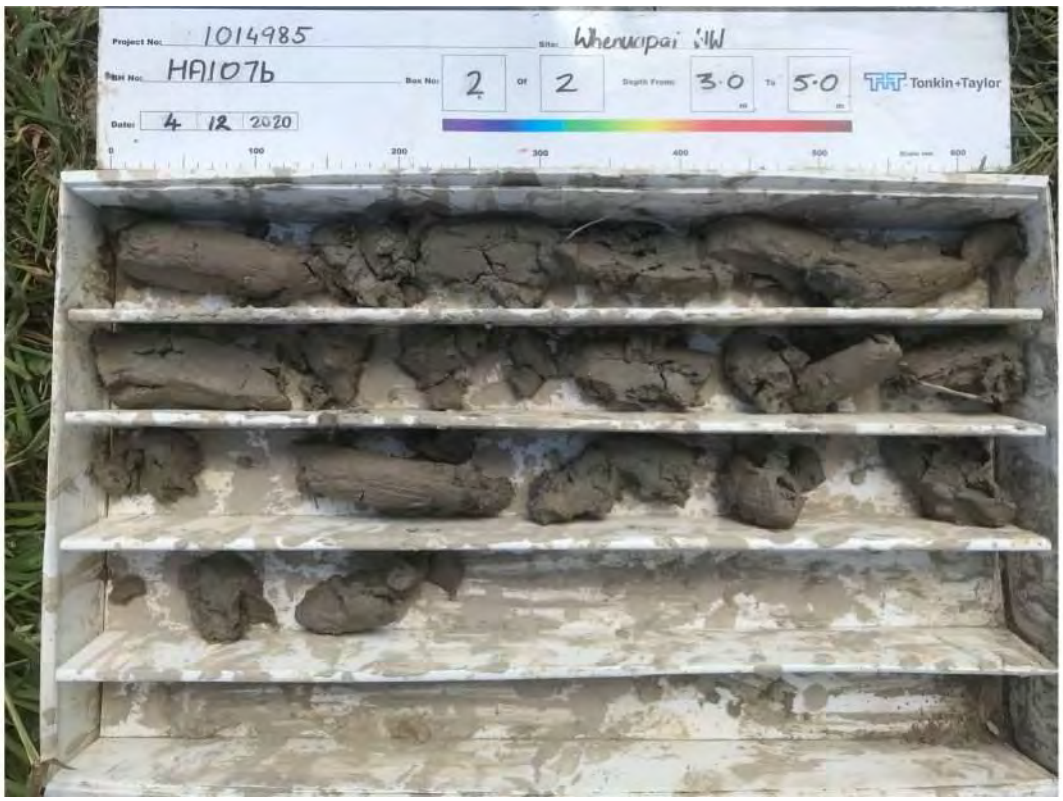
CORE PHOTOS

BOREHOLE No.: **HA107b**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5926922.30 mN (NZTM2000) 1743265.20 mE R.L.: 12.30m DATUM: NZVD2016	DRILL TYPE: 50 mm Hand auger DRILL METHOD: HA+DCP	HOLE STARTED: 04/12/2020 HOLE FINISHED: 04/12/2020 DRILLED BY: Tonkin + Taylor Ltd LOGGED BY: ROM CHECKED: CBM

0.00-3.00m



3.00-5.00m

HAND AUGER LOG

HOLE Id: **HA108**

SHEET: 1 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5926898.60 mN 1743173.50 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 03/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 03/12/2020
R.L.: 11.50m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Topsoil					Env @ 0.10m				TS	M	F		Sandy SILT, trace organics; brown. Firm, moist, low plasticity; sand, fine; organics, rootlets.
					● 131/25 kPa Env @ 0.50m		11	0.5			VSt		Sandy SILT, trace organics; brown, mottled orange. Very stiff, moist, low plasticity; sand, fine; organics, rootlets.
											St		Sandy SILT, minor clay, trace organics; brown, mottled orange. Stiff, moist, low plasticity; sand, fine; organics, rootlets.
					● 73/28 kPa Env @ 1.00m			1.0					
	03/12/2020 ▼				● 54/21 kPa		10	1.5		W	F-St		SILT, minor sand and clay, trace organics; light brown, mottled orange. Stiff, moist, low plasticity; sand, fine; organics, rootlets.
					● 26/9 kPa Env @ 2.00m			2.0					Sandy SILT, trace organics; greyish brown, mottled orange, spotted blue. Firm to stiff, wet, low plasticity; sand, fine; organics, rootlets.
					Att/psd @ 2.40m					S	F		SILT, minor sand, trace organics; brown. Firm, saturated, low plasticity; sand, fine; organics, rootlets.
Tauranga Group		100	HA+DCP		● 37/28 kPa		9	2.5					
Box 1, 0.0-3.0m					● 32/17 kPa			3.0					
					● 51/17 kPa		8	3.5					
					● 22/9 kPa			4.0					3.95m: grades to soft
					● 31/16 kPa		7	4.5					4.45m: grades to firm
Box 2, 3.0-5.0m					● 40/18 kPa								

COMMENTS:

Hole Depth 6.7m

Scale 1:25

Rev.: A

HAND AUGER LOG

HOLE Id: **HA108**

SHEET: 2 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5926898.60 mN 1743173.50 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 03/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 03/12/2020
R.L.: 11.50m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
				1 1 1 1 2 2 2 1 2 3 2 2 2 2 1 3 4 4 3 4 3 4 3 3 3 3 3 3 4 4 3 4 5			6 5	5.5 6.0 6.5					5.0 m: END OF HAND AUGER. Scala only to 6.7 m (blows per 50 mm): 1,1,1,1,2,2,2,1,2,3,2,2,2,2,1,3,4,4,3,4,3,4,3,3,3,3, 3,3,3,4,4,3,4,5
							4 3 2	7.0 7.5 8.0 8.5 9.0 9.5					6.7m: END OF INVESTIGATION

COMMENTS:

Hole Depth 6.7m

Scale 1:25

Rev.: A

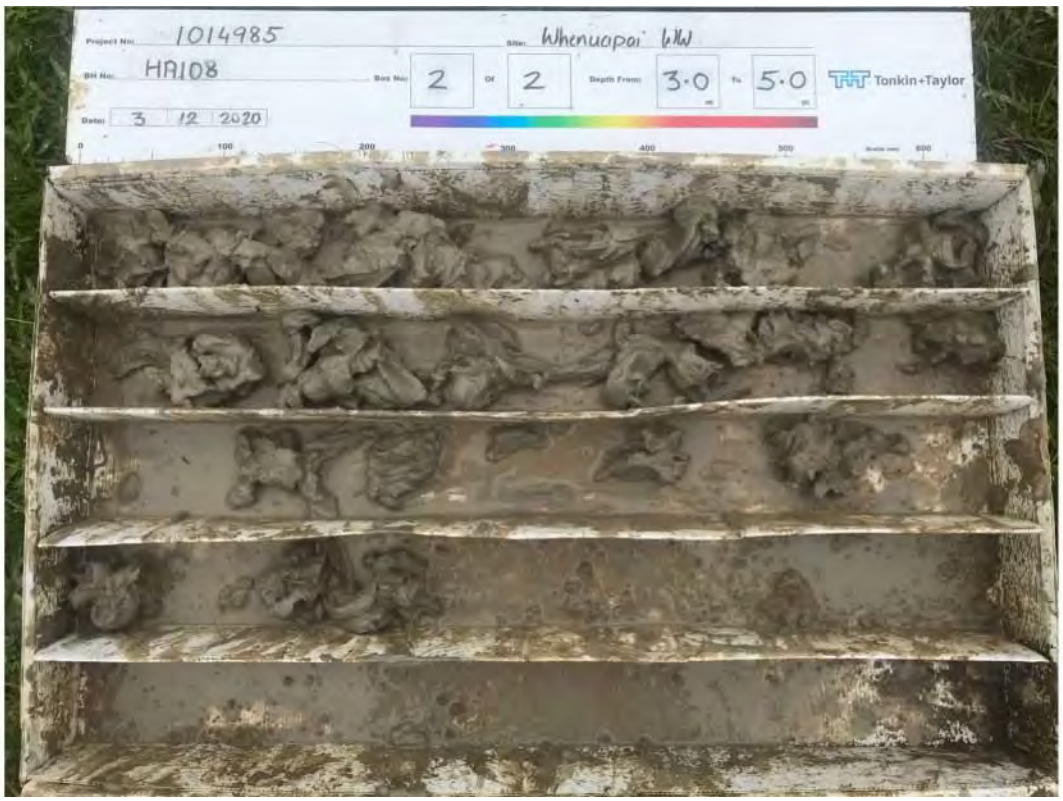
CORE PHOTOS

BOREHOLE No.: **HA108**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5926898.60 mN (NZTM2000) 1743173.50 mE R.L.: 11.50m DATUM: NZVD2016	DRILL TYPE: 50 mm Hand auger DRILL METHOD: HA+DCP	HOLE STARTED: 03/12/2020 HOLE FINISHED: 03/12/2020 DRILLED BY: Tonkin + Taylor Ltd LOGGED BY: ROM CHECKED: CBM

0.00-3.00m



3.00-5.00m

HAND AUGER LOG

HOLE Id: **HA109**

SHEET: 1 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5926901.80 mN 1743136.40 mE	DRILL TYPE: 75 and 50mm handauger	HOLE STARTED: 03/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 03/12/2020
R.L.: 11.00m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	Description and Additional Observations
Topsoil	SILT; light brown. Dry to moist, non-plastic.
Tauranga Group	SILT; yellowish brown. Very stiff, moist, non-plastic.
	SILT, some clay; light brown mottled yellowish brown. Very stiff, moist; low to no plasticity.
	SILT; light brown. Stiff, moist, non-plastic.
	Silty CLAY; light brown mottled yellowish brown. Firm, moist, high plasticity.
	Clayey SILT; light brown. Firm, moist, low plasticity.
	Silty CLAY; light brown mottled yellowish brown. Firm, moist, medium plasticity.
	Clayey SILT; light grey. Firm, wet, low plasticity.
	Silty CLAY; light brownish grey. Soft, moist, high plasticity.
	Sandy SILT; grey. Soft, saturated, non-plastic.
	Clayey SILT; grey. Firm, wet, medium plasticity.
	Clayey sandy SILT; grey. Firm to stiff, wet, low plasticity.
	Silty CLAY; light grey. Firm, wet, medium plasticity.
	Clayey SILT; light grey. Firm, wet, medium plasticity.
	Clayey sandy SILT; light grey. Firm, wet, low plasticity.
	Clayey SILT; light grey. Firm to stiff, moist, medium plasticity; sandy layers at 4.8m and 5m.

DEPTH (m)	RL (m)	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm)	TESTS	SAMPLES	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)
0.0						asb/gl/split @ 0.00m		TS	D-M		
						● 122/21 kPa			M	VSt	
						asb/gl @ 0.40m					
0.5						● 76/15 kPa				St	
						● 76/8 kPa					
1.0	10					asb/gl @ 0.90m				F	
						● 29/16 kPa					
1.5						● 48/19 kPa					
						att/psd @ 1.40m					
						● 32/8 kPa					
2.0	9					asb/gl @ 1.70m					
						● 40/21 kPa			W		
									M	S	
						● 24/13 kPa			S		
2.5						att/psd @ 2.45m					
						● 24/13 kPa					
						asb/gl @ 2.70m			W	F	
3.0	8					● 27/16 kPa					
						● 62/24 kPa				F-St	
3.5						● 32/20 kPa				F	
						asb/gl @ 3.70m					
						● 32/16 kPa					
4.0	7					● 37/15 kPa					
						● 36/20 kPa					
4.5						● 32/17 kPa				F-St	
						asb/gl @					

03/12/2020 inflow 1.5m W/L+2hrs

COMMENTS: 26 Brigham Ck Rd

Hole Depth 7.25m

Scale 1:25

Rev.: A

HAND AUGER LOG

HOLE Id: **HA109**

SHEET: 2 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5926901.80 mN 1743136.40 mE	DRILL TYPE: 75 and 50mm handauger	HOLE STARTED: 03/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 03/12/2020
R.L.: 11.00m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Box 1. 0.0-5.2m Tauranga Group				1 0 1 1 1 1 1 2 1 2 1 2 2 3 3 3 2 2 2 2 2 3 3 3 3 3 2	4.70m ● 60/24 kPa		5	5.5 6.0					[CONT] Clayey SILT; light grey. Firm to stiff, moist, medium plasticity; sandy layers at 4.8m and 5m.
				2 3 2 2 2 3 3 4 3 4 5 5			4	6.5 7.0					End of handauger at 5.2 m Scala (blows per 50 mm) 1,2,2,3,3,3,5,5,4,4 5,6,6,5,5,4,5,7,7,10
							3	7.5 8.0 8.5					7.25m: Target depth
							2	9.0 9.5					

COMMENTS: 26 Brigham Ck Rd

Hole Depth 7.25m

Scale 1:25

Rev.: A

CORE PHOTOS

BOREHOLE No.: **HA109**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5926901.80 mN 1743136.40 mE R.L.: 11.00m DATUM: NZVD2016	DRILL TYPE: 75 and 50mm handauger DRILL METHOD: HA+DCP	HOLE STARTED: 03/12/2020 HOLE FINISHED: 03/12/2020 DRILLED BY: GEOTECHNICS LOGGED BY: RBE CHECKED: CBM

0.00-5.20m

HAND AUGER LOG

HOLE Id: **HA110a**

SHEET: 1 OF 2

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926999.30 mN 1743387.70 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 08/12/2020
		DRILL METHOD: HA+DCP	HOLE FINISHED: 08/12/2020
R.L.:	14.60m		DRILLED BY: Tonkin + Taylor Ltd
DATUM:	NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Fill		100	HA		Env/asb @ 0.10m		14	0.5		M	MD		Silty, fine SAND, minor gravel, trace organics; brown. Medium dense, moist, poorly graded; organics, rootlets.
					>218 kPa Env/asb @ 0.50m PID,0.0ppm @ 0.51m					D-M	H		Silty CLAY, some sand, trace organics; grey, mottled orange and dark brown. Hard, dry to moist, high plasticity; sand, fine; organics, rootlets.
					>218 kPa PID, 0.0ppm @ 1.00m Env/asb @ 1.00m		13	1.0		M	VSt		Sandy, silty CLAY, trace organics; grey, mottled orange and dark brown. Hard, moist, medium plasticity; sand, fine; organics, rootlets.
					163/31 kPa			1.5					Sandy, clayey SILT, trace organics; light grey, mottled orange and brown. Hard, moist, medium plasticity; sand, fine; organics, rootlets.
					141/81 kPa Env/asb @ 2.00m		12	2.0			H		Silty CLAY, minor sand, trace organics; light grey, mottled orange. Hard, moist, high plasticity; sand, fine; organics, rootlets.
					84/34 kPa			2.5			St		Sandy SILT, trace organics; dark brown. Very stiff, moist, low plasticity; sand, fine; organics, rootlets.
Box 1, 0.0-3.0m					121/68 kPa Env/asb @ 3.00m		11	3.0					SILT, minor sand and clay, trace organics; brown, grey, red. Very stiff, moist, low plasticity; sand, fine; organics, rootlets.
					109/75 kPa			3.5					SILT, some sand, trace organics; brown, grey, red. Very stiff, moist, low plasticity; sand, fine; organics, rootlets.
Tauranga Group	08/12/2020				112/34 kPa		10	4.0		W	VSt St		Silty CLAY, minor sand, trace organics; light grey, mottled orange. Hard, moist, high plasticity; sand, fine; organics, rootlets.
					82/38 kPa			4.5		M	L		Grades to: SILT, some sand, minor clay, trace organics; light grey, mottled orange and dark brown. Stiff, moist, low to medium plasticity; sand, fine; organics, rootlets.
Box 2, 3.0-5.0m											St		Sandy SILT, trace organics; light grey, mottled orange and dark brown. Stiff, moist low plasticity; sand, fine; organics, rootlets.
													Organic SILT, some sand; dark brown. Stiff, moist, low plasticity; sand, fine.
											VSt		SILT, minor sand, minor clay, trace organics; grey, streaked brown. Very stiff, moist, low plasticity; sand, fine; organics, rootlets.
										W	St		Sandy SILT, trace organics; grey, streaked brown. Stiff, wet, low plasticity; sand, fine; organics, rootlets.
										M	L		Fine SAND, some silt, trace organics; grey. Loose, moist, poorly graded; organics, rootlets.
											St		Sandy SILT, some gravel, trace organicsl; grey

COMMENTS:

Hole Depth 6.85m

Scale 1:25

Rev.: A

HAND AUGER LOG

HOLE Id: **HA110a**

SHEET: 2 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5926999.30 mN 1743387.70 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 08/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 08/12/2020
R.L.: 14.60m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Tauranga Group				1 1 1 2 1 2 1 2 2 2 2 3 1 2 2 3 2 3 2 3 4 3 4 3 4 4 4 4 4 5 5 4 4 5 4	UTP		9 8	5.5 6.0 6.5					and brown, speckled black. Stiff, moist, low plasticity; sand, fine; organics, rootlets. 5.0 m: END OF HAND AUGER. Scala only to 6.85 m (blows per 50 mm): 1,1,1,2,1,2,1,2,2,2,2,3,1,2,2,3,2,3,2,3,4,3,4,3,4,4,4,4,4,3,4,4,5,5,4,4,5,4
							7 6 5	7.0 7.5 8.0 8.5 9.0 9.5					6.85m: END OF INVESTIGATION

COMMENTS:

Hole Depth 6.85m

Scale 1:25

Rev.: A

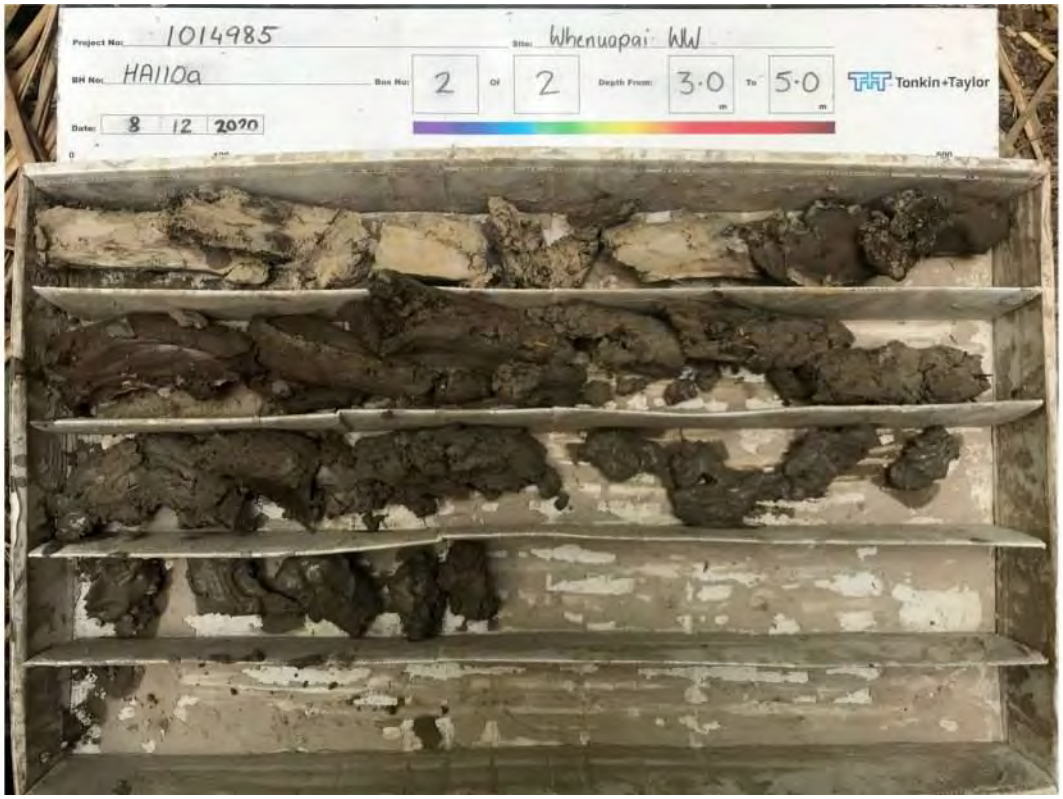
CORE PHOTOS

BOREHOLE No.: **HA110a**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5926999.30 mN (NZTM2000) 1743387.70 mE R.L.: 14.60m DATUM: NZVD2016	DRILL TYPE: 50 mm Hand auger DRILL METHOD: HA+DCP	HOLE STARTED: 08/12/2020 HOLE FINISHED: 08/12/2020 DRILLED BY: Tonkin + Taylor Ltd LOGGED BY: ROM CHECKED: CBM

0.00-3.00m



3.00-5.00m

HAND AUGER LOG

HOLE Id: **HA110b**

SHEET: 1 OF 2

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926965.40 mN 1743376.70 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 08/12/2020
		DRILL METHOD: HA+DCP	HOLE FINISHED: 08/12/2020
R.L.:	14.70m		DRILLED BY: Tonkin + Taylor Ltd
DATUM:	NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Fill					Env/asb @ 0.10m			0.0		M	MD		Silty, fine SAND, minor gravel, trace organics; brown. Tightly packed, moist, poorly graded; organics, rootlets.
					UTP Env/asb @ 0.50m PID, 0.0ppm @ 0.51m Corrosivity @ 0.60m		14	0.5			St		Sandy SILT, minor gravel, trace organics; light grey-brown. Stiff, moist, low plasticity; organics, rootlets.
					UTP Env/asb @ 1.00m PID, 0.0ppm @ 1.01m			1.0			VSt		Silty CLAY, minor sand and gravel, trace organics; brown, mottled orange and dark brown. Very stiff, moist, high plasticity; sand, fine; gravel, fine to medium, sub-angular, sandstone; organics, rootlets.
					79/25 kPa			1.5					
							13				St		Grades to: SILT, some sand, minor clay, trace organics; brown and grey. Stiff, moist, medium plasticity; sand, fine; organics, rootlets.
					65/34 kPa Env/asb @ 2.00m			2.0					
					93/37 kPa			2.5					
Box 1, 0.0-3.0m	08/12/2020	100	HA+DCP				12						Sandy SILT, minor organics; brown, speckled black and white, mottled orange. Stiff, moist, low plasticity; sand, fine to medium; organics, rootlets.
					Corrosivity @ 2.90m			3.0					
					att/psd @ 3.35m			3.5		W	L-MD		Silty, fine to coarse SAND, trace gravel and organics; grey, speckled white.Loosely packed, wet, poorly graded; gravel, fine, sub-angular, mudstone; organics, rootlets.
Tauranga Group				3 2 3 3 2 1 2 1 1 2 2 2 2 3 3 3 3 3 4 3			11	4.0					
								4.5		M	St		Sandy SILT, minor organics; brown, speckled black and white, mottled orange. Stiff, moist, low plasticity; sand, fine to medium; organics, rootlets.
Box 2, 3.0-5.0m							10				F		Organic SILT; brown. Firm, moist, low plasticity.

COMMENTS:

Hole Depth 6.95m

Scale 1:25

Rev.: A

HAND AUGER LOG

HOLE Id: **HA110b**

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5926965.40 mN 1743376.70 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 08/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 08/12/2020
R.L.: 14.70m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
				1 1 1 2 1 2 2 2 3 2 3 3 3 4 4 3 5 4 5 5 6 6 5 5 6 6 6 8 7 7 8 7 8 6 8 9 9 8 9			9 8	5.5 6.0 6.5					5.0 m: END OF HAND AUGER. Scala only to 6.95 m (blows per 50 mm): 1,1,1,2,1,2,2,2,3,2,3,3,3,4,4,3,5,4,5,5,6,6,5,5,6,6, 6,8,7,7,8,7,8,6,8,9,9,8,9
							7 6 5	7.0 7.5 8.0 8.5 9.0 9.5					6.95m: END OF INVESTIGATION

COMMENTS:

Hole Depth 6.95m

Scale 1:25

Rev.: A

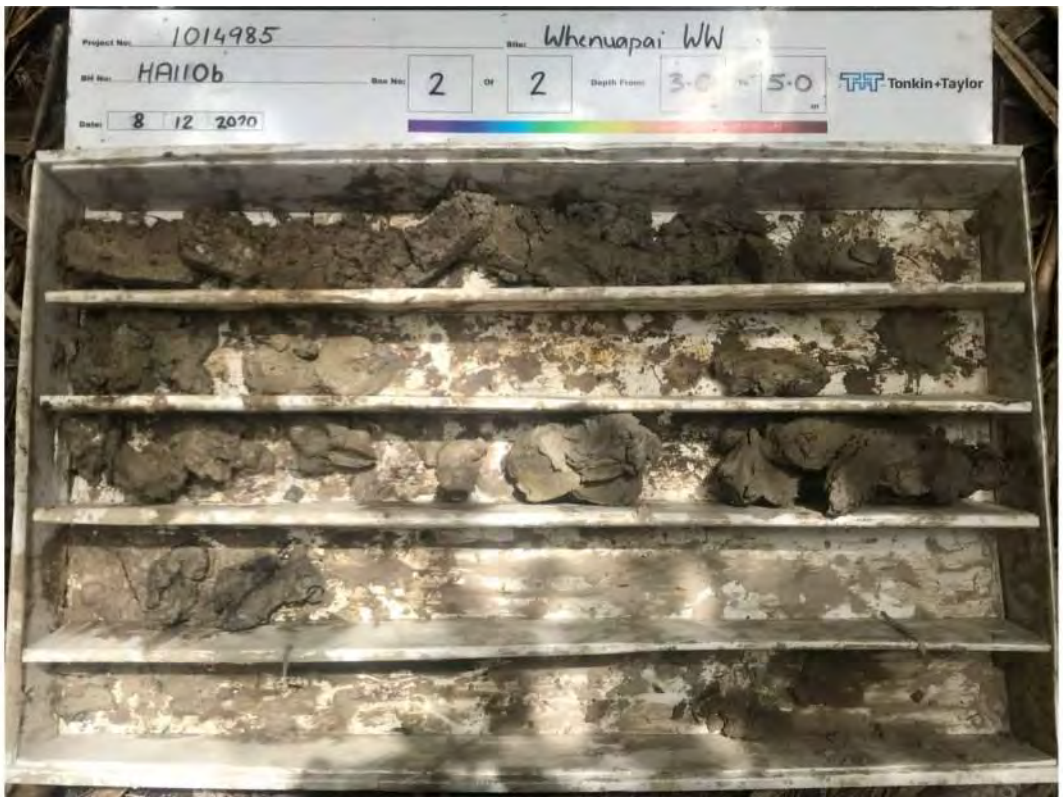
CORE PHOTOS

BOREHOLE No.: **HA110b**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926965.40 mN 1743376.70 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 08/12/2020
		DRILL METHOD: HA+DCP	HOLE FINISHED: 08/12/2020
R.L.:	14.70m		DRILLED BY: Tonkin + Taylor Ltd
DATUM:	NZVD2016		LOGGED BY: ROM CHECKED: CBM

0.00-3.00m



3.00-5.00m

HAND AUGER LOG

HOLE Id: **HA111**

SHEET: 1 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5927039.30 mN 1743395.90 mE	DRILL TYPE: 75 and 50 mm Hand auger	HOLE STARTED: 07/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 07/12/2020
R.L.: 14.40m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm)	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Observations
Fill	07/12/2020	88	HA+DCP		Env/asb @ 0.10m		14	0.5		D	F		Sandy SILT, trace organics; dark brown. Firm, dry, low plasticity; sand, fine; organics, rootlets.
					65/34 kPa Env/asb @ 0.50m								SILT, some sand, minor clay, trace gravel, and organics; light brown, mottled orange, dark grey and grey. Sand, fine; gravel, fine to medium, sub-angular, sandstone; organics, rootlets.
					31/16 kPa Env/asb @ 1.00m			1.0					
					Corrosivity @ 1.20m					M			Sandy SILT, some gravel; dark brown. Firm, moist, low plasticity; sand, fine; gravel, fine, angular, sandstone.
					16/9 kPa		13	1.5		W			1.6m: wet.
					31/20 kPa Env/asb @ 2.00m			2.0					
					Corrosivity @ 2.40m UTP		12	2.5			St		SILT, some sand, minor clay and gravel, trace organics; dark brown and black. Stiff, moist, low plasticity; sand, fine; gravel, fine, sub-angular, sandstone; organics, rootlets.
Box 1, 0.0-3.1m					Env/asb @ 3.00m			3.0			L		Gravelly, fine SAND, some silt; dark brown. Loosely packed, wet, poorly graded; gravel, fine to medium, sub-angular, sandstone.
													3.1 - 3.5m: NO RECOVERY
Tauranga Group							11	3.5					3.5 m: END OF HAND AUGER. Scala only to 6.5 m (blows per 50 mm): 1,0,1,1,0,2,2,2,2,1,2,1,1,2,2,3,4,3,4,3,3,3,3,3,3,4, 3,4,3,4,3,4,3,4,5,4,4,5,6,5,5,6,6,7,7,6,7,6,9,8,7,8, 9,7,8,8,7,9,9,9
							10	4.0					
								4.5					

COMMENTS:

Hole Depth 6.45m

Scale 1:25

Rev.: A

HAND AUGER LOG

HOLE Id: **HA111**

SHEET: 2 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5927039.30 mN 1743395.90 mE	DRILL TYPE: 75 and 50 mm Hand auger	HOLE STARTED: 07/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 07/12/2020
R.L.: 14.40m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Tauranga Group				4 3 4 5 4 4 5 6 5 5 6 6 7 7 6 7 6 9 8 7 9 8 7 8 9 9 9			9 8 7 6 5	5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5					[CONT] 3.5 m: END OF HAND AUGER. Scala only to 6.5 m (blows per 50 mm): 1,0,1,1,0,2,2,2,2,1,2,1,1,2,2,3,4,3,4,3,3,3,3,3,3,4, 3,4,3,4,3,4,3,4,5,4,4,5,6,5,5,6,6,7,7,6,7,6,9,8,7,8, 9,7,8,8,7,9,9,9
													6.45m: END OF INVESTIGATION

COMMENTS:

Hole Depth 6.45m

Scale 1:25

Rev.: A

CORE PHOTOS

BOREHOLE No.: **HA111**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5927039.30 mN (NZTM2000) 1743395.90 mE R.L.: 14.40m DATUM: NZVD2016	DRILL TYPE: 75 and 50 mm Hand auger DRILL METHOD: HA+DCP	HOLE STARTED: 07/12/2020 HOLE FINISHED: 07/12/2020 DRILLED BY: Tonkin + Taylor Ltd LOGGED BY: ROM CHECKED: CBM

0.00-3.10m

HAND AUGER LOG

HOLE Id: **HA112**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926554.90 mN 1743164.20 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 02/12/2020
		DRILL METHOD: HA+DCP	HOLE FINISHED: 02/12/2020
R.L.:	9.60m		DRILLED BY: Tonkin + Taylor Ltd
DATUM:	NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL										ENGINEERING DESCRIPTION				
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Fill					Env/asb @ 0.10m 72/16 kPa Env/asb @ 0.50m PID 0.9ppm @ 0.51m 116/22 kPa Env/asb @ 1.00m PID 1.8ppm @ 1.01m UTP Env @ 1.80m Env/corrosivity @ 2.00m		9 8 7 6 5	0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5		M	St VSt		Sandy SILT, trace organics; brown and grey mottled orange, spotted black and white. Stiff, moist, low plasticity; sand, fine; organics, rootlets & carbonaceous material. Sandy SILT, trace organics; dark grey brown, spotted black. Stiff, moist, low plasticity; sand, fine; organics, rootlets. Silty CLAY, some sand, trace organics; grey, some orange spots. Very stiff, moist, medium plasticity; sand, fine; organics, rootlets. 1.8m: Strong chemical odour 2.0m: roots, white/cream coloured powder. 2m: Refusal

Box 1, 0.0-2.0m

COMMENTS:

Hole Depth 2m

Scale 1:25

Rev.: A

CORE PHOTOS

BOREHOLE No.: **HA112**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5926554.90 mN (NZTM2000) 1743164.20 mE R.L.: 9.60m DATUM: NZVD2016	DRILL TYPE: 50 mm Hand auger DRILL METHOD: HA+DCP	HOLE STARTED: 02/12/2020 HOLE FINISHED: 02/12/2020 DRILLED BY: Tonkin + Taylor Ltd LOGGED BY: ROM CHECKED: CBM

0.00-2.00m

HAND AUGER LOG

HOLE Id: **HA113**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926630.20 mN 1743032.10 mE	DRILL TYPE: 75 and 50 mm Hand auger	HOLE STARTED: 02/12/2020
			HOLE FINISHED: 02/12/2020
R.L.:	7.90m	DRILL METHOD: HA+DCP	DRILLED BY: GEOTECHNICS
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Topsoil					asb/gI/dupC @ 0.00m				TS	M			SILT; brown with yellowish brown inclusions. Very stiff, moist, non-plastic.
					● 161/21 kPa asb/gI @ 0.40m				TS		VSt		SILT; dark brown. Very stiff, moist, non-plastic.
Tauranga Group					PID, 0.0ppm @ 0.50m			0.5					SILT, some clay; light brown. Very stiff, moist; low to no plasticity.
					● 150/37 kPa						St-VSt		Clayey SILT; light brown. Stiff to very stiff, moist; low to medium plasticity.
					● 96/32 kPa asb/gI @ 0.90m		7	1.0					1.1m: medium plasticity
	02/12/2020 Water inflow/level on completion				PID, 0.4ppm @ 1.00m ● 66/21 kPa								
					● 54/16 kPa att/psd @ 1.45m			1.5			St		Sandy SILT; light brown mottled orange brown. Stiff, moist, non-plastic; sand, fine.
					● 88/24 kPa asb/gI @ 1.90m		6	2.0		S			Silty SAND; brown, grey from 2.2m. Saturated, non-plastic.
East Coast Bays Formation				4 5 12 26 >>	● 114/13 kPa att/psd @ 2.45m			2.5					2.4m: Scala (blows per 50mm): 4.5, 4.5,12,26, bouncinig Over augered, solid refusal at 2.6m
Box 1, 0.0-2.6m							5	3.0					2.6m: Refusal
							4	4.0					
							3	4.5					

COMMENTS: Brigham Creek Road. ECBF outcrop in nearby creek bed.

Hole Depth 2.6m

Scale 1:25

Rev.: A

Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **HA113**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5926630.20 mN (NZTM2000) 1743032.10 mE R.L.: 7.90m DATUM: NZVD2016	DRILL TYPE: 75 and 50 mm Hand auger DRILL METHOD: HA+DCP	HOLE STARTED: 02/12/2020 HOLE FINISHED: 02/12/2020 DRILLED BY: GEOTECHNICS LOGGED BY: RBE CHECKED: CBM

0.00-2.60m

HAND AUGER LOG

HOLE Id: **HA114**

SHEET: 1 OF 2

PROJECT: Watercare Whenuapai-Redhill GI | LOCATION: Whenuapai | JOB No.: 1014985.0000

CO-ORDINATES: (NZTM2000) 5926872.80 mN, 1743108.40 mE
R.L.: 11.00m
DATUM: NZVD2016

DRILL TYPE: 75 and 50 mm Hand auger
DRILL METHOD: HA+DCP

HOLE STARTED: 03/12/2020
HOLE FINISHED: 03/12/2020
DRILLED BY: GEOTECHNICS
LOGGED BY: RBE
CHECKED: CBM

GEOLOGICAL / ENGINEERING DESCRIPTION

Geological unit	Depth (m)	Moisture	Strength/Density	Description and Additional Observations
Fill	0.0	D		Gravelly SILT; brown. Dry, non-plastic; (farm track).
Topsoil	0.2	M	VSt	SILT; greyish brown. Very stiff, moist, non-plastic.
Tauranga Group	0.4			SILT; light brown. Very stiff, moist, non-plastic.
	0.9		St-VSt	Clayey SILT; light grey mottled yellowish brown. Stiff to very stiff, moist, low plasticity. 1.0m: medium plasticity. 1.2m: low plasticity
	1.5		F	Silty CLAY; light greyish brown. Firm, moist, high plasticity.
	2.0	W		SILT; light brown. Firm, wet, non-plastic.
	2.2	M		Clayey SILT; light brown mottled orange brown. Firm, moist, medium plasticity.
	2.6		F-St	Sandy SILT; light brown. Stiff to firm, moist, non-plastic. 3.0m: grey
	3.2	M-W	F	Silty CLAY; light greyish brown. Firm, moist to wet, high plasticity; difficult to recover.
	4.6	M	F-St	Clayey SILT; greyish brown. Firm to stiff, moist, low plasticity.

Water: 03/12/2020 inflow 2.6m, w/l after 4hrs (at 2.2m)

Tests:
- Dup D, Asb/gl @ 0.00m
- 184/32 kPa
- asb/gl @ 0.40m
- 186/29 kPa
- 109/33 kPa
- asb/gl @ 0.90m
- 104/42 kPa
- 56/27 kPa
- att/psd @ 1.45m
- 40/24 kPa
- asb/gl @ 1.90m
- 41/27 kPa
- 42/21 kPa
- 61/16 kPa
- asb/gl @ 2.70m
- 56/15 kPa
- 37/16 kPa
- att/psd @ 3.45m
- 40/9 kPa
- asb/gl @ 3.70m
- 27/11 kPa
- 27/11 kPa
- 49/24 kPa
- 37/20 kPa
- asb/gl @

COMMENTS: 26 Brigham Ck Rd

Hole Depth 7.25m

Scale 1:25

Rev.: A

HAND AUGER LOG

HOLE Id: **HA114**

SHEET: 2 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5926872.80 mN 1743108.40 mE	DRILL TYPE: 75 and 50 mm Hand auger	HOLE STARTED: 03/12/2020
R.L.: 11.00m	DRILL METHOD: HA+DCP	HOLE FINISHED: 03/12/2020
DATUM: NZVD2016		DRILLED BY: GEOTECHNICS
		LOGGED BY: RBE CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Box 1, 0.0-5.2m Tauranga Group				0 0 0 0 1 0 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 4 3 3 2 3 2 3 2 3 2 2 3 2 3 2 3 3 3 4 4 4 4	4.70m ● 50/11 kPa		5 4	5.5 6.0 6.5 7.0					[CONT] Clayey SILT; greyish brown. Firm to stiff, moist, low plasticity. End of hand auger 5.2 m Scala (blows per 50 mm) 0,0,0,0,1,0,1,1,1,1,2,2,2,2,2,2 3,3,3,4,3,3,2,3,2,3,2,3,2,2,2,3 3,3,4,4,4,4,
							3 2	7.5 8.0 8.5 9.0 9.5					7.25m: Target depth

COMMENTS: 26 Brigham Ck Rd

Hole Depth 7.25m

Scale 1:25

Rev.: A

CORE PHOTOS

BOREHOLE No.: **HA114**

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5926872.80 mN (NZTM2000) 1743108.40 mE R.L.: 11.00m DATUM: NZVD2016	DRILL TYPE: 75 and 50 mm Hand auger DRILL METHOD: HA+DCP	HOLE STARTED: 03/12/2020 HOLE FINISHED: 03/12/2020 DRILLED BY: GEOTECHNICS LOGGED BY: RBE CHECKED: CBM

0.00-5.20m

HAND AUGER LOG

HOLE Id: **HA115**

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5926794.20 mN 1743054.00 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 03/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 03/12/2020
R.L.: 9.90m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	Description and Additional Observations
Fill	Silty SAND, trace organics; brown. Moist, poorly graded; sand, fine, loosely packed; organics, rootlets.
	Silty CLAY, minor sand; orange-brown mottled orange. Very stiff, moist; sand, fine.
	Sandy SILT, trace organics; brown. Stiff, moist, low plasticity; sand, fine; organics, rootlets..
	0.4m: Brown & light brown
Tauranga Group	Sandy SILT, minor clay, trace organics; brown and light brown mottled orange. Stiff, moist, low plasticity; sand, fine; organics, rootlets.
	SILT, minor clay and sand, trace organics; light grey-brown mottled orange. Stiff, moist, low plasticity; sand, fine; organics, rootlets.
	1.9m: Brown mottled orange
	2.6 - 2.65m: organics, decomposed wood
	Sandy SILT, trace organics; grey speckled black. Firm, wet, low plasticity; sand, fine; organics, rootlets.
	3.55m: Organics, wood
	SILT, minor sand, trace organics; brown speckled black. Firm, wet, low plasticity; sand, fine; organics, rootlets.
	Sandy SILT, trace organics; grey speckled black. Firm, saturated to wet, low plasticity; sand, fine; organics, rootlets.
	SILT, some sand, trace organics; brown speckled black. Firm, wet, low plasticity; sand, fine; organics, rootlets.

DEPTH (m)	RL (m)	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm)	TESTS	SAMPLES	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)
0.5	9		100	HA+DCP	0 2 4 6 8 10 12 14 16 18	env @ 0.10m			M	L	
										VSt	
						168/40 kPa env @ 0.50m					
										St-VSt	
1.0						171/51 kPa env @ 1.00m split/dup @ 1.01m					
1.5						82/19 kPa				St	
2.0	8					81/25 kPa env @ 2.00m					
2.5						56/22 kPa geo @ 2.60m					
3.0	7	24/11/2020				56/25 kPa			W	F	
3.5						34/16 kPa					
4.0	6					40/19 kPa			W-S		
4.5						37/28 kPa			W	St	
	5					88/54 kPa					

Box 1, 0.0-3.0m

Box 2, 3.0-5.0m

COMMENTS:

Hole Depth 6m

Scale 1:25

Rev.: A

HAND AUGER LOG

HOLE Id: **HA115**

SHEET: 2 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5926794.20 mN 1743054.00 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 03/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 03/12/2020
R.L.: 9.90m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
				2 2 3 2 4 4 4 6 5 7 7 8 9 7 9 9 10 10 12 20			4	5.5					5.0m: END OF HAND AUGER. Scala only to 6.0m(blows per 50mm): 2,2,3,2,4,4,4,6,5,7,7,8,9,7,9,9,10,10,12,20
							3	6.0					6m: Refusal
							2	6.5					
							1	7.0					
							0	7.5					
								8.0					
								8.5					
								9.0					
								9.5					

COMMENTS:

Hole Depth 6m

Scale 1:25

Rev.: A

Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **HA115**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5926794.20 mN (NZTM2000) 1743054.00 mE R.L.: 9.90m DATUM: NZVD2016	DRILL TYPE: 50 mm Hand auger DRILL METHOD: HA+DCP	HOLE STARTED: 03/12/2020 HOLE FINISHED: 03/12/2020 DRILLED BY: Tonkin + Taylor Ltd LOGGED BY: ROM CHECKED: CBM

0.00-3.00m

3.00-5.00m

HAND AUGER LOG

HOLE Id: **HA116**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5926675.90 mN 1743047.90 mE	DRILL TYPE: 75 and 50 mm Hand auger	HOLE STARTED: 02/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 02/12/2020
R.L.: 8.80m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: CBM

GEOLOGICAL / ENGINEERING DESCRIPTION

Geological unit	Tests	Depth (m)	Moisture	Strength/Density	Description and Additional Observations
Topsoil	asb/gl/split @ 0.00m	0.00	M		SILT; dark brown. Moist, non-plastic.
Tauranga Group	86/27 kPa; asb/gl @ 0.40m; PID, 0.5ppm @ 0.50m; 72/7 kPa; 49/12 kPa; asb/gl @ 0.90m; PID, 1.0ppm @ 1.00m; 58/5 kPa; 80/19 kPa; att/psd @ 1.45m; 73/24 kPa; asb/gl @ 1.90m; 66/20 kPa	0.25	M-W	F-St	Clayey SILT; greyish brown. Stiff to firm, moist, medium plasticity. 1.0m: wet to saturated
East Coast Bays Formation	>186 kPa; UTP	2.20	W	St-VSt	Sandy SILT; brown and orange brown; grey from 2.3m. Stiff to very stiff, wet, non-plastic.
		2.70	M	VSt	Clayey SILT; grey. Very stiff, moist, low plasticity.
	att/psd @ 2.95m	2.90	S		Silty SAND; grey. Saturated; well packed. 2.95m: Scala (blows per 50mm) 7,7,7,8,11,16,18,23 then bouncing. Over augered, solid refusal at 3.35m
		3.35			3.35m: Refusal

Water: 02/12/2020 level on completion (approx. 0.75m)

Scala Penetrometer (Blows/50mm): 7, 7, 7, 8, 11, 16, 18, 23 >>

Box 1, 0.0-3.4m

COMMENTS: Brigham Creek

Hole Depth 3.35m

Scale 1:25

Rev.: A

HandAugerLog - 23/12/2020 8:08:00 AM - Produced with Core-GS by GeRoc

Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **HA116**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5926675.90 mN (NZTM2000) 1743047.90 mE R.L.: 8.80m DATUM: NZVD2016	DRILL TYPE: 75 and 50 mm Hand auger DRILL METHOD: HA+DCP	HOLE STARTED: 02/12/2020 HOLE FINISHED: 02/12/2020 DRILLED BY: GEOTECHNICS LOGGED BY: RBE CHECKED: CBM

0.00-3.35m

HAND AUGER LOG

HOLE Id: **HA117**

SHEET: 1 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5926564.40 mN (NZTM2000) 1743138.40 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 02/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 02/12/2020
R.L.: 10.00m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Fill		100	HA+DCP		Env/asb @ 0.10m					D	St		Sandy SILT, trace organics; light brown mottled orange and brown. Stiff, dry, low plasticity; sand, fine; organics, rootlets..
					● 152/19 kPa Env/asb @ 0.50m PID 0.8ppm @ 0.51m			0.5		M	VSt		Silty CLAY, minor sand, trace organics & insulation fibres; light brown mottled orange. Very stiff, moist, high plasticity; sand, fine; organics, rootlets.
					● 137/16 kPa Env/asb @ 1.00m PID 6.0ppm @ 1.01m		9	1.0		D-M			Sandy SILT, trace organics; dark brown and light brown mottled orange. Very stiff, dry to moist, low plasticity; sand, fine; organics, rootlets.
					● 112/25 kPa			1.5		M			Silty CLAY, trace organics; light brown mottled orange. Very stiff, moist, high plasticity; organics, rootlets.
					● 186/76 kPa Env/corrosivity @ 2.00m		8	2.0					
Tauranga Group					● 218/81 kPa			2.5			VSt-H		Silty CLAY, some sand, minor organics; brown spotted black, speckled white and orange. Very stiff, moist, high plasticity; sand, fine; organics, carbonaceous.
Box 1, 0.0-3.0m					att/psd @ 2.70m								Sandy SILT; grey and brown speckled orange. Very stiff to hard, moist, low plasticity; sand, fine.
					● 171/48 kPa		7	3.0			VSt		SILT, some clay and sand, trace peat (spongy); brown mottled orange, streaked black. Very stiff, moist, low plasticity; sand, fine.
					● 156/75 kPa			3.5					3.6m: Grey mottled orange
					● 199/75 kPa		6	4.0					Sandy SILT, trace organics; light brown mottled orange, streaked black. Very stiff, moist, low plasticity; sand, fine; carbonaceous & decomposed wood.
					● 209/72 kPa			4.5			D		Silty SAND, trace organics; grey streaked black and brown. Moist, poorly graded; sand, fine, tightly packed; carbonaceous & decomposed wood.
Box 2, 3.0-5.0m					● 184/73 kPa								

COMMENTS:

Hole Depth 6.3m

Scale 1:25

Rev.: A

HAND AUGER LOG

HOLE Id: **HA117**

SHEET: 2 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5926564.40 mN 1743138.40 mE	DRILL TYPE: 50 mm Hand auger	HOLE STARTED: 02/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 02/12/2020
R.L.: 10.00m		DRILLED BY: Tonkin + Taylor Ltd
DATUM: NZVD2016		LOGGED BY: ROM CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
				3 4 4 4 7 7 6 7 7 9 7 7 7 8 7 7 7 6 8 8 8 10 11 10 11 11			4	5.5 6.0					5.0 m: END OF HAND AUGER. Scala only to 6.3 m (blows per 50 mm): 3,4,4,4,7,7,6,7,7,9,7,7,7,8,7,7,7,6,8,8,8,10,11,10, 11,11
							3 2 1	6.5 7.0 7.5 8.0 8.5 9.0 9.5					6.3m: END OF INVESTIGATION

COMMENTS:

Hole Depth 6.3m

Scale 1:25

Rev.: A

CORE PHOTOS

BOREHOLE No.: **HA117**

SHEET: 1 OF 1

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5926564.40 mN (NZTM2000) 1743138.40 mE R.L.: 10.00m DATUM: NZVD2016	DRILL TYPE: 50 mm Hand auger DRILL METHOD: HA+DCP	HOLE STARTED: 02/12/2020 HOLE FINISHED: 02/12/2020 DRILLED BY: Tonkin + Taylor Ltd LOGGED BY: ROM CHECKED: CBM

0.00-3.00m

3.00-5.00m

HAND AUGER LOG

HOLE Id: **HA119**

SHEET: 1 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5926938.00 mN 1743195.90 mE	DRILL TYPE: 75 and 50 mm Hand auger	HOLE STARTED: 03/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 03/12/2020
R.L.: 11.40m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

Geological Unit, Generic Name, Origin, Material Composition.	Water	Core Recovery (%)	Method	Scala Penetrometer (Blows/50mm)	Tests	Samples	RL (m)	Depth (m)	Graphic Log	Moisture Condition / Weathering	Strength/Density Classification	Shear Strength (kPa)	Description and Additional Observations
Topsoil					Dup E/asb/gl @ 0.00m		11	0	TS	D			SILT; light brown. Dry, non-plastic.
					● 125/4 kPa asb/gl @ 0.40m			0.5		M	VSt		Clayey SILT; light brown. Very stiff, moist, low plasticity.
					● 81/32 kPa						St		Silty CLAY; light brown mottled yellowish brown. Stiff, moist, medium plasticity.
					● 74/21 kPa asb/gl @ 0.90m			1.0					1.1m: sandy layer
	03/12/2020 inflow 1.6m, W/L after 45mins				● 56/19 kPa		10						Clayey SILT; light brown mottled yellowish brown. Stiff, moist, low plasticity.
					● 58/19 kPa att/psd @ 1.45m			1.5		S	F-St		Sandy SILT; brown mottled yellowish brown. Firm to stiff, saturated, non-plastic.
					● 60/11 kPa asb/gl @ 1.90m			2.0		W	S-F		Clayey SILT; grey. Soft to firm, wet, medium plasticity.
Tauranga Group					● 42/19 kPa		9						
					● 66/16 kPa att/psd @ 2.45m			2.5					
					● 23/8 kPa asb/gl @ 2.70m								
					● 29/11 kPa			3.0					
					● 48/20 kPa		8				F		Clayey sandy SILT; grey. Firm, wet, low plasticity.
					● 50/20 kPa asb/gl @ 3.70m			3.5		M	St		Clayey SILT; grey. Stiff, moist, medium plasticity.
					● 56/19 kPa			4.0					Clayey sandy SILT; light grey. Stiff, moist, low plasticity.
					● 61/32 kPa					W			Sandy SILT; grey. Stiff, wet, non-plastic.
					● 25/11 kPa		7	4.5		M	F-St		Clayey SILT; grey. Firm to stiff, moist, medium plasticity.
					● 32/19 kPa asb/gl @								

COMMENTS: 26 Brigham Ck Rd. No core photograph, the soil is very similar to HA109

Hole Depth 7.25m

Scale 1:25

Rev.: A

HAND AUGER LOG

HOLE Id: **HA119**

SHEET: 2 OF 2

PROJECT: Watercare Whenuapai-Redhill GI	LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000) 5926938.00 mN 1743195.90 mE	DRILL TYPE: 75 and 50 mm Hand auger	HOLE STARTED: 03/12/2020
	DRILL METHOD: HA+DCP	HOLE FINISHED: 03/12/2020
R.L.: 11.40m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: CBM

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/50mm) 0 2 4 6 8 10 12 14 16 18	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Box 1, 0.0-5.2m Tauranga Group				0,0,0,0,1,1,1,1,1,1,3,3,2,3,3,4,2,3,2,3,2,3,3,3,3,3,3,3,3,4,4,6,6,6,7,6,6,5,5,6,7	4.70m ● 54/13 kPa		6 5 4 3 2	5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5					[CONT] Clayey SILT; grey. Firm to stiff, moist, medium plasticity. 5.1m: some sand, minor organics end of handauger 5.2m Scala (blows per 100mm) 0,0,2,2,2,6,5,7,5,5, 5,6,6,6,8,12,13,12,10,13 7.25m: Target depth

COMMENTS: 26 Brigham Ck Rd. No core photograph, the soil is very similar to HA109

Hole Depth 7.25m

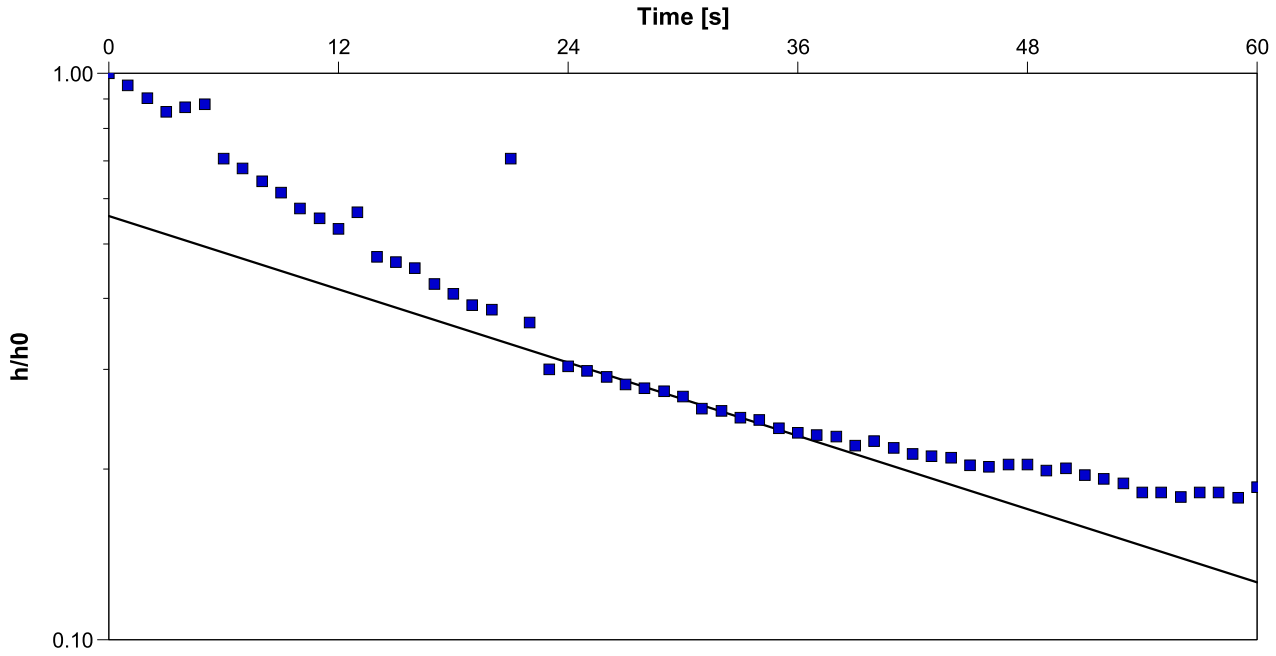
Scale 1:25

Rev.: A

Appendix F: Hydrogeology Analysis

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Road	Slug Test: BH05A Falling 1	Test Well: BH05A
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: KELE	Bouwer and Rice	Analysis Date: 3/12/2020
Aquifer Thickness: 11.14 m		

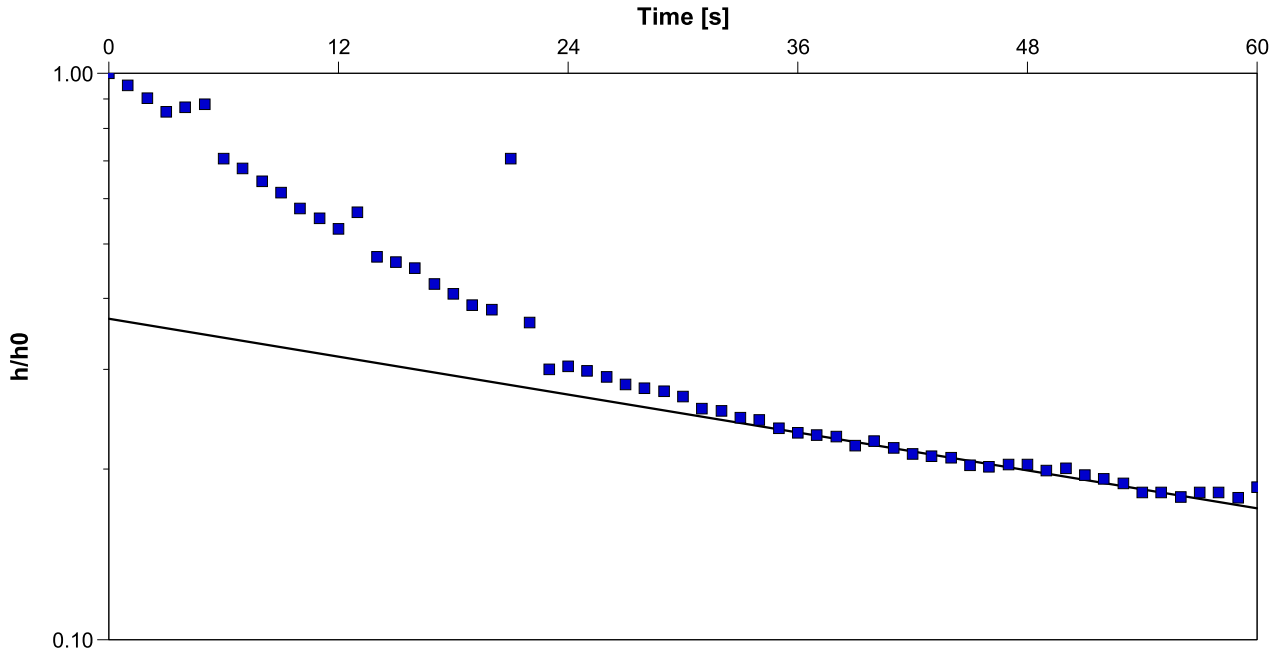


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH05A	9.62×10^{-6}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Road	Slug Test: BH05A Falling 1	Test Well: BH05A
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: KELE	Hvorslev	Analysis Date: 3/12/2020
Aquifer Thickness: 11.14 m		

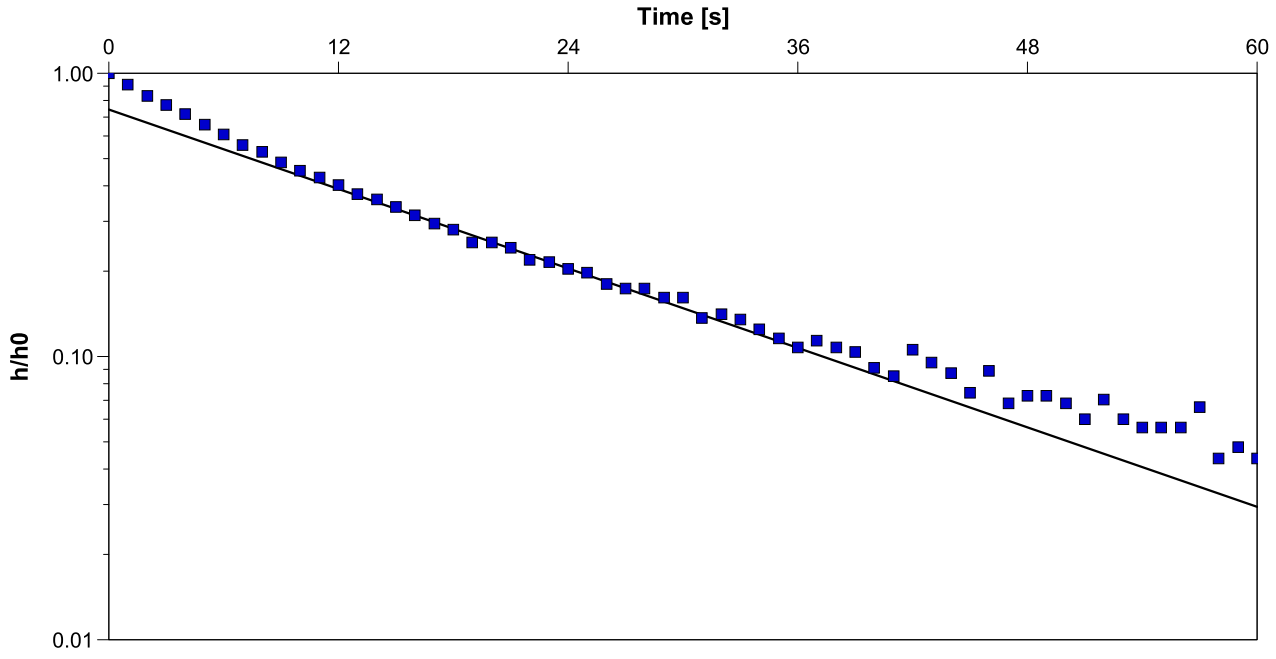


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH05A	6.44×10^{-6}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Road	Slug Test: BH05A Rising 1	Test Well: BH05A
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: KELE	Bouwer and Rice	Analysis Date: 3/12/2020
Aquifer Thickness: 11.14 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH05A	2.09×10^{-5}	

Tonkin+Taylor

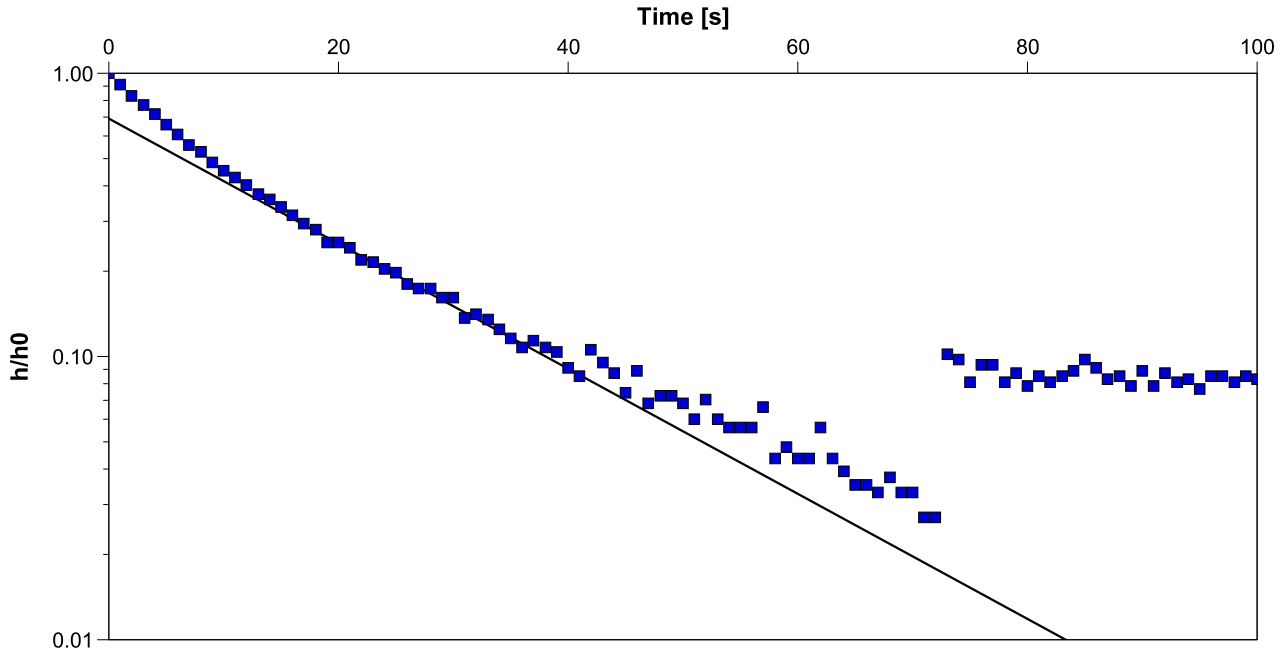
Slug Test Analysis Report

Project: Whenuapai and Redhills Wastewater Scheme

Number: 1014985

Client: Watercare Services Limited

Location: 23-27 Brigham Road	Slug Test: BH05A Rising 1	Test Well: BH05A
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: KELE	Hvorslev	Analysis Date: 3/12/2020
Aquifer Thickness: 11.14 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH05A	2.55×10^{-5}	

Tonkin+Taylor

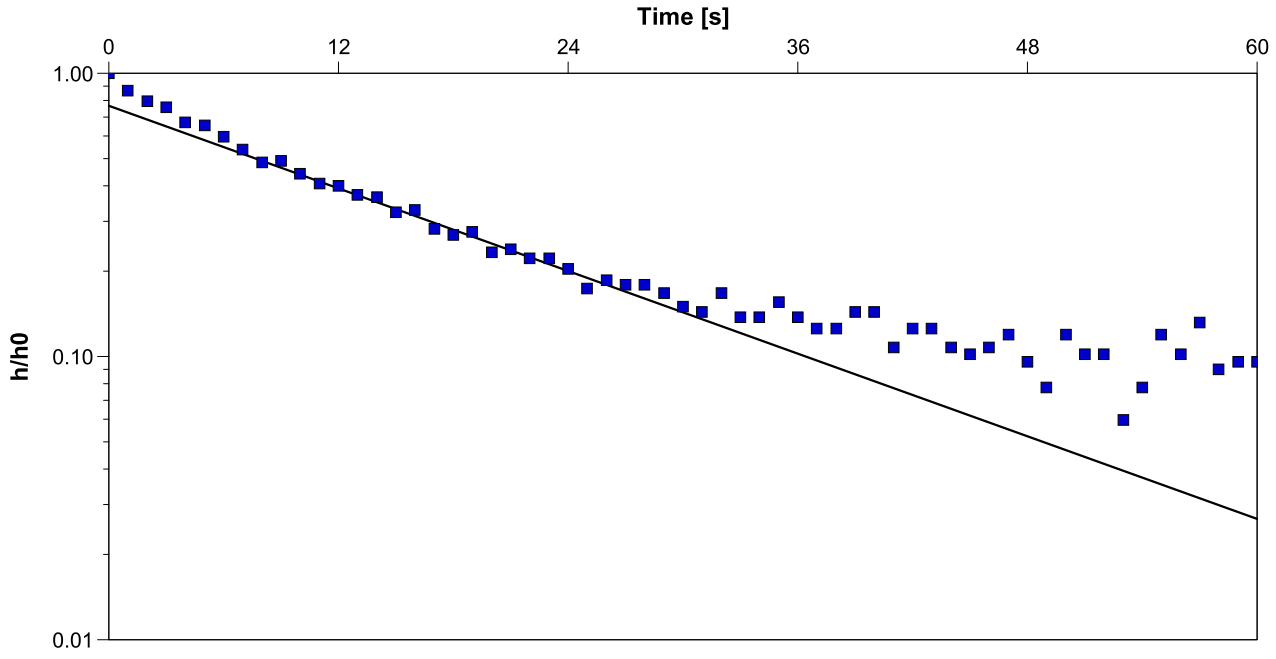
Slug Test Analysis Report

Project: Whenuapai and Redhills Wastewater Scheme

Number: 1014985

Client: Watercare Services Limited

Location: 23-27 Brigham Road	Slug Test: BH05A Falling 2	Test Well: BH05A
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: KELE	Bouwer and Rice	Analysis Date: 3/12/2020
Aquifer Thickness: 11.14 m		

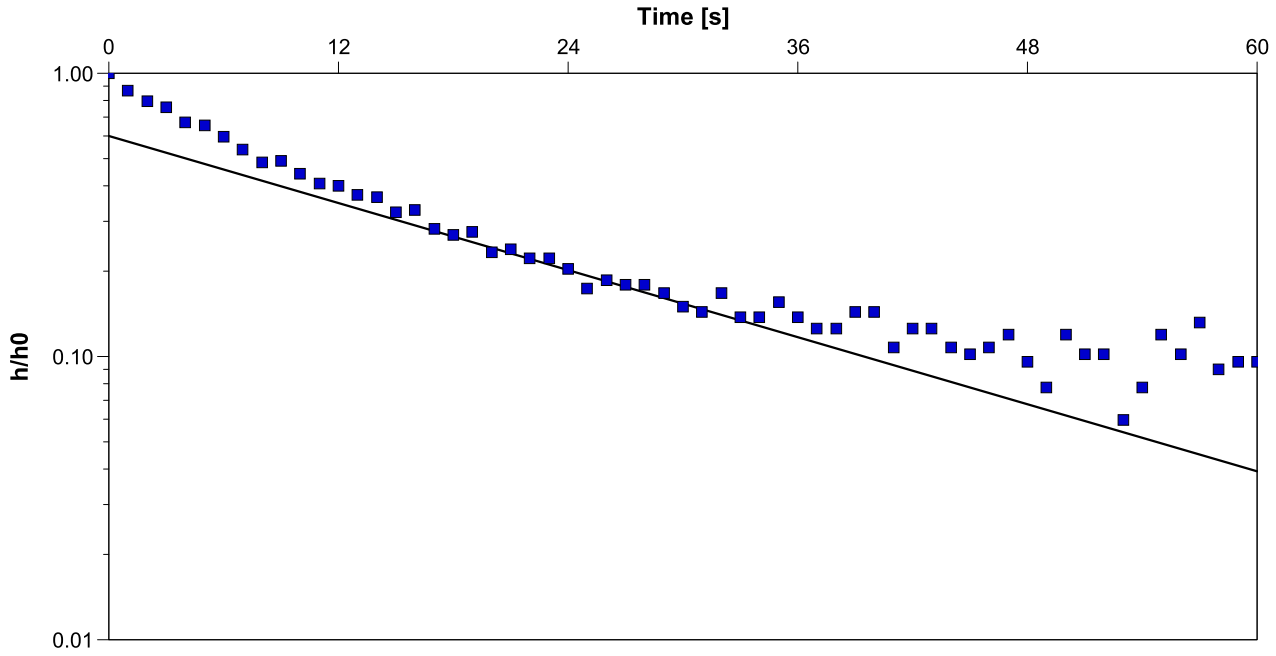


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH05A	2.17×10^{-5}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Road	Slug Test: BH05A Falling 2	Test Well: BH05A
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: KELE	Hvorslev	Analysis Date: 3/12/2020
Aquifer Thickness: 11.14 m		

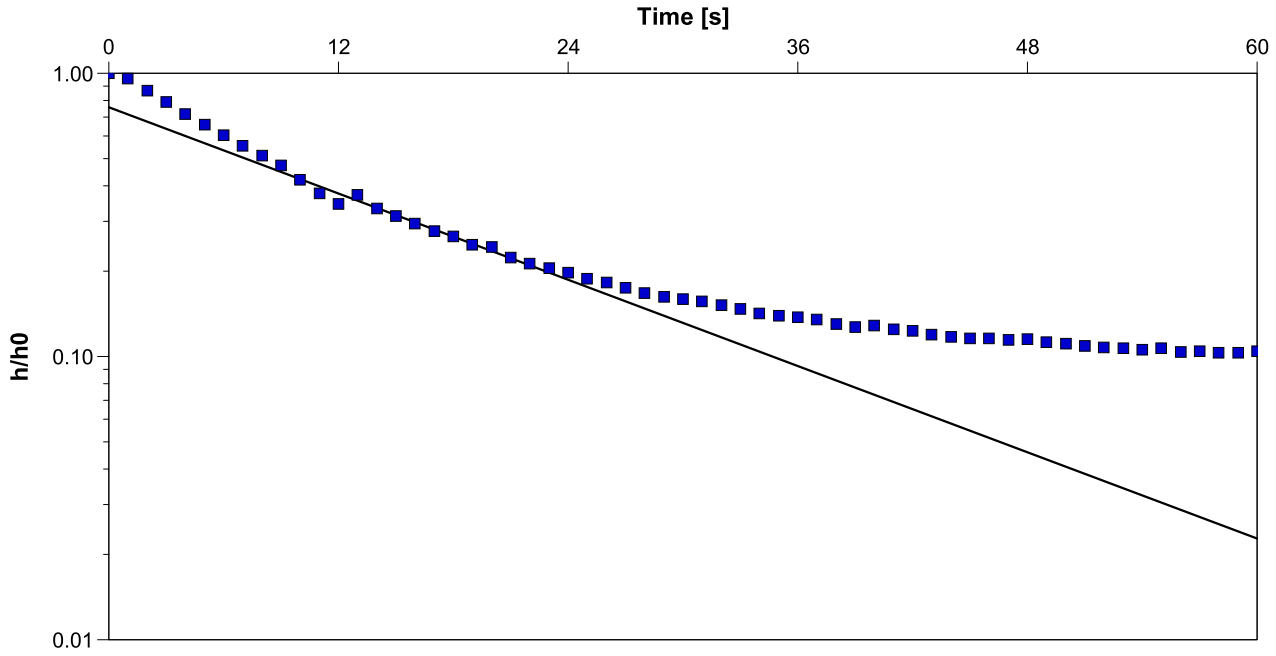


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH05A	2.28×10^{-5}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Road	Slug Test: BH05A Rising 2	Test Well: BH05A
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: KELE	Bouwer and Rice	Analysis Date: 3/12/2020
Aquifer Thickness: 11.14 m		

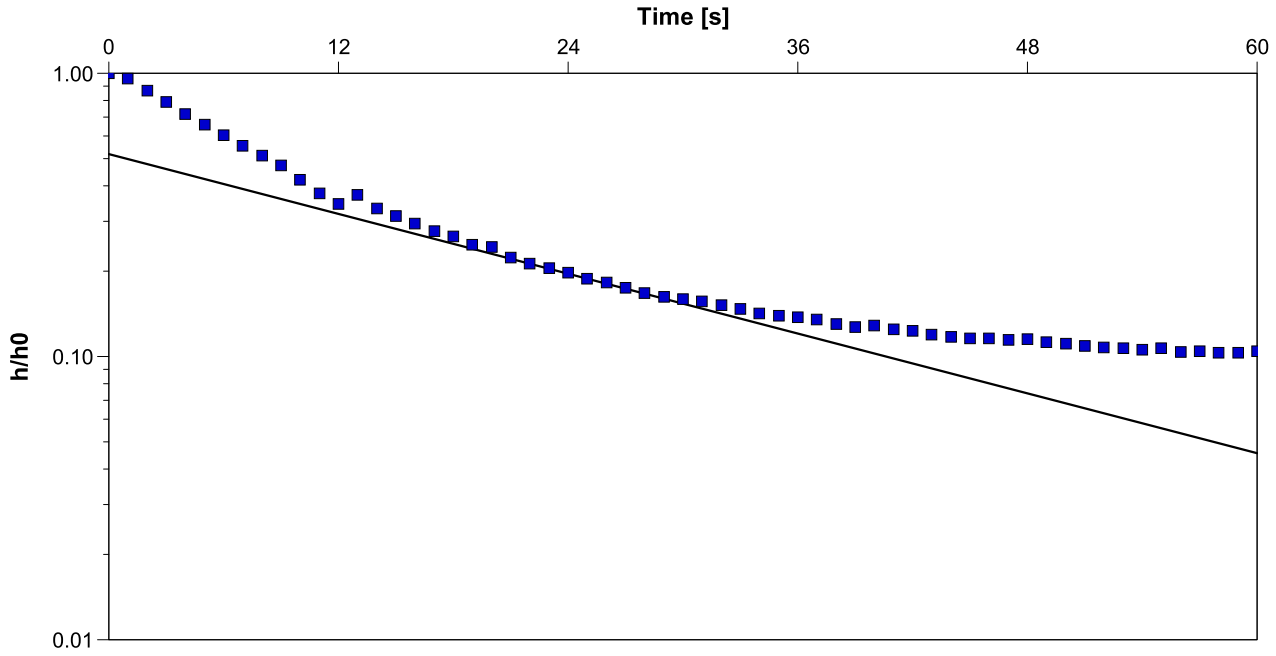


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH05A	2.27×10^{-5}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Road	Slug Test: BH05A Rising 2	Test Well: BH05A
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: KELE	Hvorslev	Analysis Date: 3/12/2020
Aquifer Thickness: 11.14 m		

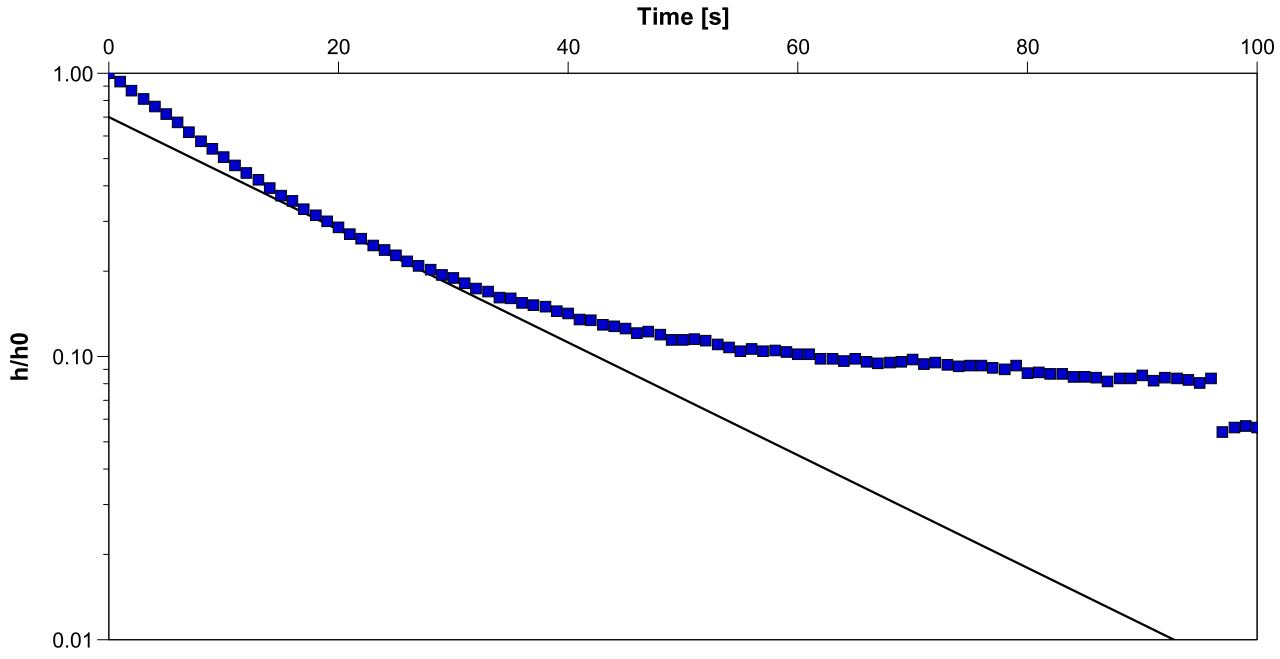


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH05A	2.03×10^{-5}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Road	Slug Test: BH05A Falling 3	Test Well: BH05A
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: KELE	Bouwer and Rice	Analysis Date: 3/12/2020
Aquifer Thickness: 11.14 m		

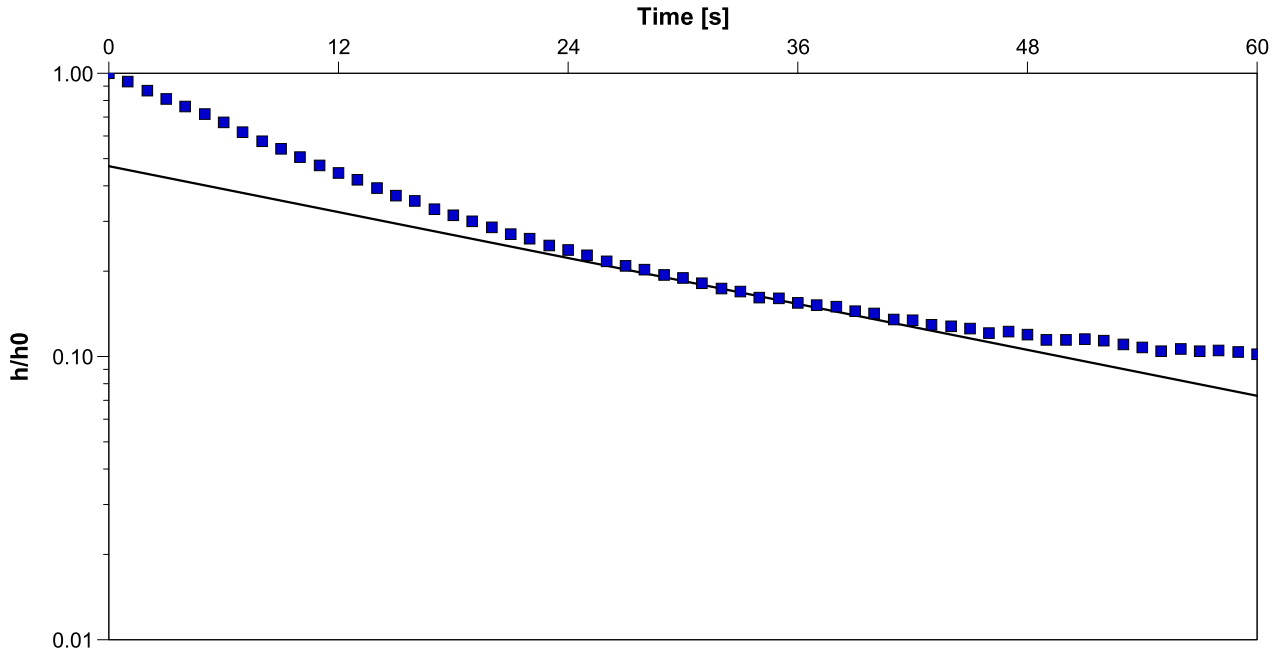


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH05A	1.78×10^{-5}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Road	Slug Test: BH05A Falling 3	Test Well: BH05A
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: KELE	Hvorslev	Analysis Date: 3/12/2020
Aquifer Thickness: 11.14 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH05A	1.56×10^{-5}	

Tonkin+Taylor

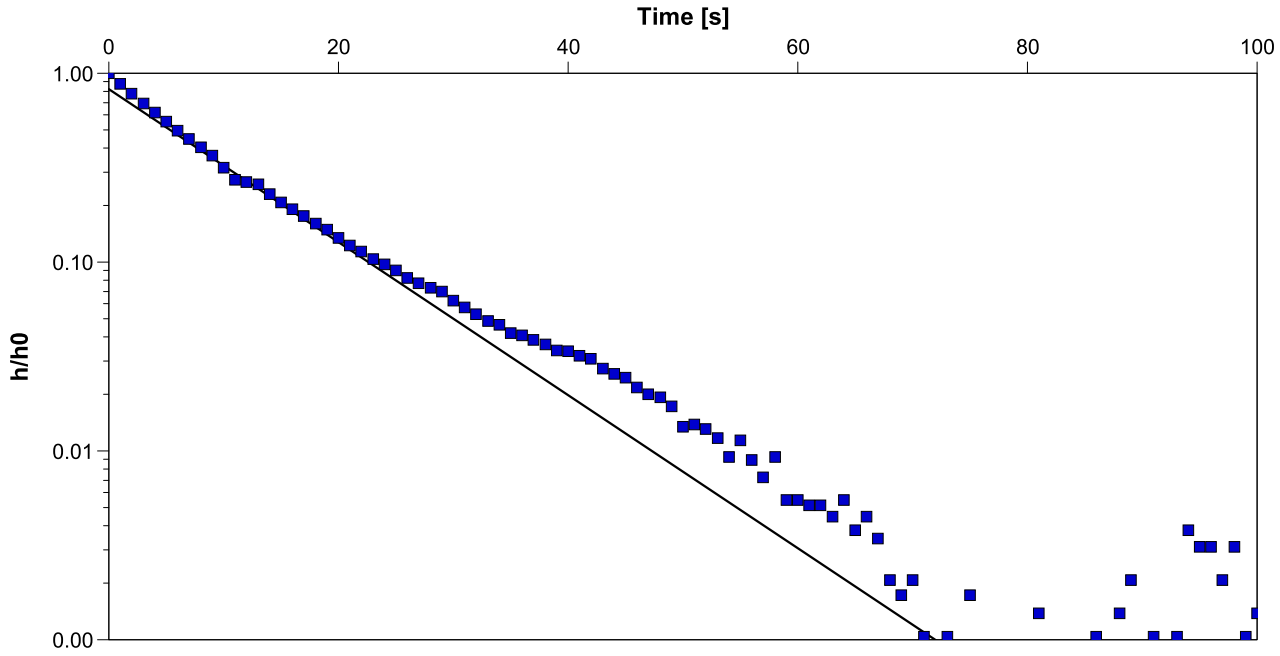
Slug Test Analysis Report

Project: Whenuapai and Redhills Wastewater Scheme

Number: 1014985

Client: Watercare Services Limited

Location: 23-27 Brigham Road	Slug Test: BH05A Rising 3	Test Well: BH05A
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: KELE	Bouwer and Rice	Analysis Date: 3/12/2020
Aquifer Thickness: 11.14 m		

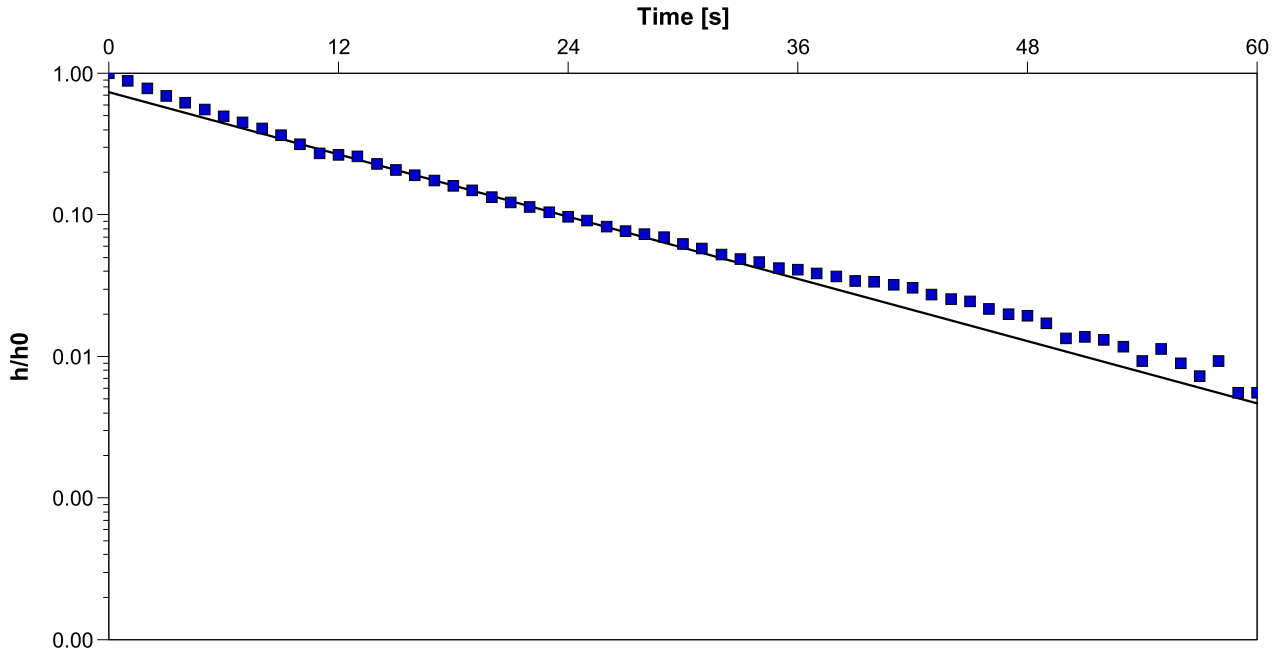


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH05A	3.62×10^{-5}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Road	Slug Test: BH05A Rising 3	Test Well: BH05A
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: KELE	Hvorslev	Analysis Date: 3/12/2020
Aquifer Thickness: 11.14 m		

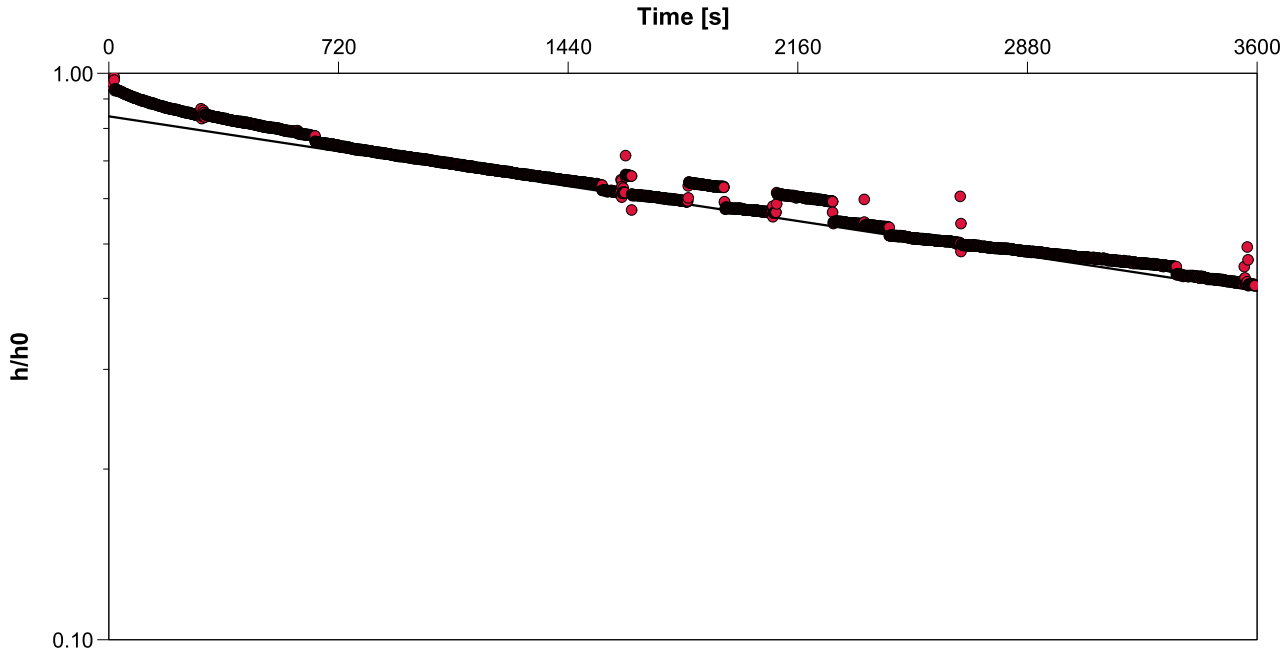


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH05A	4.23×10^{-5}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Road	Slug Test: BH05B Falling	Test Well: BH05B
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 3/12/2020
Aquifer Thickness: 2.66 m		

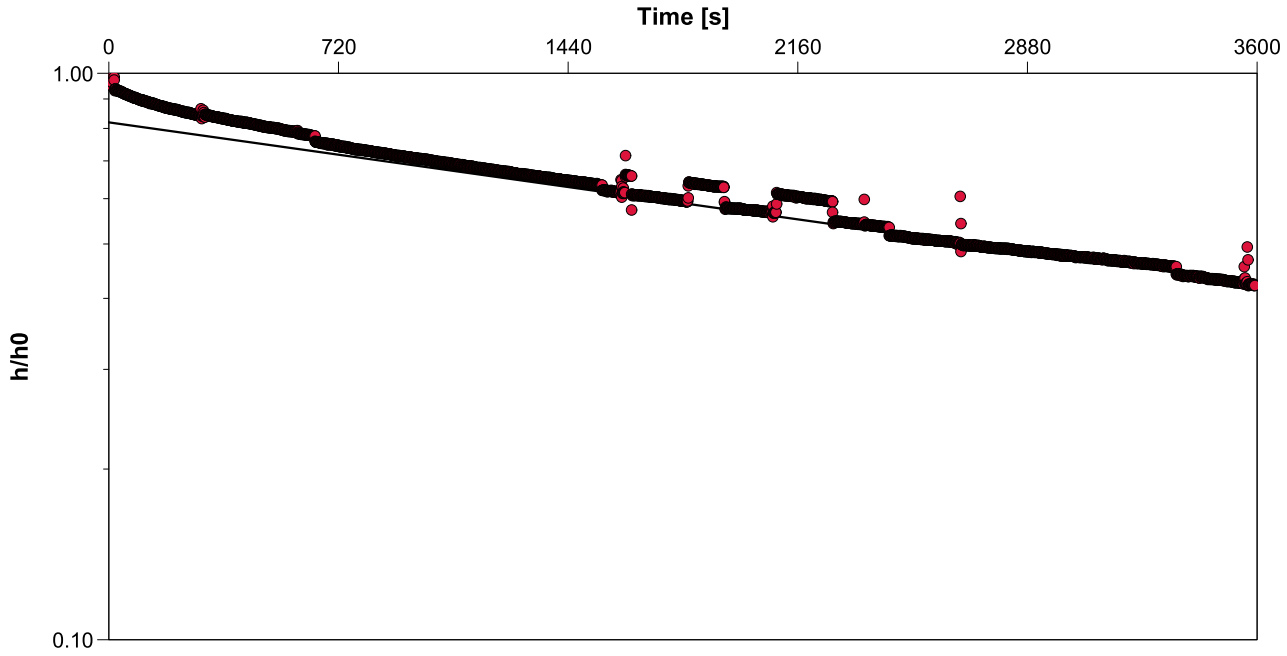


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH05B	1.09×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Road	Slug Test: BH05B Falling	Test Well: BH05B
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 3/12/2020
Aquifer Thickness: 2.66 m		

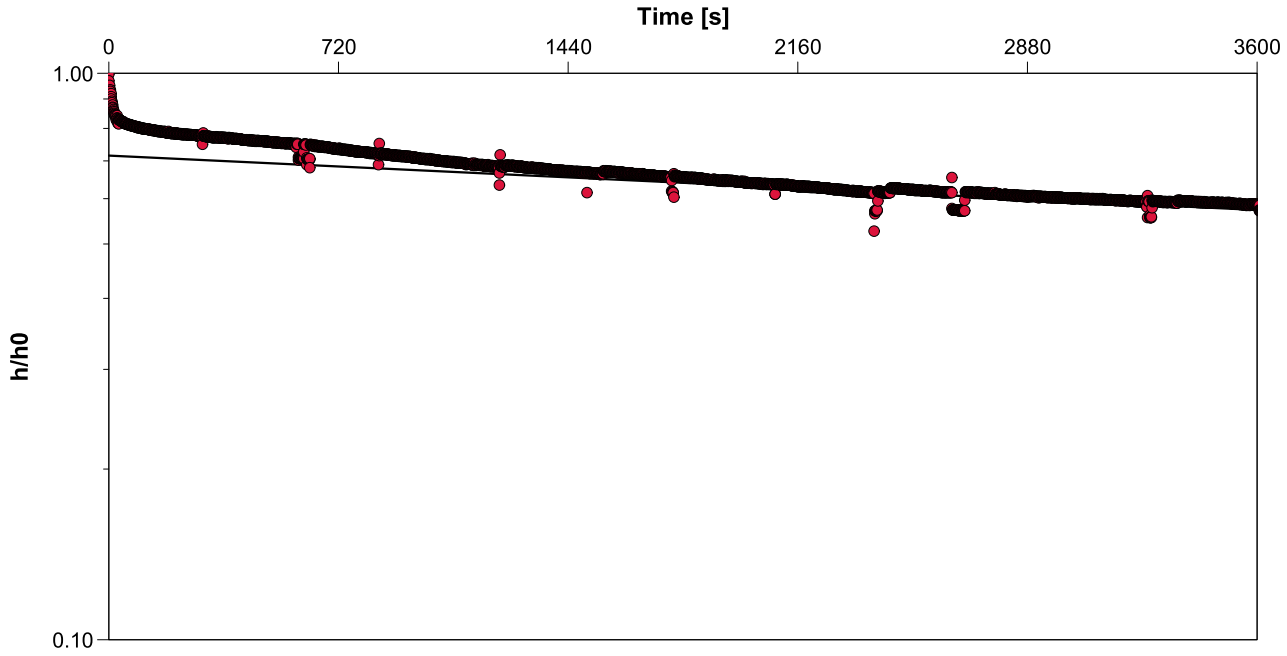


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH05B	1.31×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Road	Slug Test: BH05B Rising	Test Well: BH05B
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 3/12/2020
Aquifer Thickness: 2.66 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH05B	3.40×10^{-8}	

Tonkin+Taylor

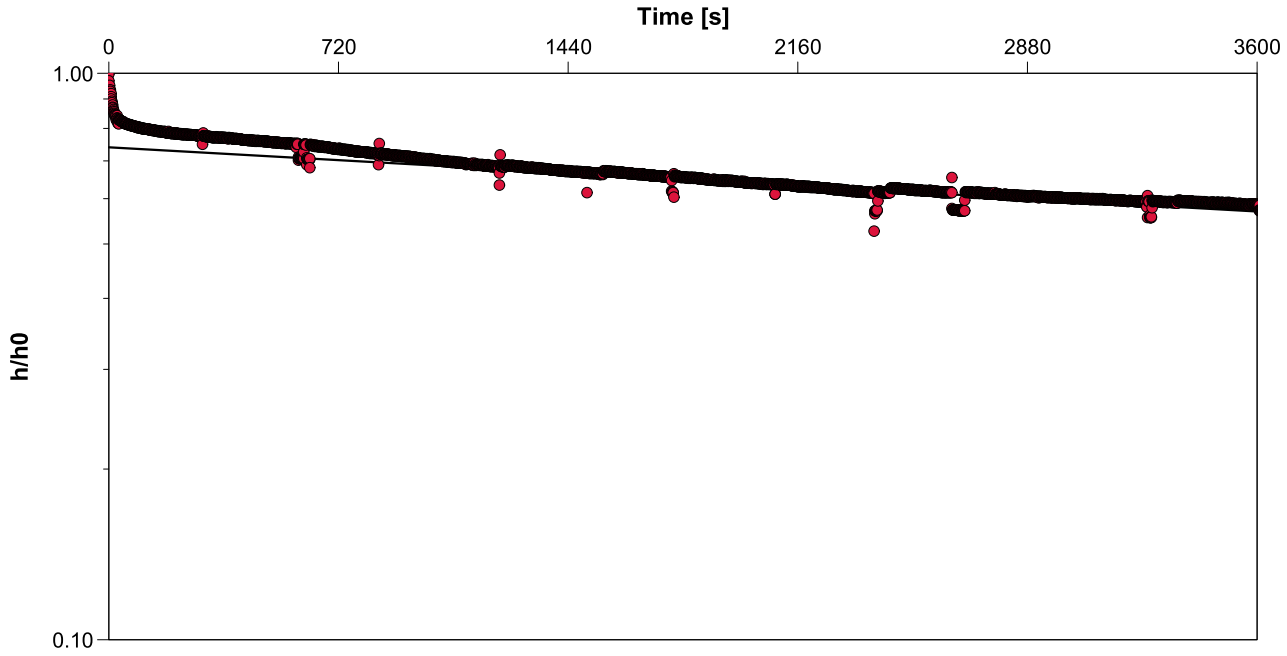
Slug Test Analysis Report

Project: Whenuapai and Redhills Wastewater Scheme

Number: 1014985

Client: Watercare Services Limited

Location: 23-27 Brigham Road	Slug Test: BH05B Rising	Test Well: BH05B
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 3/12/2020
Aquifer Thickness: 2.66 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH05B	5.26×10^{-8}	

Tonkin+Taylor

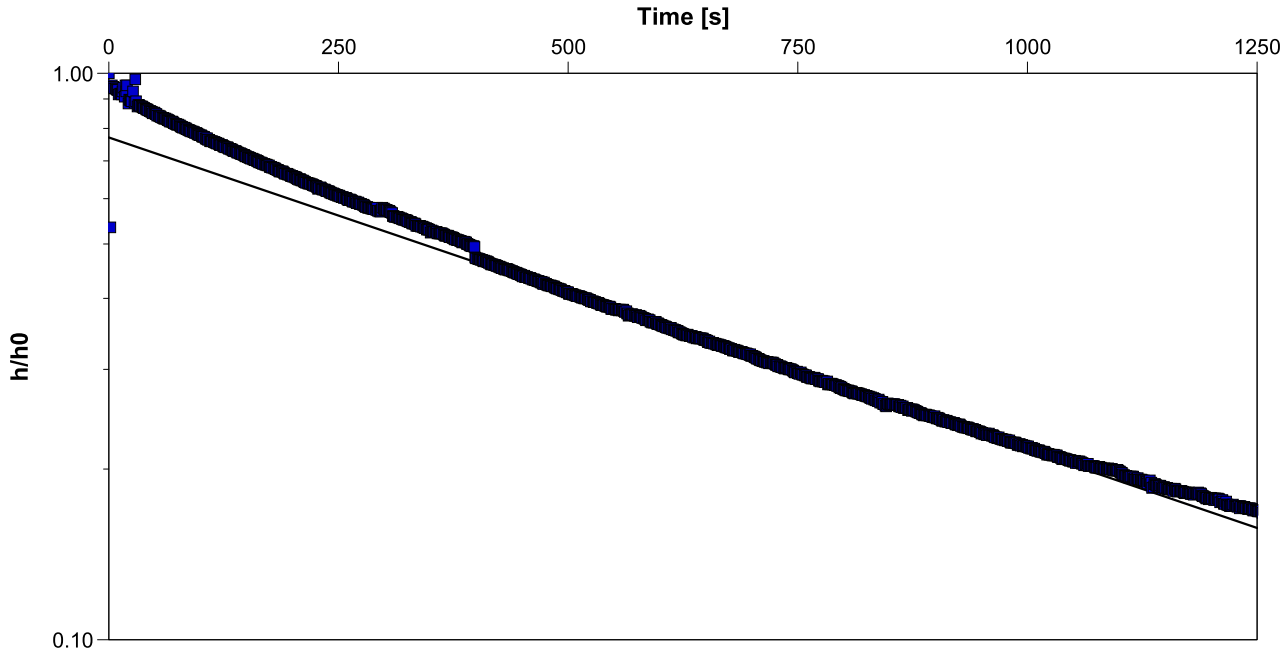
Slug Test Analysis Report

Project: Whenuapai and Redhills Wastewater Scheme

Number: 1014985

Client: Watercare Services Limited

Location: 16 Spedding Road	Slug Test: BH06 Falling	Test Well: BH06
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 3/12/2020
Aquifer Thickness: 2.41 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH06	8.36×10^{-7}	

Tonkin+Taylor

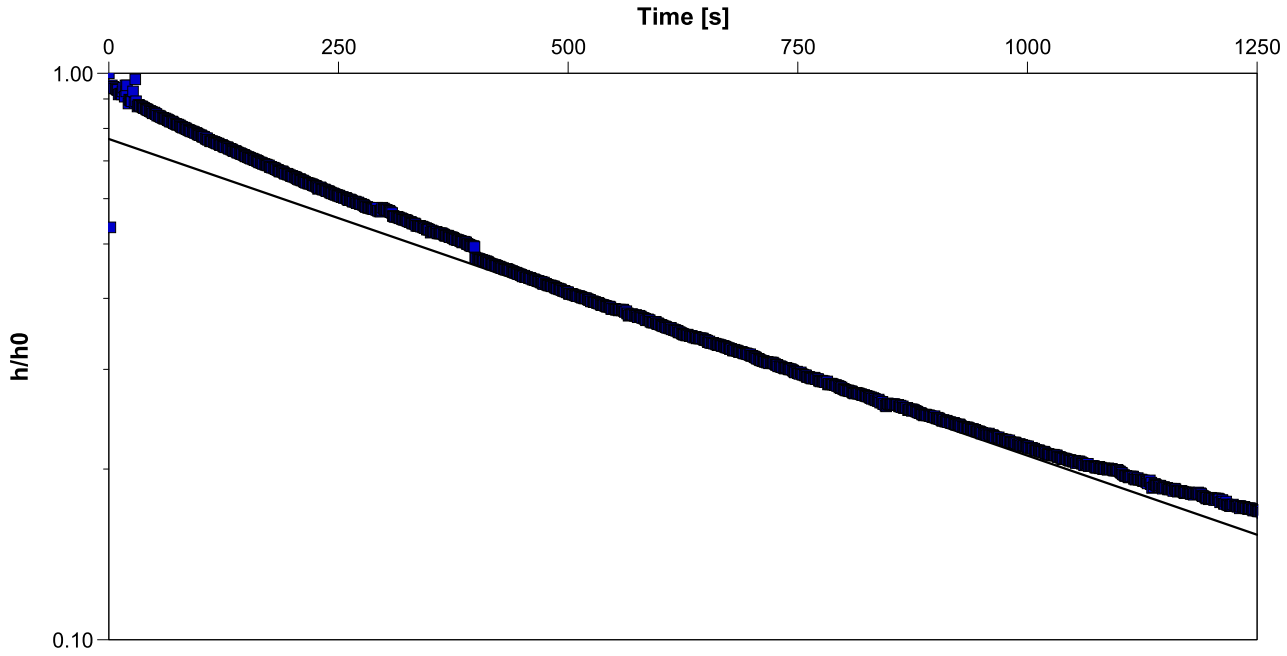
Slug Test Analysis Report

Project: Whenuapai and Redhills Wastewater Scheme

Number: 1014985

Client: Watercare Services Limited

Location: 16 Spedding Road	Slug Test: BH06 Falling	Test Well: BH06
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 3/12/2020
Aquifer Thickness: 2.41 m		

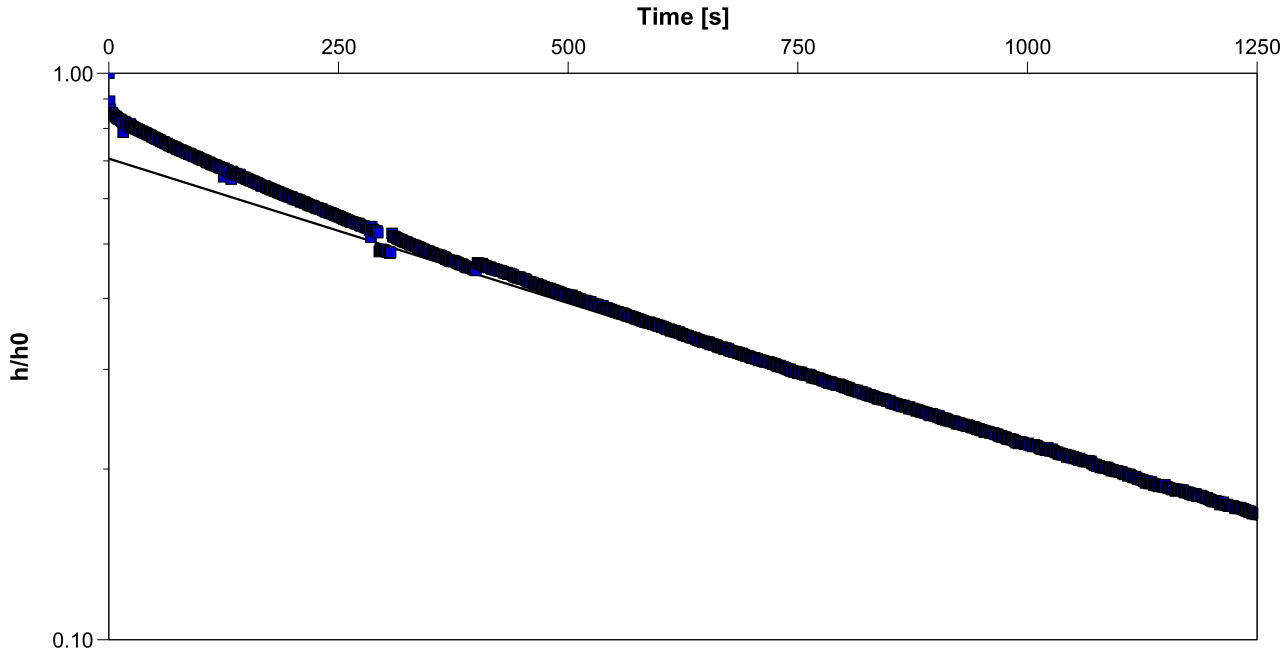


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH06	1.10×10^{-6}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 16 Spedding Road	Slug Test: BH06 Rising	Test Well: BH06
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 3/12/2020
Aquifer Thickness: 2.41 m		

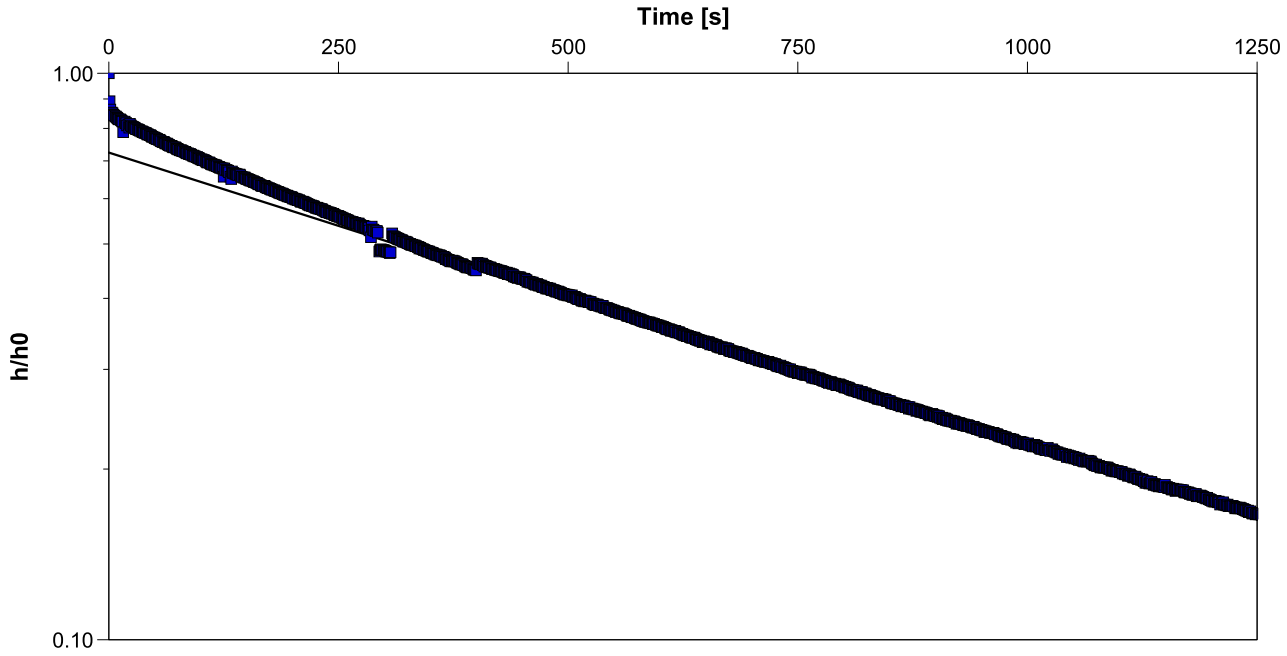


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH06	7.73×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 16 Spedding Road	Slug Test: BH06 Rising	Test Well: BH06
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 3/12/2020
Aquifer Thickness: 2.41 m		

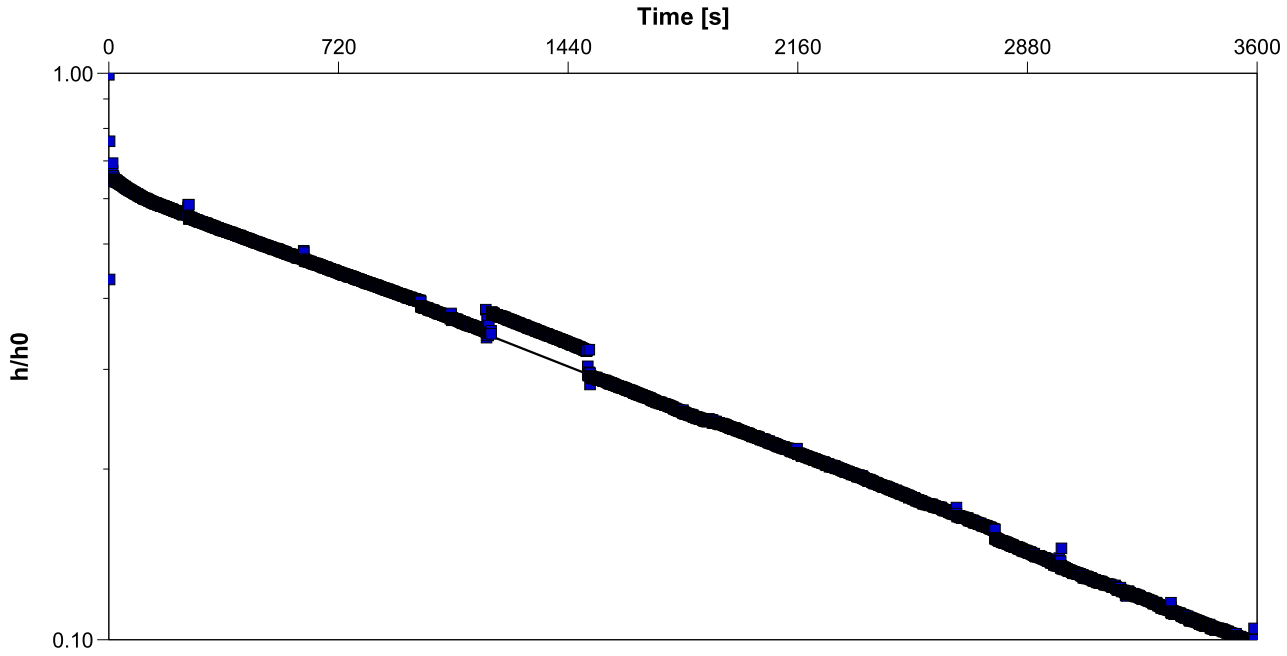


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH06	1.02×10^{-6}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 16 Spedding Road	Slug Test: BH08 Falling	Test Well: BH08
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 3/12/2020
Aquifer Thickness: 4.92 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH08	1.97×10^{-7}	

Tonkin+Taylor

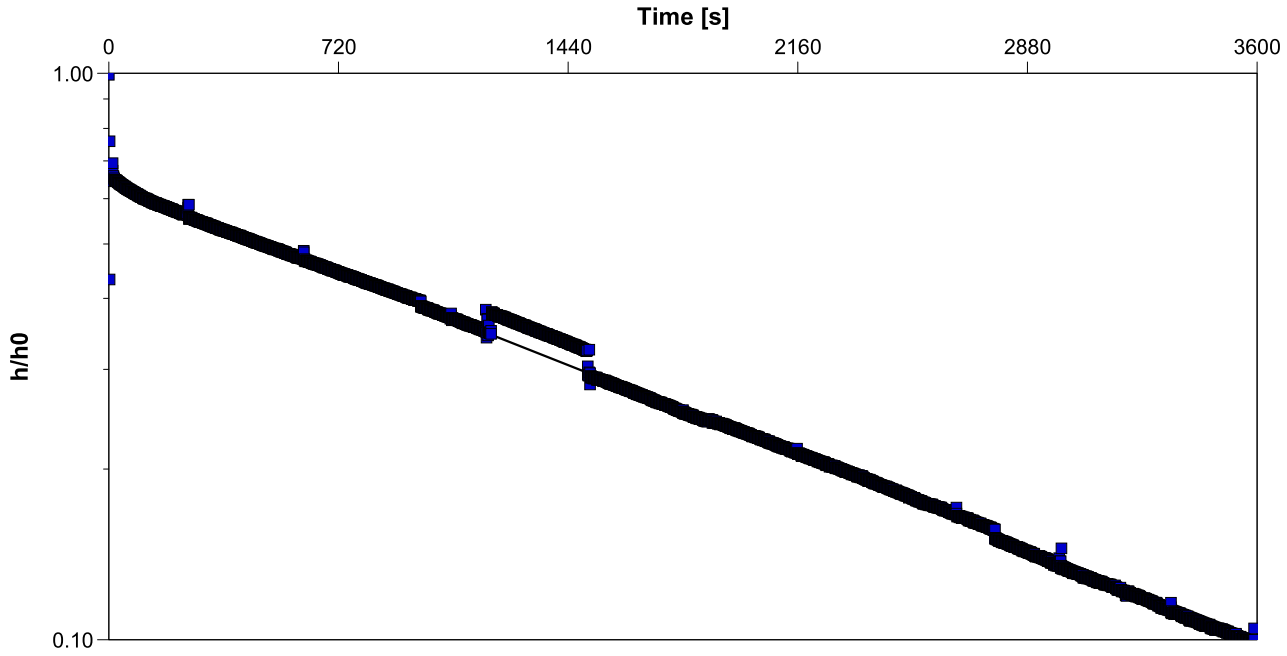
Slug Test Analysis Report

Project: Whenuapai and Redhills Wastewater Scheme

Number: 1014985

Client: Watercare Services Limited

Location: 16 Spedding Road	Slug Test: BH08 Falling	Test Well: BH08
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 3/12/2020
Aquifer Thickness: 4.92 m		

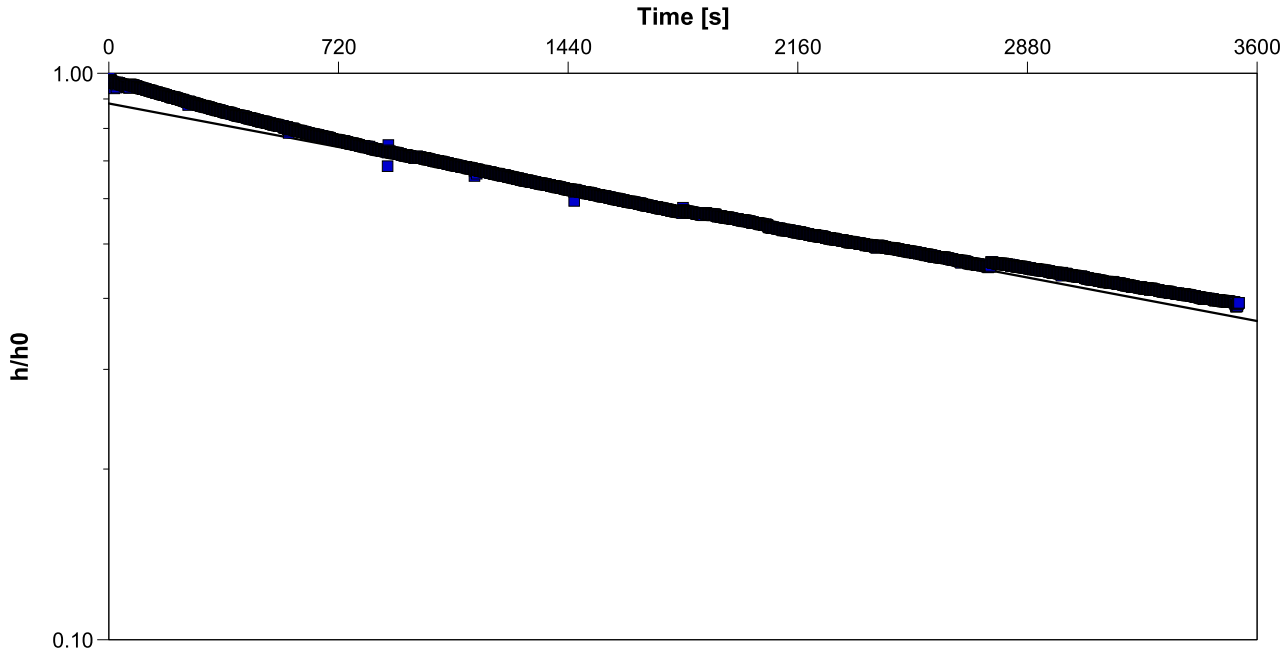


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH08	2.57×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 16 Spedding Road	Slug Test: BH08 Rising	Test Well: BH08
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 3/12/2020
Aquifer Thickness: 4.92 m		

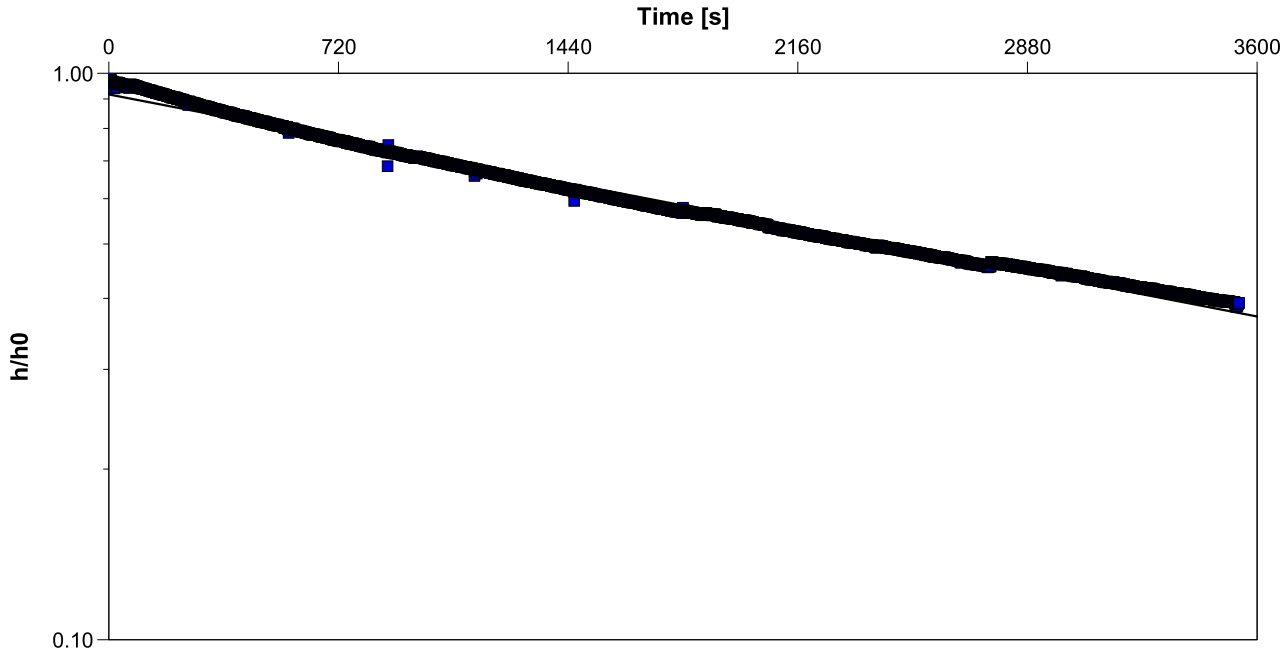


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH08	9.53×10^{-8}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 16 Spedding Road	Slug Test: BH08 Rising	Test Well: BH08
Test Conducted by: BRAL		Test Date: 1/12/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 3/12/2020
Aquifer Thickness: 4.92 m		

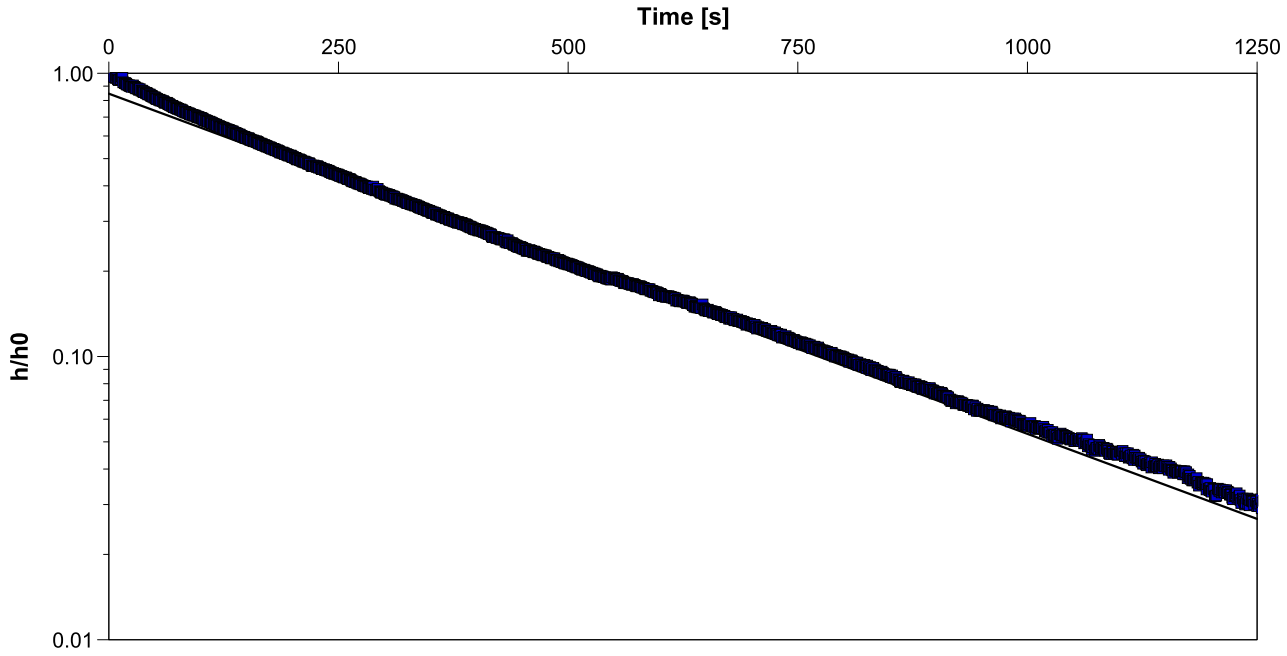


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH08	1.25×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Creek Road	Slug Test: BH110 Falling 1	Test Well: BH110
Test Conducted by: BRAL		Test Date: 7/12/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 8/12/2020
Aquifer Thickness: 6.26 m		

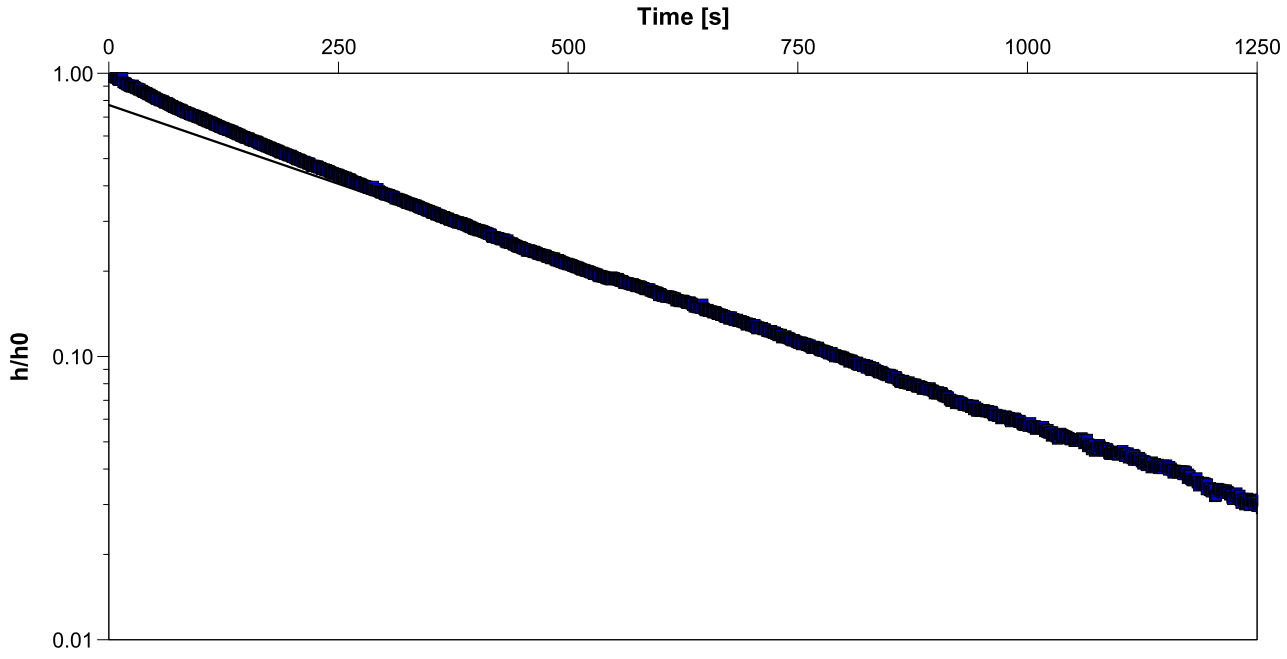


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH110	1.07×10^{-6}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Creek Road	Slug Test: BH110 Falling 1	Test Well: BH110
Test Conducted by: BRAL		Test Date: 7/12/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 8/12/2020
Aquifer Thickness: 6.26 m		

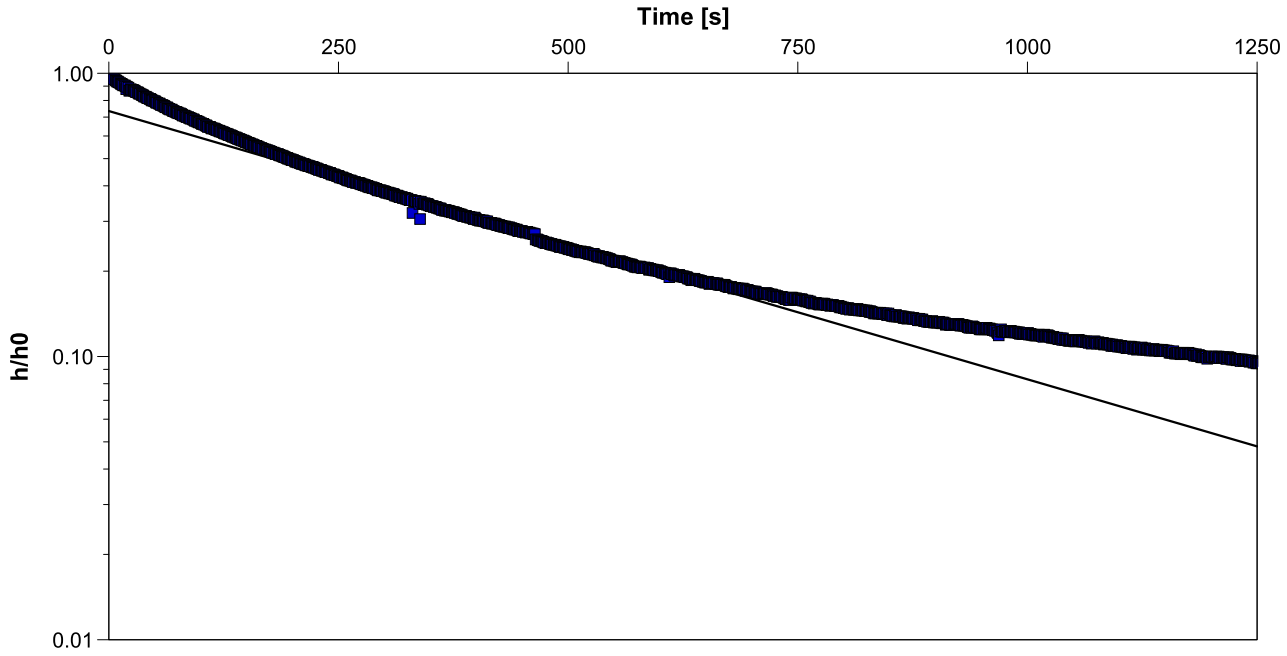


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH110	1.29×10^{-6}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Creek Road	Slug Test: BH110 Rising 1	Test Well: BH110
Test Conducted by: BRAL		Test Date: 7/12/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 8/12/2020
Aquifer Thickness: 6.26 m		

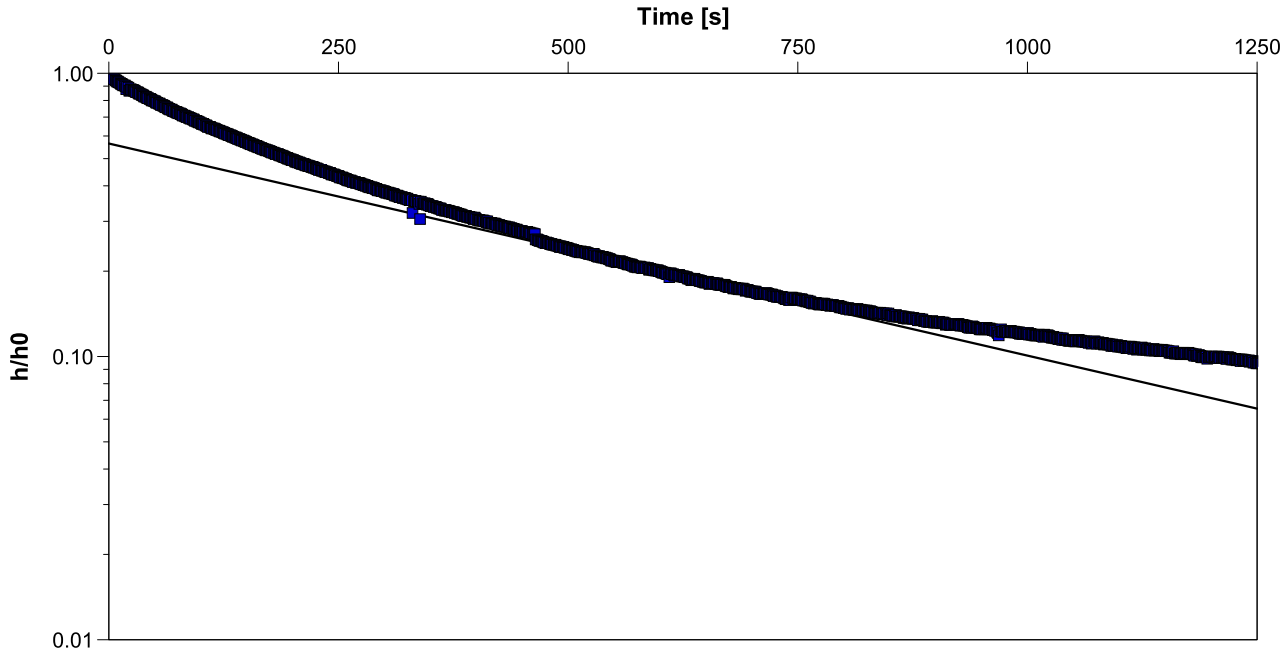


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH110	8.46×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Creek Road	Slug Test: BH110 Rising 1	Test Well: BH110
Test Conducted by: BRAL		Test Date: 7/12/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 8/12/2020
Aquifer Thickness: 6.26 m		

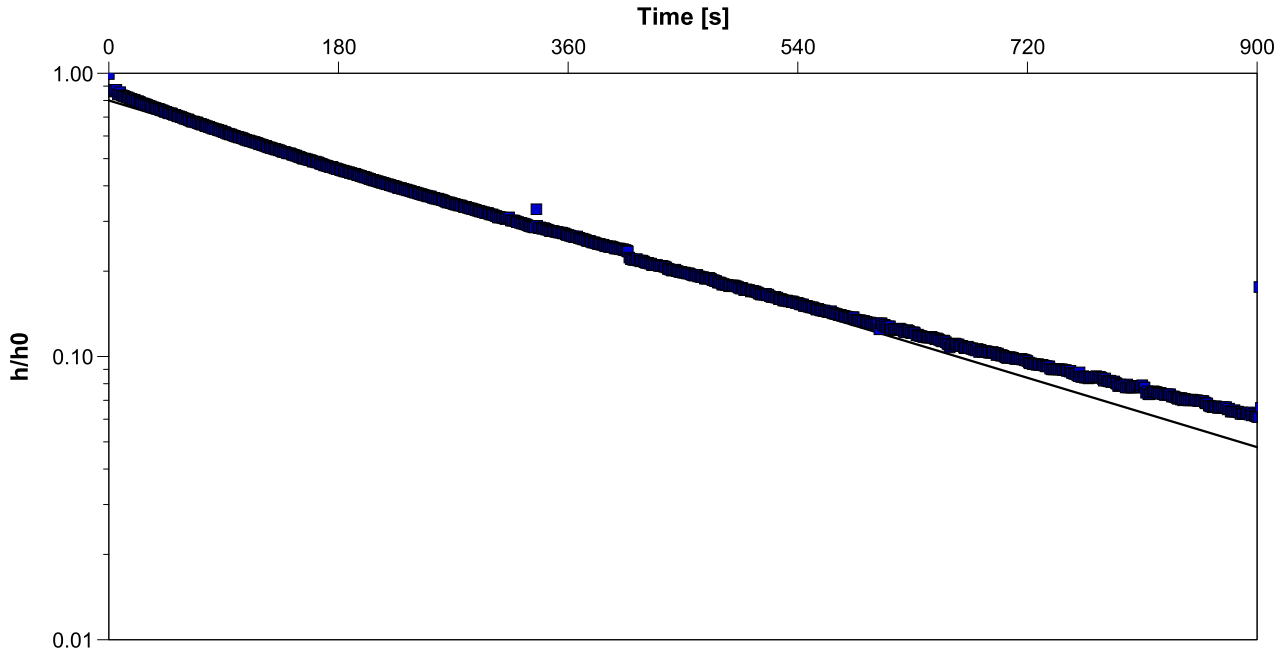


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH110	8.64×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Creek Road	Slug Test: BH110 Falling 2	Test Well: BH110
Test Conducted by: BRAL		Test Date: 7/12/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 8/12/2020
Aquifer Thickness: 6.26 m		

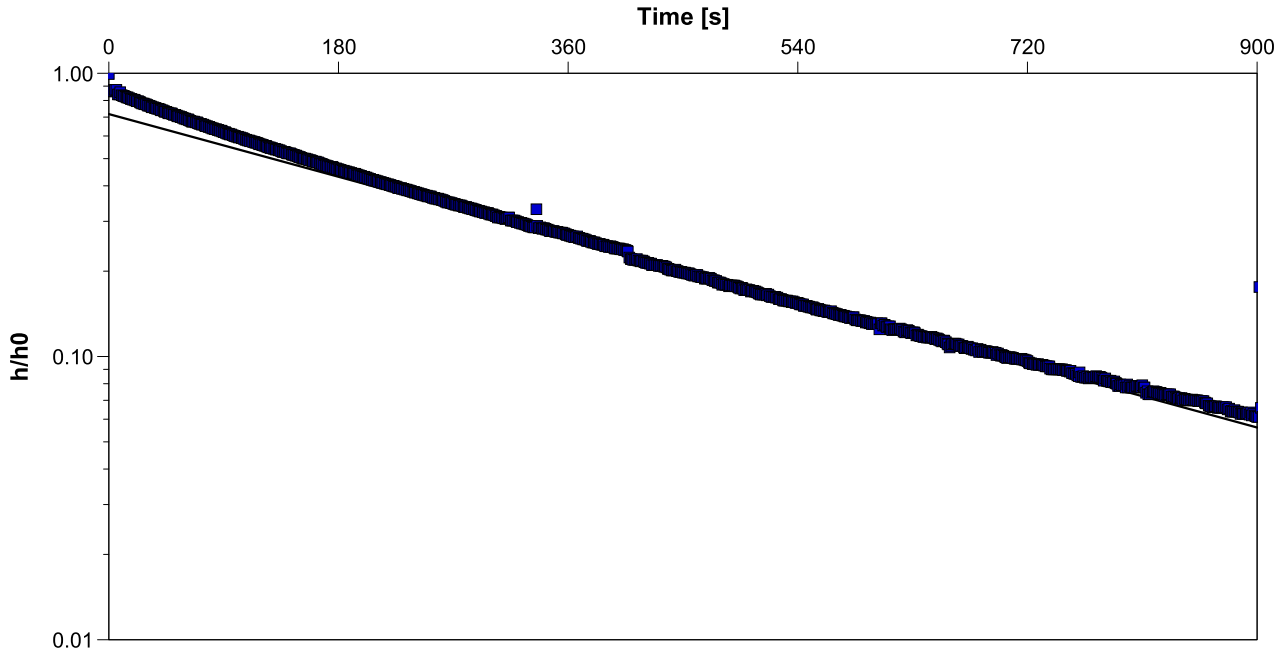


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH110	1.21×10^{-6}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Creek Road	Slug Test: BH110 Falling 2	Test Well: BH110
Test Conducted by: BRAL		Test Date: 7/12/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 8/12/2020
Aquifer Thickness: 6.26 m		

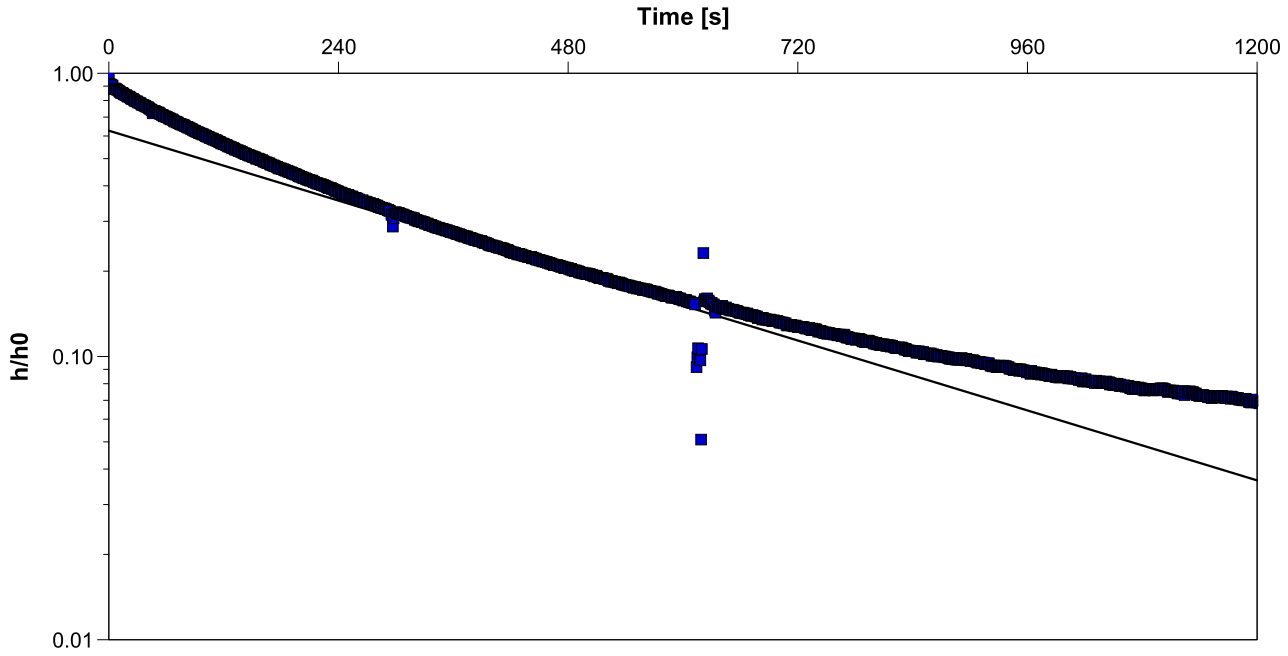


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH110	1.42×10^{-6}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Creek Road	Slug Test: BH110 Rising 2	Test Well: BH110
Test Conducted by: BRAL		Test Date: 7/12/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 8/12/2020
Aquifer Thickness: 6.26 m		

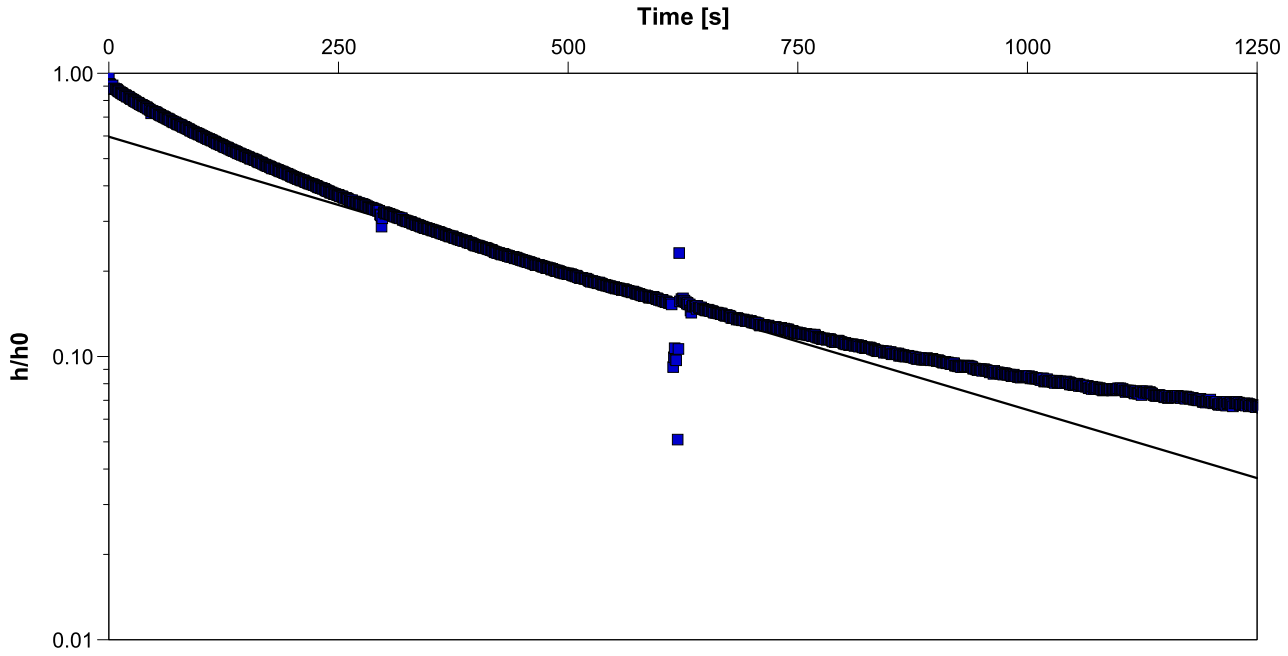


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH110	9.20×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Creek Road	Slug Test: BH110 Rising 2	Test Well: BH110
Test Conducted by: BRAL		Test Date: 7/12/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 8/12/2020
Aquifer Thickness: 6.26 m		

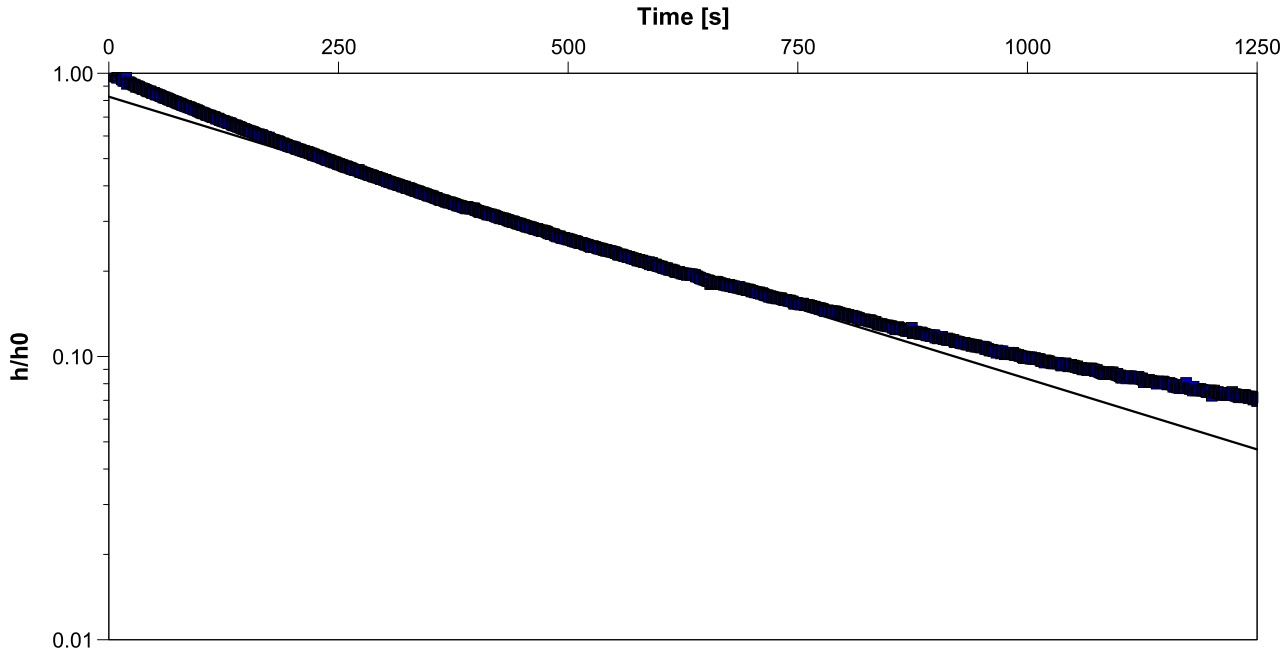


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH110	1.11×10^{-6}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Creek Road	Slug Test: BH110 Falling 3	Test Well: BH110
Test Conducted by: BRAL		Test Date: 7/12/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 8/12/2020
Aquifer Thickness: 6.26 m		

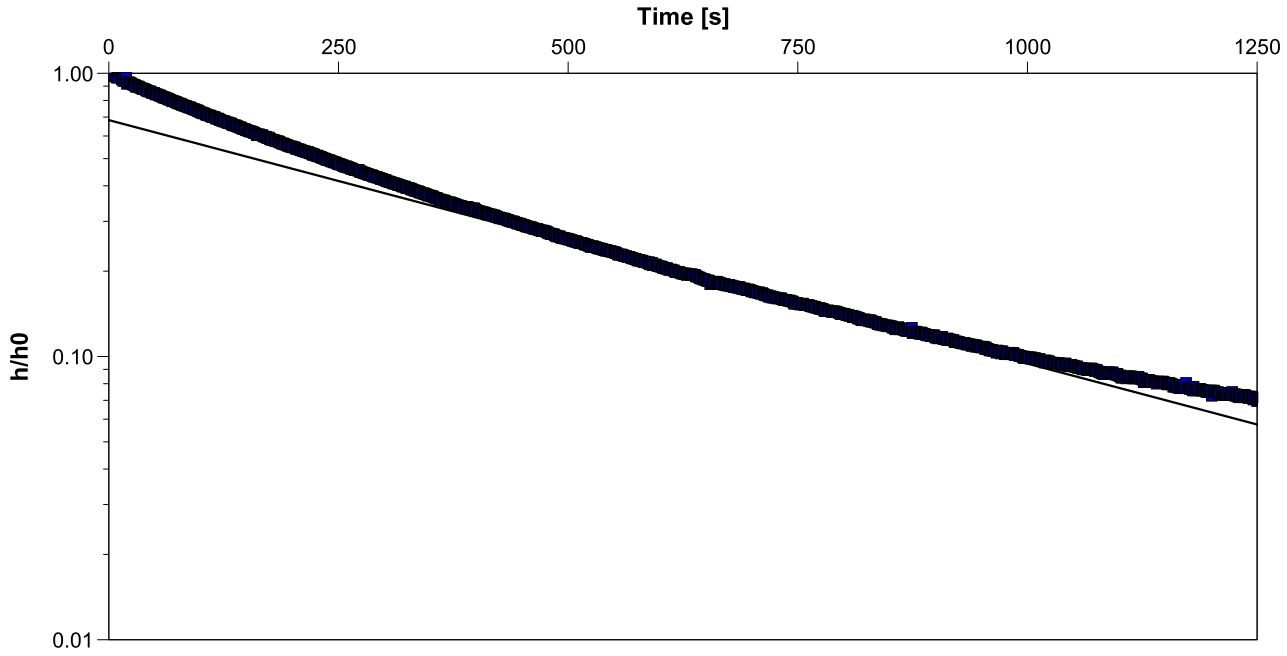


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH110	8.89×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Creek Road	Slug Test: BH110 Falling 3	Test Well: BH110
Test Conducted by: BRAL		Test Date: 7/12/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 8/12/2020
Aquifer Thickness: 6.26 m		

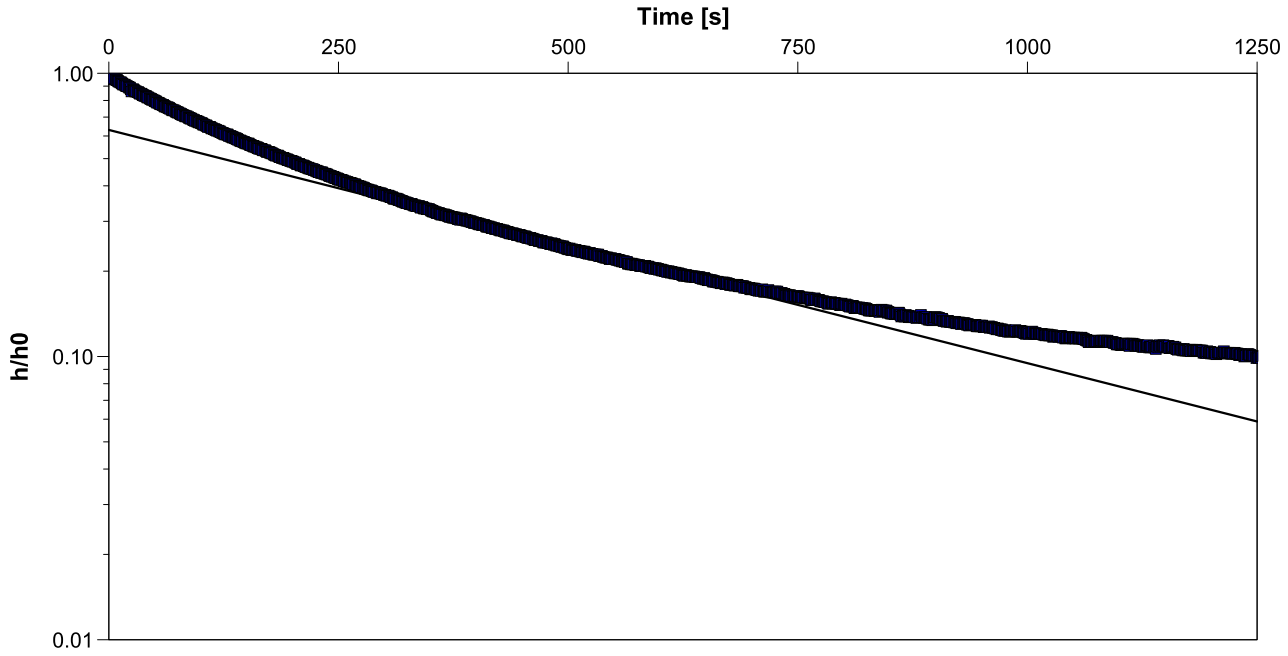


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH110	9.94×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Creek Road	Slug Test: BH110 Rising 3	Test Well: BH110
Test Conducted by: BRAL		Test Date: 7/12/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 8/12/2020
Aquifer Thickness: 6.26 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH110	7.35×10^{-7}	

Tonkin+Taylor

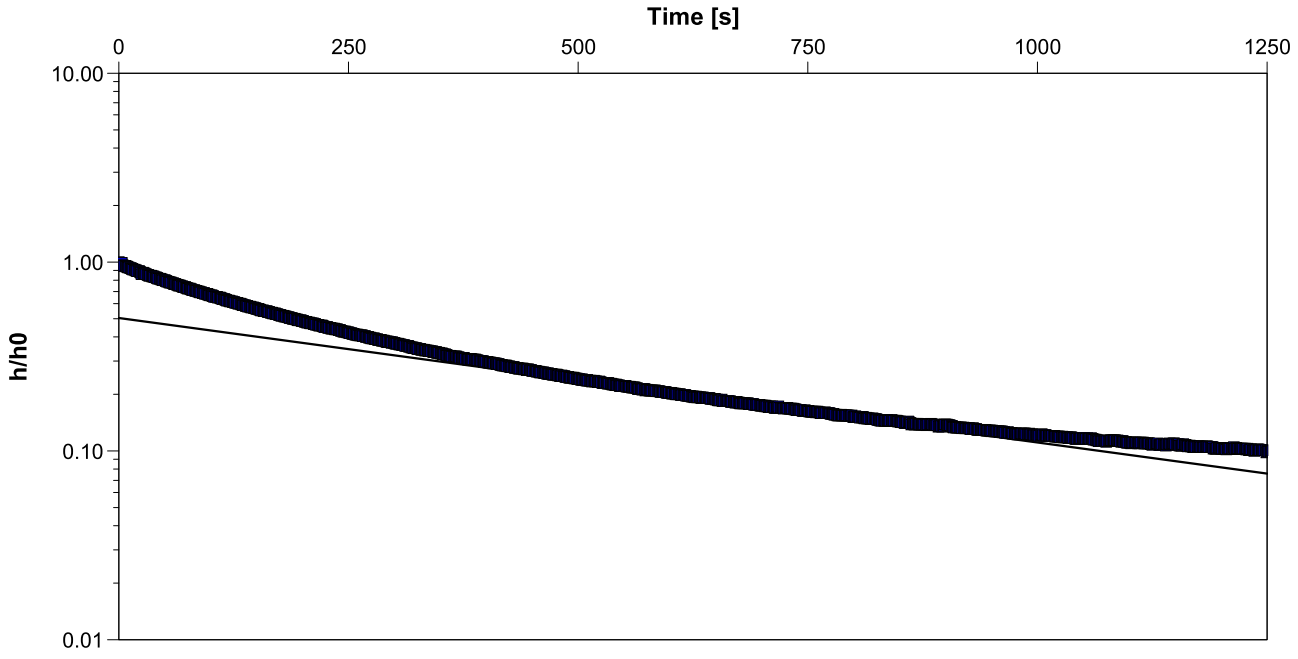
Slug Test Analysis Report

Project: Whenuapai and Redhills Wastewater Scheme

Number: 1014985

Client: Watercare Services Limited

Location: 23-27 Brigham Creek Road	Slug Test: BH110 Rising 3	Test Well: BH110
Test Conducted by: BRAL		Test Date: 7/12/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 8/12/2020
Aquifer Thickness: 6.26 m		

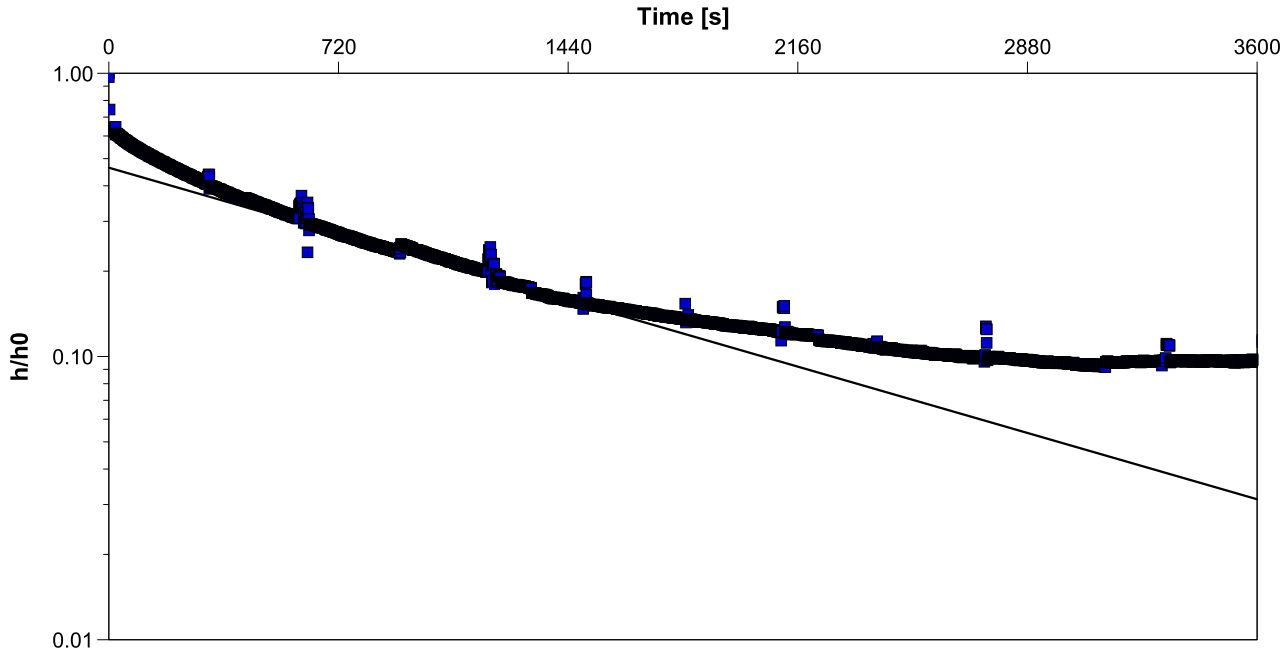


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH110	7.63×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Creek Road	Slug Test: BH111 Falling	Test Well: BH111
Test Conducted by: BRAL		Test Date: 17/11/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 26/11/2020
Aquifer Thickness: 3.12 m		

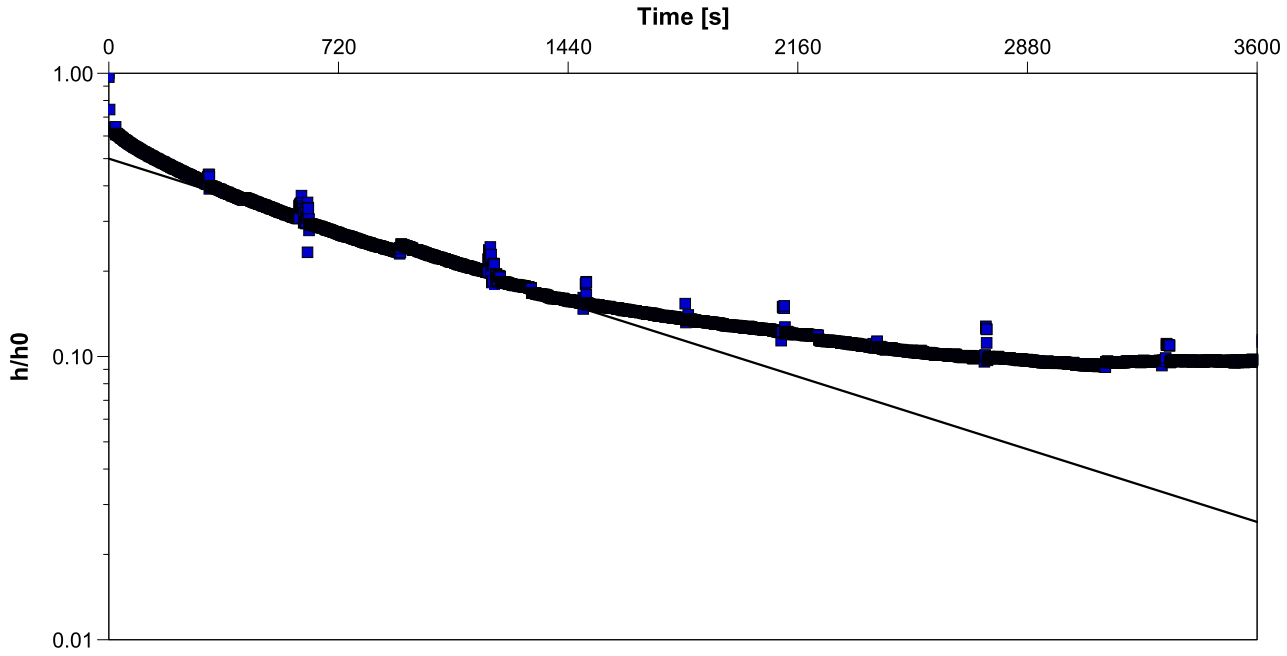


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH111	3.96×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Creek Road	Slug Test: BH111 Falling	Test Well: BH111
Test Conducted by: BRAL		Test Date: 17/11/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 26/11/2020
Aquifer Thickness: 3.12 m		

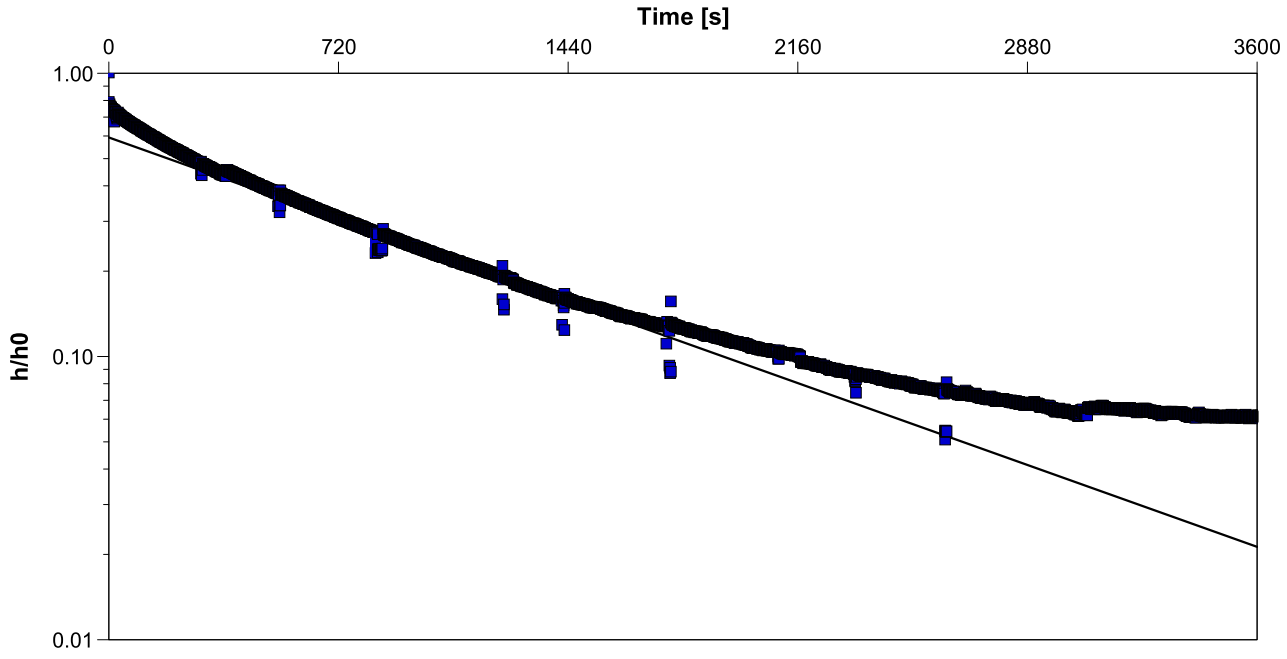


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH111	5.66×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Creek Road	Slug Test: BH111 Rising	Test Well: BH111
Test Conducted by: BRAL		Test Date: 17/11/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 26/11/2020
Aquifer Thickness: 3.12 m		

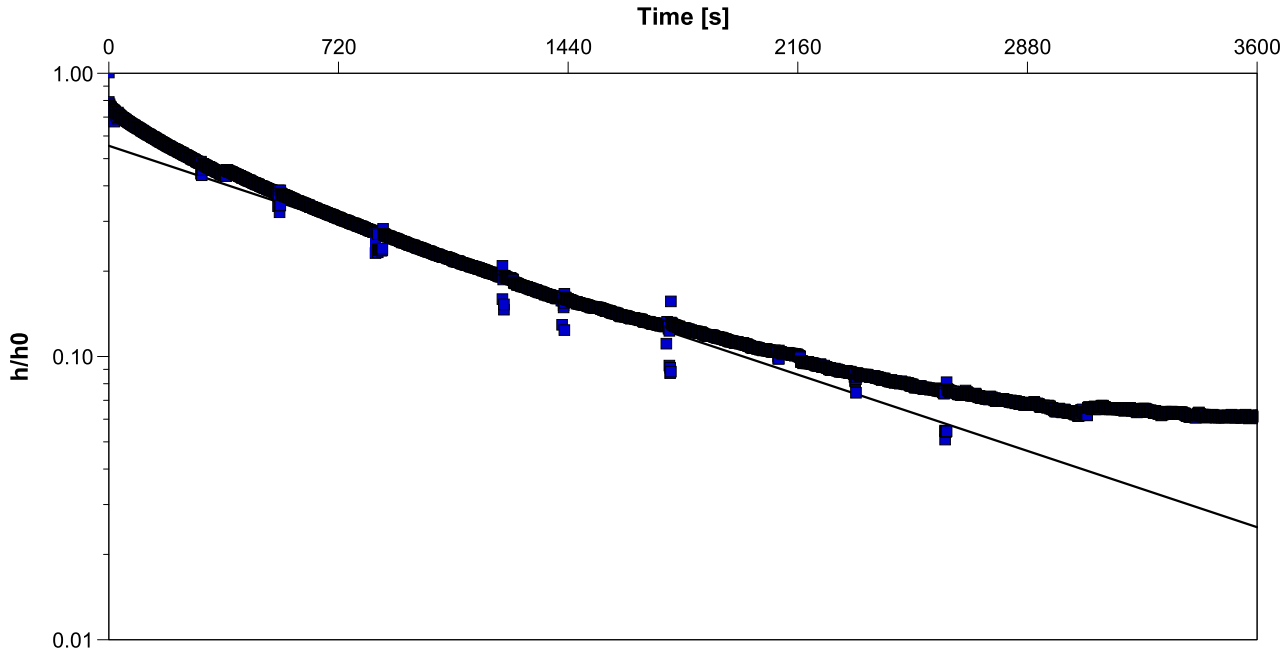


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH111	4.90×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Creek Road	Slug Test: BH111 Rising	Test Well: BH111
Test Conducted by: BRAL		Test Date: 17/11/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 26/11/2020
Aquifer Thickness: 3.12 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH111	5.93×10^{-7}	

Tonkin+Taylor

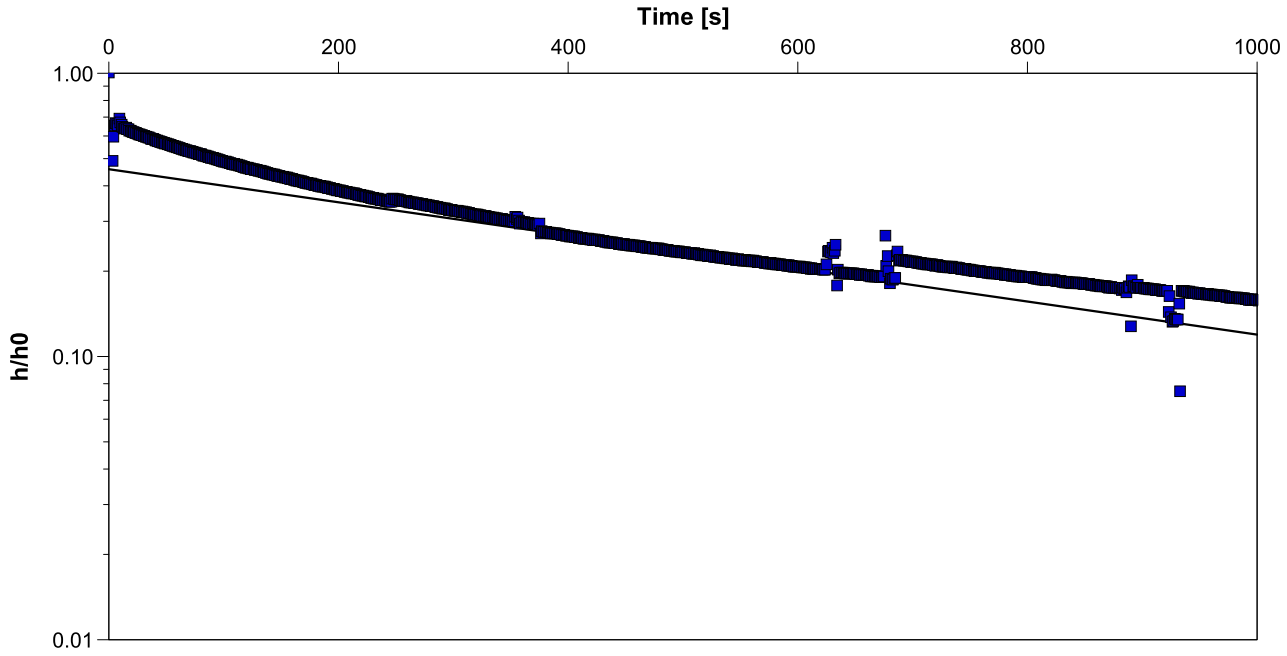
Slug Test Analysis Report

Project: Whenuapai and Redhills Wastewater Scheme

Number: 1014985

Client: Watercare Services Limited

Location: 28 Brigham Creek Road	Slug Test: BH113 Falling 1	Test Well: BH113
Test Conducted by: BRAL/AMHO		Test Date: 18/11/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 26/11/2020
Aquifer Thickness: 2.07 m		

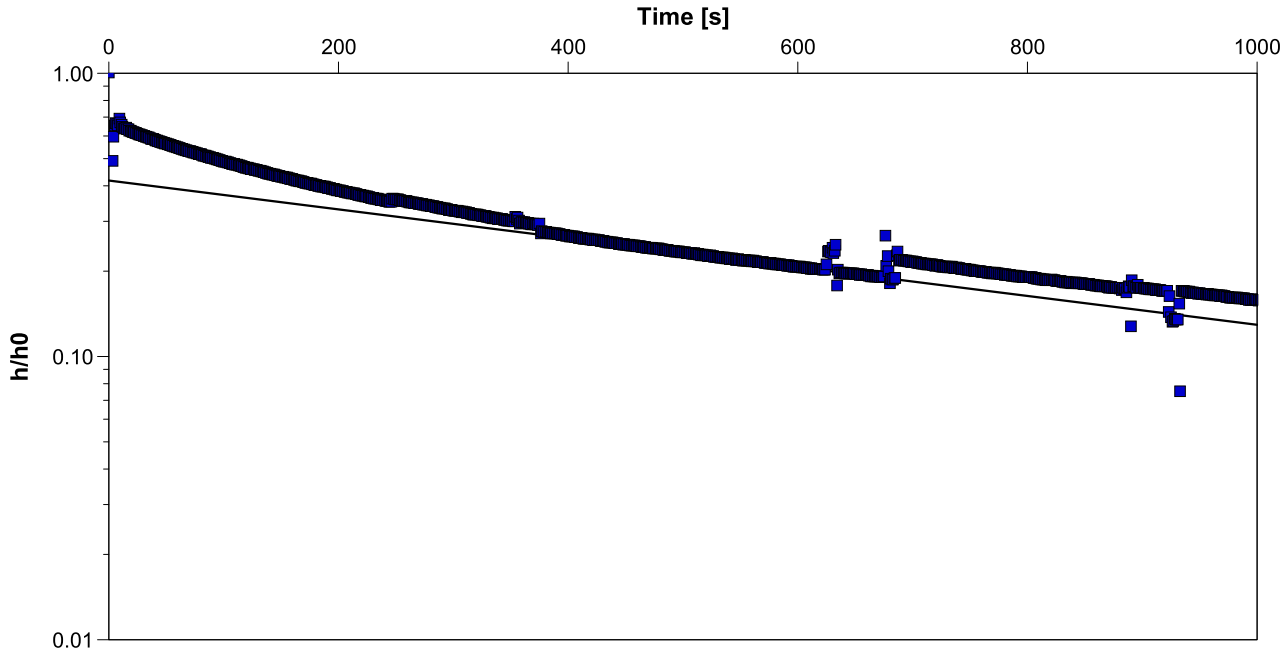


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH113	7.13×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 28 Brigham Creek Road	Slug Test: BH113 Falling 1	Test Well: BH113
Test Conducted by: BRAL/AMHO		Test Date: 18/11/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 26/11/2020
Aquifer Thickness: 2.07 m		

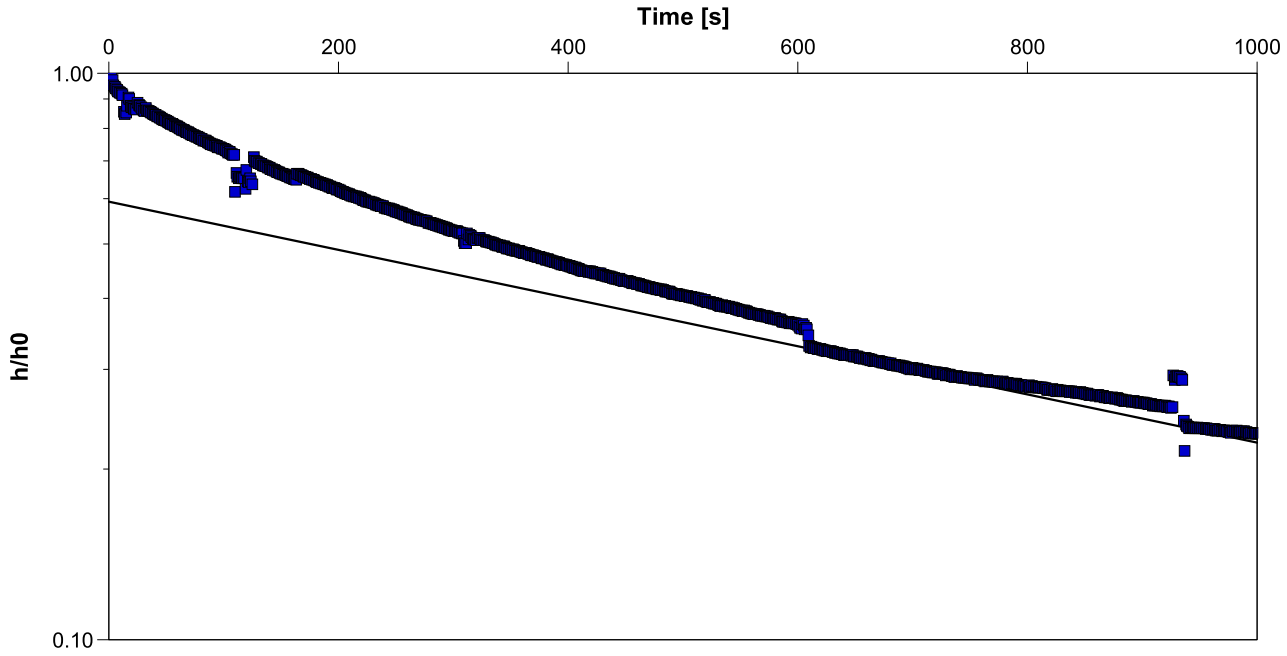


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH113	8.06×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 28 Brigham Creek Road	Slug Test: BH113 Rising 1	Test Well: BH113
Test Conducted by: BRAL/AMHO		Test Date: 18/11/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 26/11/2020
Aquifer Thickness: 2.07 m		

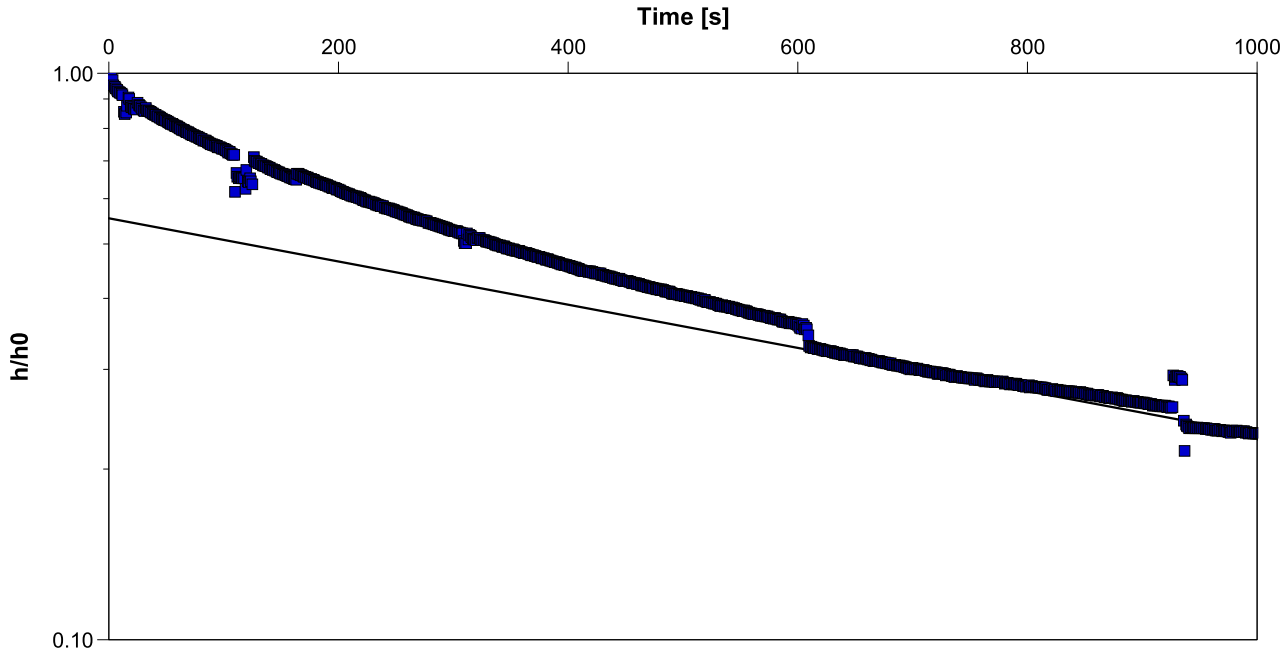


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH113	5.19×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 28 Brigham Creek Road	Slug Test: BH113 Rising 1	Test Well: BH113
Test Conducted by: BRAL/AMHO		Test Date: 18/11/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 26/11/2020
Aquifer Thickness: 2.07 m		

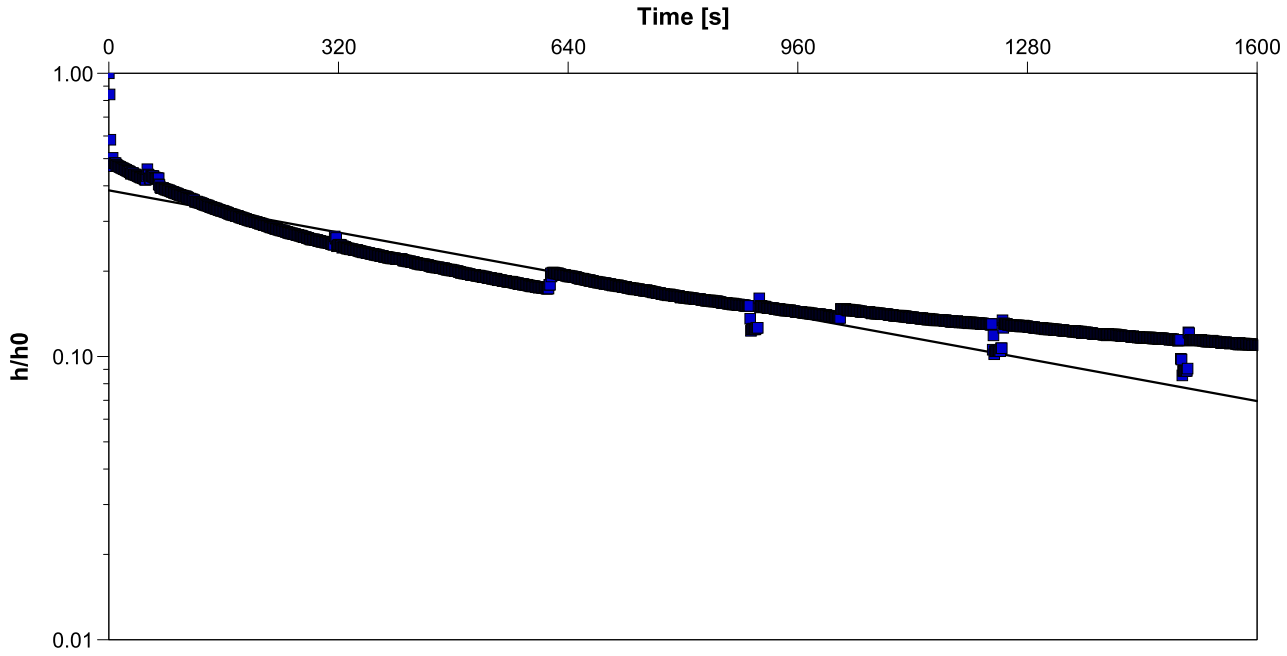


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH113	6.05×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 28 Brigham Creek Road	Slug Test: BH113 Falling 2	Test Well: BH113
Test Conducted by: BRAL/AMHO		Test Date: 18/11/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 26/11/2020
Aquifer Thickness: 2.07 m		

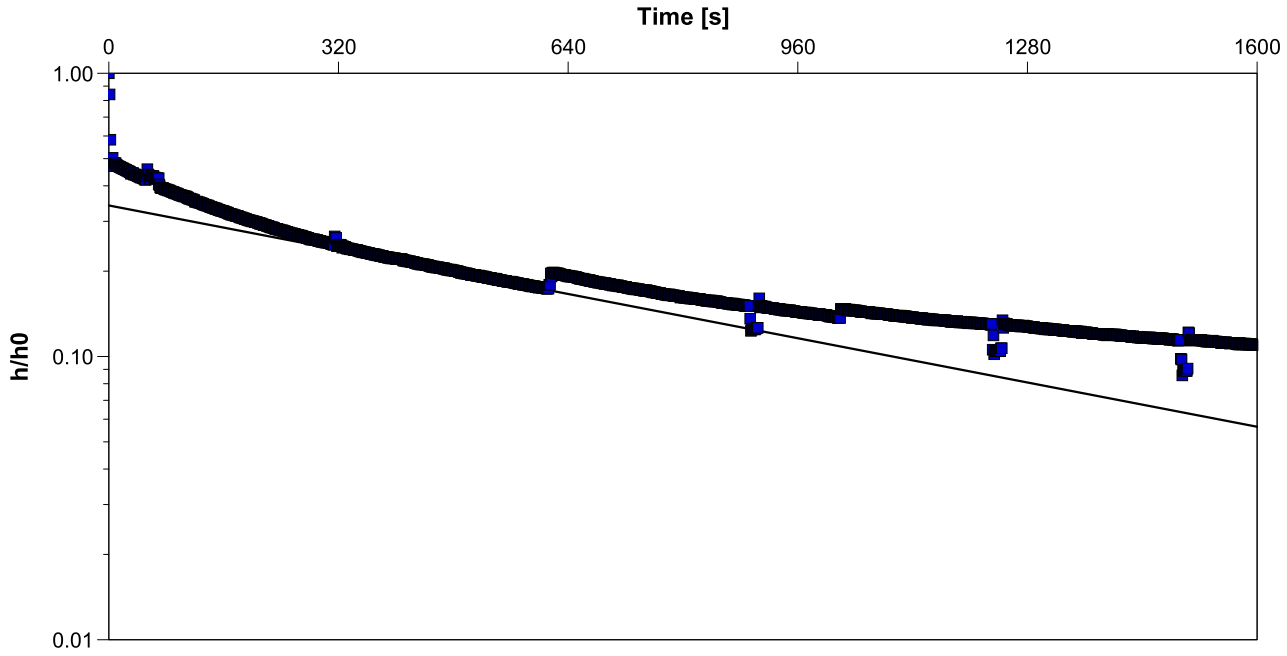


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH113	5.67×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 28 Brigham Creek Road	Slug Test: BH113 Falling 2	Test Well: BH113
Test Conducted by: BRAL/AMHO		Test Date: 18/11/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 26/11/2020
Aquifer Thickness: 2.07 m		

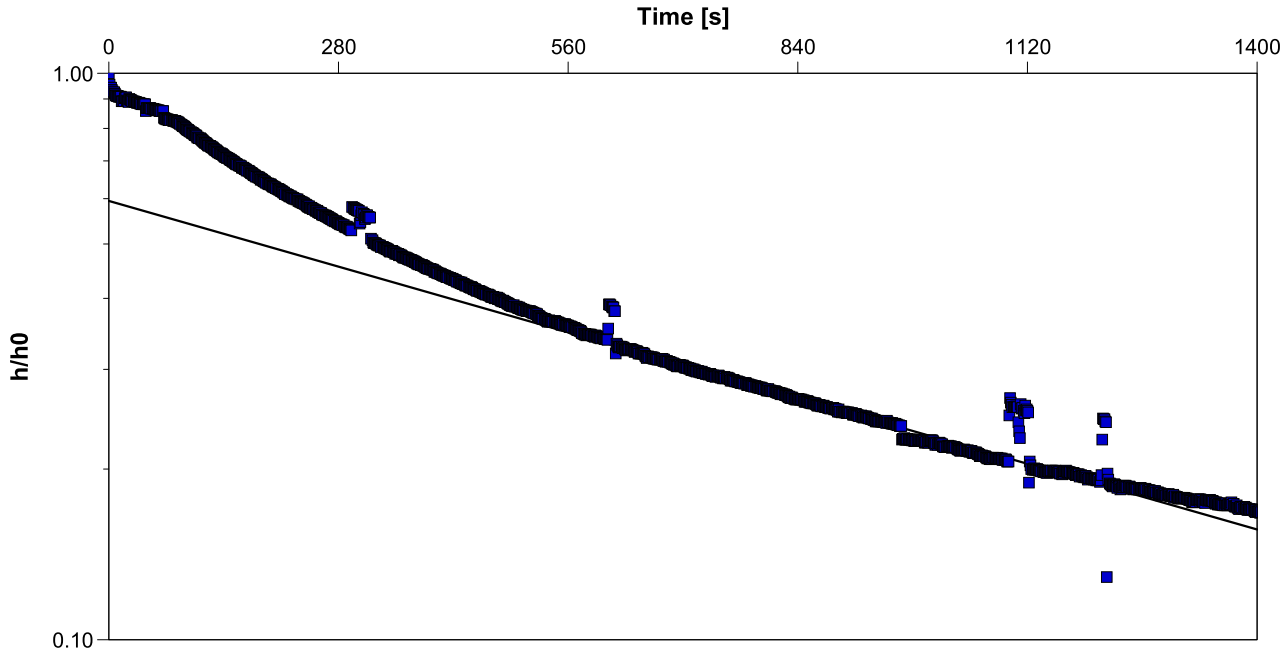


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH113	7.75×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 28 Brigham Creek Road	Slug Test: BH113 Rising 2	Test Well: BH113
Test Conducted by: BRAL/AMHO		Test Date: 18/11/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 26/11/2020
Aquifer Thickness: 2.07 m		

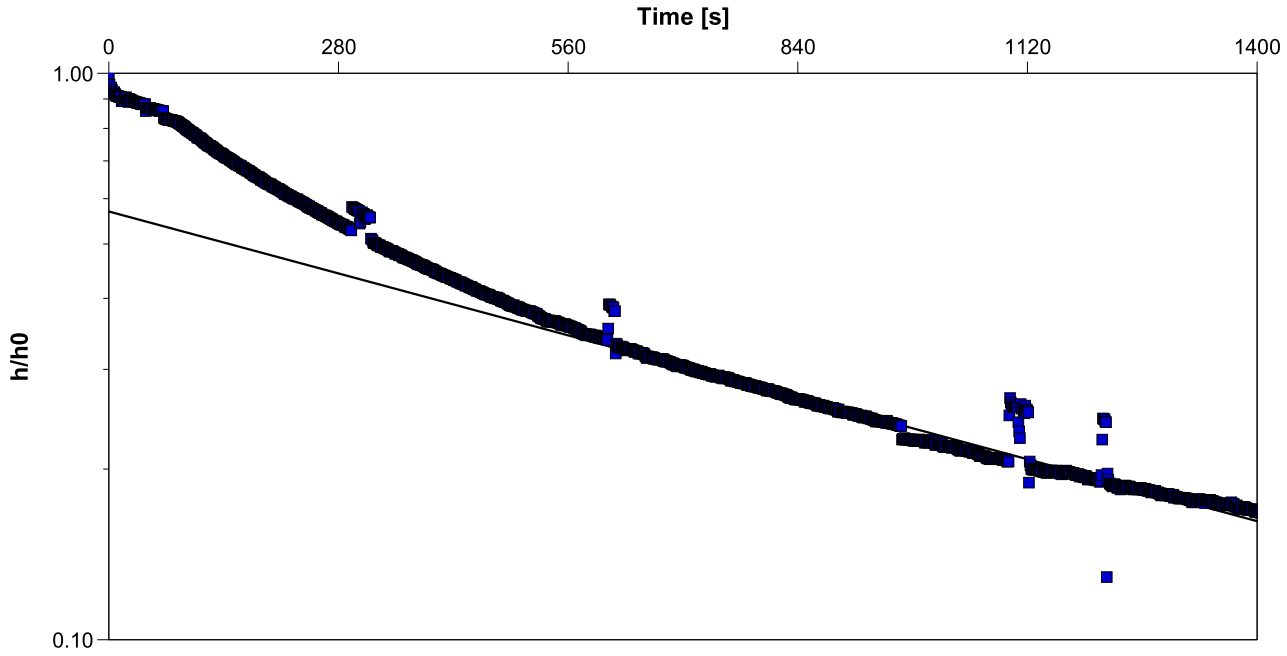


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH113	5.06×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 28 Brigham Creek Road	Slug Test: BH113 Rising 2	Test Well: BH113
Test Conducted by: BRAL/AMHO		Test Date: 18/11/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 26/11/2020
Aquifer Thickness: 2.07 m		

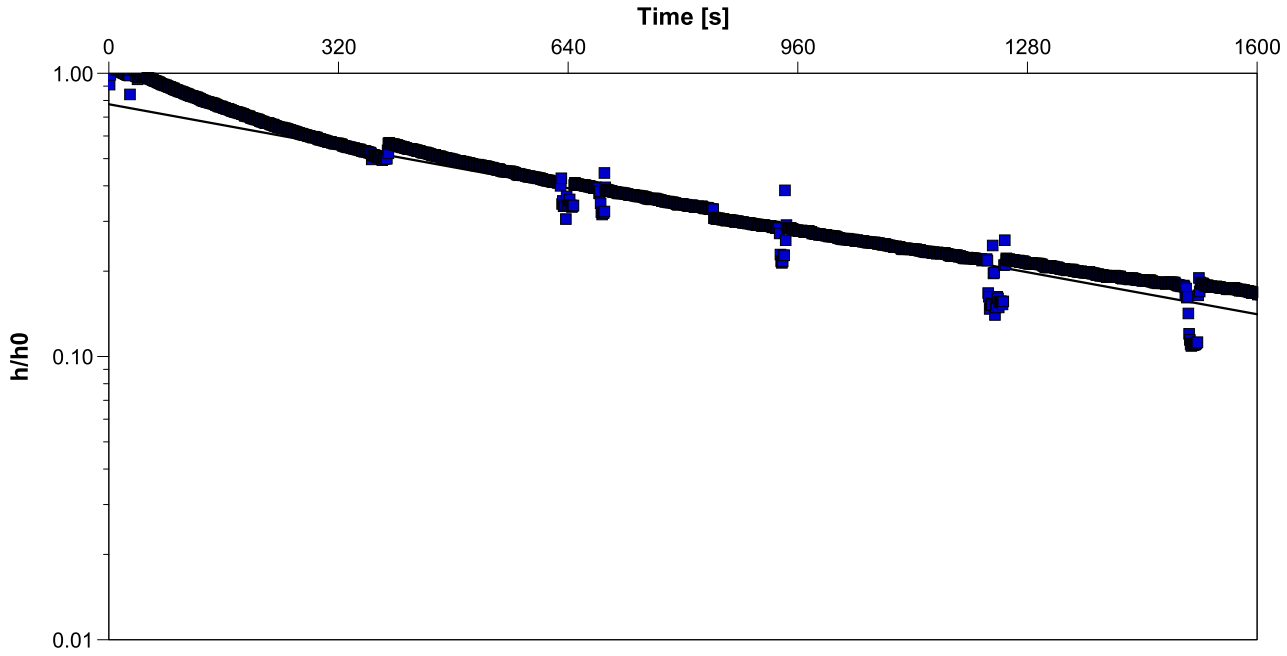


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH113	6.20×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 28 Brigham Creek Road	Slug Test: BH113 Falling 3	Test Well: BH113
Test Conducted by: BRAL/AMHO		Test Date: 18/11/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 26/11/2020
Aquifer Thickness: 2.07 m		

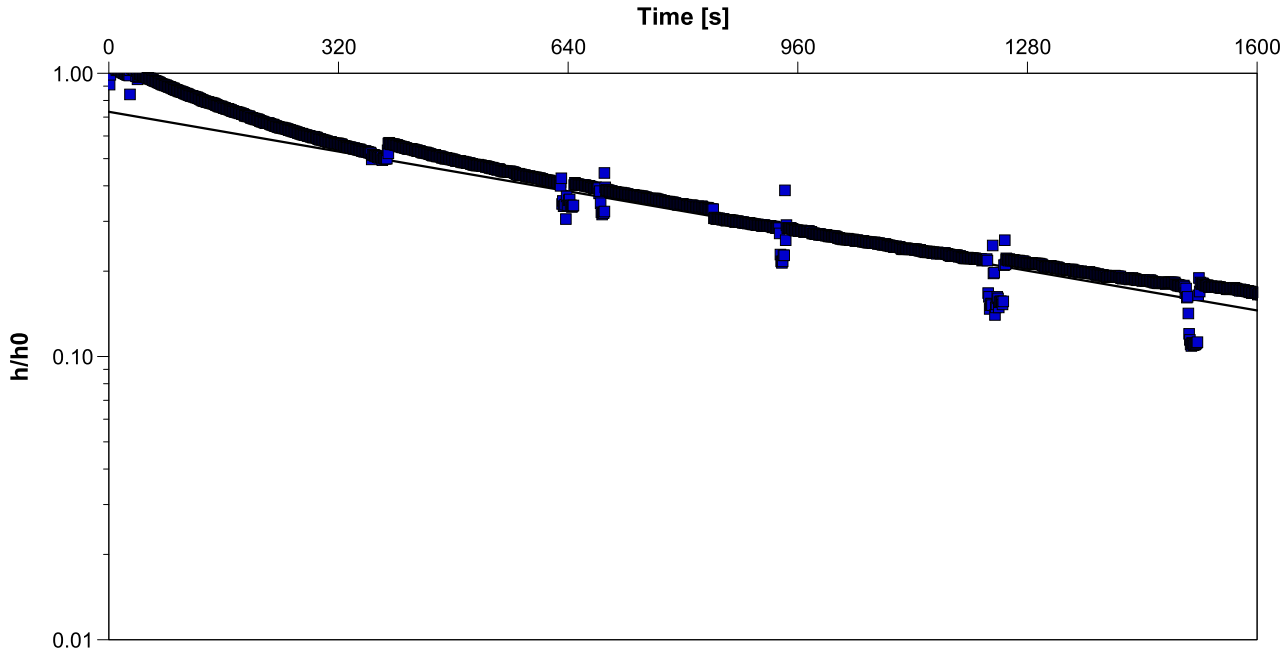


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH113	5.65×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 28 Brigham Creek Road	Slug Test: BH113 Falling 3	Test Well: BH113
Test Conducted by: BRAL/AMHO		Test Date: 18/11/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 26/11/2020
Aquifer Thickness: 2.07 m		

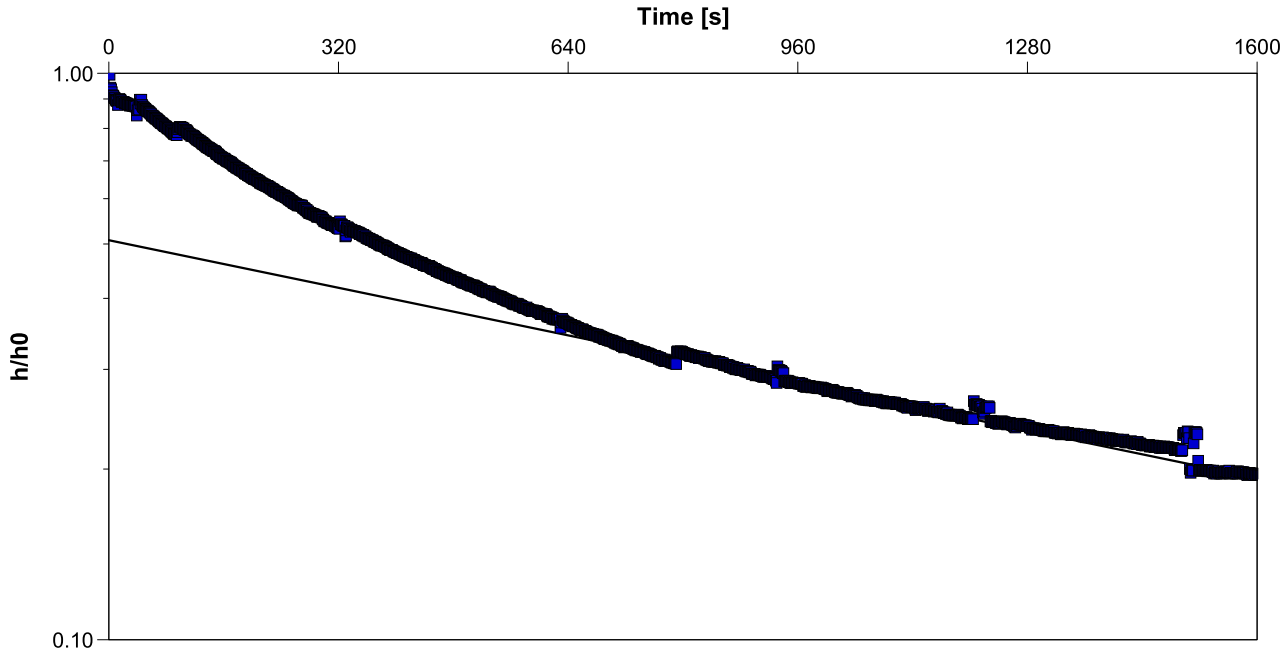


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH113	6.95×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 28 Brigham Creek Road	Slug Test: BH113 Rising 3	Test Well: BH113
Test Conducted by: BRAL/AMHO		Test Date: 18/11/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 26/11/2020
Aquifer Thickness: 2.07 m		

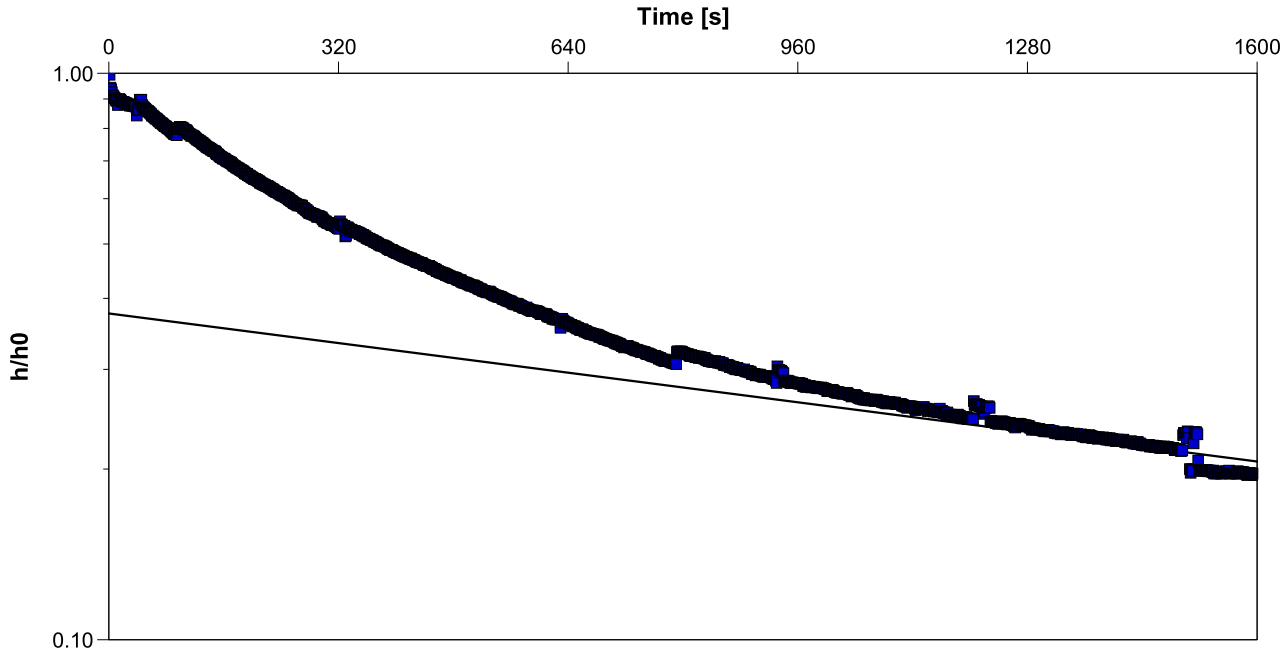


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH113	3.20×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 28 Brigham Creek Road	Slug Test: BH113 Rising 3	Test Well: BH113
Test Conducted by: BRAL/AMHO		Test Date: 18/11/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 26/11/2020
Aquifer Thickness: 2.07 m		

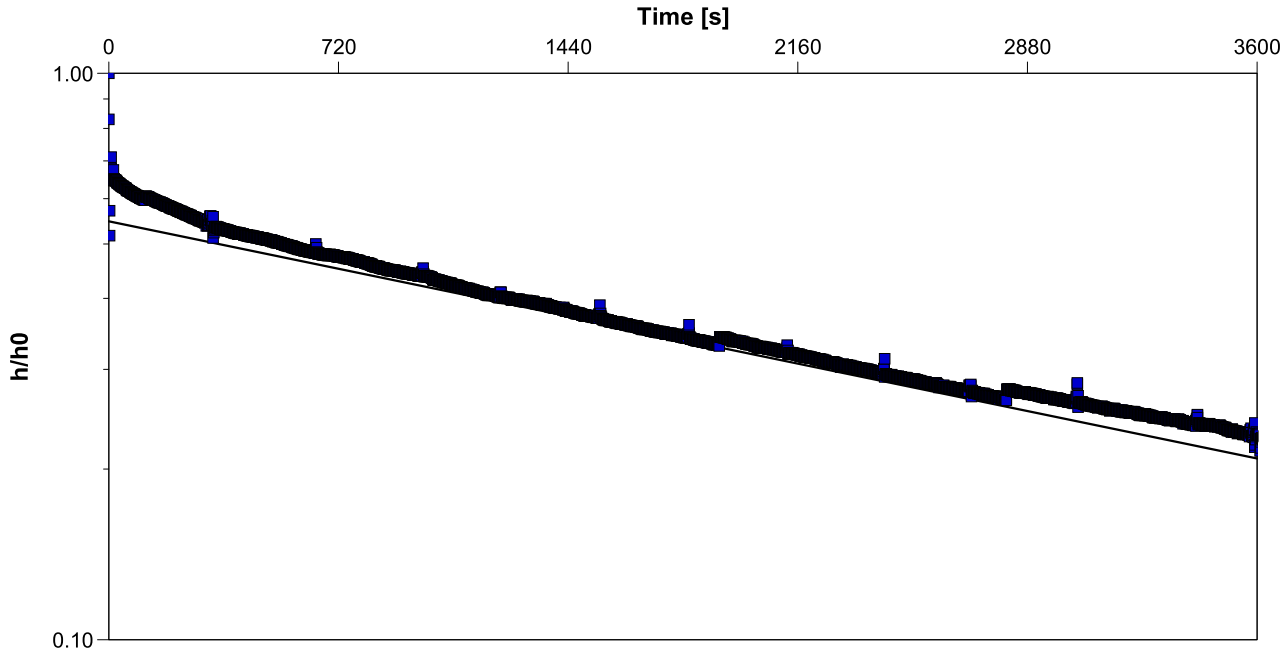


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH113	2.60×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 28 Brigham Creek Road	Slug Test: BH116 Falling	Test Well: BH116
Test Conducted by: BRAL		Test Date: 18/11/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 26/11/2020
Aquifer Thickness: 4.31 m		

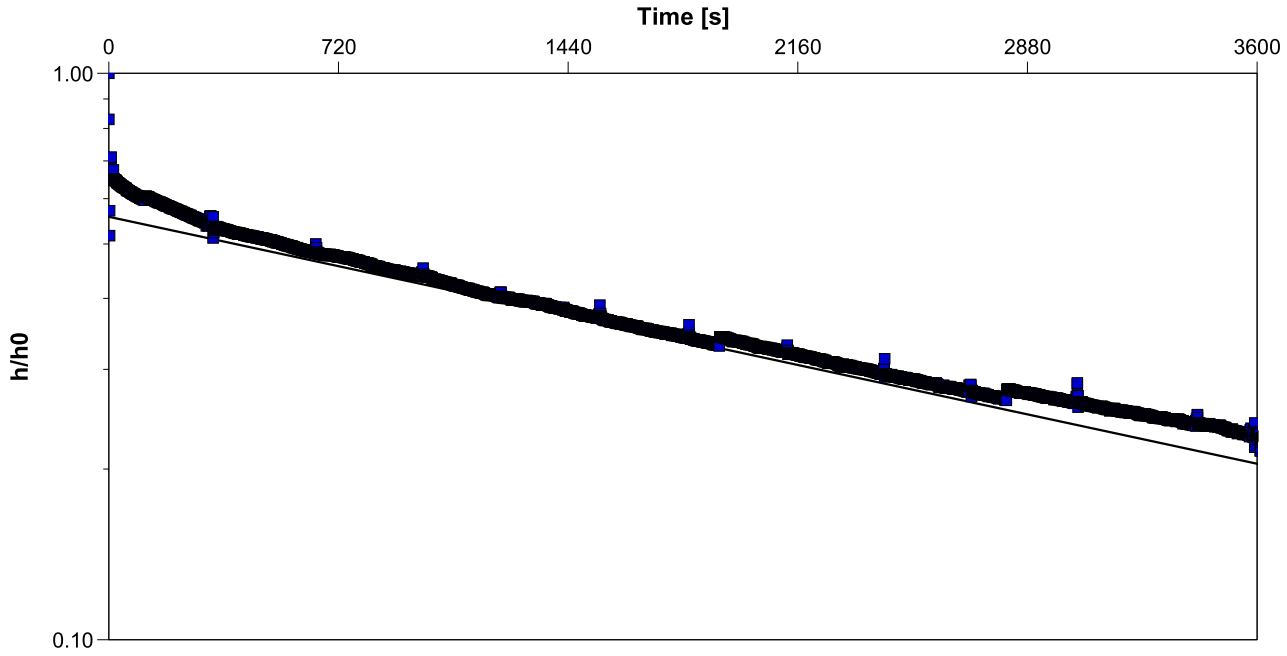


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH116	1.04×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 28 Brigham Creek Road	Slug Test: BH116 Falling	Test Well: BH116
Test Conducted by: BRAL		Test Date: 18/11/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 26/11/2020
Aquifer Thickness: 4.31 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH116	1.40×10^{-7}	

Tonkin+Taylor

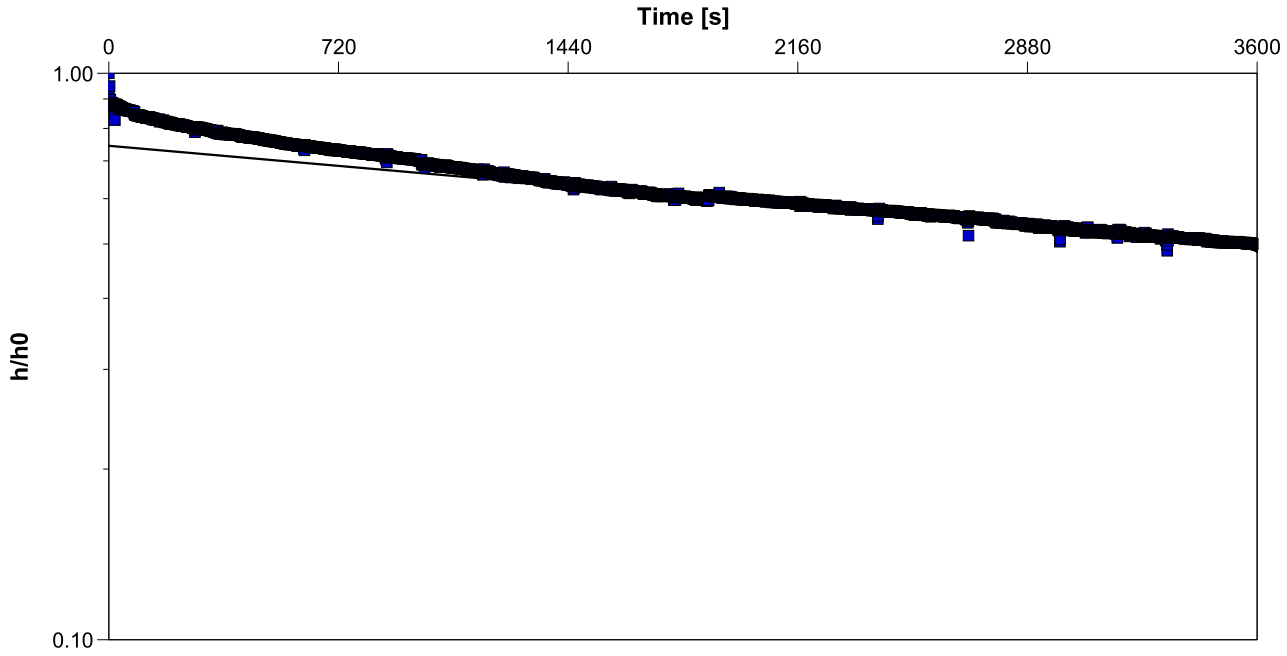
Slug Test Analysis Report

Project: Whenuapai and Redhills Wastewater Scheme

Number: 1014985

Client: Watercare Services Limited

Location: 28 Brigham Creek Road	Slug Test: BH116 Rising	Test Well: BH116
Test Conducted by: BRAL		Test Date: 18/11/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 26/11/2020
Aquifer Thickness: 4.31 m		

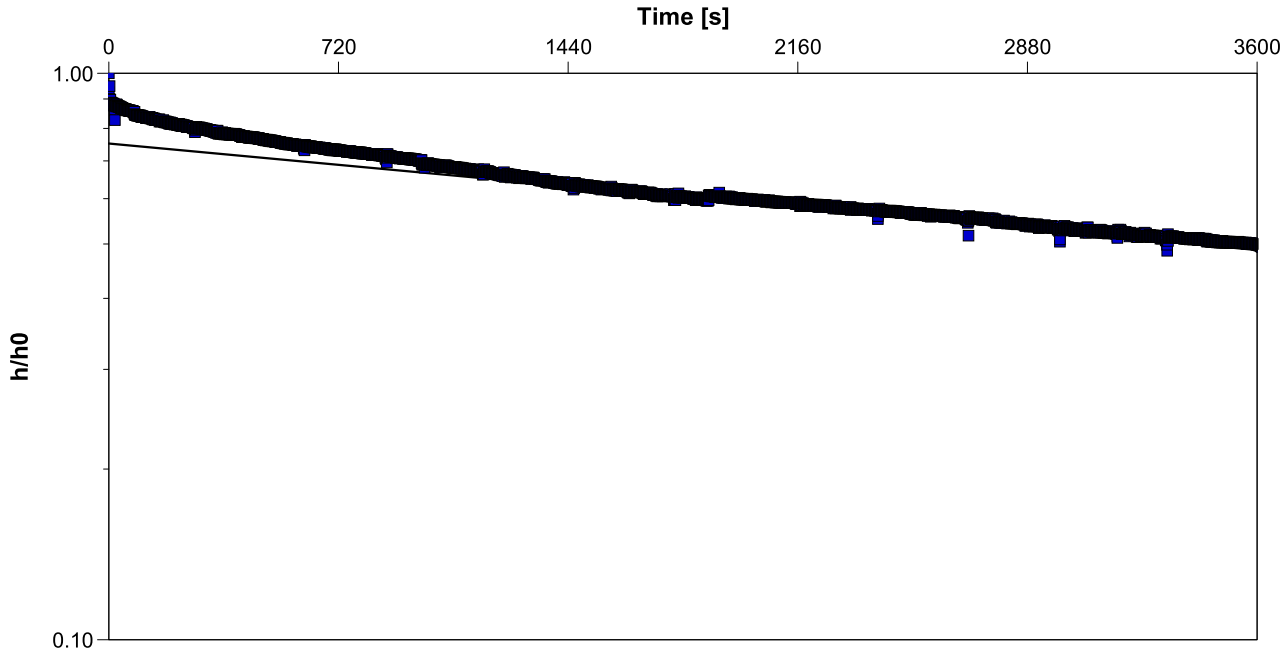


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH116	4.40×10^{-8}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhills Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 28 Brigham Creek Road	Slug Test: BH116 Rising	Test Well: BH116
Test Conducted by: BRAL		Test Date: 18/11/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 26/11/2020
Aquifer Thickness: 4.31 m		

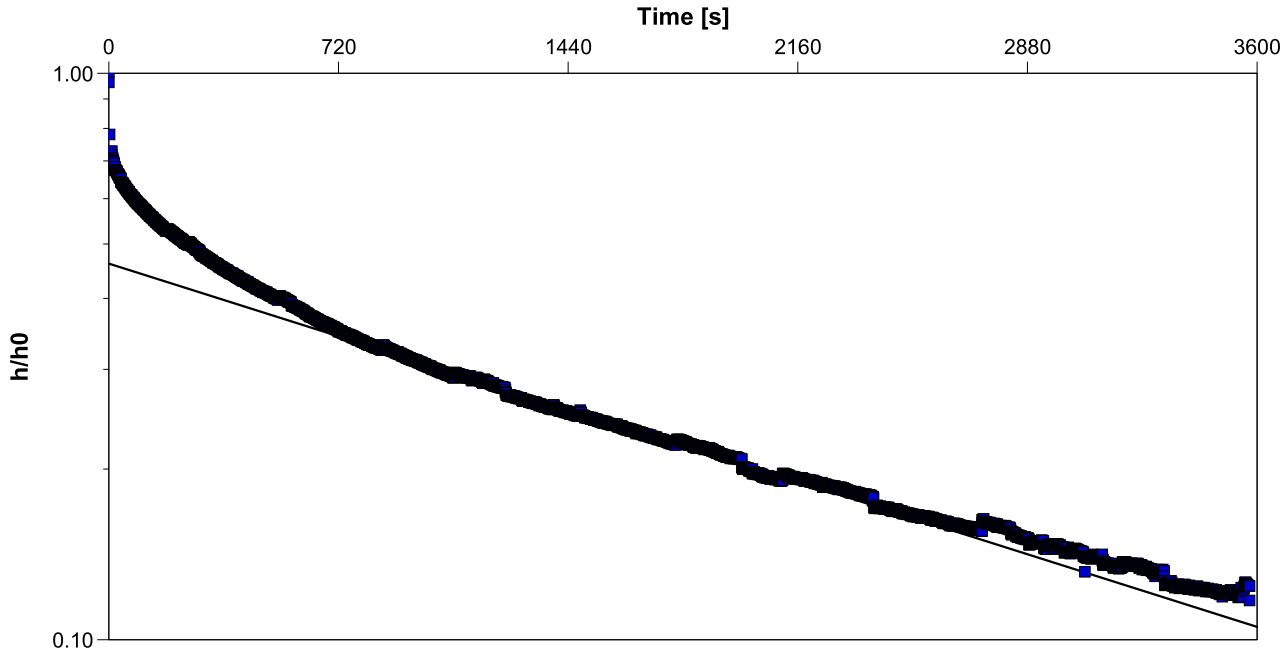


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH116	6.03×10^{-8}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhilss Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Creek Road	Slug Test: BH117 Falling	Test Well: BH117
Test Conducted by: BRAL/AMHO		Test Date: 17/11/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 26/11/2020
Aquifer Thickness: 9.82 m		

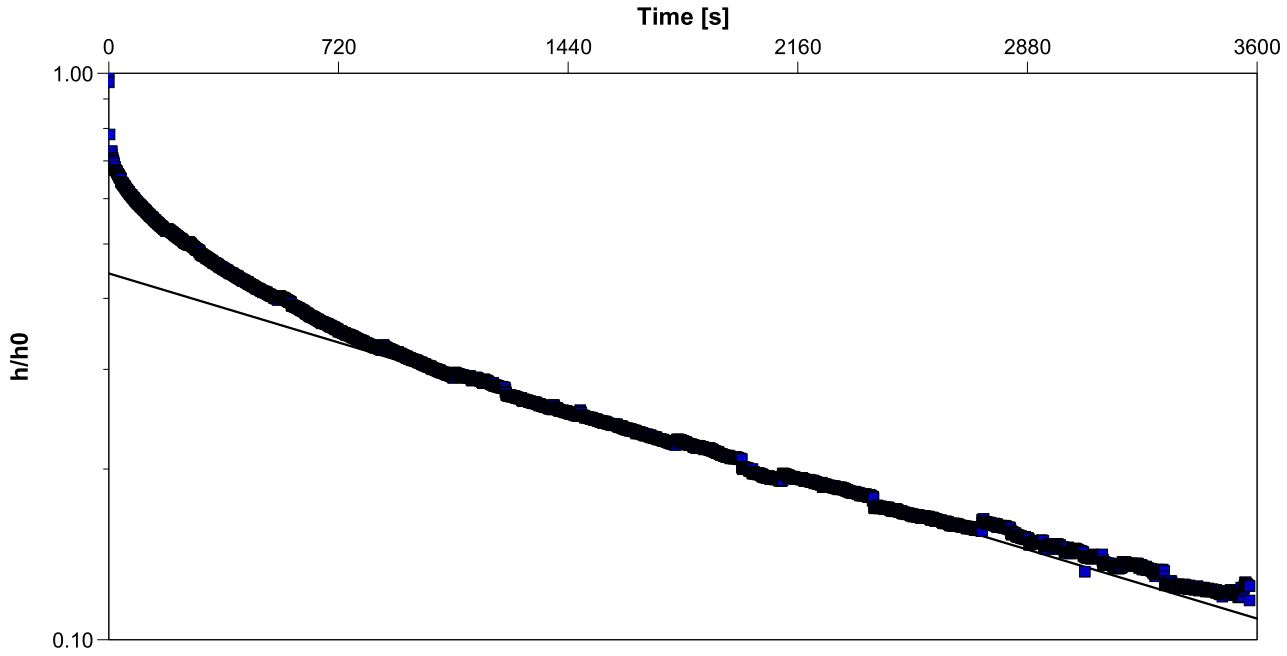


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH117	2.17×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhilss Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Creek Road	Slug Test: BH117 Falling	Test Well: BH117
Test Conducted by: BRAL/AMHO		Test Date: 17/11/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 26/11/2020
Aquifer Thickness: 9.82 m		

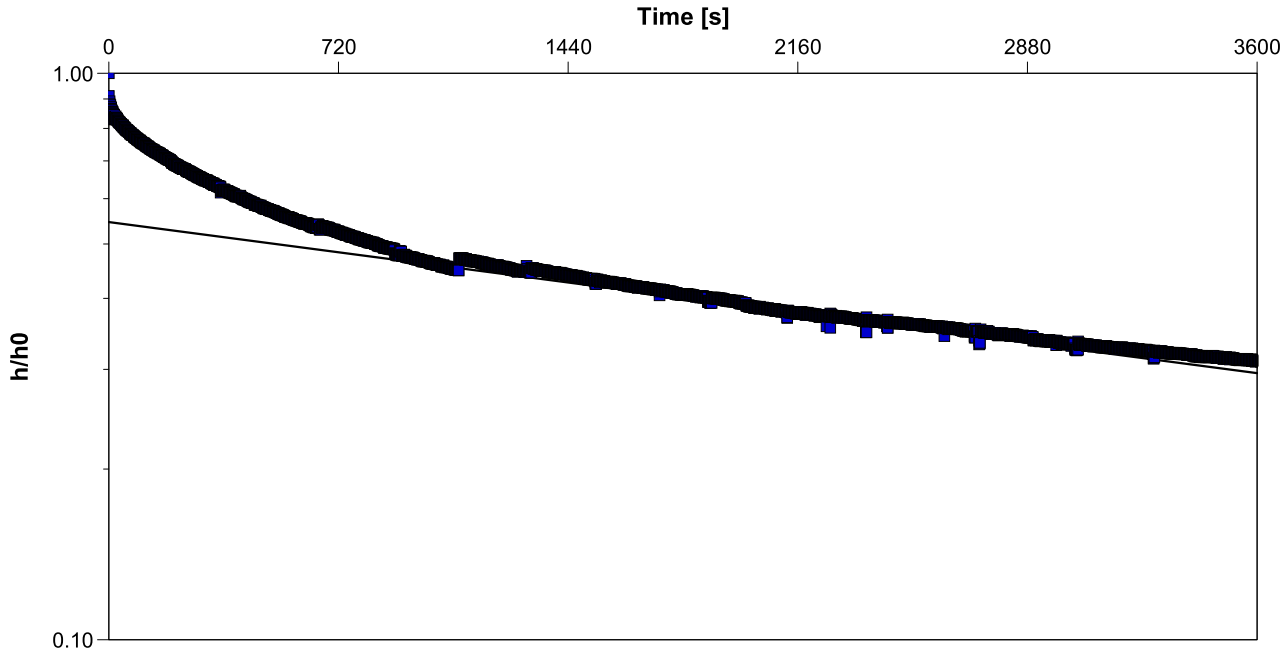


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH117	2.68×10^{-7}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhilss Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Creek Road	Slug Test: BH117 Rising	Test Well: BH117
Test Conducted by: BRAL/AMHO		Test Date: 17/11/2020
Analysis Performed by: BRAL	Bouwer and Rice	Analysis Date: 26/11/2020
Aquifer Thickness: 9.82 m		

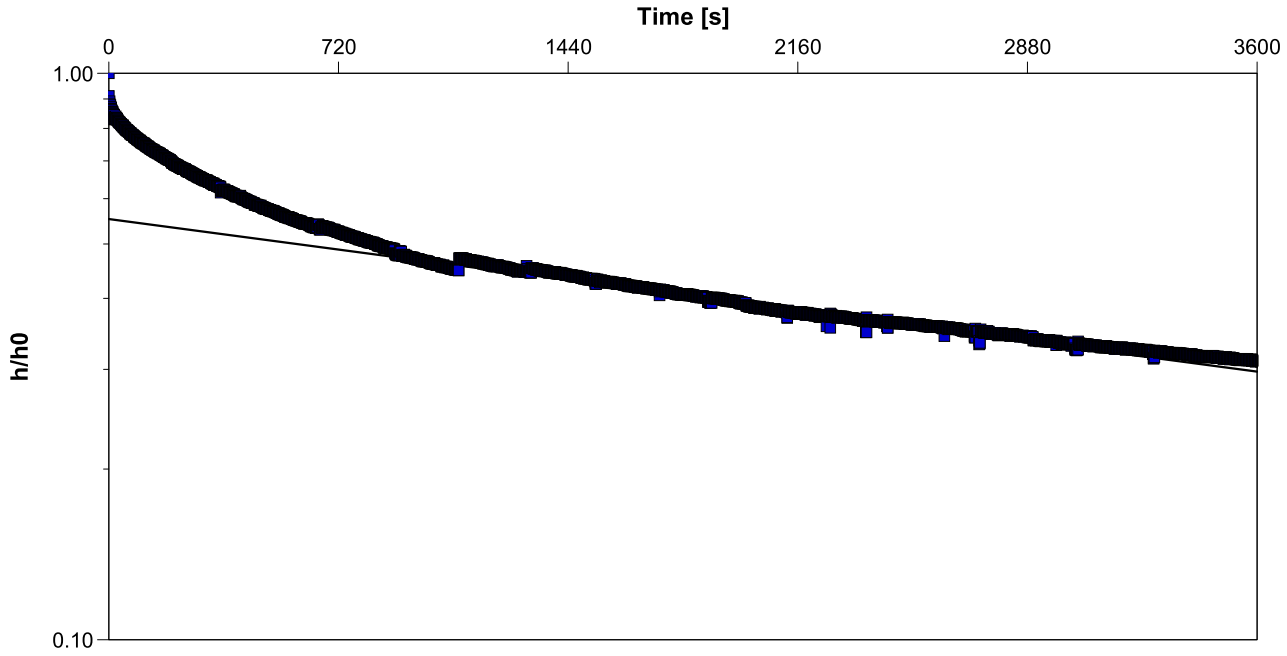


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH117	9.01×10^{-8}	

Tonkin+Taylor	**Slug Test Analysis Report**
	Project: Whenuapai and Redhilss Wastewater Scheme
	Number: 1014985
	Client: Watercare Services Limited

Location: 23-27 Brigham Creek Road	Slug Test: BH117 Rising	Test Well: BH117
Test Conducted by: BRAL/AMHO		Test Date: 17/11/2020
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 26/11/2020
Aquifer Thickness: 9.82 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH117	1.19×10^{-7}	

Appendix G: Geotechnical Laboratory Test Results

GEOTECHNICS

Our Ref: 1100655.0000/Rep 1
Customer Ref: 1014985.0000
26 January 2021

Tonkin + Taylor
PO Box 5271
Victoria Street West
Auckland 1142

Attention: Chris Monk

Dear Chris

Watercare Whenuapai-Redhills

Laboratory Test Report

Samples from the above mentioned site have been tested as received according to your instructions and the results are included in this report. Results apply only to the samples tested.

Descriptions are enclosed for your information, but are not covered under the IANZ endorsement of this report.

This report has been prepared for the benefit of Tonkin + Taylor, with respect to the particular brief given to us and it cannot be relied upon in other contexts or for any other purpose without our prior review and agreement.

This report may be reproduced only in full.

Samples not destroyed during testing will be retained for one month from the date of this report before being discarded. If we can be of any further assistance, feel free to get in touch. Contact details are provided at the bottom of this page.

GEOTECHNICS LTD

Report prepared by:

Authorised for Geotechnics by:

..... Sim Tirunahari I am the author of this document 2021.01.26 16:03:37 +13'00' .....

Sim Tirunahari
Soils Laboratory Manager
Approved Signatory

.....

Steven Anderson
Project Director

ACCREDITED IANZ TESTING LABORATORY

Test results indicated as not accredited are outside the scope of the laboratory's accreditation

Report checked by:

.....

James Kimiangatau
Laboratory Technician

26-Jan-21
t:\geotechnicsgroup\projects\1100655\issueddocuments\20210126.watercare whenuapai_redhills.st.final rep1.docx

GEOTECHNICS

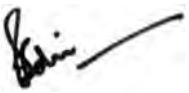
Auckland
1 Hill Street
Onehunga
Auckland 1061
New Zealand

p + 64 9 356 3510

Report No: ASM:W20AK-0256
Issue No: 3
This report replaces all previous issues of report no 'ASM:W20AK-0256'.

Material Test Report

Customer: Tonkin & Taylor Limited
Address: Level 2, 105 Carlton Gore Rd
Newmarket Auckland 1023
Project: **Watercare Whenuapai-Redhills**
Project No.: 1100655.0000
Customer Reference No.: 1014985.0000
Report Authorised By : Sim Tirunahari



Approved By:
Sim Tirunahari
(Soils Laboratory Manager)
Date of Issue: 26/01/2021

Material Details

Product:
Sampled From: **Location:** Watercare Whenuapai-Redhills
Specification:

Sample Details

Sampled By:						
'Sampling Endorsed:'						
Sample ID:	S20AK000827	S20AK000828	S20AK000829	S20AK000830	S20AK000831	S20AK000832
Client Sample ID:	BH05A_2.2m	BH05A_3.5m	BH06_1.5m	BH07_2.5m	BH07_5.5m	BH08_1.5m
Field Sample ID:						
Date Sampled:						
Date Tested:	1/12/2020	1/12/2020	1/12/2020	1/12/2020	1/12/2020	1/12/2020
Tested By:	James Kimiangatau	James Kimiangatau	James Kimiangatau	James Kimiangatau	James Kimiangatau	James Kimiangatau

Other Test Results

Description	Method	Results					
Moisture Content (%)	NZS 4402:1986 Test 2.1	69.4	73.0	44.6	46.9	43.0	36.8

Comments

N/A

If samples have been taken, and were not destroyed during testing, they will be retained for one month from the date of this report before being discarded.

GEOTECHNICS

Auckland
1 Hill Street
Onehunga
Auckland 1061
New Zealand

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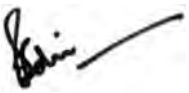
Material Test Report

Report No: ASM:W20AK-0256
Issue No: 3
This report replaces all previous issues of report no 'ASM:W20AK-0256'.

Customer: Tonkin & Taylor Limited
Address: Level 2, 105 Carlton Gore Rd
Newmarket Auckland 1023
Project: **Watercare Whenuapai-Redhills**
Project No.: 1100655.0000
Customer Reference No.: 1014985.0000
Report Authorised By : Sim Tirunahari



Approved By:
Sim Tirunahari
(Soils Laboratory Manager)
Date of Issue: 26/01/2021

Material Details

Product:
Sampled From: **Location:** Watercare Whenuapai-Redhills
Specification:

Sample Details

Sampled By:			
'Sampling Endorsed:'			
Sample ID:	S20AK000833	S20AK000834	S20AK000835
Client Sample ID:	BH08_3.0m	BH110_1.5m	BH111_1.5m
Field Sample ID:			
Date Sampled:			
Date Tested:	1/12/2020	1/12/2020	1/12/2020
Tested By:	James Kimiangatau	James Kimiangatau	James Kimiangatau

Other Test Results

Description	Method	Results		
Moisture Content (%)	NZS 4402:1986 Test 2.1	42.1	36.4	45.7

Comments

N/A

If samples have been taken, and were not destroyed during testing, they will be retained for one month from the date of this report before being discarded.

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Onehunga
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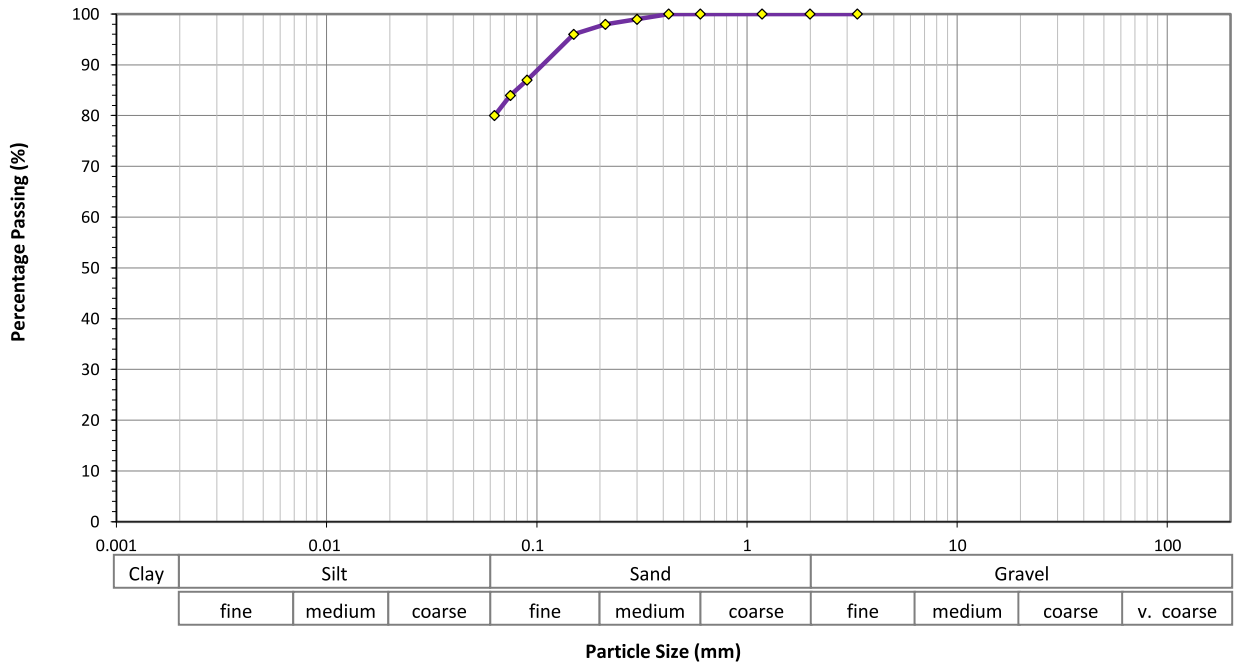
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0256
Customer Project ID	1014985.0000

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000827		
	Reference	BH05A	**Top Depth**	1.5m
	Sampled By		**Bottom Depth**	
	Description	sandy clayey SILT, firm to stiff, light grey mixed with light yellowish orange brown, mottled black.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	99
100	-	19.0	-	3.35	100	0.212	98
75.0	-	16.0	-	2.00	100	0.150	96
63.0	-	13.2	-	1.18	100	0.090	87
53.0	-	9.50	-	0.600	100	0.075	84
37.5	-	6.70	-	0.425	100	0.063	80

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. • This test result is IANZ accredited.•Date tested 01/12/2020

Approved Signatory Sim Tirunahari

Date 26/01/2021

GEOTECHNICS

1 Hill Street
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Auckland 1061
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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0256
Customer Project ID	1014985.0000

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (single point), 2.3 & 2.4

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000828		
	Reference	BH05A	**Top Depth**	2.2m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, stiff, light brownish grey, mottled orange, extremely high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**135**
Plastic Limit	**40**
Plasticity Index	**95**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.•Date tested 07/12/2020

Approved Signatory	Sim Tirunahari
Date	26/01/2021

GEOTECHNICS
1 Hill Street, Onehunga, Auckland 1061
p 64 9 356 3510
www.geotechnics.co.nz

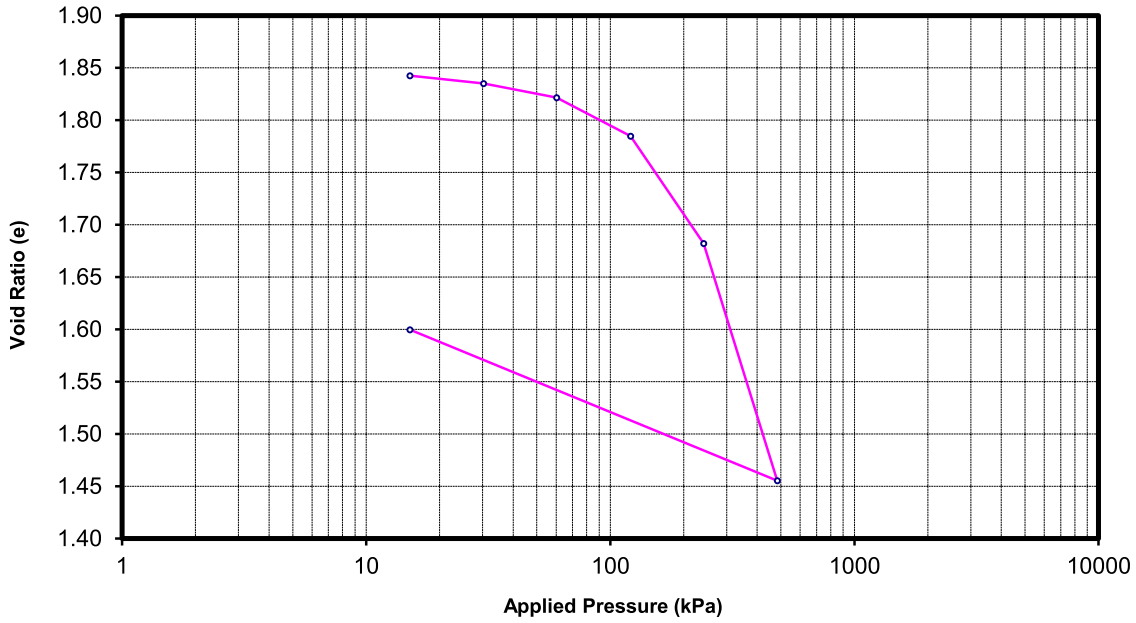
Your Job No.: **1014985.0000**

Site: **Watercare Whenuapai-Redhills** Our Job No.: **1100655.0000**

BH No.: **BH 05A** Sample ID.: **---** Depth: **3.30-3.35 (m)**

Test Method Used: NZS 4402:1986 Test 7.1 One-Dimensional Consolidation

ONE-DIMENSIONAL CONSOLIDATION TEST



Pressure (kPa)		Void Ratio (e)	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m^2/yr)	Coefficient of Volume Compressibility Mv (m^2/MN)
As received	0	1.846			
Preload	15.1	1.843	0 to 15.1	NA	0.085
	30.2	1.835	15.1 to 30.2	4.8	0.18
	60.3	1.822	30.2 to 60.3	3.6	0.16
	121	1.785	60.3 to 121	2.2	0.22
	241	1.682	121 to 241	1.2	0.31
	483	1.455	241 to 483	0.81	0.35
Unload	15.1	1.600	483 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at NWC.

Description: SILT with minor to some clay and trace of sand, firm, light greenish grey, mottled black.

Initial Dry Density (t/m³): 0.93 Initial Water Content: 67.5%

Solid Density (t/m³): 2.65 (Assumed) Initial Saturation: 97%

Temperature During Testing: Max = 21 ^{0}C Min = 19 ^{0}C

Remarks: SQR of time fitting method was used. We have assumed a value of 2.65 t/m³. The calculations of void ratio are affected by the solid density value.

The test results are IANZ accredited but the sample description is not IANZ accredited.

Entered by: ST Date: 26.01.21 Checked by: JK Date: 26.01.21

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1 Hill Street
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Auckland 1061
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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0256
Customer Project ID	1014985.0000

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (single point), 2.3 & 2.4

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000829		
	Reference	BH05A	**Top Depth**	3.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with some sand, firm to stiff, light greyish brown, mottled orange-black, extremely high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**96**
Plastic Limit	**43**
Plasticity Index	**53**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.•Date tested 07/12/2020

Approved Signatory	Sim Tirunahari
Date	26/01/2021

GEOTECHNICS

1 Hill Street
Onehunga
Auckland 1061
New Zealand
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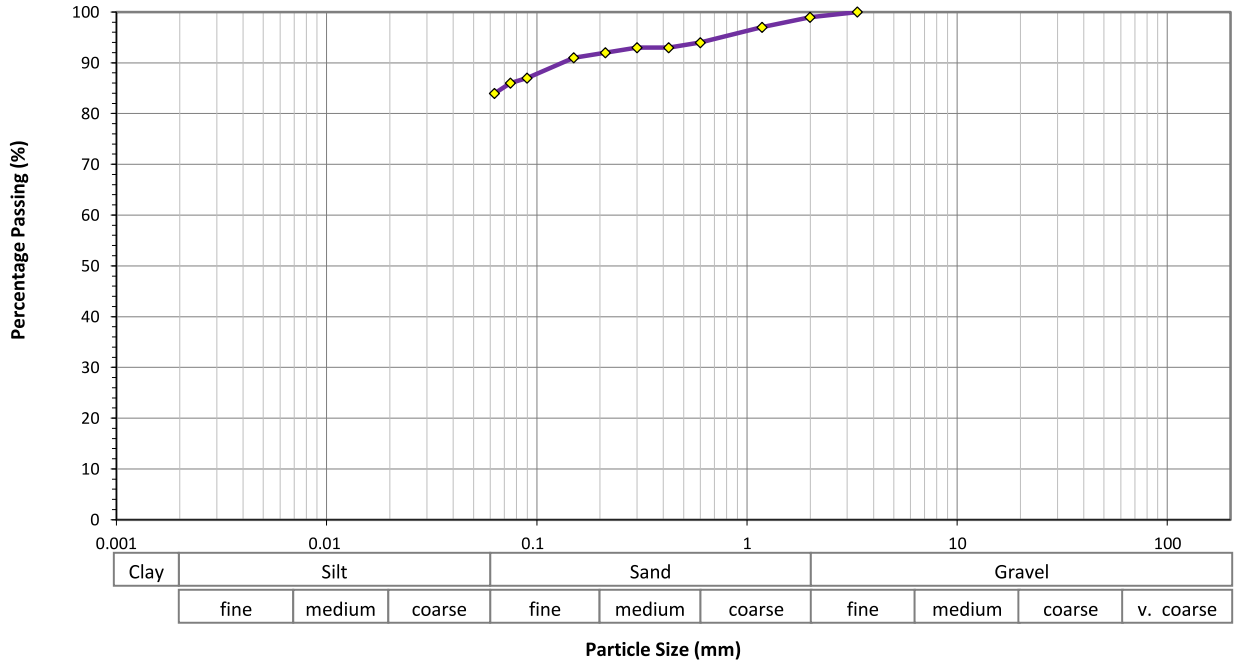
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0256
Customer Project ID	1014985.0000

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000829		
	Reference	BH05A	**Top Depth**	3.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with some sand, firm to stiff, light greyish brown, mottled orange-black, extremely high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	93
100	-	19.0	-	3.35	100	0.212	92
75.0	-	16.0	-	2.00	99	0.150	91
63.0	-	13.2	-	1.18	97	0.090	87
53.0	-	9.50	-	0.600	94	0.075	86
37.5	-	6.70	-	0.425	93	0.063	84

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. • This test result is IANZ accredited.•Date tested 01/12/2020

Approved Signatory Sim Tirunahari

Date 26/01/2021

GEOTECHNICS

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0256
Customer Project ID	1014985.0000

Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000830		
	Reference	BH05A	**Top Depth**	6.0m
	Sampled By		**Bottom Depth**	
	BH/TP No.			
	Description	Organic SILT with minor to some clay and trace of sand, firm, dark brown mixed with black.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Organic Matter Content 20%

TEST REMARKS

• The result was obtained in accordance with the Standard Test Method. • This test result is IANZ accredited.•Date tested 02/12/2020

Approved Signatory	Sim Tirunahari
Date	26/01/2021

Our Ref.No.1100655.0000/Rep1

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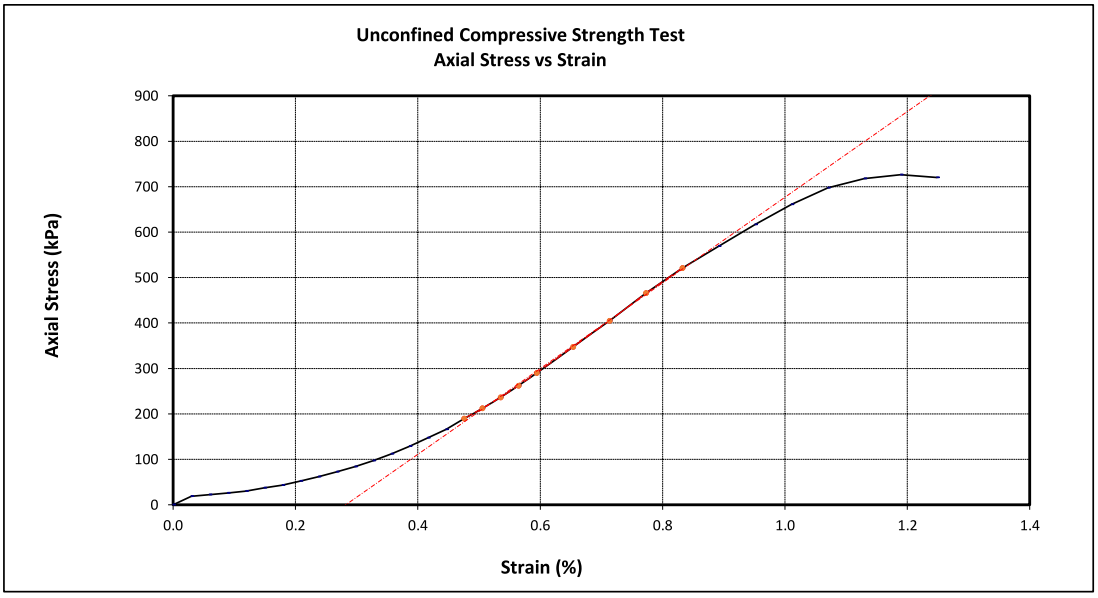
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0256
Customer Project ID	1014985.0000

Unconfined Compressive Strength of Cohesive Soil - NZS 4402:1986 - Test 6.3.1

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000831	**BH No**	
	Reference	BH05A	**Top Depth**	14.2m
	Sampled By		**Bottom Depth**	
	Description	Light greenish grey, extremely weak, fine to medium grained SANDSTONE.		
	Sample History	The sample used for testing was natural, undisturbed.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

Test Result



Sample Parameters

Sample Height	(mm)	168.20
Sample Diameter	(mm)	82.51
Test Height	(mm)	168.20
Test H/D Ratio		2.04

Bulk Density	(t/m³)	2.05
Dry Density	(t/m³)	1.65
Water Content	(%)	22.6

Failure Value

Axial Strain (%)	Unconfined Compressive Strength qu (kPa)	Rate of Compression (mm/min)	Modulus of Elasticity (MPa)
1.2	730	0.065	94

Mode of Failure Shear

Test Remarks

• Modulus of Elasticity value reported based upon straight line portion of the curve and provided as indicative only. • Unconfined compressive strength (kPa) is rounded to 2 significant figures. • This test result is IANZ accredited.•Date tested 03/12/2020

Approved Signatory Sim Tirunahari

Date 26/01/2021

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0256
Customer Project ID	1014985.0000

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (single point), 2.3 & 2.4

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000832		
	Reference	BH06	**Top Depth**	1.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, few rootlets, stiff, light brown mixed with light grey, mottled orange, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**82**
Plastic Limit	**31**
Plasticity Index	**51**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.•Date tested 07/12/2020

Approved Signatory	Sim Tirunahari
Date	26/01/2021

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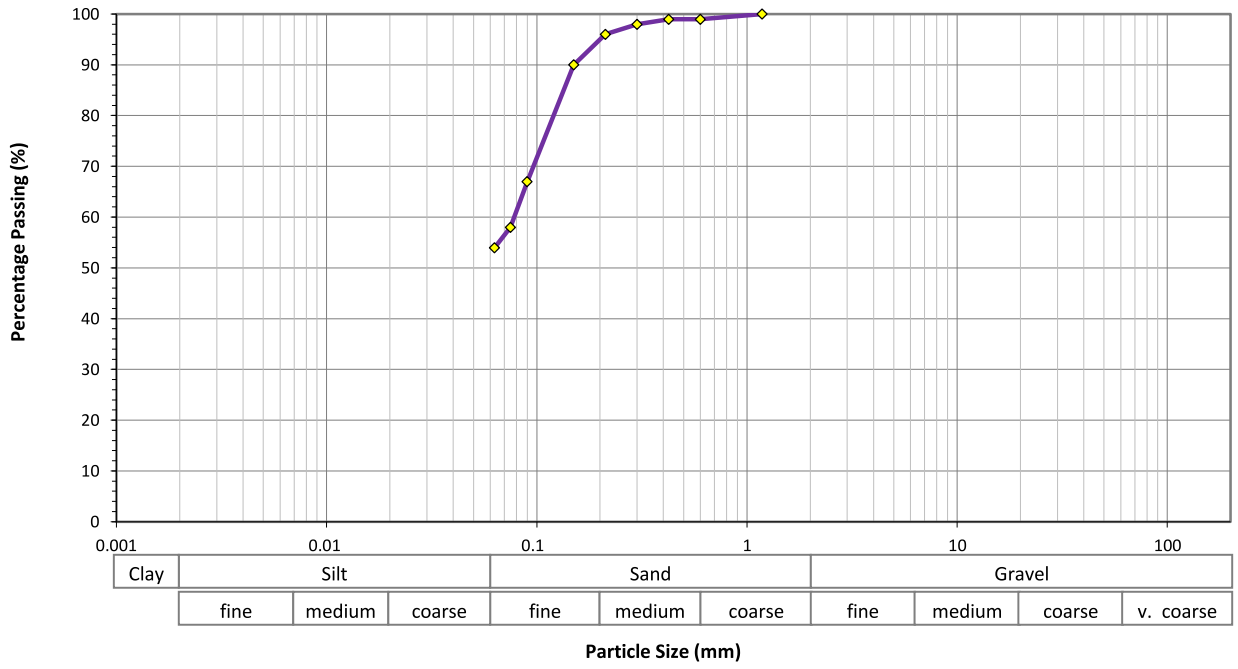
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0256
Customer Project ID	1014985.0000

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000833		
	Reference	BH06	**Top Depth**	3.0m
	Sampled By		**Bottom Depth**	
	Description	silty SAND with minor clay, loosely packed, light greenish grey.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	98
100	-	19.0	-	3.35	-	0.212	96
75.0	-	16.0	-	2.00	-	0.150	90
63.0	-	13.2	-	1.18	100	0.090	67
53.0	-	9.50	-	0.600	99	0.075	58
37.5	-	6.70	-	0.425	99	0.063	54

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. • This test result is IANZ accredited.•Date tested 01/12/2020

Approved Signatory Sim Tirunahari

Date 26/01/2021

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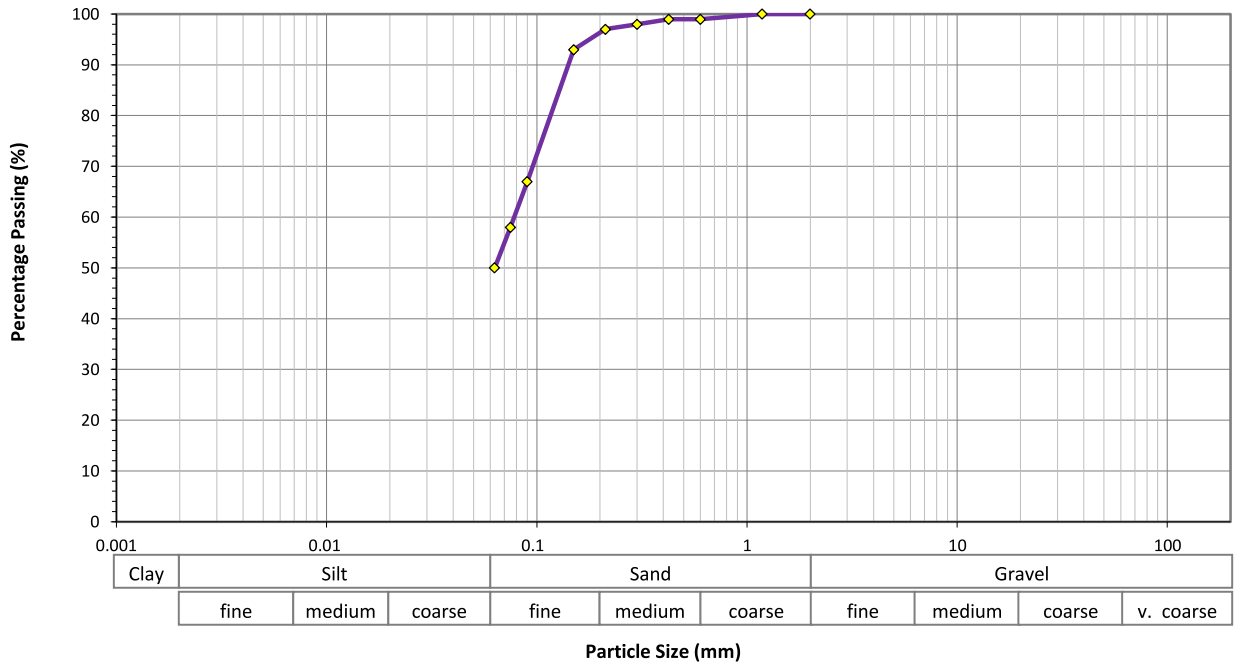
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0256
Customer Project ID	1014985.0000

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000834		
	Reference	BH06	**Top Depth**	5.0m
	Sampled By		**Bottom Depth**	
	Description	silty SAND with minor clay, tightly packed, light greenish grey, mottled orange.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	98
100	-	19.0	-	3.35	-	0.212	97
75.0	-	16.0	-	2.00	100	0.150	93
63.0	-	13.2	-	1.18	100	0.090	67
53.0	-	9.50	-	0.600	99	0.075	58
37.5	-	6.70	-	0.425	99	0.063	50

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. • This test result is IANZ accredited.•Date tested 01/12/2020

Approved Signatory Sim Tirunahari

Date 26/01/2021

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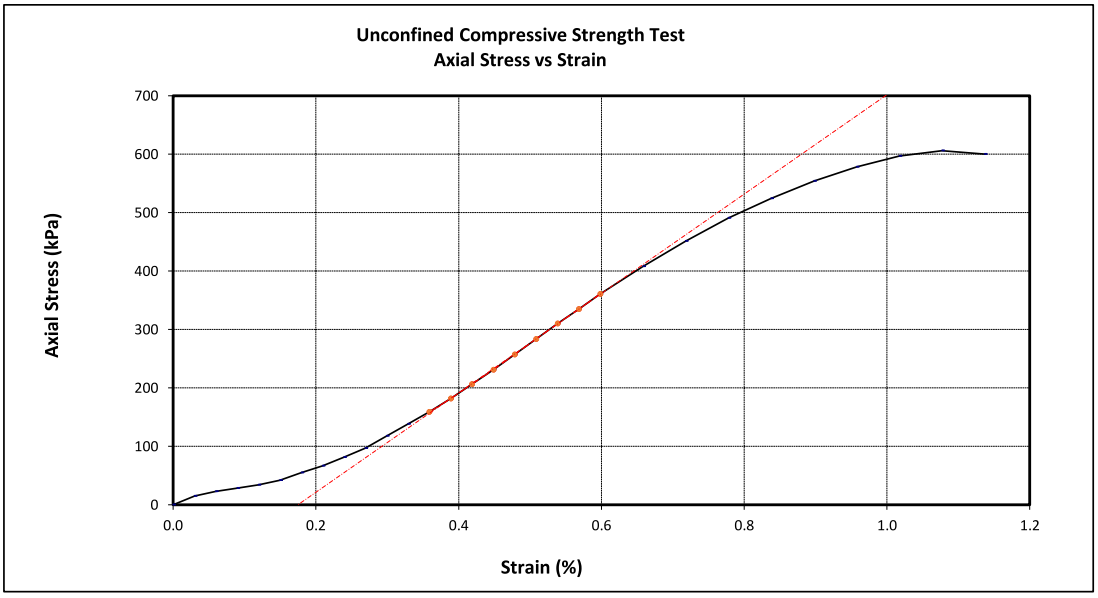
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0256
Customer Project ID	1014985.0000

Unconfined Compressive Strength of Cohesive Soil - NZS 4402:1986 - Test 6.3.1

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000835	**BH No**	
	Reference	BH06	**Top Depth**	13.8m
	Sampled By		**Bottom Depth**	
	Description	Light greenish grey, extremely weak, fine to medium grained SANDSTONE.		
	Sample History	The sample used for testing was natural, undisturbed.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

Test Result



Sample Parameters

Sample Height	(mm)	167.09
Sample Diameter	(mm)	81.81
Test Height	(mm)	167.09
Test H/D Ratio		2.04

Bulk Density	(t/m^3)	2.05
Dry Density	(t/m^3)	1.70
Water Content	(%)	20.5

Failure Value

Axial Strain (%)	Unconfined Compressive Strength qu (kPa)	Rate of Compression (mm/min)	Modulus of Elasticity (MPa)
1.1	610	0.062	85

Mode of Failure Shear

Test Remarks

• Modulus of Elasticity value reported based upon straight line portion of the curve and provided as indicative only. • Unconfined compressive strength (kPa) is rounded to 2 significant figures. • This test result is IANZ accredited.•Date tested 03/12/2020

Approved Signatory Sim Tirunahari

Date 26/01/2021

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0256
Customer Project ID	1014985.0000

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (single point), 2.3 & 2.4

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000847		
	Reference	BH07	**Top Depth**	2.5m
	Sampled By		**Bottom Depth**	
	Description	sandy clayey SILT, stiff, light brown mixed with light grey, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**73**
Plastic Limit	**32**
Plasticity Index	**41**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.•Date tested 07/12/2020

Approved Signatory	Sim Tirunahari
Date	26/01/2021

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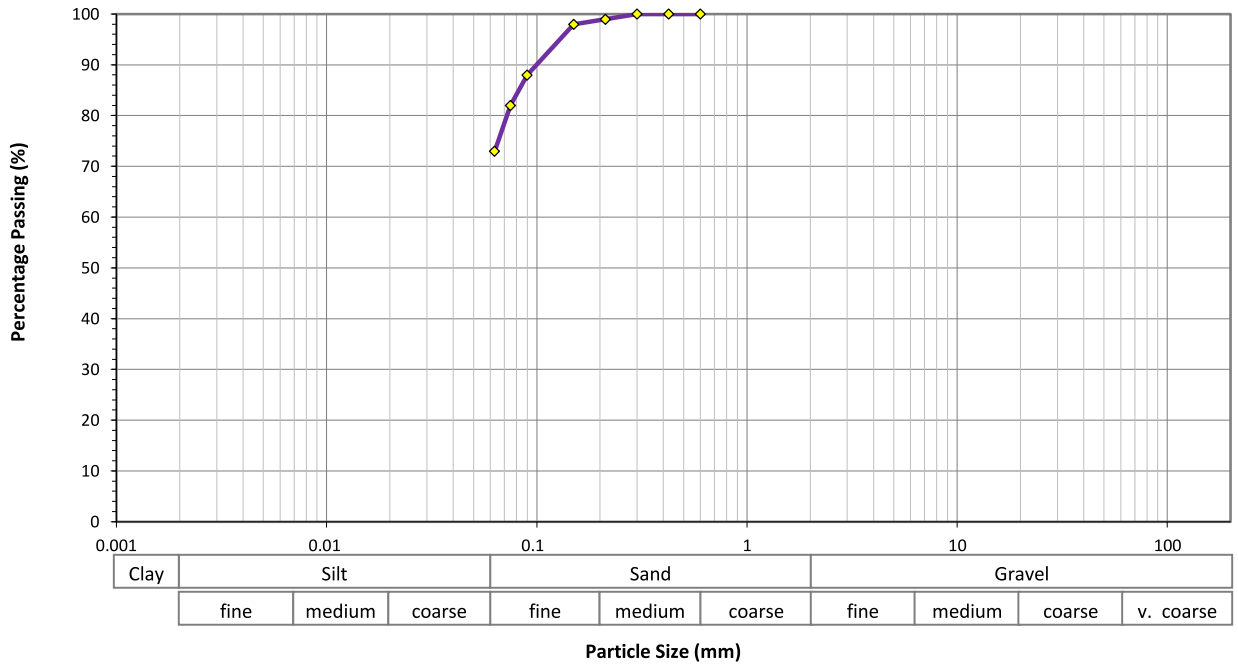
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0256
Customer Project ID	1014985.0000

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000847		
	Reference	BH07	**Top Depth**	2.5m
	Sampled By		**Bottom Depth**	
	Description	sandy clayey SILT, stiff, light brown mixed with light grey, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	100
100	-	19.0	-	3.35	-	0.212	99
75.0	-	16.0	-	2.00	-	0.150	98
63.0	-	13.2	-	1.18	-	0.090	88
53.0	-	9.50	-	0.600	100	0.075	82
37.5	-	6.70	-	0.425	100	0.063	73

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. • This test result is IANZ accredited.•Date tested 01/12/2020

Approved Signatory	Sim Tirunahari
Date	26/01/2021

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0012
Customer Project ID	1014985.0000

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (single point), 2.3 & 2.4

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000034		
	Reference	BH07	**Top Depth**	5.5m
	Sampled By		**Bottom Depth**	
	Description	sandy SILT with some clay, firm to stiff, light grrenish grey, mottled orange, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**75**
Plastic Limit	**27**
Plasticity Index	**48**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.•Date tested 07/12/2020

Approved Signatory	Sim Tirunahari
Date	26/01/2021

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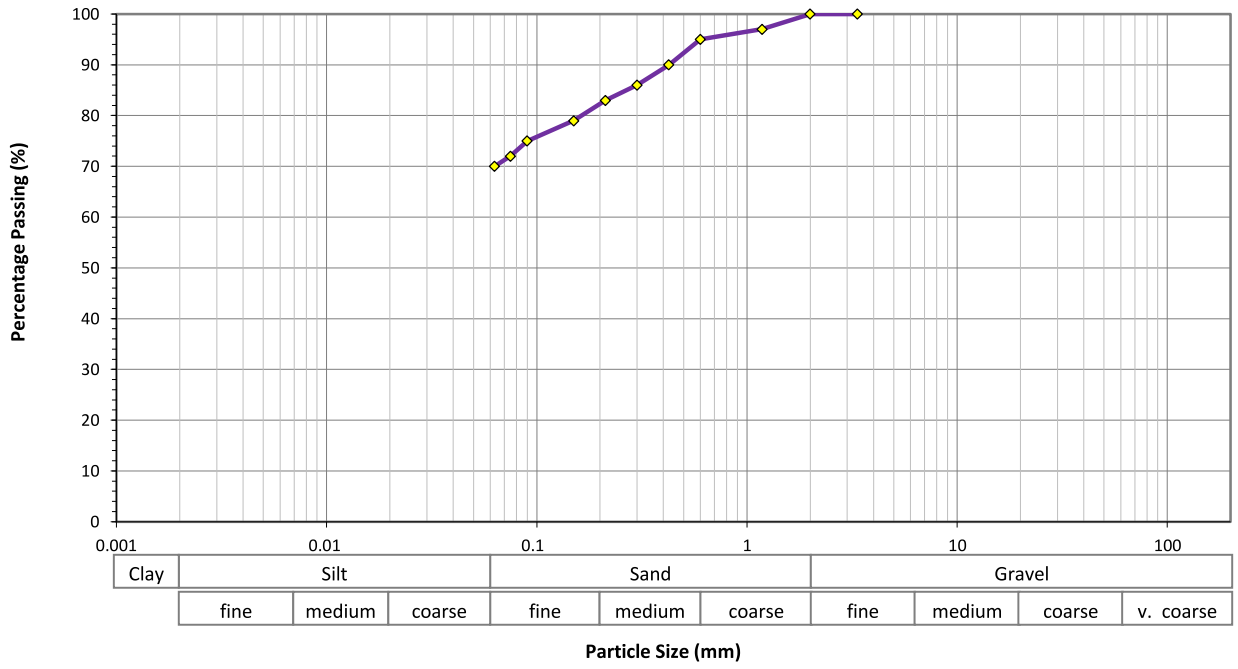
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0012
Customer Project ID	1014985.0000

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000034		
	Reference	BH07	**Top Depth**	5.5m
	Sampled By		**Bottom Depth**	
	Description	sandy SILT with some clay, firm to stiff, light grrenish grey, mottled orange, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	86
100	-	19.0	-	3.35	100	0.212	83
75.0	-	16.0	-	2.00	100	0.150	79
63.0	-	13.2	-	1.18	97	0.090	75
53.0	-	9.50	-	0.600	95	0.075	72
37.5	-	6.70	-	0.425	90	0.063	70

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. • This test result is IANZ accredited.•Date tested 01/12/2020

Approved Signatory	Sim Tirunahari
Date	26/01/2021

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0012
Customer Project ID	1014985.0000

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (single point), 2.3 & 2.4

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000035		
	Reference	BH08	**Top Depth**	1.5m
	Sampled By		**Bottom Depth**	
	Description	sandy clayey SILT, firm to stiff, few rootlets, light greenish grey, mottled black, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**74**
Plastic Limit	**26**
Plasticity Index	**48**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.•Date tested 07/12/2020

Approved Signatory	Sim Tirunahari
Date	26/01/2021

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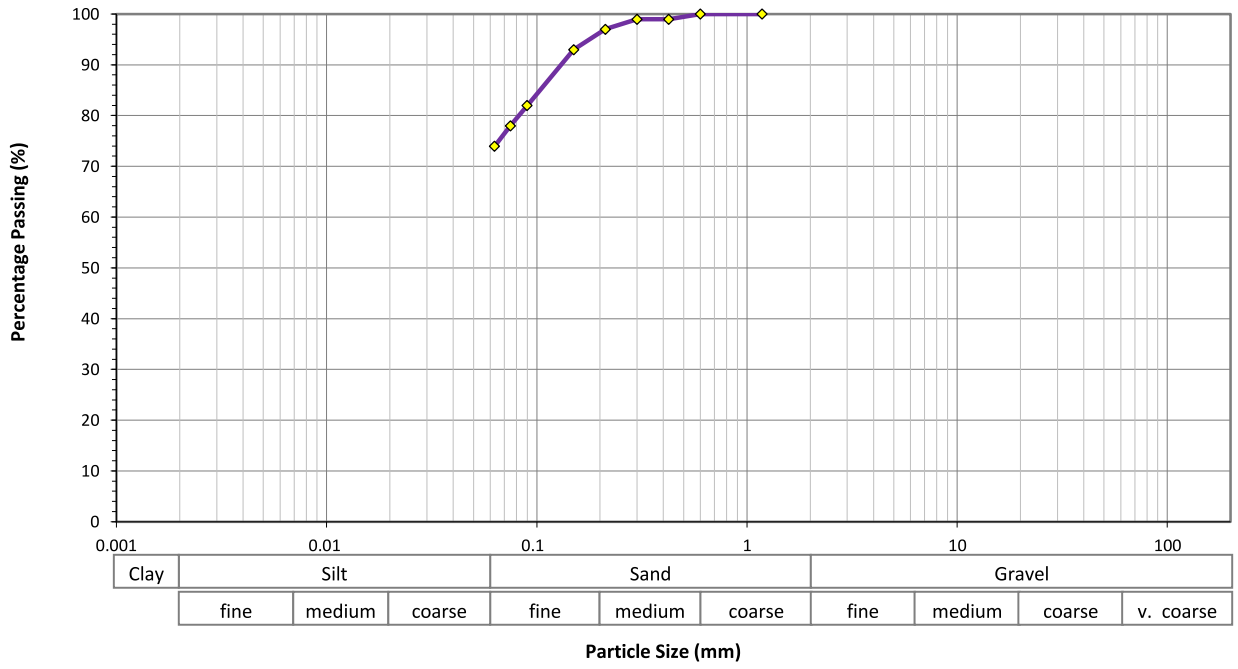
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0012
Customer Project ID	1014985.0000

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000035		
	Reference	BH08	**Top Depth**	1.5m
	Sampled By		**Bottom Depth**	
	Description	sandy clayey SILT, firm to stiff, few rootlets, light greenish grey, mottled black, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	99
100	-	19.0	-	3.35	-	0.212	97
75.0	-	16.0	-	2.00	-	0.150	93
63.0	-	13.2	-	1.18	100	0.090	82
53.0	-	9.50	-	0.600	100	0.075	78
37.5	-	6.70	-	0.425	99	0.063	74

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. • This test result is IANZ accredited.•Date tested 01/12/2020

Approved Signatory Sim Tirunahari

Date 26/01/2021

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0012
Customer Project ID	1014985.0000

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (single point), 2.3 & 2.4

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000036		
	Reference	BH08	**Top Depth**	3.0m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with some sand, few rootlets, firm to stiff, light greenish grey, mottled black, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**73**
Plastic Limit	**26**
Plasticity Index	**47**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.•Date tested 07/12/2020

Approved Signatory	Sim Tirunahari
Date	26/01/2021

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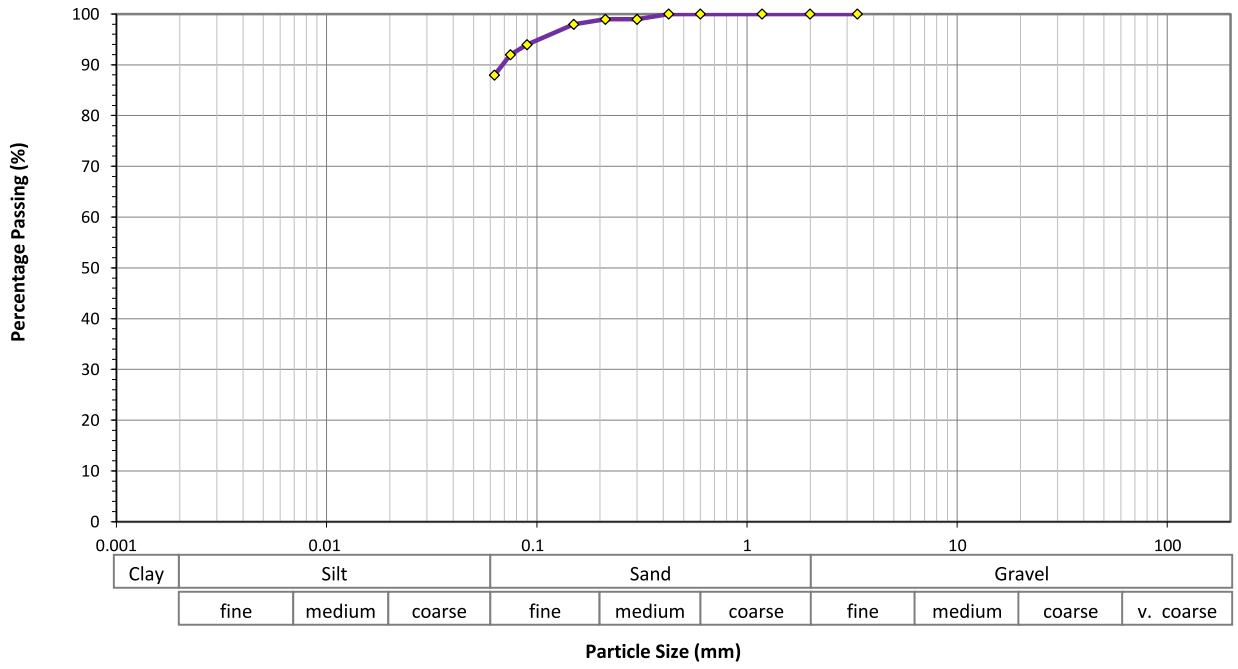
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0012
Customer Project ID	1014985.0000

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000036		
	Reference	BH08	**Top Depth**	3.0m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with some sand, few rootlets, firm to stiff, light greenish grey, mottled black, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	99
100	-	19.0	-	3.35	100	0.212	99
75.0	-	16.0	-	2.00	100	0.150	98
63.0	-	13.2	-	1.18	100	0.090	94
53.0	-	9.50	-	0.600	100	0.075	92
37.5	-	6.70	-	0.425	100	0.063	88

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. • This test result is IANZ accredited.•Date tested 01/12/2020

Approved Signatory Sim Tirunahari

Date 26/01/2021

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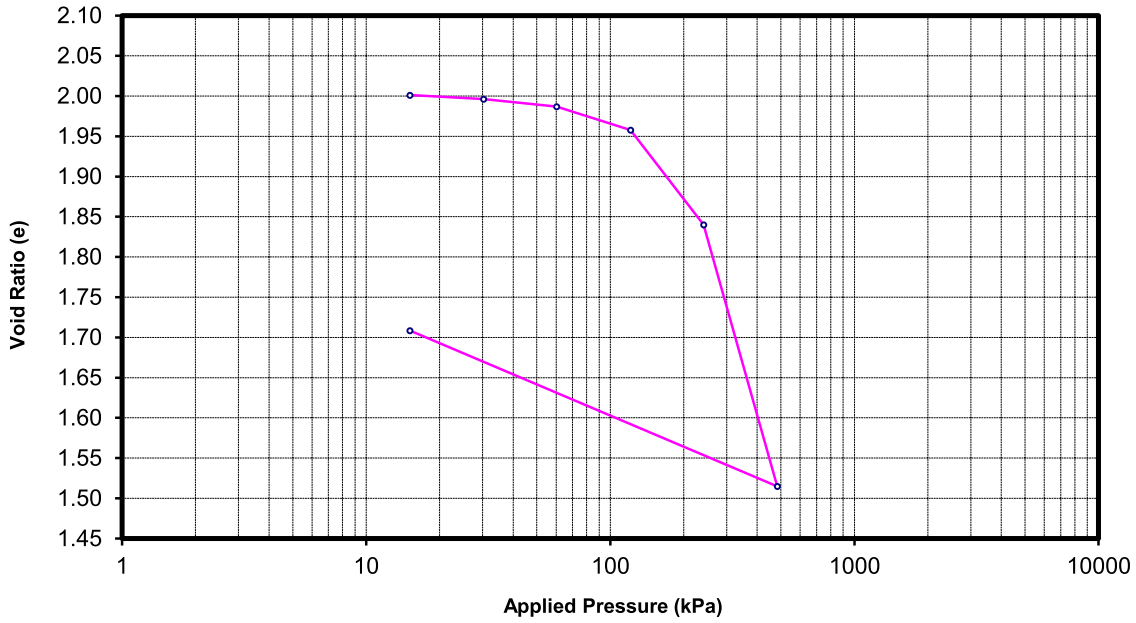
Your Job No.: **1014985.0000**

Site: **Watercare Whenuapai-Redhills** Our Job No.: **1100655.0000**

BH No.: **BH 08** Sample ID.: **---** Depth: **6.30-6.35 (m)**

Test Method Used: NZS 4402:1986 Test 7.1 One-Dimensional Consolidation

ONE-DIMENSIONAL CONSOLIDATION TEST



Pressure (kPa)		Void Ratio (e)	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m^2/yr)	Coefficient of Volume Compressibility Mv (m^2/MN)
As received	0	2.007			
Preload	15.1	2.001	0 to 15.1	NA	0.12
	30.2	1.996	15.1 to 30.2	7.9	0.11
	60.3	1.987	30.2 to 60.3	6.6	0.10
	121	1.958	60.3 to 121	5.2	0.16
	241	1.840	121 to 241	1.4	0.33
	483	1.515	241 to 483	0.62	0.47
Unload	15.1	1.708	483 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at NWC.

Description: SILT with minor to some clay and trace of sand, trace of organics, firm, grey mixed with dark brown, mottled black.

Initial Dry Density (t/m³): 0.88 Initial Water Content: 73.6%

Solid Density (t/m³): 2.65 (Assumed) Initial Saturation: 97%

Temperature During Testing: Max = 21 ^{0}C Min = 19 ^{0}C

Remarks: SQR of time fitting method was used. We have assumed a value of 2.65 t/m³. The calculations of void ratio are affected by the solid density value.

The test results are IANZ accredited but the sample description is not IANZ accredited.

Entered by: ST Date: 26.01.21 Checked by: JK Date: 26.01.21

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0012
Customer Project ID	1014985.0000

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (single point), 2.3 & 2.4

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000037		
	Reference	BH110	**Top Depth**	1.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with minor sand, few rootlets, light grey mixed with light brown, mottled orange, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**77**
Plastic Limit	**29**
Plasticity Index	**48**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.•Date tested 07/12/2020

Approved Signatory	Sim Tirunahari
Date	26/01/2021

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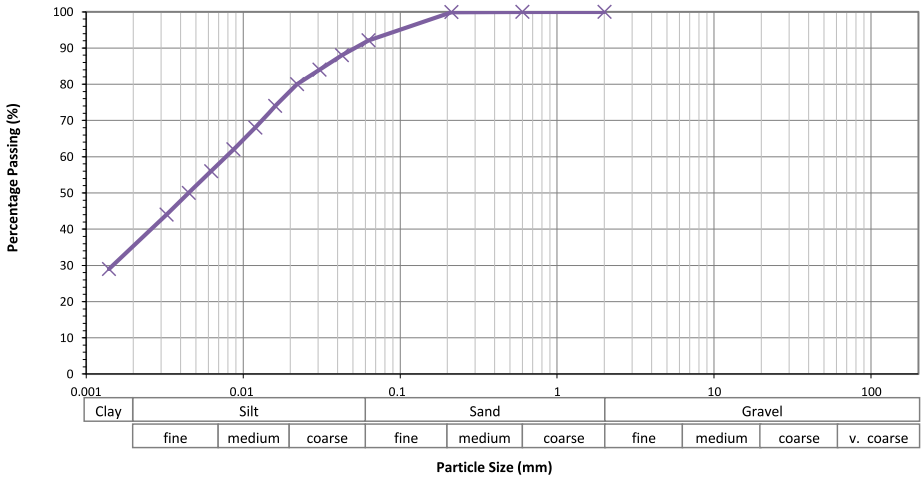
Geotechnics Project Number	1100655.0000
QESTLab Workorder ID	W21AK-0012
Customer Project ID	1014985.0000

Determination of the Particle-Size Distribution
NZS 4402:1986 Test 2.8.4 Hydrometer Method

Test Details

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000037	**Sampled By**	N/A
	Reference	BH110	**Top Depth**	1.5m
			Bottom Depth	N/A
	Description	clayey SILT with minor sand, few rootlets, light grey mixed with light brown, mottled orange, very high plasticity.	**Sample History**	Natural

Test Results



Sieve (mm)	Total % Passing
2.00	100
0.600	100
0.212	100
0.063	92

Equivalent Particle Diameter D (mm)	% of Particles Finer than D
0.0426	88
0.0307	84
0.0221	80
0.0160	74
0.0120	68
0.0087	62
0.0063	56
0.0045	50
0.0033	44
0.0014	29

Test Remarks

Date tested 02/12/2020

• The material used for testing was Natural.

Suspension pH 8

Solid Density (Assumed) = 2.65 t/m³

• This test result is IANZ accredited.

Approved Signatory Sim Tirunahari

Date 26/01/2021

Our Ref.No.1100655.0000/Rep1

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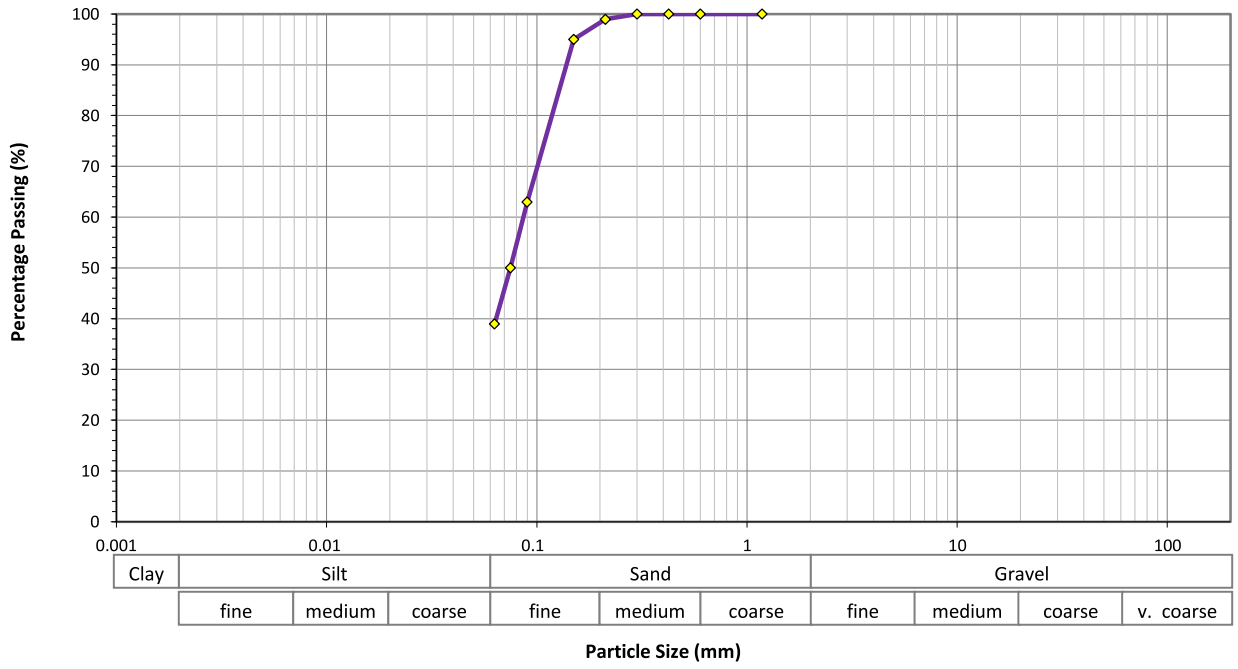
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0012
Customer Project ID	1014985.0000

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000038		
	Reference	BH110	**Top Depth**	3.5m
	Sampled By		**Bottom Depth**	
	Description	silty SAND with minor clay, stiff, light greenish grey, mottled orange.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	100
100	-	19.0	-	3.35	-	0.212	99
75.0	-	16.0	-	2.00	-	0.150	95
63.0	-	13.2	-	1.18	100	0.090	63
53.0	-	9.50	-	0.600	100	0.075	50
37.5	-	6.70	-	0.425	100	0.063	39

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. • This test result is IANZ accredited.•Date tested 01/12/2021

Approved Signatory Sim Tirunahari

Date 26/01/2021

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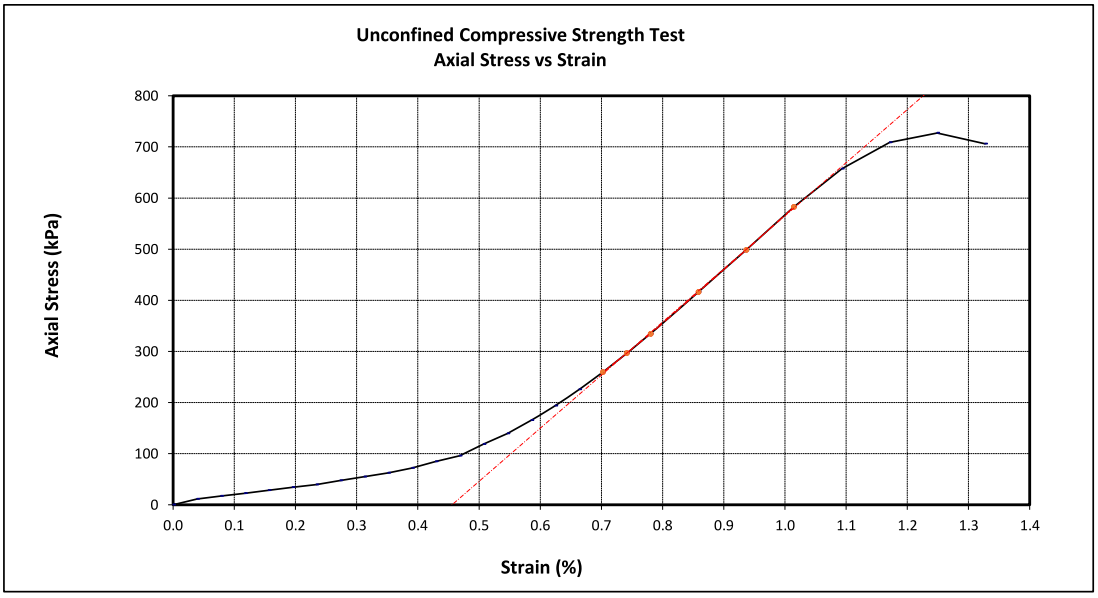
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0012
Customer Project ID	1014985.0000

Unconfined Compressive Strength of Cohesive Soil - NZS 4402:1986 - Test 6.3.1

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000039	**BH No**	
	Reference	BH110	**Top Depth**	9.4m
	Sampled By		**Bottom Depth**	
	Description	Light greenish grey, extremely weak, fine to medium SANDSTONE.		
	Sample History	The sample used for testing was natural, undisturbed.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

Test Result



Sample Parameters

Sample Height	(mm)	128.11
Sample Diameter	(mm)	82.02
Test Height	(mm)	128.11
Test H/D Ratio		1.56

Bulk Density	(t/m^3)	1.98
Dry Density	(t/m^3)	1.65
Water Content	(%)	20.9

Failure Value

Axial Strain (%)	Unconfined Compressive Strength qu (kPa)	Rate of Compression (mm/min)	Modulus of Elasticity (MPa)
1.2	730	0.059	104

Mode of Failure Shear

Test Remarks

• Modulus of Elasticity value reported based upon straight line portion of the curve and provided as indicative only. • Unconfined compressive strength (kPa) is rounded to 2 significant figures. • The sample height to diameter ratio is less than the required 2. The strength may be lower, due to the height to diameter ratio. • This test result is IANZ accredited.•Date tested 03/12/2020

Approved Signatory Sim Tirunahari
Date 26/01/2021

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0012
Customer Project ID	1014985.0000

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (single point), 2.3 & 2.4

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000040		
	Reference	BH111	**Top Depth**	1.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with minor sand, stiff, light grey with light brown, mottled yellow-orange, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**84**
Plastic Limit	**28**
Plasticity Index	**56**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.•Date tested 07/12/2020

Approved Signatory	Sim Tirunahari
Date	26/01/2021

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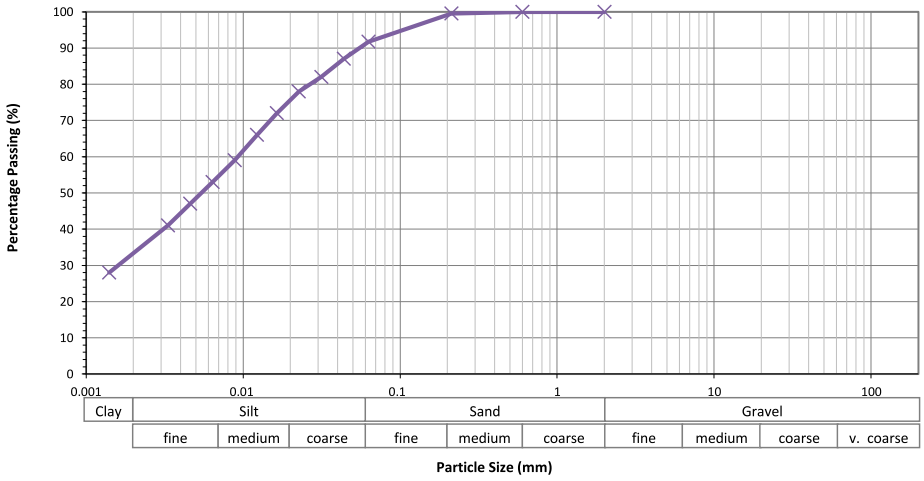
Geotechnics Project Number	1100655.0000
QESTLab Workorder ID	W21AK-0012
Customer Project ID	1014985.0000

Determination of the Particle-Size Distribution
NZS 4402:1986 Test 2.8.4 Hydrometer Method

Test Details

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000040	**Sampled By**	N/A
	Reference	BH111	**Top Depth**	1.5m
			Bottom Depth	N/A
	Description	clayey SILT with minor sand, stiff, light grey with light brown, mottled yellow-orange, very high plasticity.	**Sample History**	Natural

Test Results



Sieve (mm)	Total % Passing
2.00	100
0.600	100
0.212	100
0.063	92

Equivalent Particle Diameter D (mm)	% of Particles Finer than D
0.0437	87
0.0315	82
0.0226	78
0.0164	72
0.0122	66
0.0088	59
0.0064	53
0.0046	47
0.0033	41
0.0014	28

Test Remarks

Date tested 02/12/2020

• The material used for testing was Natural.

Suspension pH 8

Solid Density (Assumed) = 2.65 t/m³

• This test result is IANZ accredited.

Approved Signatory Sim Tirunahari

Date 26/01/2021

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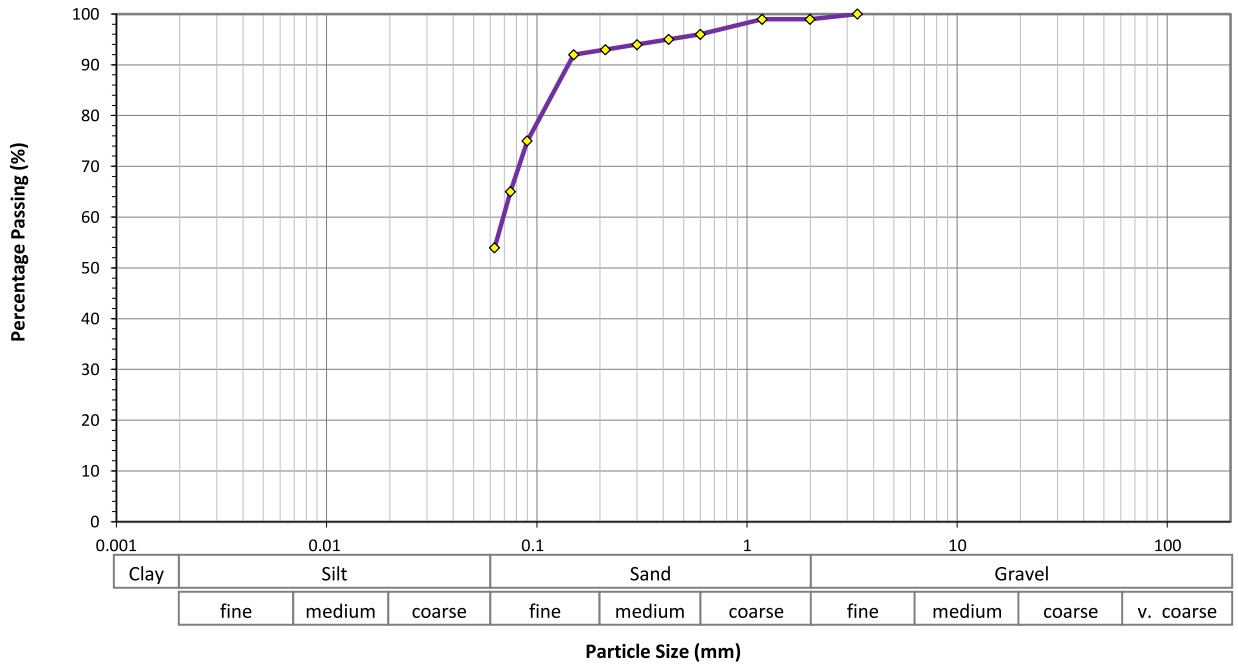
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0012
Customer Project ID	1014985.0000

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000041		
	Reference	BH111	**Top Depth**	3.0m
	Sampled By		**Bottom Depth**	
	Description	silty SAND with some clay, stiff, light greenish grey, mottled orange.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	94
100	-	19.0	-	3.35	100	0.212	93
75.0	-	16.0	-	2.00	99	0.150	92
63.0	-	13.2	-	1.18	99	0.090	75
53.0	-	9.50	-	0.600	96	0.075	65
37.5	-	6.70	-	0.425	95	0.063	54

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. • This test result is IANZ accredited.•Date tested 01/12/2020

Approved Signatory Sim Tirunahari

Date 26/01/2021

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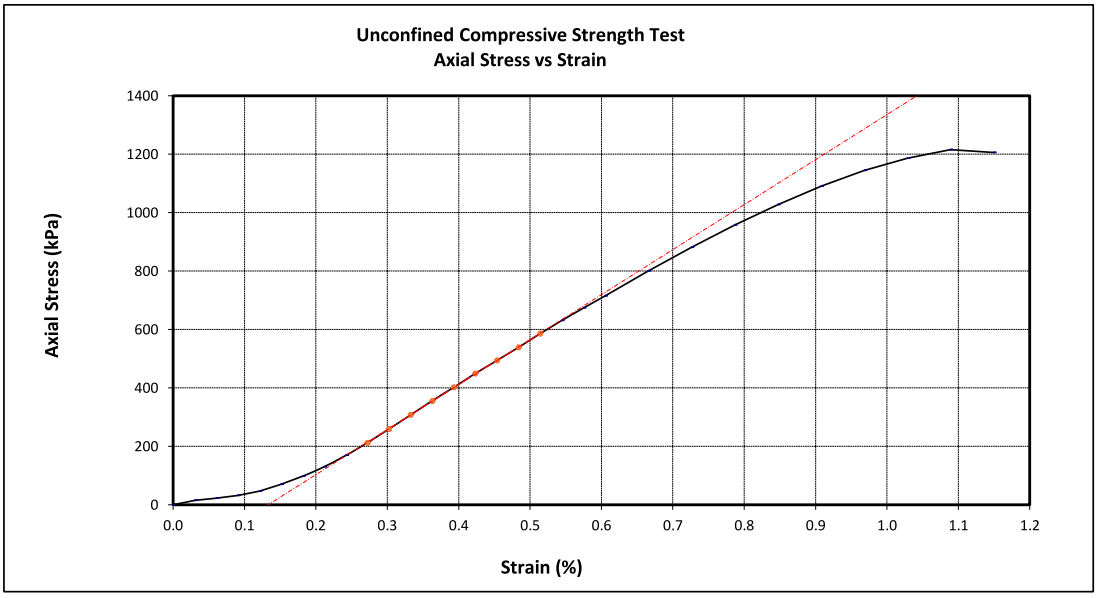
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0012
Customer Project ID	1014985.0000

Unconfined Compressive Strength of Cohesive Soil - NZS 4402:1986 - Test 6.3.1

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000042	**BH No**	
	Reference	BH111	**Top Depth**	7.3m
	Sampled By		**Bottom Depth**	
	Description	Light greenish grey, very weak, fine to medium SANDSTONE.		
	Sample History	The sample used for testing was natural, undisturbed.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

Test Result



Sample Parameters

Sample Height	(mm)	165.26
Sample Diameter	(mm)	82.13
Test Height	(mm)	165.26
Test H/D Ratio		2.01

Bulk Density	(t/m^3)	2.02
Dry Density	(t/m^3)	1.65
Water Content	(%)	22.2

Failure Value

Axial Strain (%)	Unconfined Compressive Strength qu (kPa)	Rate of Compression (mm/min)	Modulus of Elasticity (MPa)
1.1	1200	0.062	154

Mode of Failure Shear

Test Remarks

• Modulus of Elasticity value reported based upon straight line portion of the curve and provided as indicative only. • Unconfined compressive strength (kPa) is rounded to 2 significant figures. • This test result is IANZ accredited.•Date tested 03/12/2020

Approved Signatory Sim Tirunahari

Date 26/01/2021

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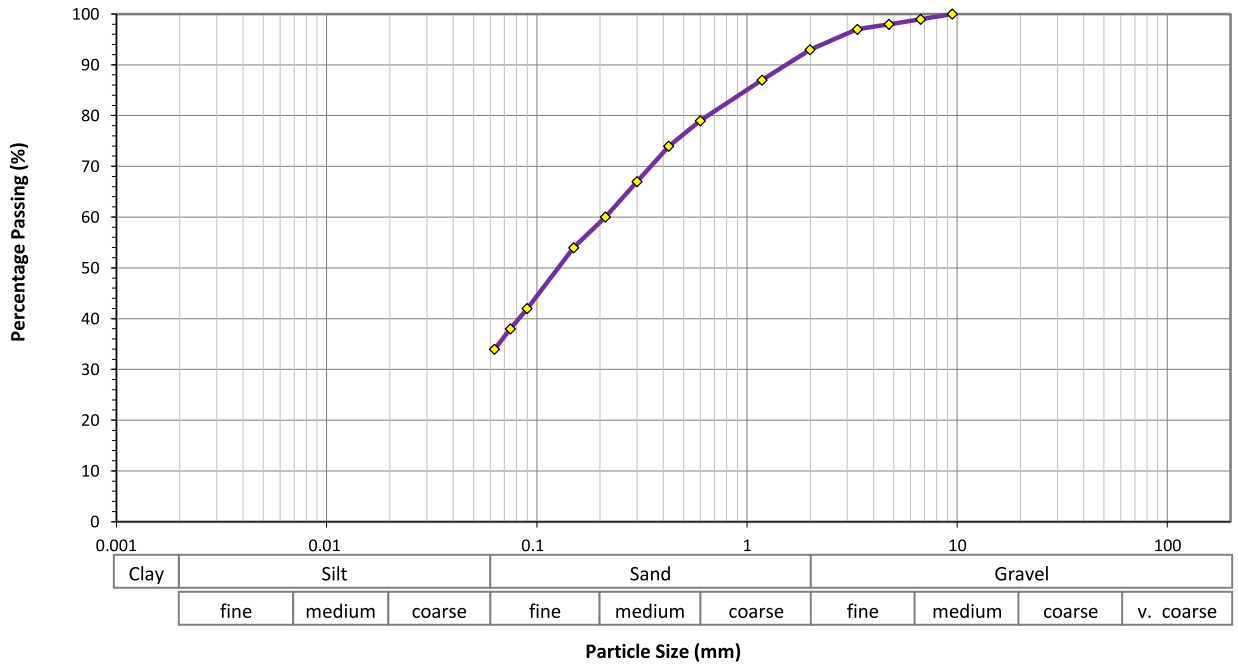
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0248
Customer Project ID	1014985.0000

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000774		
	Reference	BH113	**Top Depth**	3.00m
	Sampled By		**Bottom Depth**	3.45m
	Description	silty SAND with minor clay and minor gravel, soft, light yellowish brown mixed with light bluish grey, mottled black.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	98	0.300	67
100	-	19.0	-	3.35	97	0.212	60
75.0	-	16.0	-	2.00	93	0.150	54
63.0	-	13.2	-	1.18	87	0.090	42
53.0	-	9.50	100	0.600	79	0.075	38
37.5	-	6.70	99	0.425	74	0.063	34

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. • This test result is IANZ accredited.•Date tested 23/11/2020

Approved Signatory Sim Tirunahari

Date 22/01/2021

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0248
Customer Project ID	1014985.0000

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (single point), 2.3 & 2.4

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000775		
	Reference	BH113	**Top Depth**	4.50m
	Sampled By		**Bottom Depth**	4.95m
	Description	clayey SILT with some sand, very stiff, light yellowish brown mixed with light bluish grey, mottled black, extremely high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**95**
Plastic Limit	**33**
Plasticity Index	**62**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.•Date tested 24/11/2020

Approved Signatory	Sim Tirunahari
Date	22/01/2021

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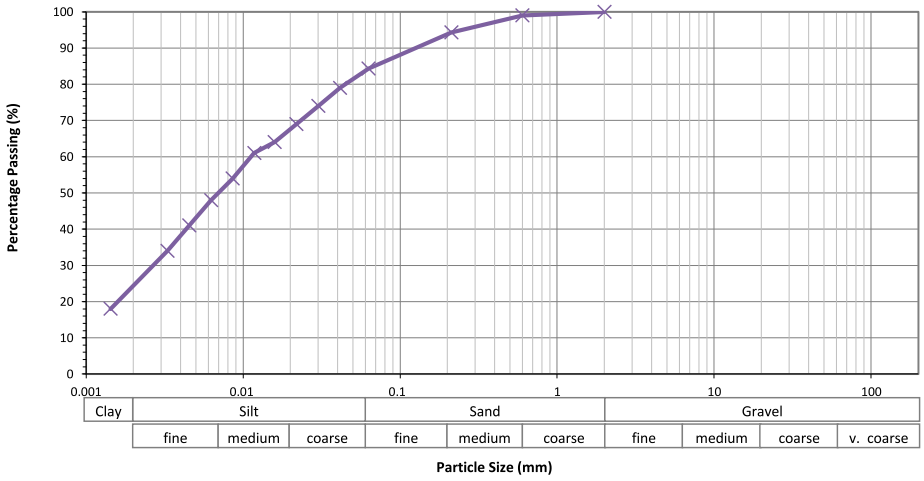
Geotechnics Project Number	1100655.0000
QESTLab Workorder ID	W20AK-0248
Customer Project ID	1014985.0000

Determination of the Particle-Size Distribution
NZS 4402:1986 Test 2.8.4 Hydrometer Method

Test Details

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000775	**Sampled By**	N/A
	Reference	BH113	**Top Depth**	4.50m
			Bottom Depth	4.95m
	Description	clayey SILT with some sand, very stiff, light yellowish brown mixed with light bluish grey, mottled black, extremely high plasticity.	**Sample History**	Natural

Test Results



Sieve (mm)	Total % Passing
2.00	100
0.600	99
0.212	94
0.063	84

Equivalent Particle Diameter D (mm)	% of Particles Finer than D
0.0414	79
0.0301	74
0.0219	69
0.0159	64
0.0118	61
0.0086	54
0.0063	48
0.0045	41
0.0033	34
0.0014	18

Test Remarks

• The material used for testing was Natural.

Suspension pH 8

Solid Density (Assumed) = 2.65 t/m³ •Date tested 23.11.20

• This test result is IANZ accredited.

Approved Signatory Sim Tirunahari

Date 22/01/2021

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0248
Customer Project ID	1014985.0000

Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000777		
	Reference	BH113	**Top Depth**	6.03m
	Sampled By		**Bottom Depth**	6.15m
	BH/TP No.			
	Description	SILT with minor to some clay and trace of sand, some organics, firm, dark greyish brown, mottled black.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Organic Matter Content 15%

TEST REMARKS

• The result was obtained in accordance with the Standard Test Method. • The ignition method is sufficiently accurate for day-to-day engineering purposes, but it should not be relied on for organic contents less than about 15%. • This test result is IANZ accredited.•Date tested 24/11/2020

Approved Signatory	Sim Tirunahari
Date	22/01/2021

Our Ref.No.1100655.0000/Rep1

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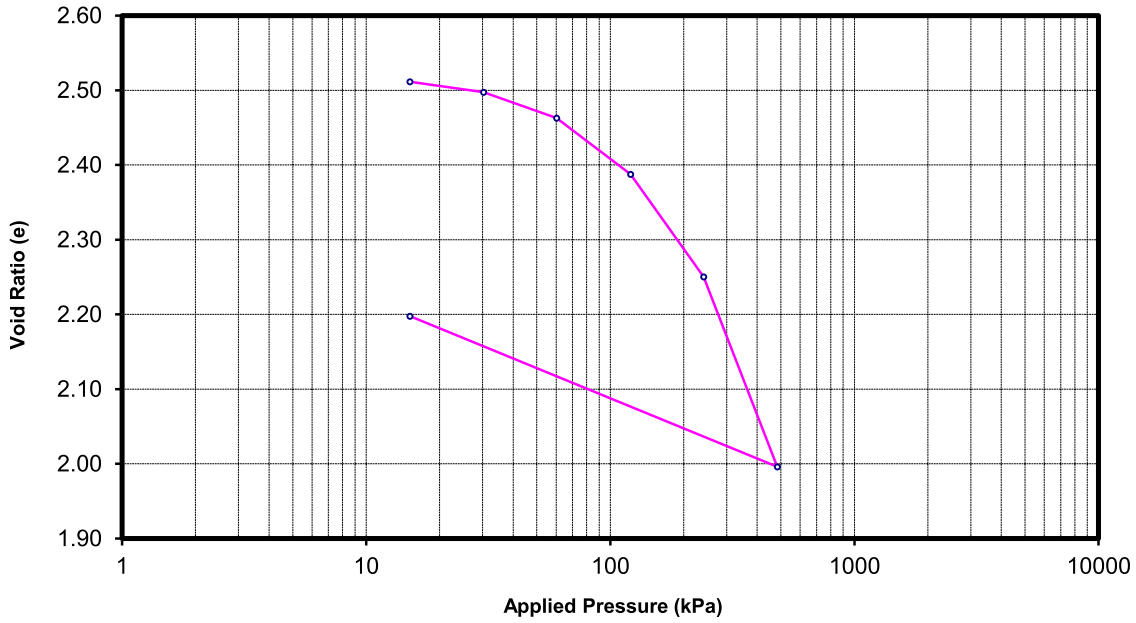
Your Job No.: **1014985.0000**

Site: **Watercare Whenuapai-Redhills** Our Job No.: **1100655.0000**

BH No.: **113** Sample ID.: **---** Depth: **6.15-6.20 (m)**

Test Method Used: NZS 4402:1986 Test 7.1 One-Dimensional Consolidation

ONE-DIMENSIONAL CONSOLIDATION TEST



Pressure (kPa)		Void Ratio (e)	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m^2/yr)	Coefficient of Volume Compressibility Mv (m^2/MN)
As received	0	2.516			
Preload	15.1	2.511	0 to 15.1	NA	0.090
	30.2	2.498	15.1 to 30.2	1.7	0.26
	60.3	2.463	30.2 to 60.3	1.3	0.33
	121	2.388	60.3 to 121	0.84	0.36
	241	2.250	121 to 241	0.70	0.34
	483	1.996	241 to 483	0.46	0.32
Unload	15.1	2.198	483 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at NWC.

Description: SILT with minor to some clay and trace of sand, some organics, firm, dark greyish brown, mottled black.

Initial Dry Density (t/m³): 0.74 Initial Water Content: 93.3%

Solid Density (t/m³): 2.60 (Assumed) Initial Saturation: 96%

Temperature During Testing: Max = 20 ^{0}C Min = 19 ^{0}C

Remarks: SQR of time fitting method was used. We have assumed a value of 2.60 t/m³. The calculations of void ratio are affected by the solid density value.

The test results are IANZ accredited but the sample description is not IANZ accredited.

Entered by: ST Date: 22.01.21 Checked by: JK Date: 22.01.21

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0248
Customer Project ID	1014985.0000

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (single point), 2.3 & 2.4

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000776		
	Reference	BH113	**Top Depth**	5.70m
	Sampled By		**Bottom Depth**	5.80m
	Description	SILT with some clay, some sand, some organics, very stiff, dark grey mixed dark brown and light yellow, mottled black, extremely high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**148**
Plastic Limit	**60**
Plasticity Index	**88**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.•Date tested 24/11/2020

Approved Signatory	Sim Tirunahari
Date	22/01/2021

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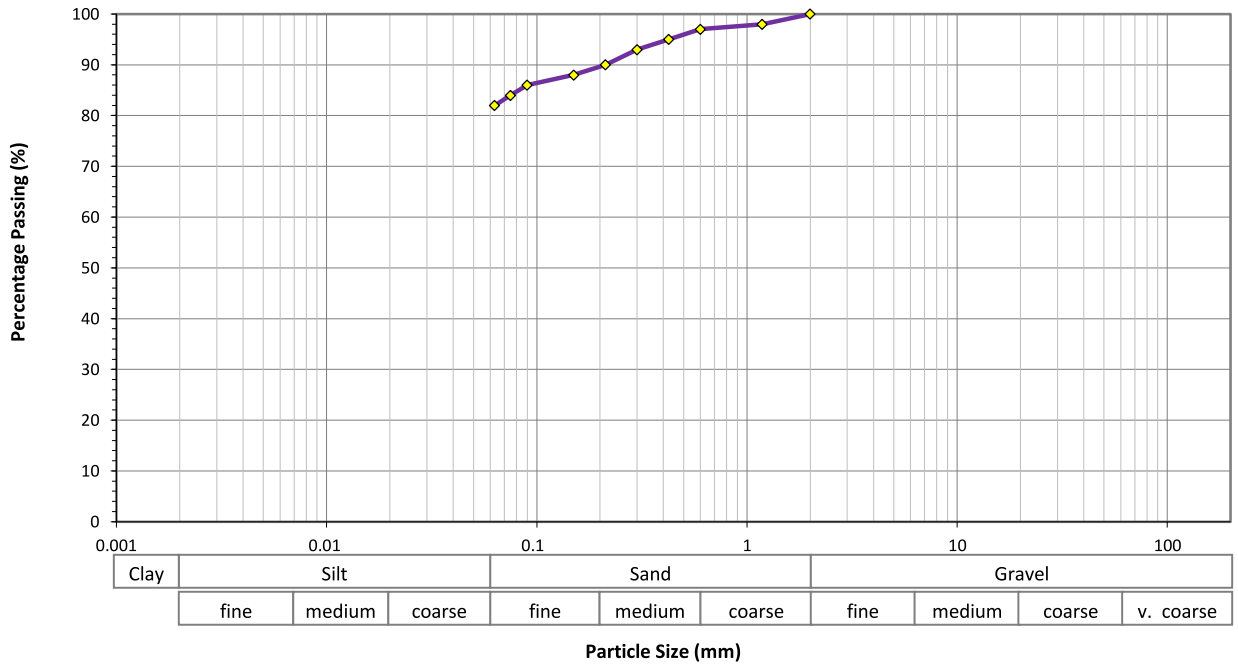
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0248
Customer Project ID	1014985.0000

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000776		
	Reference	BH113	**Top Depth**	5.70m
	Sampled By		**Bottom Depth**	5.80m
	Description	SILT with some clay, some sand, some organics, very stiff, dark grey mixed dark brown and light yellow, mottled black, extremely high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	93
100	-	19.0	-	3.35	-	0.212	90
75.0	-	16.0	-	2.00	100	0.150	88
63.0	-	13.2	-	1.18	98	0.090	86
53.0	-	9.50	-	0.600	97	0.075	84
37.5	-	6.70	-	0.425	95	0.063	82

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. • This test result is IANZ accredited.•Date tested 23/11/2020

Approved Signatory Sim Tirunahari

Date 22/01/2021

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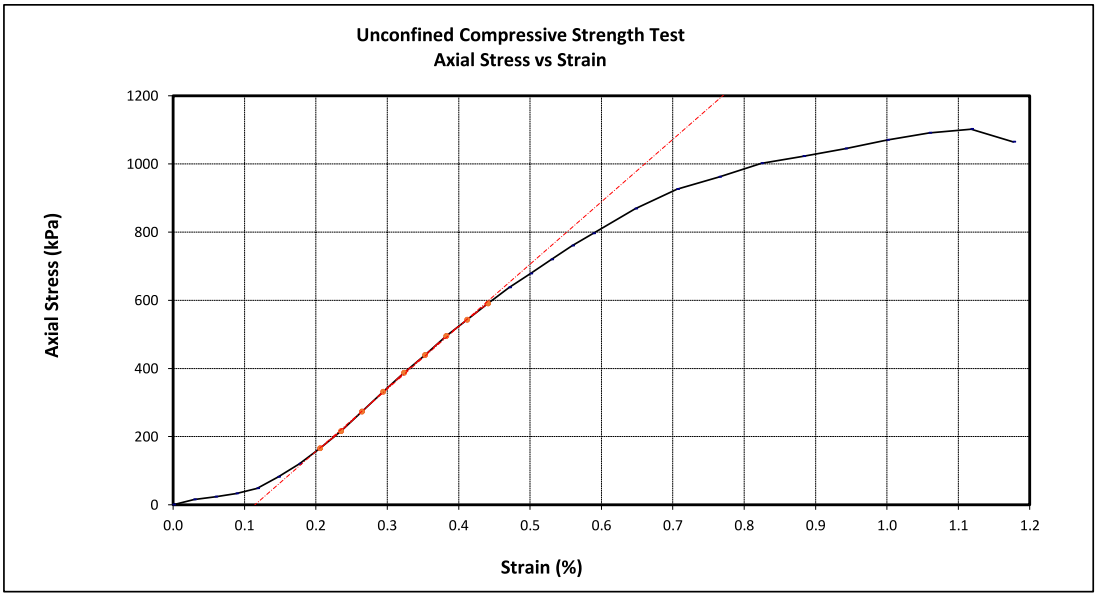
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0248
Customer Project ID	1014985.0000

Unconfined Compressive Strength of Cohesive Soil - NZS 4402:1986 - Test 6.3.1

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000778	**BH No**	
	Reference	BH113	**Top Depth**	16.3m
	Sampled By		**Bottom Depth**	16.5m
	Description	Light greenish grey, very weak, SILTSTONE with a SANDSTONE laminae.		
	Sample History	The sample used for testing was natural, undisturbed.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

Test Result



Sample Parameters

Sample Height	(mm)	169.94
Sample Diameter	(mm)	81.13
Test Height	(mm)	169.94
Test H/D Ratio		2.09

Bulk Density	(t/m³)	2.06
Dry Density	(t/m³)	1.65
Water Content	(%)	24.0

Failure Value

Axial Strain (%)	Unconfined Compressive Strength qu (kPa)	Rate of Compression (mm/min)	Modulus of Elasticity (MPa)
1.1	1100	0.063	183

Mode of Failure Shear

Test Remarks

• Modulus of Elasticity value reported based upon straight line portion of the curve and provided as indicative only. • Unconfined compressive strength (kPa) is rounded to 2 significant figures. • This test result is IANZ accredited.•Date tested 27/11/2020

Approved Signatory Sim Tirunahari

Date 22/01/2021

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0248
Customer Project ID	1014985.0000

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (single point), 2.3 & 2.4

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000779		
	Reference	BH116	**Top Depth**	1.50m
	Sampled By		**Bottom Depth**	1.95m
	Description	sandy SILT with minor to some clay, few rootlets, stiff, light grey mixed with light yellowish brown, mottled black, high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**51**
Plastic Limit	**23**
Plasticity Index	**28**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.•Date tested 24/11/2020

Approved Signatory	Sim Tirunahari
Date	22/01/2021

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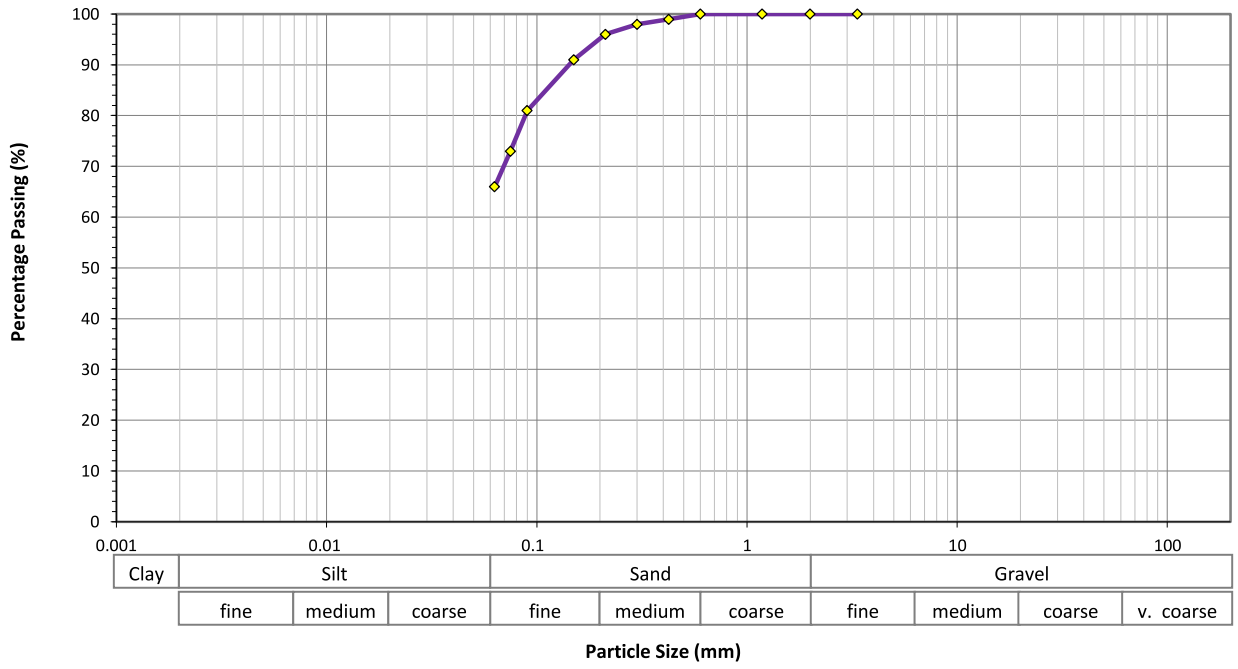
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0248
Customer Project ID	1014985.0000

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000779		
	Reference	BH116	**Top Depth**	1.50m
	Sampled By		**Bottom Depth**	1.95m
	Description	sandy SILT with minor to some clay, few rootlets, stiff, light grey mixed with light yellowish brown, mottled black, high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	98
100	-	19.0	-	3.35	100	0.212	96
75.0	-	16.0	-	2.00	100	0.150	91
63.0	-	13.2	-	1.18	100	0.090	81
53.0	-	9.50	-	0.600	100	0.075	73
37.5	-	6.70	-	0.425	99	0.063	66

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. • This test result is IANZ accredited.•Date tested 23/11/2020

Approved Signatory Sim Tirunahari

Date 22/01/2021

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0248
Customer Project ID	1014985.0000

Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000780		
	Reference	BH116	**Top Depth**	4.60m
	Sampled By		**Bottom Depth**	4.75m
	BH/TP No.			
	Description	SILT with some clay and trace of sand, trace of organics, firm, dark grey mixed with dark brown, mottled black.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Organic Matter Content 4%

TEST REMARKS

• The result was obtained in accordance with the Standard Test Method. • The ignition method is sufficiently accurate for day-to-day engineering purposes, but it should not be relied on for organic contents less than about 15%. • This test result is IANZ accredited.•Date tested 24/11/2020

Approved Signatory	Sim Tirunahari
Date	22/01/2021

Our Ref.No.1100655.0000/Rep1

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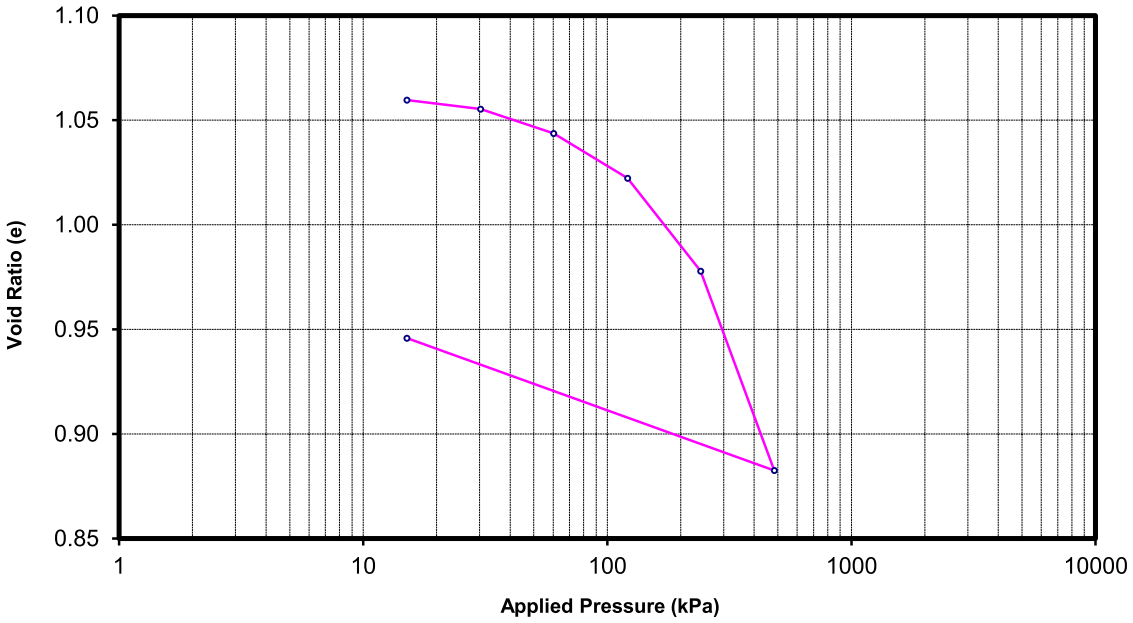
Your Job No.: **1014985.0000**

Site: **Watercare Whenuapai-Redhills** Our Job No.: **1100655.0000**

BH No.: **116** Sample ID.: **---** Depth: **4.75-4.80 (m)**

Test Method Used: NZS 4402:1986 Test 7.1 One-Dimensional Consolidation

ONE-DIMENSIONAL CONSOLIDATION TEST



Pressure (kPa)		Void Ratio (e)	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m^2/yr)	Coefficient of Volume Compressibility Mv (m^2/MN)
As received	0	1.063			
Preload	15.1	1.060	0 to 15.1	NA	0.098
	30.2	1.055	15.1 to 30.2	6.7	0.14
	60.3	1.044	30.2 to 60.3	4.1	0.19
	121	1.022	60.3 to 121	2.7	0.17
	241	0.978	121 to 241	1.8	0.18
	483	0.883	241 to 483	1.1	0.20
Unload	15.1	0.946	483 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at NWC.

Description: SILT with some clay and trace of sand, trace of organics, firm, dark grey mixed with dark brown, mottled black.

Initial Dry Density (t/m³): 1.28 Initial Water Content: 38.1%

Solid Density (t/m³): 2.65 (Assumed) Initial Saturation: 95%

Temperature During Testing: Max = 20 ^{0}C Min = 19 ^{0}C

Remarks: SQR of time fitting method was used. We have assumed a value of 2.65 t/m³. The calculations of void ratio are affected by the solid density value.

The test results are IANZ accredited but the sample description is not IANZ accredited.

Entered by: ST Date: 22.01.21 Checked by: JK Date: 22.01.21

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0248
Customer Project ID	1014985.0000

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (single point), 2.3 & 2.4

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000781		
	Reference	BH116	**Top Depth**	5.00m
	Sampled By		**Bottom Depth**	5.45m
	Description	sandy SILT with minor to some clay, firm, dark grey mixed with dark brown, mottled black, high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**66**
Plastic Limit	**28**
Plasticity Index	**38**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.•Date tested 24/11/2020

Approved Signatory	Sim Tirunahari
Date	22/01/2021

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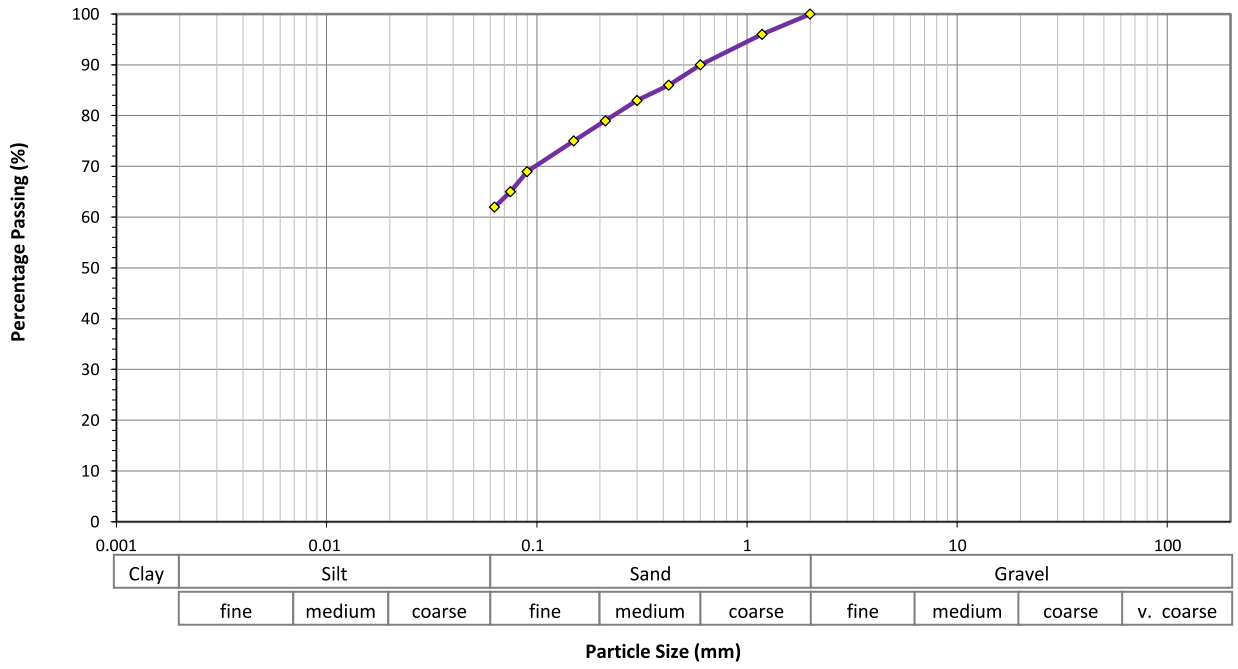
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0248
Customer Project ID	1014985.0000

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000781		
	Reference	BH116	**Top Depth**	5.00m
	Sampled By		**Bottom Depth**	5.45m
	Description	sandy SILT with minor to some clay, firm, dark grey mixed with dark brown, mottled black, high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	83
100	-	19.0	-	3.35	-	0.212	79
75.0	-	16.0	-	2.00	100	0.150	75
63.0	-	13.2	-	1.18	96	0.090	69
53.0	-	9.50	-	0.600	90	0.075	65
37.5	-	6.70	-	0.425	86	0.063	62

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. • This test result is IANZ accredited.•Date tested 23/11/2020

Approved Signatory	Sim Tirunahari
Date	22/01/2021

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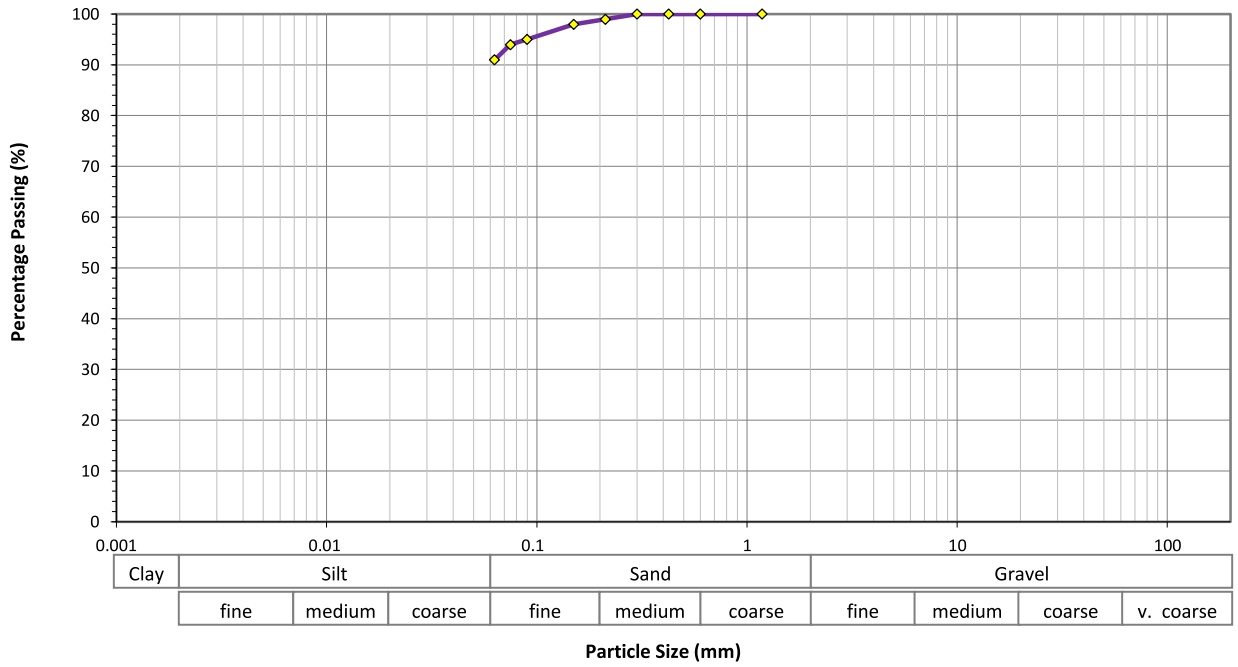
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0248
Customer Project ID	1014985.0000

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000783		
	Reference	BH117	**Top Depth**	1.50m
	Sampled By		**Bottom Depth**	1.95m
	Description	clayey SILT with minor sand, firm, light grey mixed with light brown.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	100
100	-	19.0	-	3.35	-	0.212	99
75.0	-	16.0	-	2.00	-	0.150	98
63.0	-	13.2	-	1.18	100	0.090	95
53.0	-	9.50	-	0.600	100	0.075	94
37.5	-	6.70	-	0.425	100	0.063	91

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. • This test result is IANZ accredited.•Date tested 23/11/2020

Approved Signatory	Sim Tirunahari
Date	22/01/2021

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0248
Customer Project ID	1014985.0000

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (single point), 2.3 & 2.4

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000784		
	Reference	BH117	**Top Depth**	3.00m
	Sampled By		**Bottom Depth**	3.45m
	Description	clayey SILT with some sand, minor organics, very stiff, dark grey mixed with dark brown and light yellow, mottled black, extremely high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**132**
Plastic Limit	**47**
Plasticity Index	**85**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.•Date tested 24/11/2020

Approved Signatory	Sim Tirunahari
Date	22/01/2021

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0248
Customer Project ID	1014985.0000

Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000784		
	Reference	BH117	**Top Depth**	3.00m
	Sampled By		**Bottom Depth**	3.45m
	BH/TP No.			
	Description	clayey SILT with some sand, minor organics, very stiff, dark grey mixed with dark brown and light yellow, mottled black, extremely high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Organic Matter Content 6%

TEST REMARKS

• The result was obtained in accordance with the Standard Test Method. • The ignition method is sufficiently accurate for day-to-day engineering purposes, but it should not be relied on for organic contents less than about 15%. • This test result is IANZ accredited.•Date tested 24/11/2020

Approved Signatory	Sim Tirunahari
Date	22/01/2021

Our Ref.No.1100655.0000/Rep1

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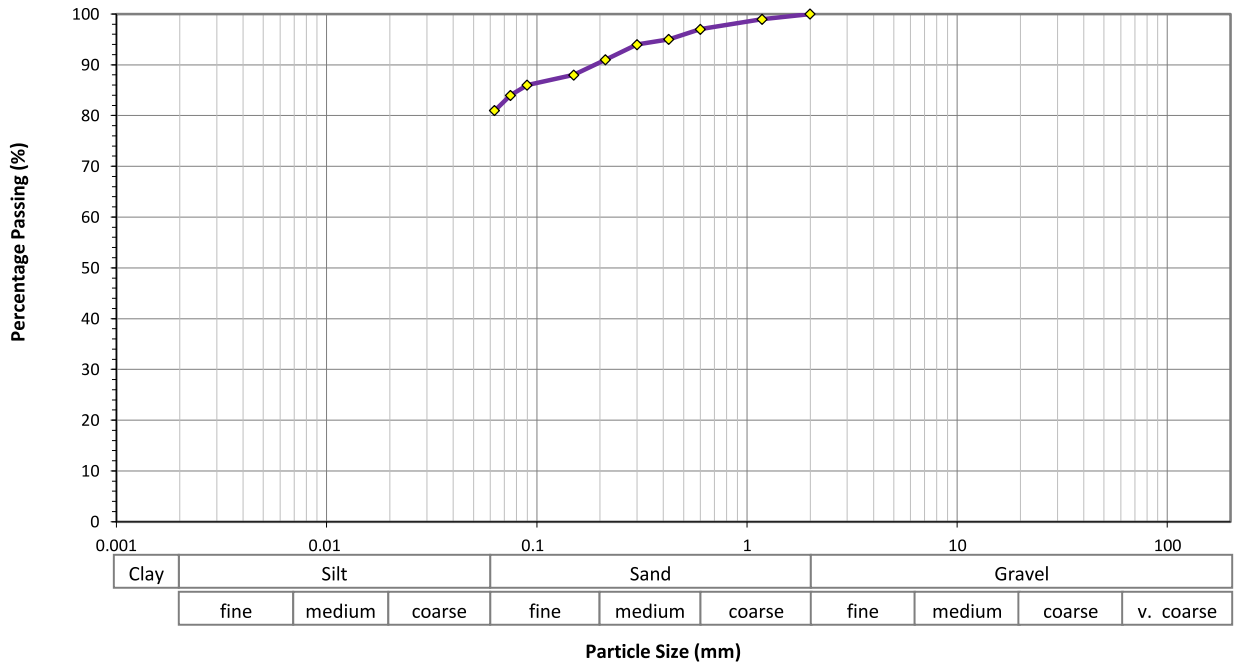
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0248
Customer Project ID	1014985.0000

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000784		
	Reference	BH117	**Top Depth**	3.00m
	Sampled By		**Bottom Depth**	3.45m
	Description	clayey SILT with some sand, minor organics, very stiff, dark grey mixed with dark brown and light yellow, mottled black, extremely high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	94
100	-	19.0	-	3.35	-	0.212	91
75.0	-	16.0	-	2.00	100	0.150	88
63.0	-	13.2	-	1.18	99	0.090	86
53.0	-	9.50	-	0.600	97	0.075	84
37.5	-	6.70	-	0.425	95	0.063	81

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. • This test result is IANZ accredited.•Date tested 24/11/2020

Approved Signatory	Sim Tirunahari
Date	22/01/2021

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W20AK-0248
Customer Project ID	1014985.0000

Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000785		
	Reference	BH117	**Top Depth**	4.65m
	Sampled By		**Bottom Depth**	4.80m
	BH/TP No.			
	Description	SILT with minor to some clay and trace of sand, trace of organics, firm, light greenish grey mixed with dark brown, mottled black.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Organic Matter Content 3%

TEST REMARKS

• The result was obtained in accordance with the Standard Test Method. • The ignition method is sufficiently accurate for day-to-day engineering purposes, but it should not be relied on for organic contents less than about 15%. • This test result is IANZ accredited.•Date tested 24/11/2020

Approved Signatory	Sim Tirunahari
Date	22/01/2021

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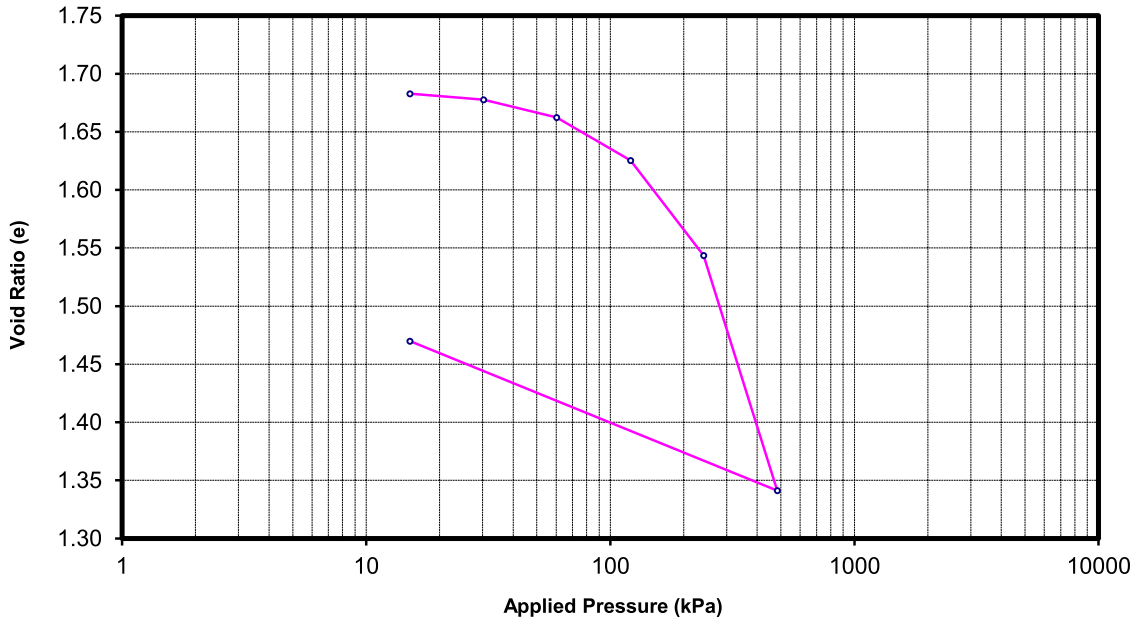
Your Job No.: **1014985.0000**

Site: **Watercare Whenuapai-Redhills** Our Job No.: **1100655.0000**

BH No.: **117** Sample ID.: **---** Depth: **4.80-4.85 (m)**

Test Method Used: NZS 4402:1986 Test 7.1 One-Dimensional Consolidation

ONE-DIMENSIONAL CONSOLIDATION TEST



Pressure (kPa)		Void Ratio (e)	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m^2/yr)	Coefficient of Volume Compressibility Mv (m^2/MN)
As received	0	1.687			
Preload	15.1	1.683	0 to 15.1	NA	0.098
	30.2	1.678	15.1 to 30.2	4.1	0.13
	60.3	1.663	30.2 to 60.3	2.9	0.19
	121	1.625	60.3 to 121	2.6	0.23
	241	1.544	121 to 241	0.96	0.26
	483	1.341	241 to 483	0.57	0.33
Unload	15.1	1.470	483 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at NWC.

Description: SILT with minor to some clay and trace of sand, trace of organics, firm, light greenish grey mixed with dark brown, mottled black.

Initial Dry Density (t/m³): 0.97 Initial Water Content: 63.1%

Solid Density (t/m³): 2.60 (Assumed) Initial Saturation: 97%

Temperature During Testing: Max = 20 ^{0}C Min = 19 ^{0}C

Remarks: SQR of time fitting method was used. We have assumed a value of 2.60 t/m³. The calculations of void ratio are affected by the solid density value.

The test results are IANZ accredited but the sample description is not IANZ accredited.

Entered by: ST Date: 22.01.21 Checked by: JK Date: 22.01.21

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Report No: ASM:W21AK-0004
Issue No: 3
This report replaces all previous issues of report no 'ASM:W21AK-0004'.

Material Test Report

Customer: Tonkin & Taylor Limited
Address: Level 2, 105 Carlton Gore Rd
Newmarket Auckland 1023
Project: **Watercare Whenuapai-Redhills**
Project No.: 1100655.0000
Customer Reference No.: 1014985.0000
Report Authorised By : Sim Tirunahari

Approved By:
Sim Tirunahari
(Soils Laboratory Manager)
Date of Issue: 26/01/2021

Material Details

Product:
Sampled From: **Location:** Watercare Whenuapai-Redhills
Specification:

Sample Details

Sampled By:						
'Sampling Endorsed:'						
Sample ID:	S21AK000012	S21AK000013	S21AK000014	S21AK000015	S21AK000016	S21AK000017
Client Sample ID:	HA108_2.4m	HA109_2.45m	HA110A_3.40m	HA114_3.45m	HA115_2.6m	HA119_1.5m
Field Sample ID:						
Date Sampled:						
Date Tested:	18/12/2020	18/12/2020	18/12/2020	18/12/2020	18/12/2020	18/12/2020
Tested By:	James Kimiangatau	James Kimiangatau	James Kimiangatau	James Kimiangatau	James Kimiangatau	James Kimiangatau

Other Test Results

Description	Method	Results					
Moisture Content (%)	NZS 4402:1986 Test 2.1	42.3	43.6	52.0	50.1	44.9	38.0

Comments

N/A

If samples have been taken, and were not destroyed during testing, they will be retained for one month from the date of this report before being discarded.

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0004
Customer Project ID	1014985.0000

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (single point), 2.3 & 2.4

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000012		
	Reference	HA108_2.4m		
	Description	sandy SILT with some clay, soft, light grey, mottled black, medium plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**48**
Plastic Limit	**24**
Plasticity Index	**24**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.•Date tested 18/01/2021

Approved Signatory	Sim Tirunahari
Date	26/01/2021

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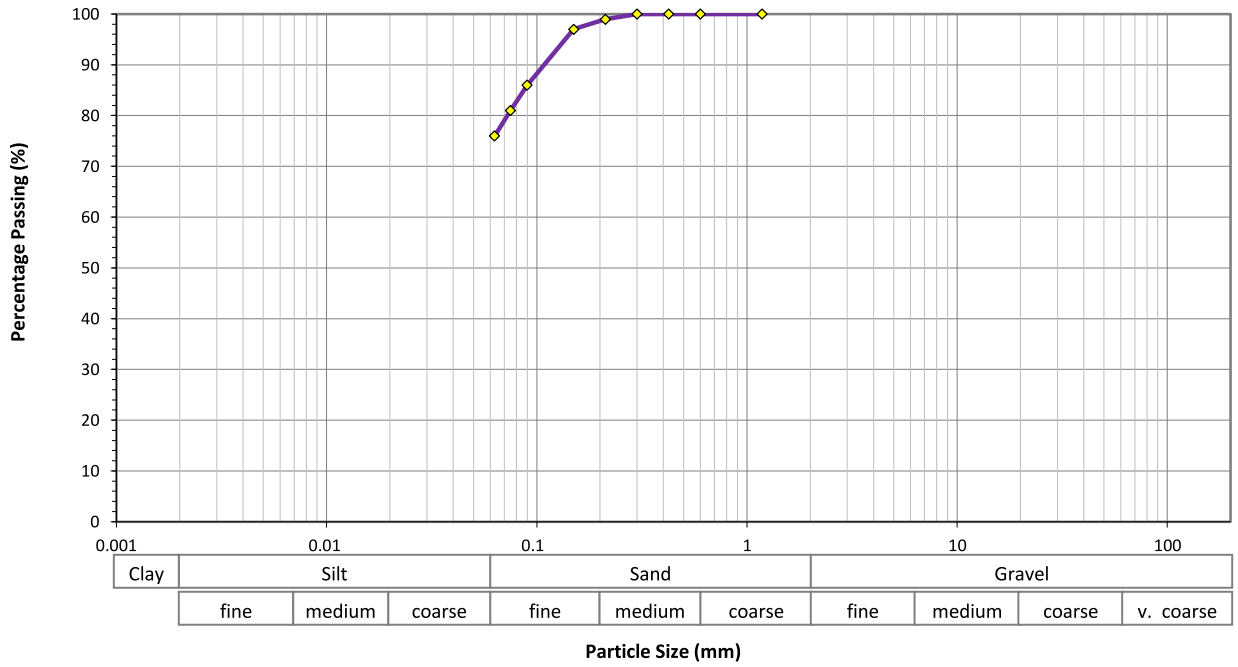
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0004
Customer Project ID	1014985.0000

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000012		
	Reference	HA108_2.4m		
	Description	sandy SILT with some clay, soft, light grey, mottled black, medium plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	100
100	-	19.0	-	3.35	-	0.212	99
75.0	-	16.0	-	2.00	-	0.150	97
63.0	-	13.2	-	1.18	100	0.090	86
53.0	-	9.50	-	0.600	100	0.075	81
37.5	-	6.70	-	0.425	100	0.063	76

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. • This test result is IANZ accredited.•Date tested 18/12/2020

Approved Signatory	Sim Tirunahari
Date	26/01/2021

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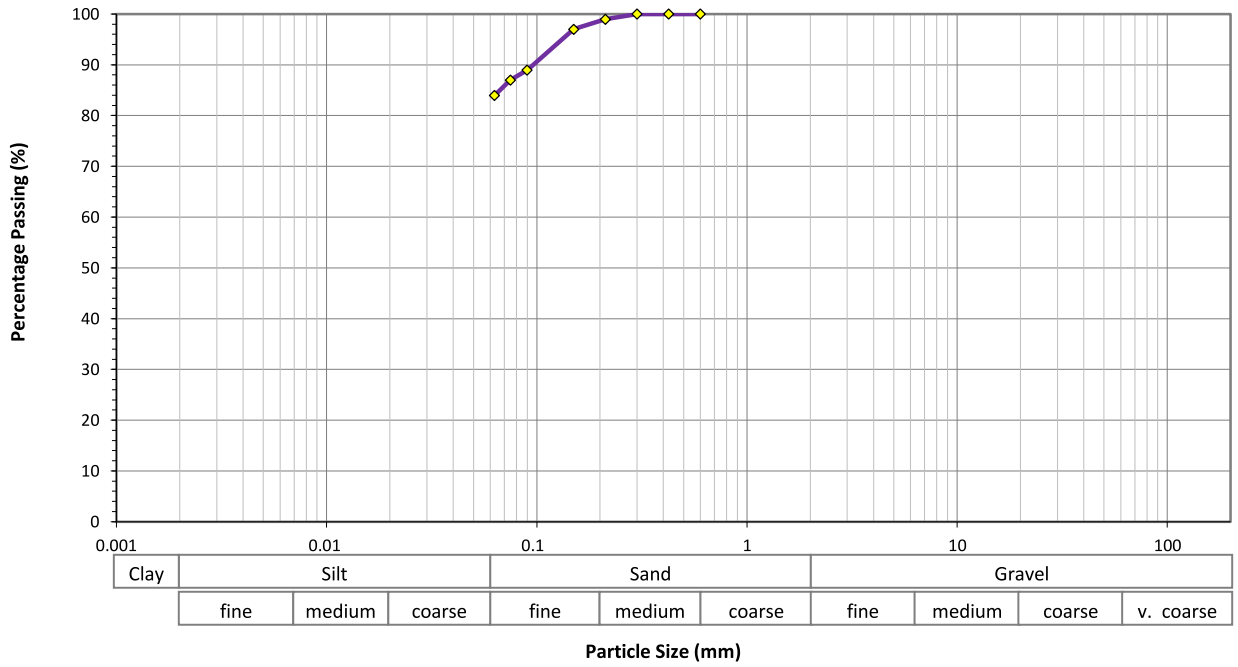
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0004
Customer Project ID	1014985.0000

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000013		
	Reference	HA109_2.45m		
	Description	SILT with some clay and some sand, soft, light grey, mottled black.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	100
100	-	19.0	-	3.35	-	0.212	99
75.0	-	16.0	-	2.00	-	0.150	97
63.0	-	13.2	-	1.18	-	0.090	89
53.0	-	9.50	-	0.600	100	0.075	87
37.5	-	6.70	-	0.425	100	0.063	84

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. • This test result is IANZ accredited.•Date tested 18/12/2020

Approved Signatory	Sim Tirunahari
Date	26/01/2021

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0004
Customer Project ID	1014985.0000

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (single point), 2.3 & 2.4

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000014		
	Reference	HA110A_3.40m		
	Description	SILT with some clay and some sand, minor organics, soft to firm, medium to dark brown mixed with grey, mottled black, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**71**
Plastic Limit	**35**
Plasticity Index	**36**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.•Date tested 18/01/2021

Approved Signatory	Sim Tirunahari
Date	26/01/2021

GEOTECHNICS

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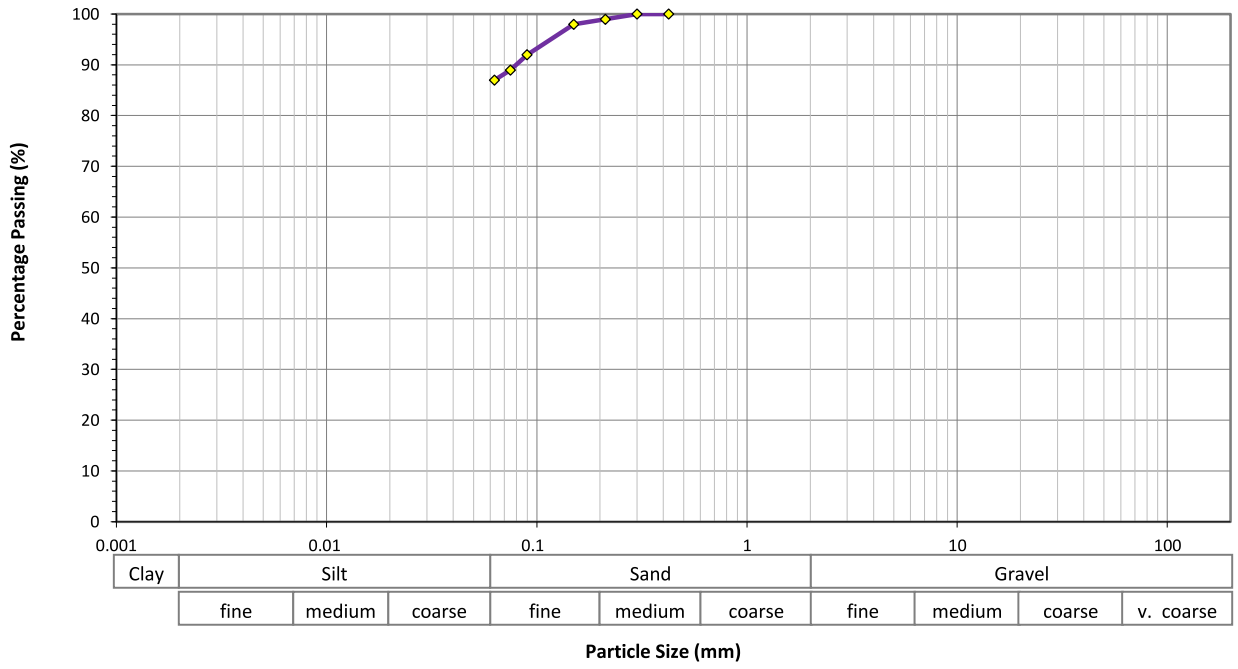
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0004
Customer Project ID	1014985.0000

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000014		
	Reference	HA110A_3.40m		
	Description	SILT with some clay and some sand, minor organics, soft to firm, medium to dark brown mixed with grey, mottled black, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	100
100	-	19.0	-	3.35	-	0.212	99
75.0	-	16.0	-	2.00	-	0.150	98
63.0	-	13.2	-	1.18	-	0.090	92
53.0	-	9.50	-	0.600	-	0.075	89
37.5	-	6.70	-	0.425	100	0.063	87

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. • This test result is IANZ accredited.•Date tested 18/12/2020

Approved Signatory	Sim Tirunahari
Date	26/01/2021

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0004
Customer Project ID	1014985.0000

Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills
	Data	N/A
SAMPLE	**Geotechnics ID**	S21AK000014
	Reference	HA110A_3.40m
	Description	SILT with some clay and some sand, minor organics, soft to firm, medium to dark brown mixed with grey, mottled black, very high plasticity.
SPECIMEN	**Reference**	N/A
	Description	N/A

Depth N/A

TEST RESULTS

Organic Matter Content 6%

TEST REMARKS

• The result was obtained in accordance with the Standard Test Method. • The ignition method is sufficiently accurate for day-to-day engineering purposes, but it should not be relied on for organic contents less than about 15%. • This test result is IANZ accredited.•Date tested 21/12/2020

Approved Signatory	Sim Tirunahari
Date	26/01/2021

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0004
Customer Project ID	1014985.0000

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (single point), 2.3 & 2.4

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000015		
	Reference	HA114_3.45m		
	Description	sandy clayey SILT, soft to firm, grey, mottled orange, high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**63**
Plastic Limit	**25**
Plasticity Index	**38**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.•Date tested 18/01/2021

Approved Signatory	Sim Tirunahari
Date	26/01/2021

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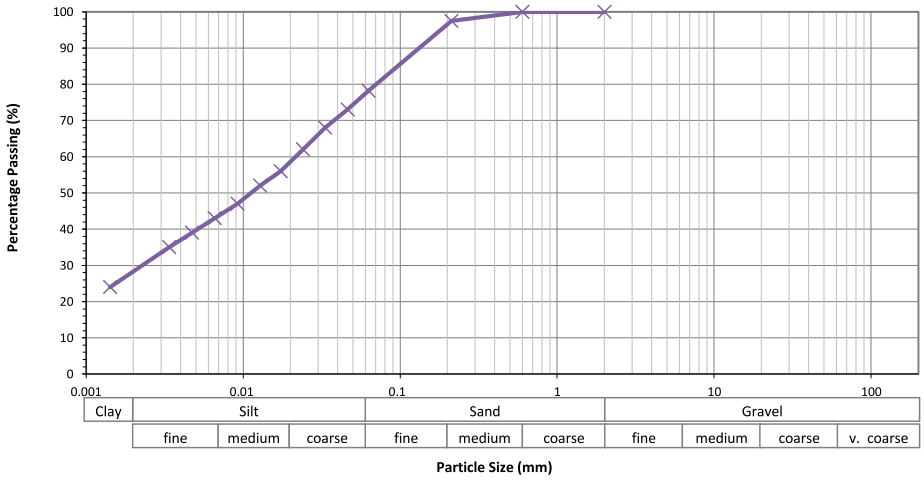
Geotechnics Project Number	1100655.0000
QESTLab Workorder ID	W21AK-0004
Customer Project ID	1014985.0000

Determination of the Particle-Size Distribution
NZS 4402:1986 Test 2.8.4 Hydrometer Method

Test Details

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000015		
	Reference	HA114_3.45m		
	Description	sandy clayey SILT, soft to firm, grey, mottled orange, high plasticity.	**Sample History**	Natural

Test Results



Sieve (mm)	Total % Passing
2.00	100
0.600	100
0.212	98
0.063	78

Equivalent Particle Diameter D (mm)	% of Particles Finer than D
0.0463	73
0.0333	68
0.0240	62
0.0174	56
0.0128	52
0.0092	47
0.0066	43
0.0047	39
0.0034	35
0.0014	24

Test Remarks

Date tested 14/01/2021

• The material used for testing was Natural.

Suspension pH 8

Solid Density (Assumed) = 2.65 t/m³

• This test result is IANZ accredited.

Approved Signatory Sim Tirunahari

Date 26/01/2021

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0004
Customer Project ID	1014985.0000

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (single point), 2.3 & 2.4

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000016		
	Reference	HA115_2.6m		
	Description	SILT with some clay and minor sand, firm to stiff, light brown mixed with grey, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**72**
Plastic Limit	**33**
Plasticity Index	**39**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.•Date tested 18/01/2021

Approved Signatory	Sim Tirunahari
Date	26/01/2021

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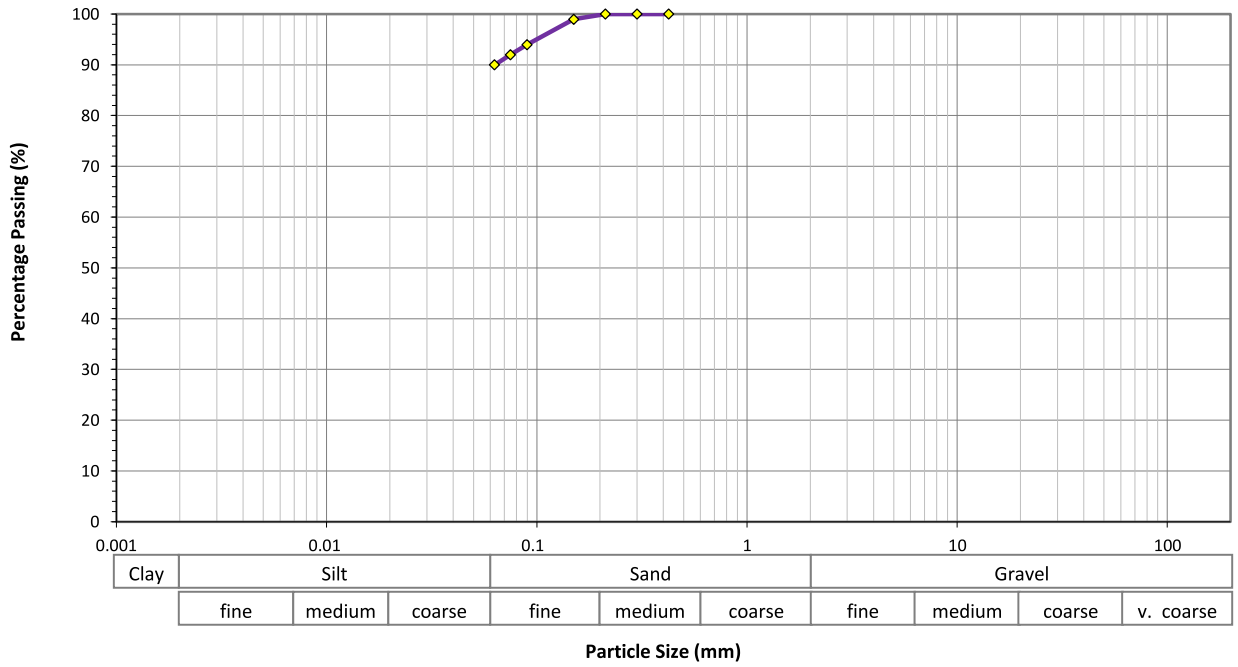
Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0004
Customer Project ID	1014985.0000

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000016		
	Reference	HA115_2.6m		
	Description	SILT with some clay and minor sand, firm to stiff, light brown mixed with grey, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	100
100	-	19.0	-	3.35	-	0.212	100
75.0	-	16.0	-	2.00	-	0.150	99
63.0	-	13.2	-	1.18	-	0.090	94
53.0	-	9.50	-	0.600	-	0.075	92
37.5	-	6.70	-	0.425	100	0.063	90

TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. • This test result is IANZ accredited.•Date tested 18/12/2020

Approved Signatory	Sim Tirunahari
Date	26/01/2021

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Geotechnics Project Number	1100655.0000
QESTLab Work Order ID	W21AK-0004
Customer Project ID	1014985.0000

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (single point), 2.3 & 2.4

TEST DETAILS

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000017		
	Reference	HA119_1.5m		
	Description	clayey SILT with minor sand, firm, light greyish brown, high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**65**
Plastic Limit	**23**
Plasticity Index	**42**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.•Date tested 18/01/2021

Approved Signatory	Sim Tirunahari
Date	26/01/2021

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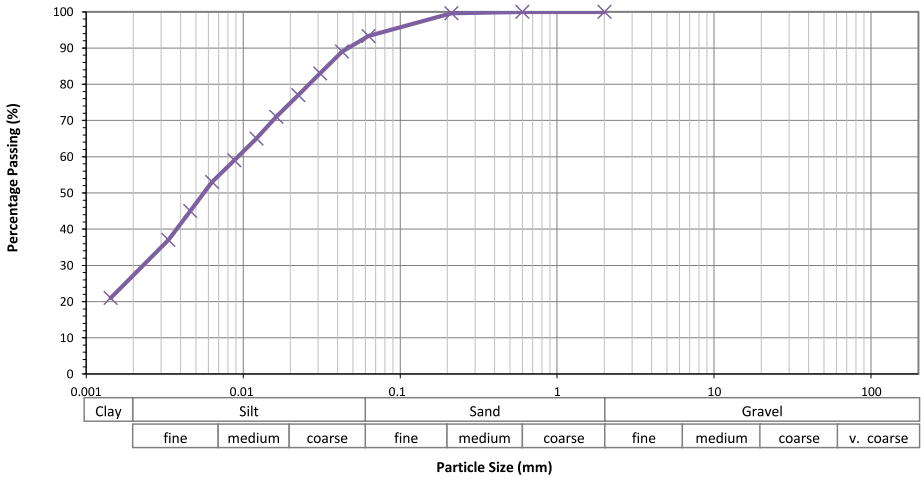
Geotechnics Project Number	1100655.0000
QESTLab Workorder ID	W21AK-0004
Customer Project ID	1014985.0000

Determination of the Particle-Size Distribution
NZS 4402:1986 Test 2.8.4 Hydrometer Method

Test Details

LOCATION	**Description**	Watercare Whenuapai-Redhills		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S21AK000017		
	Reference	HA119_1.5m		
	Description	clayey SILT with minor sand, firm, light greyish brown, high plasticity.	**Sample History**	Natural

Test Results



Sieve (mm)	Total % Passing
2.00	100
0.600	100
0.212	100
0.063	93

Equivalent Particle Diameter D (mm)	% of Particles Finer than D
0.0426	89
0.0309	83
0.0224	77
0.0162	71
0.0121	65
0.0088	59
0.0063	53
0.0046	45
0.0033	37
0.0014	21

Test Remarks

Date tested 14.1.21

• The material used for testing was Natural.

Suspension pH 8

Solid Density (Assumed) = 2.65 t/m³

• This test result is IANZ accredited.

Approved Signatory Sim Tirunahari

Date 26/01/2021

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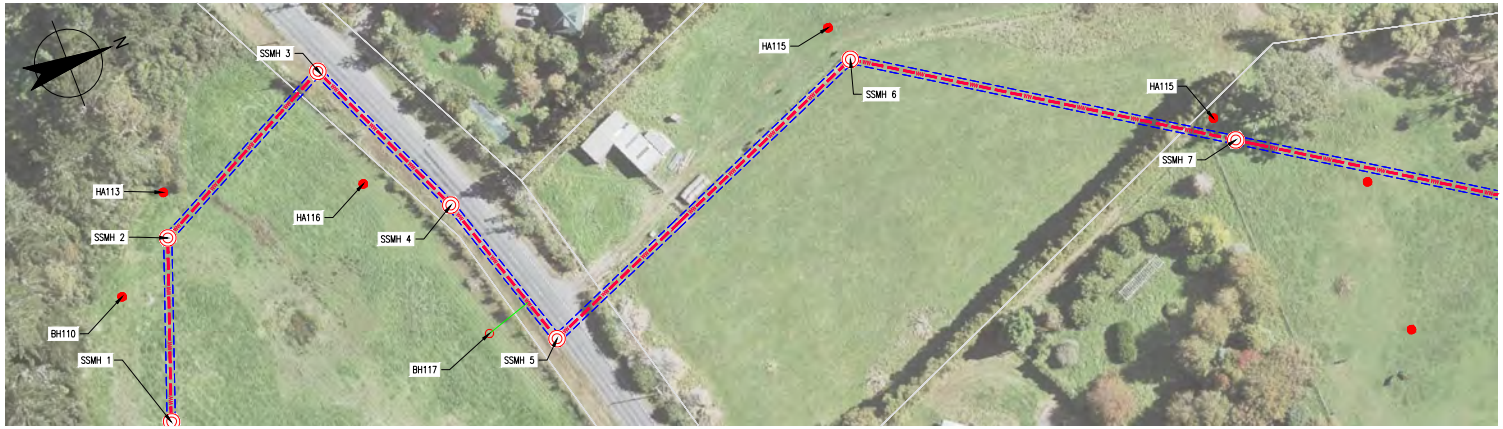
Appendix D – Geological long sections



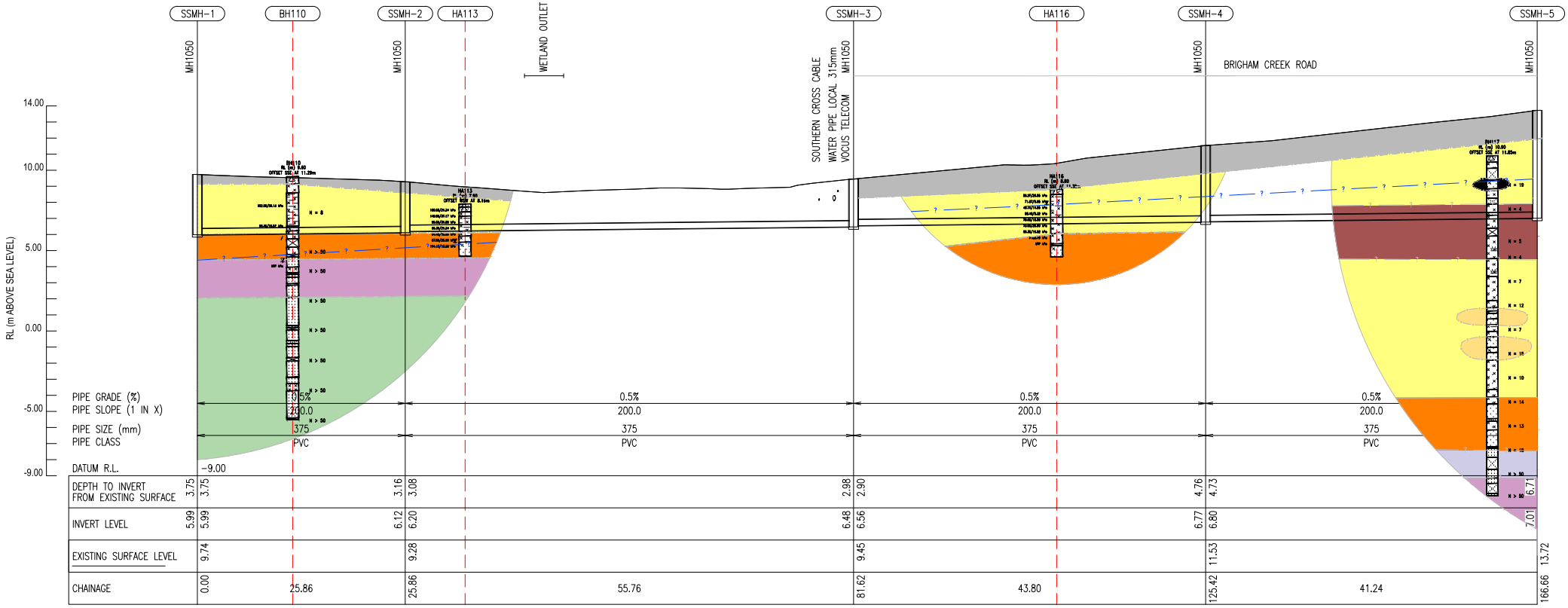
PLAN
SCALE 1:250

LEGEND

- TOP SOIL/FILL (NON - ENGINEERED)
- TGA-P: ORGANIC CLAY/SILT & PEAT
- TGA-C/TGA-ST: CLAY & SILT DOMINATED ALLUVIUM
- TGA-S: SAND DOMINATED ALLUVIUM
- ECBF-RS: EAST COAST BAYS RESIDUAL SOIL
- ECBF-HW: EAST COAST BAYS HIGH WEATHERED ROCK
- ECBF-MW: EAST COAST BAYS MODERATELY WEATHERED ROCK
- ECBF SW-UW: EAST COAST BAYS SLIGHTLY TO UNWEATHERED ROCK
- AL-CO CW: ALBANY CONGLOMERATE COMPLETELY WEATHERED
- AL-CO HW-MW: ALBANY CONGLOMERATE HIGHLY TO MODERATELY WEATHERED
- AL-CO SW-UW: ALBANY CONGLOMERATE SLIGHTLY TO UNWEATHERED
- INFERRED GEOLOGICAL UNIT BOUNDARY
- INFERRED GROUNDWATER
- LIMITS OF GEOLOGICAL INTERPRETATION

- FILL
- SANDY SILT
- SILTY CLAY
- SILTY SAND
- SILT
- SANDY CLAY
- CLAY
- CLAYEY SAND
- ORGANIC CLAY
- SANDY CLAY
- CLAYEY GRAVEL
- PEAT
- CORELOSS
- SAND

186/37 kPa CORRECTED UNDRAINED/DRAINED SHEAR STRENGTH VALUE
N > 50 UNCORRECTED SPT N VALUE
SCALA PENETROMETER
R / TD SCALA REFUSAL/TARGET DEPTH



A	FOR INTERNAL GHD REVIEW		15.03.2021
Rev	Description	Checked Approved	Date

Author
Designer
Drafting Check
Design Check

VERTICAL 1:250 AT ORIGINAL SIZE
HORIZONTAL 1:500 AT ORIGINAL SIZE
0 2.5 5 7.5 10 12.5m
0 5 10 15 20 25m

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Project No. 12508391

Client WATERCARE
Project WHENUAPAI REDHILLS
Status
Status Code

Drawing Title
GEOTECHNICAL LONG SECTION
SHEET 1 OF 6

Size A1
Drawing No. 12508391-C101
Rev A

Plot Date: 23 March 2021 - 3:00 PM
Plotted by: Paige Boyed
File Name: \\ghdnet\ghd\NZ\Auckland\Projects\51\12508391\Tech\Geotech\Package 1 Whenuapai Redhills\02 GIR\Working Folder\Drawings\12508391-C101_C106 - PB EDIT.dwg

LEGEND

- TOP SOIL/FILL (NON - ENGINEERED)
- TGA-P: ORGANIC CLAY/SILT & PEAT
- TGA-C/TGA-ST: CLAY & SILT DOMINATED ALLUVIUM
- TGA-S: SAND DOMINATED ALLUVIUM
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- ECBF-MW: EAST COAST BAYS MODERATELY WEATHERED ROCK
- ECBF SW-UW: EAST COAST BAYS SLIGHTLY TO UNWEATHERED ROCK
- AL-CO CW: ALBANY CONGLOMERATE COMPLETELY WEATHERED
- AL-CO HW-MW: ALBANY CONGLOMERATE HIGHLY TO MODERATELY WEATHERED
- AL-CO SW-UW: ALBANY CONGLOMERATE SLIGHTLY TO UNWEATHERED
- INFERRED GEOLOGICAL UNIT BOUNDARY
- INFERRED GROUNDWATER
- LIMITS OF GEOLOGICAL INTERPRETATION

FILL, SANDY SILT, SILTY CLAY, SILTY SAND, SILT, SANDY CLAY, CLAY, CLAYEY SAND, ORGANIC CLAY, SANDY CLAY, CLAYEY GRAVEL, PEAT, CORELOSS, SAND

166/37 kPa CORRECTED UNDRAINED/DRAINED SHEAR STRENGTH VALUE

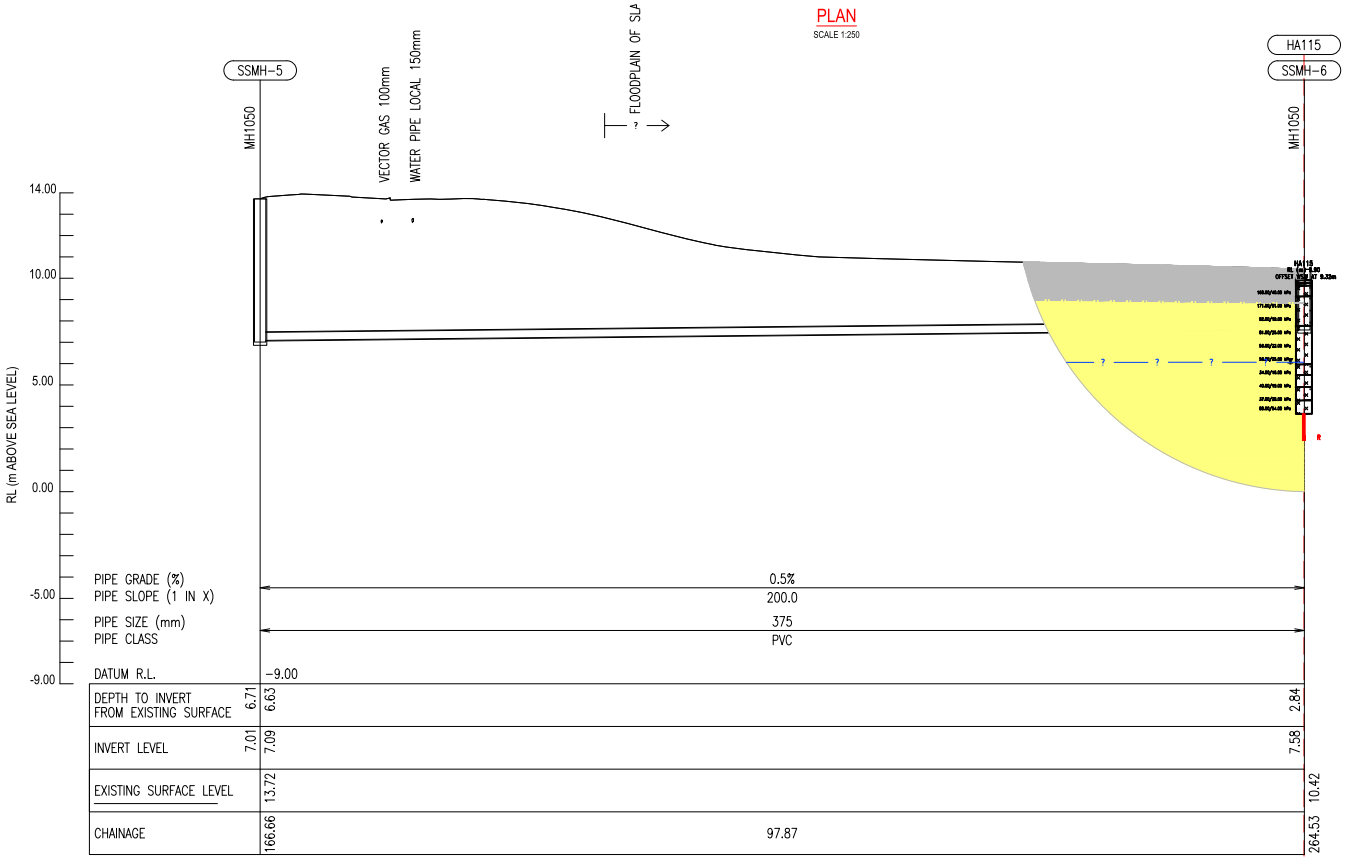
N > 50 UNCORRECTED SPT N VALUE

SCALA PENETROMETER

R / TD SCALA REFUSAL/TARGET DEPTH

PLAN

SCALE 1:250



Rev	Description	Checked	Approved	Date
A	FOR INTERNAL GHD REVIEW			15.03.2021

Author | Drafting Check

Designer | Design Check

VERTICAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

HORIZONTAL 1:500 AT ORIGINAL SIZE 0 5 10 15 20 25m

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Project No. 12508391

Client WATER CARE

Project WHENUAPAI REDHILLS

Status | Status Code

Drawing Title: GEOTECHNICAL LONG SECTION SHEET 2 OF 6

Size A1

Drawing No. 12508391-C102

Rev A

Plot Date: 23 March 2021 - 3:01 PM Plotted by: Paige Boyed

File Name: \\ghdnet\ghd\NZ\Auckland\Projects\51\12508391\Tech\Geotech\Package 1 Whenuapai Redhills\02 GIR\Working Folder\Drawings\12508391-C101_C106 - PB EDIT.dwg

PLAN

SCALE 1:250

LEGEND

- TOP SOIL/FILL (NON - ENGINEERED)
- TGA-P: ORGANIC CLAY/SILT & PEAT
- TGA-C/TGA-ST: CLAY & SILT DOMINATED ALLUVIUM
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- ECBF-RS: EAST COAST BAYS RESIDUAL SOIL
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- ECBF-MW: EAST COAST BAYS MODERATELY WEATHERED ROCK
- ECBF SW-UW: EAST COAST BAYS SLIGHTLY TO UNWEATHERED ROCK
- AL-CO CW: ALBANY CONGLOMERATE COMPLETELY WEATHERED
- AL-CO HW-MW: ALBANY CONGLOMERATE HIGHLY TO MODERATELY WEATHERED
- AL-CO SW-UW: ALBANY CONGLOMERATE SLIGHTLY TO UNWEATHERED
- INFERRED GEOLOGICAL UNIT BOUNDARY
- INFERRED GROUNDWATER
- LIMITS OF GEOLOGICAL INTERPRETATION

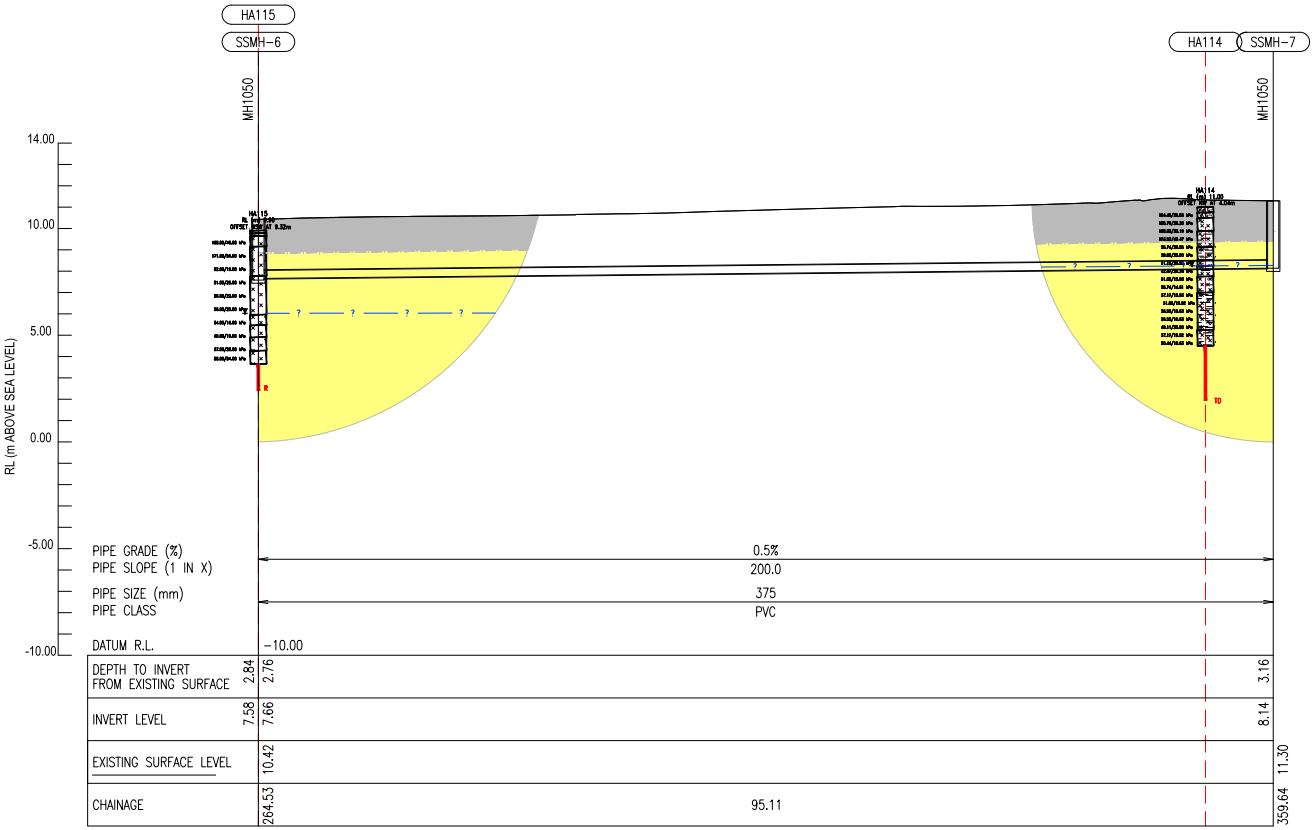
- FILL
- SANDY SILT
- SILTY CLAY
- SILTY SAND
- SILT
- SANDY CLAY
- CLAY
- CLAYEY SAND
- ORGANIC CLAY
- SANDY CLAY
- CLAYEY GRAVEL
- PEAT
- CORELOSS
- SAND

146/57 kPa — CORRECTED UNDRAINED/DRAINED SHEAR STRENGTH VALUE

N > 50 — UNCORRECTED SPT N VALUE

SCALA PENETROMETER

R / TD — SCALA REFUSAL/TARGET DEPTH



Rev	Description	Checked	Approved	Date
A	FOR INTERNAL GHD REVIEW			15.03.2021

Author — Drafting Check

Designer — Design Check

VERTICAL 1:250 AT ORIGINAL SIZE

HORIZONTAL 1:500 AT ORIGINAL SIZE

0 2.5 5 7.5 10 12.5m

0 5 10 15 20 25m

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Project No. 12508391

Client WATER CARE

Project WHENUAPAI REDHILLS

Status

Status Code

Drawing Title: GEOTECHNICAL LONG SECTION SHEET 3 OF 6

Drawing No. 12508391-C103

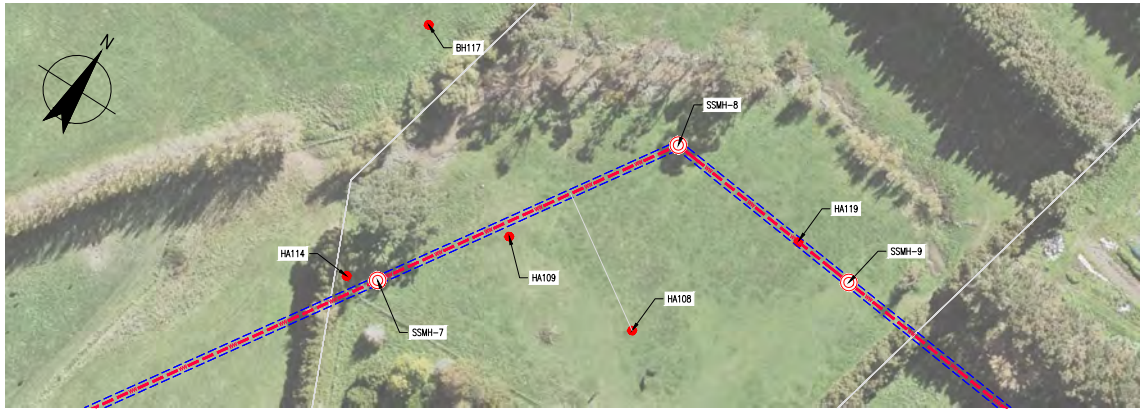
Size A1

Rev A

Plot Date: 23 March 2021 - 3:01 PM

Plotted by: Paige Boyed

File Name: \\ghdnet\ghd\NZ\Auckland\Projects\51\12508391\Tech\Geotech\Package 1 Whenuapai Redhills\02 GIR\Working Folder\Drawings\12508391-C101_C106 - PB EDIT.dwg



PLAN
NOT TO SCALE

LEGEND

- TOP SOIL/FILL (NON - ENGINEERED)
- TGA-P: ORGANIC CLAY/SILT & PEAT
- TGA-C/TGA-ST: CLAY & SILT DOMINATED ALLUVIUM
- TGA-S: SAND DOMINATED ALLUVIUM
- ECBF-RS: EAST COAST BAYS RESIDUAL SOIL
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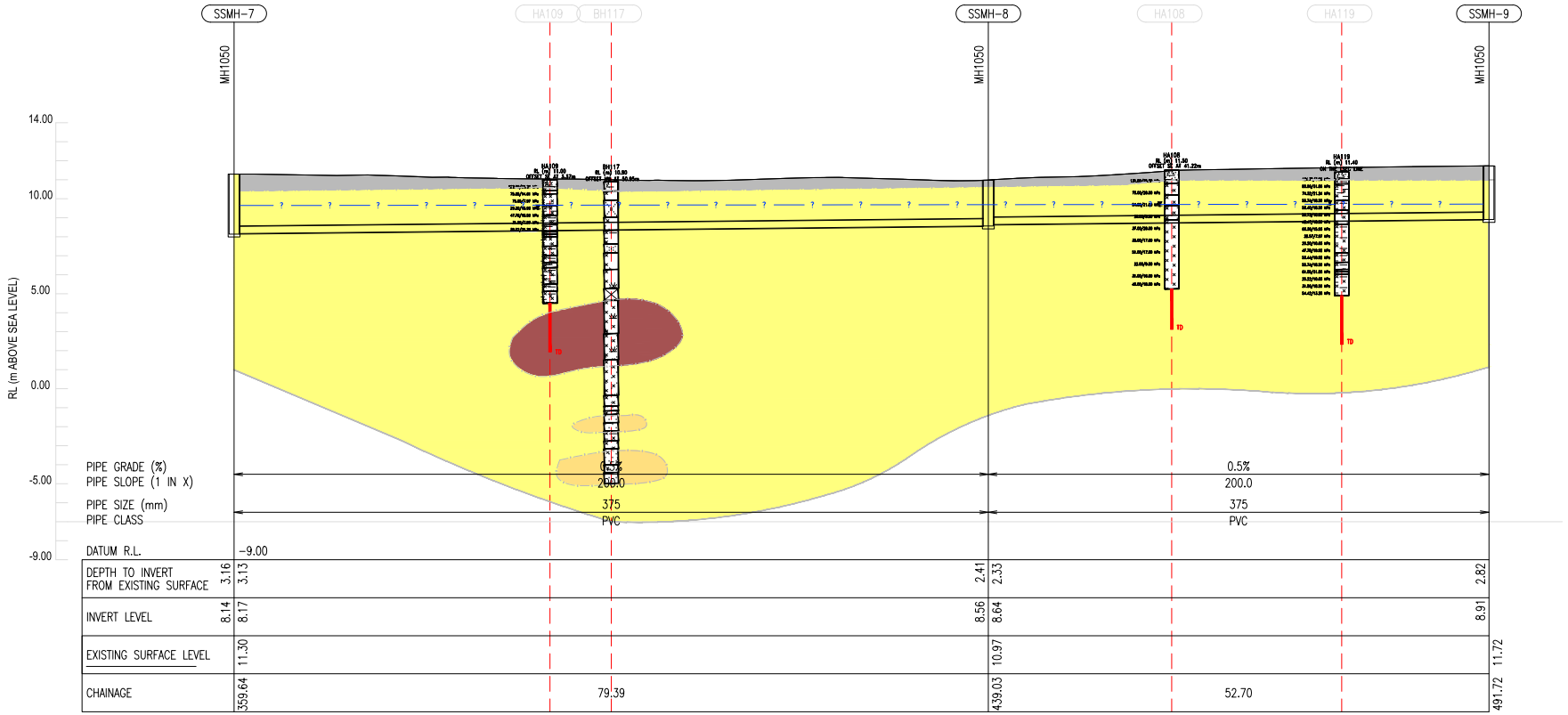
- ECBF SW-UW: EAST COAST BAYS SLIGHTLY TO UNWEATHERED ROCK
- AL-CO CW: ALBANY CONGLOMERATE COMPLETELY WEATHERED
- AL-CO HW-MW: ALBANY CONGLOMERATE HIGHLY TO MODERATELY WEATHERED
- AL-CO SW-UW: ALBANY CONGLOMERATE SLIGHTLY TO UNWEATHERED
- INFERRED GEOLOGICAL UNIT BOUNDARY
- INFERRED GROUNDWATER
- LIMITS OF GEOLOGICAL INTERPRETATION

- FILL
- SANDY SILT
- SILTY CLAY
- SILTY SAND
- SILT
- SANDY CLAY
- CLAY
- CLAYEY SAND
- ORGANIC CLAY
- SANDY CLAY
- CLAYEY GRAVEL
- PEAT
- CORELOSS
- SAND

166/57 kPa CORRECTED UNDRAINED/DRAINED SHEAR STRENGTH VALUE
N > 50 UNCORRECTED SPT N VALUE
SCALA PENETROMETER
R / TD SCALA REFUSAL/TARGET DEPTH



PIPE GRADE (%) / PIPE SLOPE (1 IN X)			200.0			0.5% / 200.0			
PIPE SIZE (mm)			375			375			
PIPE CLASS			PVC			PVC			
DATUM R.L.	-9.00								
DEPTH TO INVERT FROM EXISTING SURFACE	3.16	3.13			2.41	2.33			2.82
INVERT LEVEL	8.14	8.17			8.56	8.64			8.91
EXISTING SURFACE LEVEL	11.30				10.97				11.72
CHAINAGE	359.64		79.39		439.03		52.70		491.72

Rev	Description	Checked	Approved	Date
A	FOR INTERNAL GHD REVIEW			15.03.2021

Author | Drafting Check
Designer | Design Check

VERTICAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m
HORIZONTAL 1:500 AT ORIGINAL SIZE 0 5 10 15 20 25m

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Project No. 12508391

Client WATER CARE
Project WHENUAPAI REDHILLS
Status
Status Code

Drawing Title: GEOTECHNICAL LONG SECTION SHEET 4 OF 6
Size: A1
Drawing No. 12508391-C104
Rev: A

Plot Date: 23 March 2021 - 3:01 PM Plotted by: Paige Boyed
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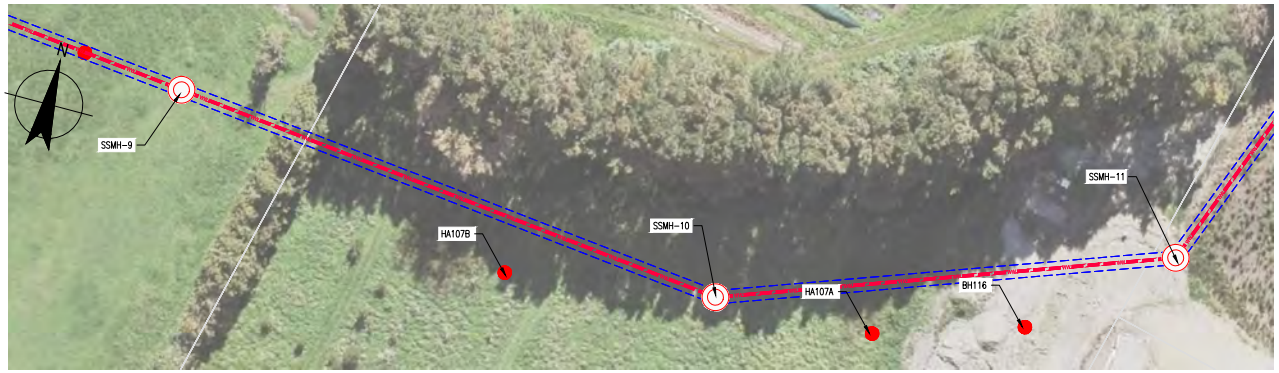

LEGEND

- TOP SOIL/FILL (NON - ENGINEERED)
- TGA-P: ORGANIC CLAY/SILT & PEAT
- TGA-C/TGA-ST: CLAY & SILT DOMINATED ALLUVIUM
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- SILTY SAND
- SILT
- SANDY CLAY
- CLAY
- CLAYEY SAND
- ORGANIC CLAY
- SANDY CLAY
- CLAYEY GRAVEL
- PEAT
- CORELOSS
- SAND

166/37 kPa CORRECTED UNDRAINED/DRAINED SHEAR STRENGTH VALUE

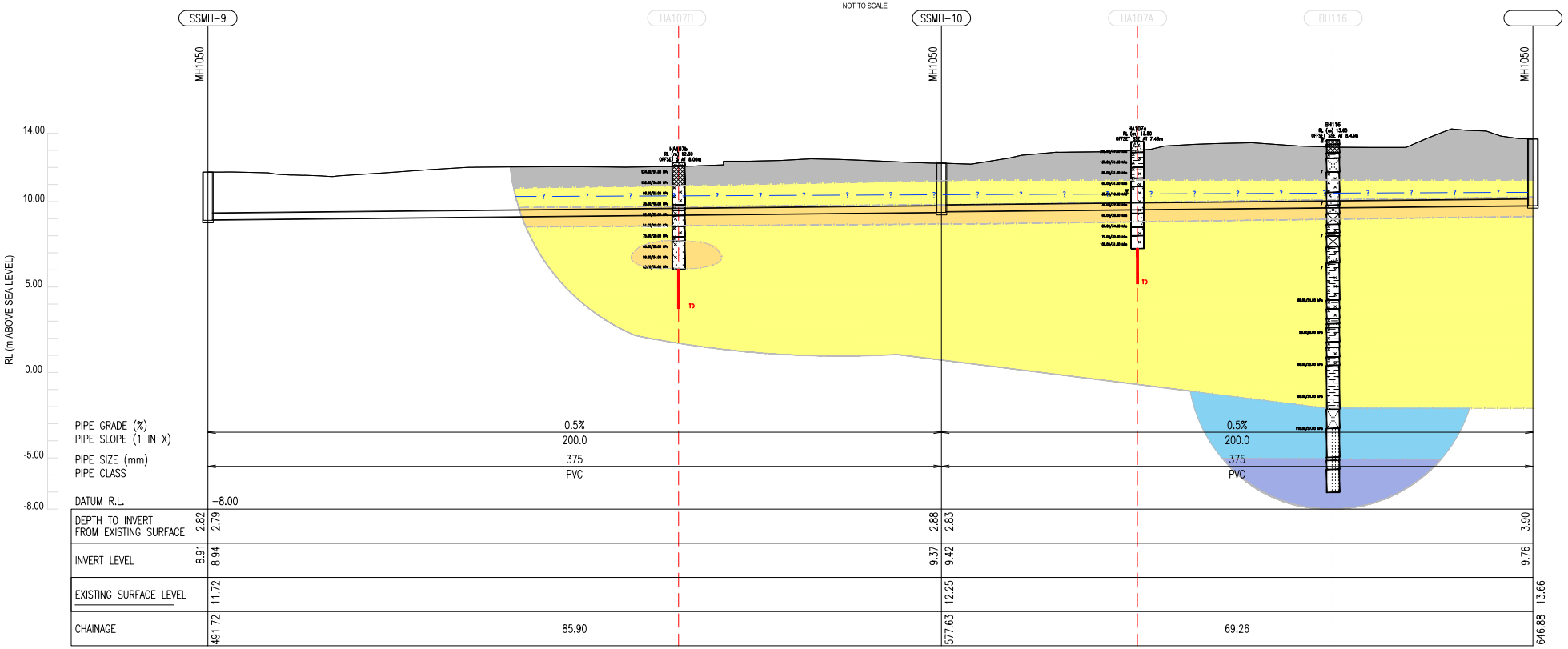
N > 50 UNCORRECTED SPT N VALUE

SCALA PENETROMETER

R / TD SCALA REFUSAL/TARGET DEPTH

PLAN

NOT TO SCALE



PIPE GRADE (%)			0.5%				0.5%		
PIPE SLOPE (1 IN X)			200.0				200.0		
PIPE SIZE (mm)			375				375		
PIPE CLASS			PVC				PVC		
DATUM R.L.		-8.00							
DEPTH TO INVERT FROM EXISTING SURFACE	2.82	2.79			2.88	2.83			3.90
INVERT LEVEL	8.91	8.94			9.37	9.42			9.76
EXISTING SURFACE LEVEL	11.72				12.25				13.66
CHAINAGE	491.72		85.90		577.63		69.26		646.88

Rev	Description	Checked	Approved	Date
A	FOR INTERNAL GHD REVIEW			15.03.2021

Author | Drafting Check

Designer | Design Check

VERTICAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

HORIZONTAL 1:500 AT ORIGINAL SIZE 0 5 10 15 20 25m

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Project No. 12508391

Client WATER CARE

Project WHENUAPAI REDHILLS

Status | Status Code

Drawing Title: GEOTECHNICAL LONG SECTION SHEET 5 OF 6

Size: A1

Drawing No. 12508391-C105

Rev

Plot Date: 23 March 2021 - 3:02 PM Plotted by: Paige Boyed

File Name: \\ghdnet\ghd\NZ\Auckland\Projects\51\12508391\Tech\Geotech\Package 1 Whenuapai Redhills\02 GIR\Working Folder\Drawings\12508391-C101_C106 - PB EDIT.dwg

LEGEND

- TOP SOIL/FILL (NON - ENGINEERED)
- TGA-P: ORGANIC CLAY/SILT & PEAT
- TGA-C/TGA-ST: CLAY & SILT DOMINATED ALLUVIUM
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- INFERRED GROUNDWATER
- LIMITS OF GEOLOGICAL INTERPRETATION

- FILL
- SANDY SILT
- SILTY CLAY
- SILTY SAND
- SILT
- SANDY CLAY
- CLAY
- CLAYEY SAND
- ORGANIC CLAY
- SANDY CLAY
- CLAYEY GRAVEL
- PEAT
- CORELOSS
- SAND

186/37 kPa CORRECTED UNDRAINED/DRAINED SHEAR STRENGTH VALUE

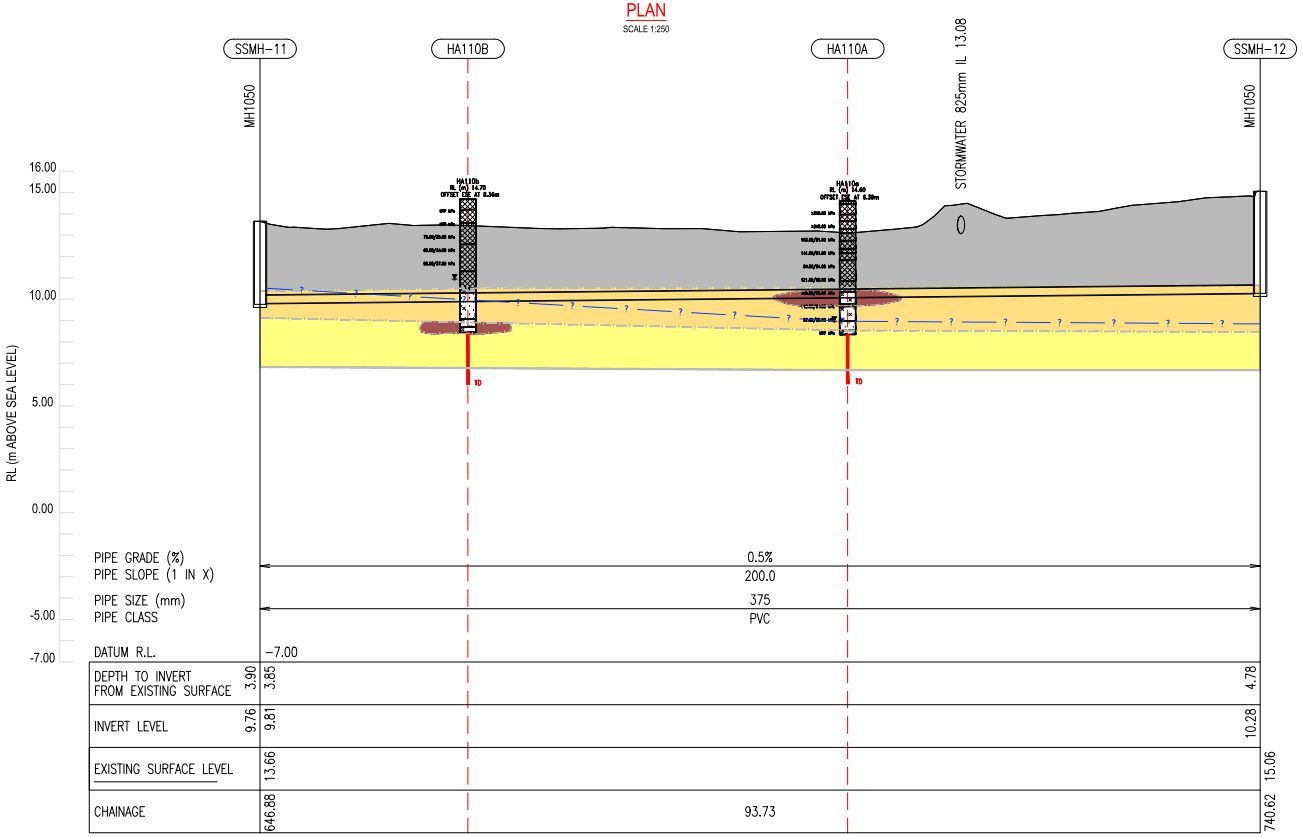
N > 50 UNCORRECTED SPT N VALUE

SCALA PENETROMETER

R / TD SCALA REFUSAL/TARGET DEPTH

PLAN

SCALE 1:250



Rev	Description	Checked	Approved	Date
A	FOR INTERNAL GHD REVIEW			15.03.2021

Author | Drafting Check

Designer | Design Check

VERTICAL 1:250 AT ORIGINAL SIZE
HORIZONTAL 1:500 AT ORIGINAL SIZE
0 2.5 5 7.5 10 12.5m
0 5 10 15 20 25m

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Project No. 12508391

Client WATERCARE

Project WHENUAPAI REDHILLS

Status | Status Code

Drawing Title: GEOTECHNICAL LONG SECTION SHEET 6 OF 6

Drawing No. 12508391-C106

Size A1

Rev A

Plot Date: 23 March 2021 - 3:02 PM Plotted by: Paige Boyed

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PLAN
NOT TO SCALE

LEGEND

- TOP SOIL/FILL (NON - ENGINEERED)
- TGA-P: ORGANIC CLAY/SILT & PEAT
- TGA-C/TGA-ST: CLAY & SILT DOMINATED ALLUVIUM
- TGA-S: SAND DOMINATED ALLUVIUM
- ECBF-RS: EAST COAST BAYS RESIDUAL SOIL
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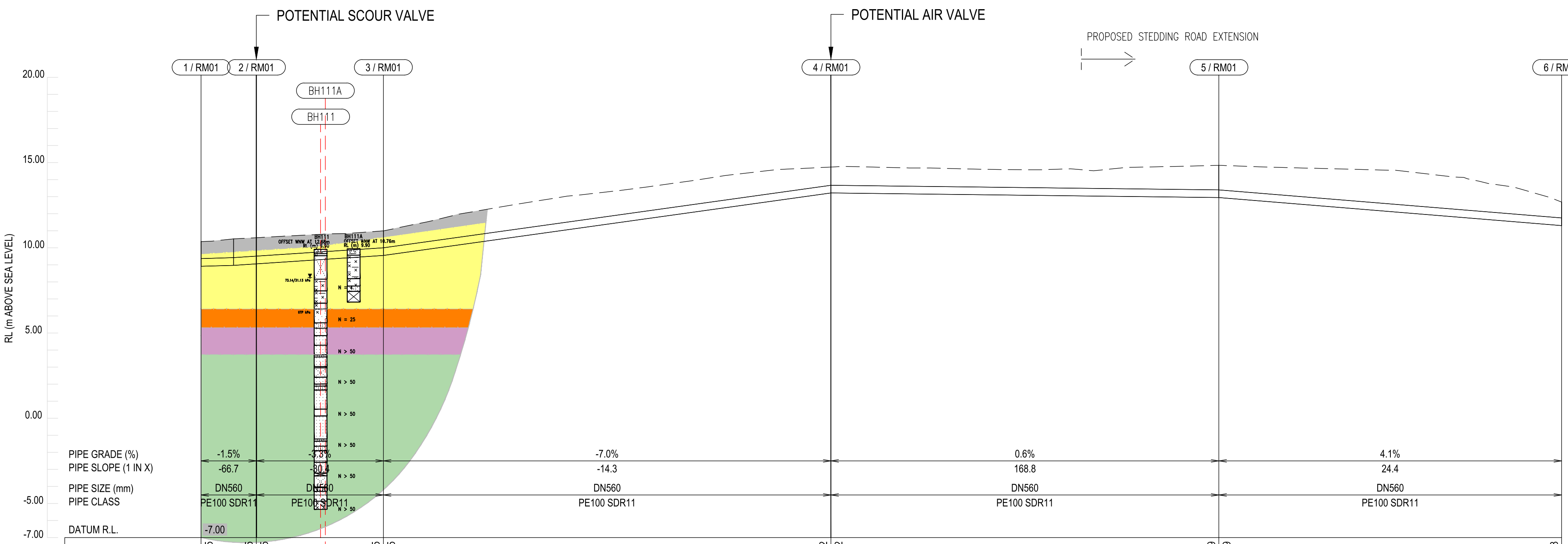
- INFERRED GEOLOGICAL UNIT BOUNDARY
- INFERRED GROUNDWATER
- LIMITS OF GEOLOGICAL INTERPRETATION
- FILL
- SANDY SILT
- SILTY CLAY
- SILTY SAND
- SILT
- SANDY CLAY
- CLAY
- CLAYEY SAND
- ORGANIC CLAY
- SANDY CLAY
- CLAYEY GRAVEL
- PEAT
- CORELOSS
- SAND
- 166/37 kPa CORRECTED UNDRAINED/DRAINED SHEAR STRENGTH VALUE
- N > 50 UNCORRECTED SPT N VALUE
- SCALA PENETROMETER
- R / TD SCALA REFUSAL/TARGET DEPTH



	1 / RM01 – 2 / RM01	2 / RM01 – 3 / RM01	3 / RM01 – 4 / RM01	4 / RM01 – 5 / RM01	5 / RM01 – 6 / RM01
PIPE GRADE (%)	-1.5%	-3.3%	-7.0%	0.6%	4.1%
PIPE SLOPE (1 IN X)	-66.7	-30.4	-14.3	168.8	24.4
PIPE SIZE (mm)	DN560	DN560	DN560	DN560	DN560
PIPE CLASS	PE100 SDR11	PE100 SDR11	PE100 SDR11	PE100 SDR11	PE100 SDR11
CHAINAGE (length)	3.83	17.58	52.56	45.57	40.25

DATUM R.L. -7.00

	1 / RM01	2 / RM01	3 / RM01	4 / RM01	5 / RM01	6 / RM01
DEPTH TO INVERT FROM EXISTING SURFACE	1.45	1.55 / 1.55	1.45 / 1.45	1.52 / 1.52	1.89 / 1.89	1.38
INVERT LEVEL	8.91	8.97 / 8.97	9.55 / 9.55	13.22 / 13.22	12.95 / 12.95	11.30
EXISTING SURFACE LEVEL	10.36	10.52	11.00	14.74	14.84	12.68
CHAINAGE	0.00	3.83	21.41	73.98	119.54	159.79

Rev	Description	Checked	Approved	Date
A	FOR INTERNAL GHD REVIEW			15.03.2021

Author — Drafting Check
Designer — Design Check

VERTICAL 1:250 AT ORIGINAL SIZE (0, 2.5, 5, 7.5, 10, 12.5m)
HORIZONTAL 1:500 AT ORIGINAL SIZE (0, 5, 10, 15, 20, 25m)

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www.ghd.com

Project No. 12508391

Client WATER CARE

Project WHENUAPAI REDHILLS

Status

Status Code

Drawing Title GEOTECHNICAL LONG SECTION SHEET 1 OF 14

Size A1

Drawing No. 12508391-C201

Rev A

Plot Date: 23 March 2021 - 1:28 PM Plotted by: Paige Boyed File Name: N:\NZ\Auckland\Projects\51\12508391\Tech\Geotech\Package 1 Whenuapai Redhills\02 GIR\Working Folder\Drawings\12508391-C201_C214 pb EDIT.dwg

PLAN
SCALE 1:250

LEGEND

- TOP SOIL/FILL (NON - ENGINEERED)
- TGA-P: ORGANIC CLAY/SILT & PEAT
- TGA-C/TGA-ST: CLAY & SILT DOMINATED ALLUVIUM
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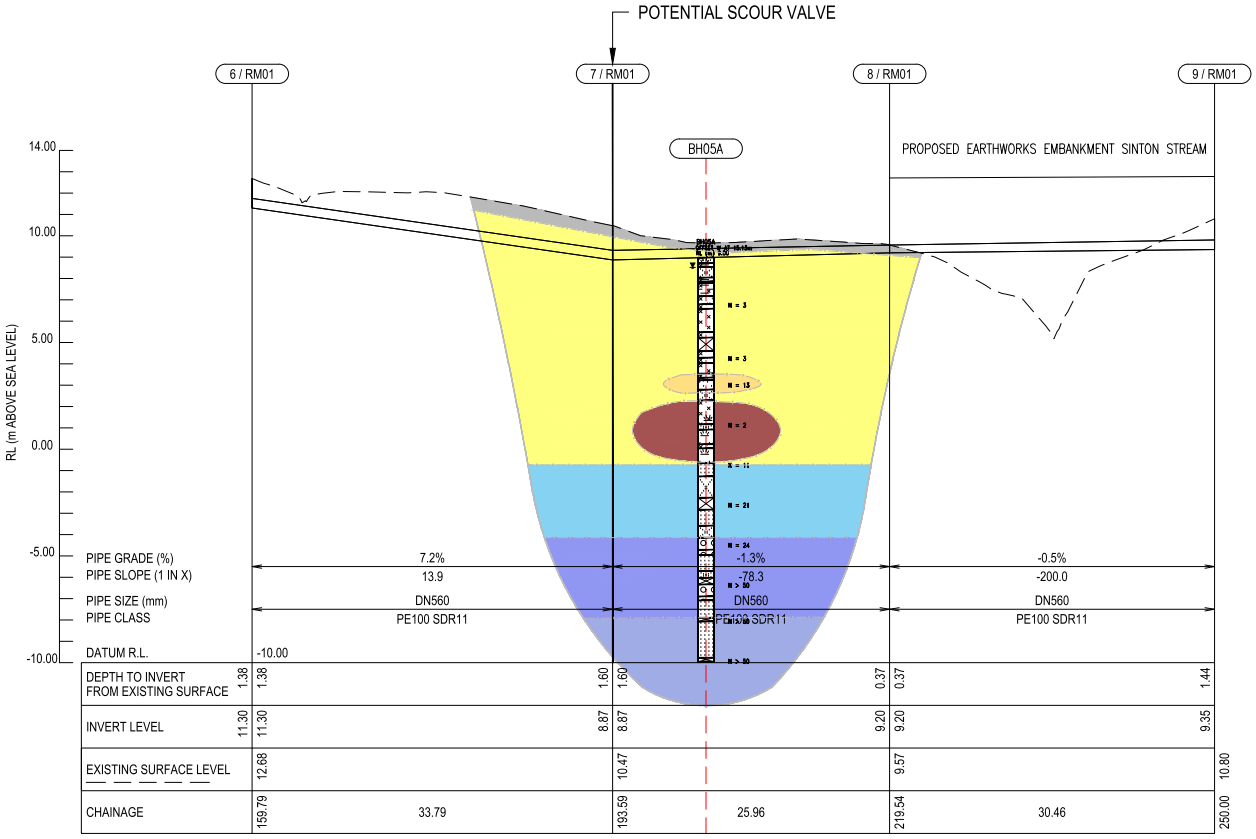
- LIMITS OF GEOLOGICAL INTERPRETATION

- FILL
- SANDY SILT
- SILTY CLAY
- SILTY SAND
- SILT
- SANDY CLAY
- CLAY
- CLAYEY SAND
- ORGANIC CLAY
- SANDY CLAY
- CLAYEY GRAVEL
- PEAT
- CORELOSS
- SAND

166/37 kPa CORRECTED UNDRAINED/DRAINED SHEAR STRENGTH VALUE
N > 50 UNCORRECTED SPT N VALUE
SCALA PENETROMETER
R / TD SCALA REFUSAL/TARGET DEPTH



Rev	Description	Checked	Approved	Date
A	FOR INTERNAL GHD REVIEW			15.03.2021

Author | Drafting Check
Designer | Design Check

VERTICAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m
HORIZONTAL 1:500 AT ORIGINAL SIZE 0 5 10 15 20 25m

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Project No. 12508391

Client WATER CARE
Project WHENUAPAI REDHILLS
Status
Status Code

Drawing Title: GEOTECHNICAL LONG SECTION SHEET 2 OF 14
Drawing No. 12508391-C202
Size A1
Rev A

Plot Date: 23 March 2021 - 1:29 PM Plotted by: Paige Boyed
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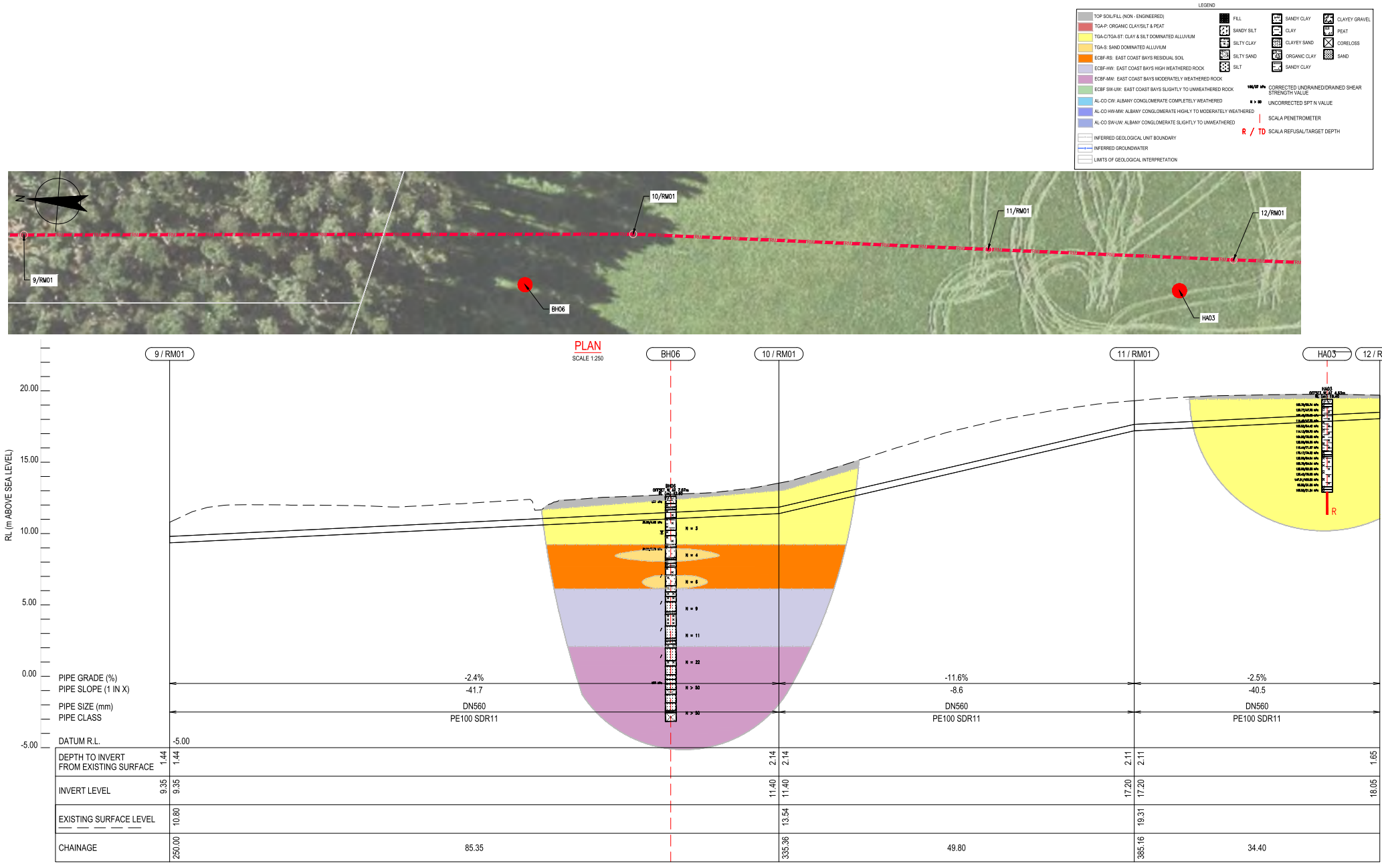

Rev	Description	Checked	Approved	Date
A	FOR INTERNAL GHD REVIEW			15.03.2021

Author | Drafting Check

Designer | Design Check

VERTICAL 1:250 AT ORIGINAL SIZE
HORIZONTAL 1:500 AT ORIGINAL SIZE
0 2.5 5 7.5 10 12.5m
0 5 10 15 20 25m

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Project No. 12508391

Client: WATER CARE

Project: WHENUAPAI REDHILLS

Status | Status Code

Drawing Title: GEOTECHNICAL LONG SECTION SHEET 3 OF 14

Size: A1

Drawing No.: 12508391-C203

Rev: A

Plot Date: 23 March 2021 - 1:31 PM Plotted by: Paige Boyed

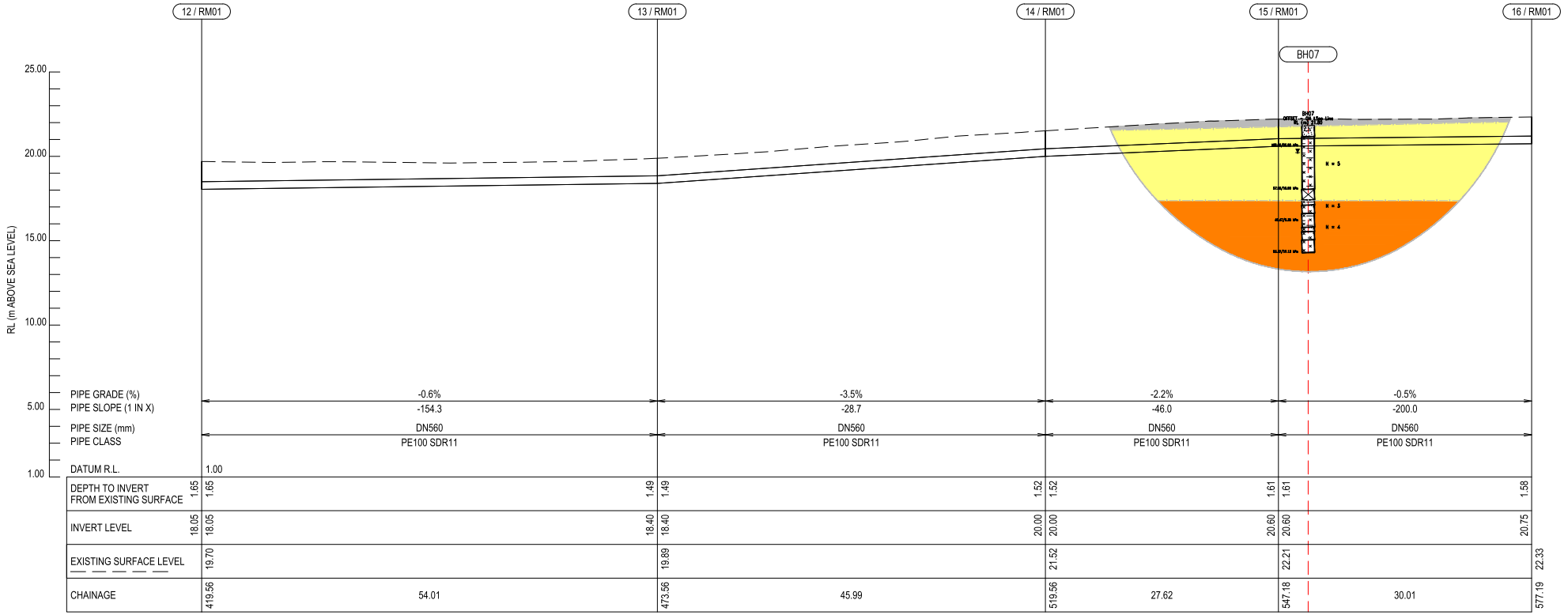
File Name: N:\NZ\Auckland\Projects\51\12508391\Tech\Geotech\Package 1 Whenuapai Redhills\02 GIR\Working Folder\Drawings\12508391-C201_C214 pb EDIT.dwg

LEGEND

TOP SOIL/FILL (NON - ENGINEERED)	FILL	SANDY CLAY	CLAYEY GRAVEL
TGA-P: ORGANIC CLAY/SILT & PEAT	SANDY SILT	CLAY	PEAT
TGA-C/TGA-ST: CLAY & SILT DOMINATED ALLUVIUM	SILTY CLAY	CLAYEY SAND	CORELOSS
TGA-S: SAND DOMINATED ALLUVIUM	SILTY SAND	ORGANIC CLAY	SAND
ECBF-RS: EAST COAST BAYS RESIDUAL SOIL	SILT	SANDY CLAY	
ECBF-HW: EAST COAST BAYS HIGH WEATHERED ROCK			
ECBF-MW: EAST COAST BAYS MODERATELY WEATHERED ROCK			
ECBF SW-UW: EAST COAST BAYS SLIGHTLY TO UNWEATHERED ROCK		100/37 kPa	CORRECTED UNDRAINED/DRAINED SHEAR STRENGTH VALUE
AL-CO CW: ALBANY CONGLOMERATE COMPLETELY WEATHERED		N > 50	UNCORRECTED SPT N VALUE
AL-CO HW-MW: ALBANY CONGLOMERATE HIGHLY TO MODERATELY WEATHERED			SCALA PENETROMETER
AL-CO SW-UW: ALBANY CONGLOMERATE SLIGHTLY TO UNWEATHERED		R / TD	SCALA REFUSAL/TARGET DEPTH
INFERRED GEOLOGICAL UNIT BOUNDARY			
INFERRED GROUNDWATER			
LIMITS OF GEOLOGICAL INTERPRETATION			

PLAN

NOT TO SCALE



	12 / RM01		13 / RM01		14 / RM01		15 / RM01		16 / RM01	
PIPE GRADE (%)		-0.6%		-3.5%		-2.2%		-0.5%		
PIPE SLOPE (1 IN X)		-154.3		-28.7		-46.0		-200.0		
PIPE SIZE (mm)		DN560		DN560		DN560		DN560		
PIPE CLASS		PE100 SDR11		PE100 SDR11		PE100 SDR11		PE100 SDR11		
DATUM R.L.	1.00									
DEPTH TO INVERT FROM EXISTING SURFACE	1.65	1.65	1.49	1.49	1.52	1.52	1.61	1.61	1.58	
INVERT LEVEL	18.05	18.05	18.40	18.40	20.00	20.00	20.60	20.60	20.75	
EXISTING SURFACE LEVEL	19.70		19.89		21.52		22.21		22.33	
CHAINAGE	419.56	54.01	473.56	45.99	519.56	27.62	547.18	30.01	577.19	

Rev	Description	Checked	Approved	Date
A	FOR INTERNAL GHD REVIEW			15.03.2021

Author | Drafting Check

Designer | Design Check

VERTICAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

HORIZONTAL 1:500 AT ORIGINAL SIZE 0 5 10 15 20 25m

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Project No. 12508391

Client: WATER CARE

Project: WHENUAPAI REDHILLS

Status | Status Code

Drawing Title: GEOTECHNICAL LONG SECTION SHEET 4 OF 14

Size: A1

Drawing No. 12508391-C204

Rev: A

Plot Date: 23 March 2021 - 1:31 PM Plotted by: Paige Boyed

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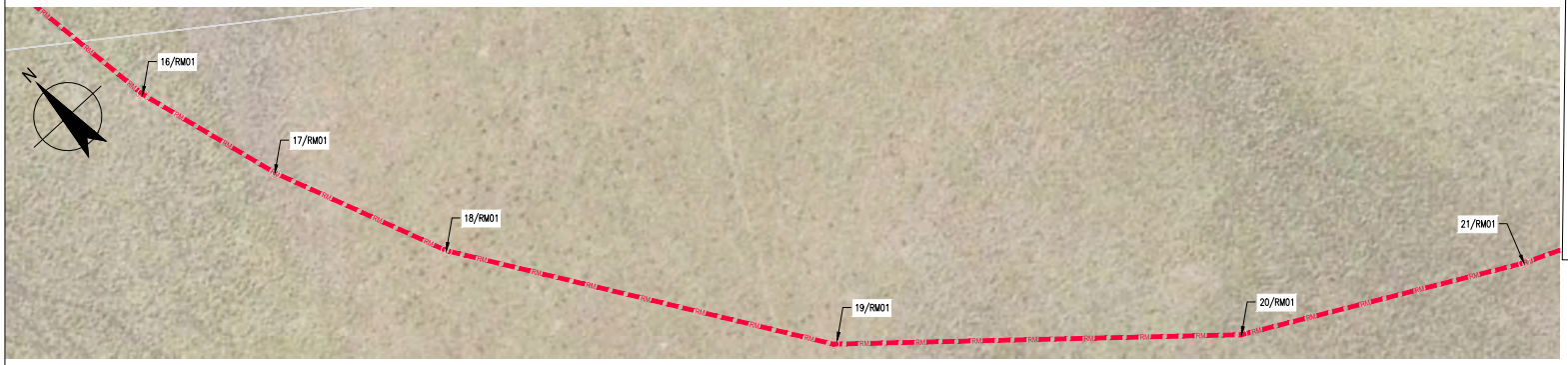


LEGEND

- TOP SOIL/FILL (NON - ENGINEERED)
- TGA-P: ORGANIC CLAY/SILT & PEAT
- TGA-C/TGA-ST: CLAY & SILT DOMINATED ALLUVIUM
- TGA-S: SAND DOMINATED ALLUVIUM
- ECBF-RS: EAST COAST BAYS RESIDUAL SOIL
- ECBF-HW: EAST COAST BAYS HIGH WEATHERED ROCK
- ECBF-MW: EAST COAST BAYS MODERATELY WEATHERED ROCK
- ECBF SW-UW: EAST COAST BAYS SLIGHTLY TO UNWEATHERED ROCK
- AL-CO CW: ALBANY CONGLOMERATE COMPLETELY WEATHERED
- AL-CO HW-MW: ALBANY CONGLOMERATE HIGHLY TO MODERATELY WEATHERED
- AL-CO SW-UW: ALBANY CONGLOMERATE SLIGHTLY TO UNWEATHERED
- INFERRED GEOLOGICAL UNIT BOUNDARY
- INFERRED GROUNDWATER
- LIMITS OF GEOLOGICAL INTERPRETATION

- FILL
- SANDY SILT
- SILTY CLAY
- SILTY SAND
- SILT
- SANDY CLAY
- CLAY
- CLAYEY SAND
- ORGANIC CLAY
- SANDY CLAY
- CLAYEY GRAVEL
- PEAT
- CORELOSS
- SAND

186/37 kPa CORRECTED UNDRAINED/DRAINED SHEAR STRENGTH VALUE

N > 50 UNCORRECTED SPT N VALUE

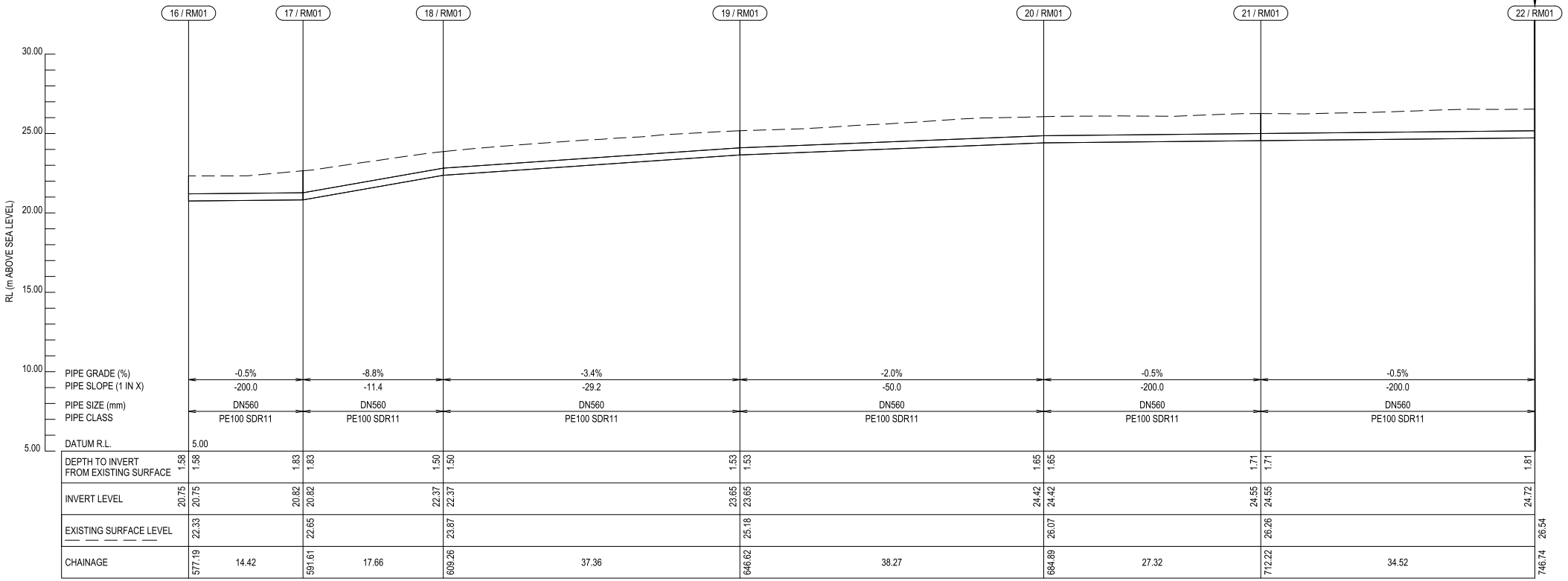
SCALA PENETROMETER

R / TD SCALA REFUSAL/TARGET DEPTH

PLAN

NOT TO SCALE

POTENTIAL AIR VALVE



PIPE GRADE (%)		-0.5%		-8.8%		-3.4%		-2.0%		-0.5%		-0.5%	
PIPE SLOPE (1 IN X)		-200.0		-11.4		-29.2		-50.0		-200.0		-200.0	
PIPE SIZE (mm)		DN560		DN560		DN560		DN560		DN560		DN560	
PIPE CLASS		PE100 SDR11		PE100 SDR11		PE100 SDR11		PE100 SDR11		PE100 SDR11		PE100 SDR11	
DATUM R.L.		5.00											
DEPTH TO INVERT FROM EXISTING SURFACE	1.58	1.58	1.83	1.83	1.50	1.50	1.53	1.53	1.65	1.65	1.71	1.71	1.81
INVERT LEVEL	20.75	20.75	20.82	20.82	22.37	22.37	23.65	23.65	24.42	24.42	24.55	24.55	24.72
EXISTING SURFACE LEVEL	22.33		22.65		23.87		25.18		26.07		26.26		26.54
CHAINAGE	577.19	14.42	591.61	17.66	609.26	37.36	646.62	38.27	684.89	27.32	712.22	34.52	746.74

Rev	Description	Checked	Approved	Date
A	FOR INTERNAL GHD REVIEW			15.03.2021

Author | Drafting Check

Designer | Design Check

VERTICAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

HORIZONTAL 1:500 AT ORIGINAL SIZE 0 5 10 15 20 25m

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Project No. 12508391

Client WATER CARE

Project WHENUAPAI REDHILLS

Status | Status Code

Drawing Title: GEOTECHNICAL LONG SECTION SHEET 5 OF 14

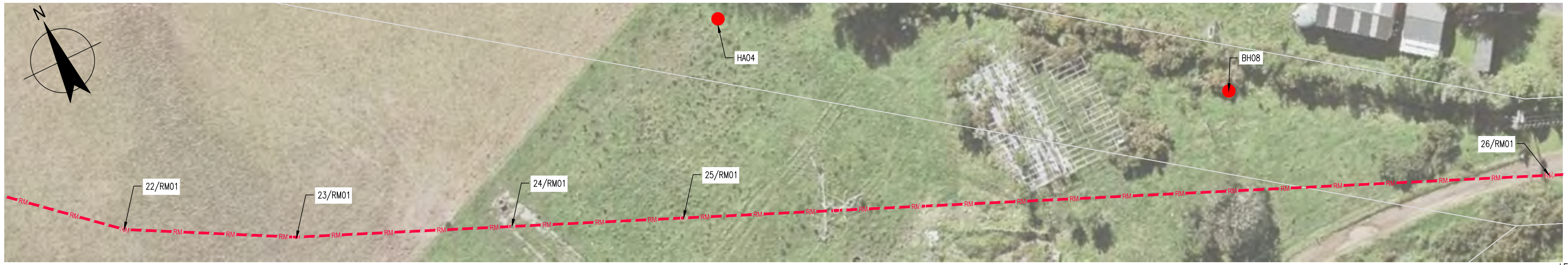
Drawing No. 12508391-C205

Size A1

Rev A

Plot Date: 23 March 2021 - 1:34 PM Plotted by: Paige Boyed

File Name: N:\NZ\Auckland\Projects\51\12508391\Tech\Geotech\Package 1 Whenuapai Redhills\02 GIR\Working Folder\Drawings\12508391-C201_C214 pb EDIT.dwg



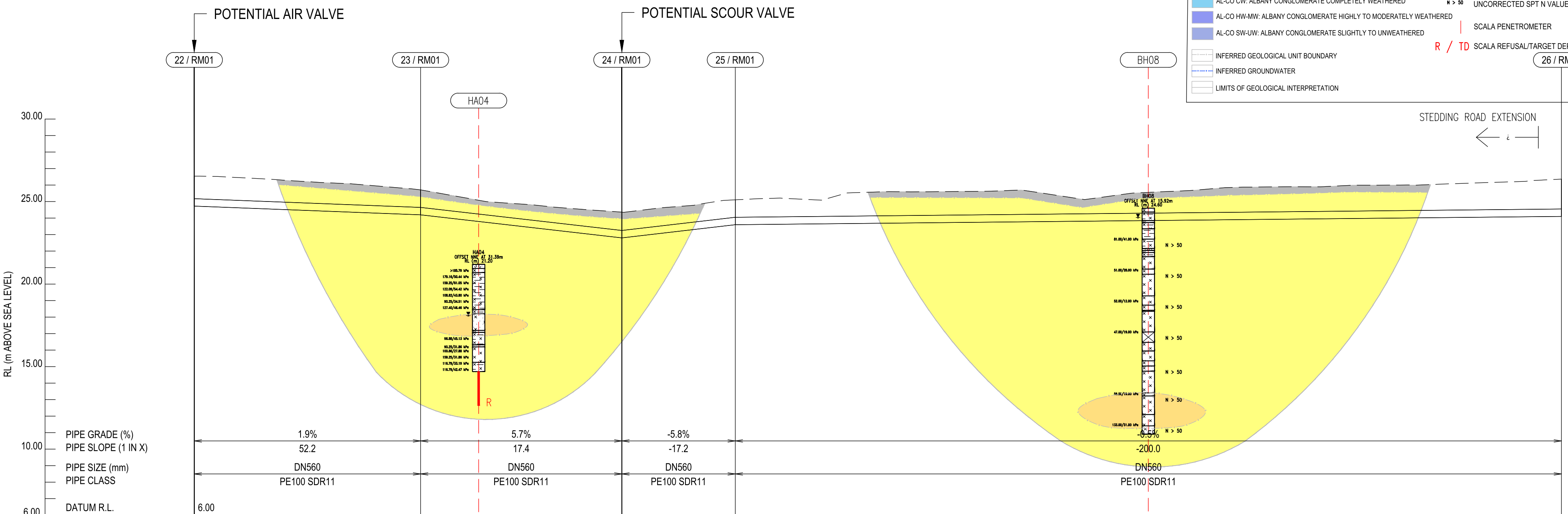
PLAN
SCALE 1:250

LEGEND

- TOP SOIL/FILL (NON - ENGINEERED)
- TGA-P: ORGANIC CLAY/SILT & PEAT
- TGA-C/TGA-ST: CLAY & SILT DOMINATED ALLUVIUM
- TGA-S: SAND DOMINATED ALLUVIUM
- ECBF-RS: EAST COAST BAYS RESIDUAL SOIL
- ECBF-HW: EAST COAST BAYS HIGH WEATHERED ROCK
- ECBF-MW: EAST COAST BAYS MODERATELY WEATHERED ROCK
- ECBF SW-UW: EAST COAST BAYS SLIGHTLY TO UNWEATHERED ROCK
- AL-CO CW: ALBANY CONGLOMERATE COMPLETELY WEATHERED
- AL-CO HW-MW: ALBANY CONGLOMERATE HIGHLY TO MODERATELY WEATHERED
- AL-CO SW-UW: ALBANY CONGLOMERATE SLIGHTLY TO UNWEATHERED
- INFERRED GEOLOGICAL UNIT BOUNDARY
- INFERRED GROUNDWATER
- LIMITS OF GEOLOGICAL INTERPRETATION

FILL; SANDY SILT; SILTY CLAY; SILTY SAND; SILT; SANDY CLAY; CLAY; CLAYEY SAND; ORGANIC CLAY; SANDY CLAY; CLAYEY GRAVEL; PEAT; CORELOSS; SAND

166/37 kPa — CORRECTED UNDRAINED/DRAINED SHEAR STRENGTH VALUE
N > 50 — UNCORRECTED SPT N VALUE
SCALA PENETROMETER
R / TD — SCALA REFUSAL/TARGET DEPTH



	22 / RM01		23 / RM01		24 / RM01		25 / RM01		26 / RM01
PIPE GRADE (%)		1.9%		5.7%		-5.8%		-0.5%	
PIPE SLOPE (1 IN X)		52.2		17.4		-17.2		-200.0	
PIPE SIZE (mm)		DN560		DN560		DN560		DN560	
PIPE CLASS		PE100 SDR11		PE100 SDR11		PE100 SDR11		PE100 SDR11	
DATUM R.L.	6.00								
DEPTH TO INVERT FROM EXISTING SURFACE	1.81 / 1.81		1.51 / 1.51		1.56 / 1.56		1.51 / 1.51		2.26
INVERT LEVEL	24.72 / 24.72		24.20 / 24.20		22.80 / 22.80		23.60 / 23.60		24.10
EXISTING SURFACE LEVEL	26.54		25.71		24.36		25.11		26.36
CHAINAGE	746.74	27.39	774.13	24.36	798.49	13.73	812.22	100.00	912.22

Rev	Description	Checked	Approved	Date
A	FOR INTERNAL GHD REVIEW			15.03.2021

Author — Drafting Check
Designer — Design Check

VERTICAL 1:250 AT ORIGINAL SIZE — 0 2.5 5 7.5 10 12.5m
HORIZONTAL 1:500 AT ORIGINAL SIZE — 0 5 10 15 20 25m

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Project No. 12508391

Client: WATER CARE
Project: WHENUAPAI REDHILLS
Status
Status Code

Drawing Title: GEOTECHNICAL LONG SECTION SHEET 6 OF 14

Size A1
Drawing No. 12508391-C206
Rev A

Plot Date: 23 March 2021 - 1:36 PM Plotted by: Paige Boyed
File Name: N:\NZ\Auckland\Projects\51\12508391\Tech\Geotech\Package 1 Whenuapai Redhills\02 GIR\Working Folder\Drawings\12508391-C201_C214 pb EDIT.dwg

PLAN
SCALE 1:250

LEGEND

- TOP SOIL/FILL (NON - ENGINEERED)
- TGA-P: ORGANIC CLAY/SILT & PEAT
- TGA-C/TGA-ST: CLAY & SILT DOMINATED ALLUVIUM
- TGA-S: SAND DOMINATED ALLUVIUM
- ECBF-RS: EAST COAST BAYS RESIDUAL SOIL
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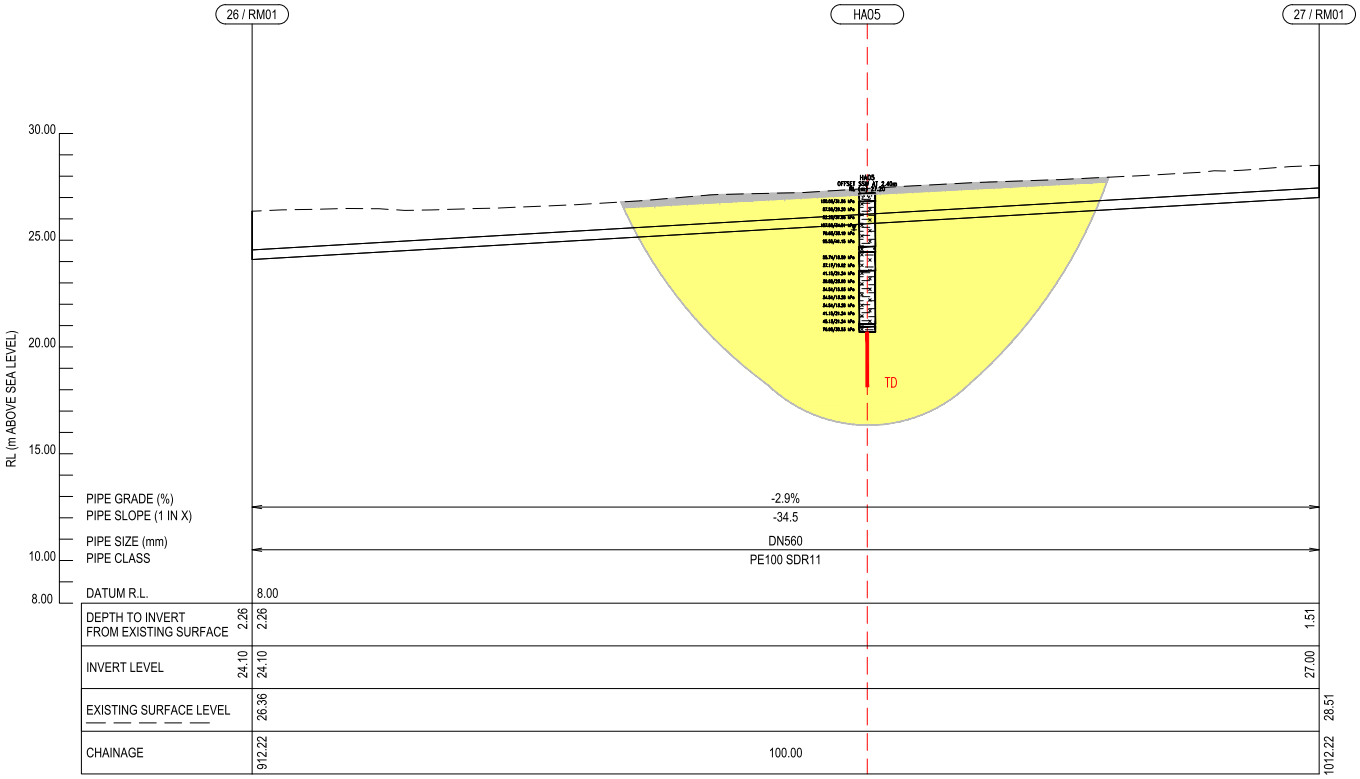
- INFERRED GEOLOGICAL UNIT BOUNDARY
- INFERRED GROUNDWATER
- LIMITS OF GEOLOGICAL INTERPRETATION

- FILL
- SANDY SILT
- SILTY CLAY
- SILTY SAND
- SILT
- SANDY CLAY
- CLAY
- CLAYEY SAND
- ORGANIC CLAY
- SANDY CLAY
- CLAYEY GRAVEL
- PEAT
- CORELOSS
- SAND

168/37 kPa — CORRECTED UNDRAINED/DRAINED SHEAR STRENGTH VALUE
N > 50 — UNCORRECTED SPT N VALUE
SCALA PENETROMETER
R / TD — SCALA REFUSAL/TARGET DEPTH



Rev	Description	Date
A	FOR INTERNAL GHD REVIEW	15.03.2021

	Checked	Approved	Date
Author	Drafting Check		
Designer	Design Check		

VERTICAL 1:250 AT ORIGINAL SIZE
HORIZONTAL 1:500 AT ORIGINAL SIZE
0 2.5 5 7.5 10 12.5m
0 5 10 15 20 25m

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Project No. 12508391

Client WATER CARE
Project WHENUAPAI REDHILLS
Status
Status Code

Drawing Title: GEOTECHNICAL LONG SECTION SHEET 7 OF 14
Size: A1
Drawing No. 12508391-C207
Rev: A

Plot Date: 23 March 2021 - 1:38 PM Plotted by: Paige Boyed
File Name: N:\NZ\Auckland\Projects\51\12508391\Tech\Geotech\Package 1 Whenuapai Redhills\02 GIR\Working Folder\Drawings\12508391-C201_C214 pb EDIT.dwg

PLAN

SCALE 1:250

LEGEND

- TOP SOIL/FILL (NON - ENGINEERED)
- TGA-P: ORGANIC CLAY/SILT & PEAT
- TGA-C/TGA-ST: CLAY & SILT DOMINATED ALLUVIUM
- TGA-S: SAND DOMINATED ALLUVIUM
- ECBF-RS: EAST COAST BAYS RESIDUAL SOIL
- ECBF-HW: EAST COAST BAYS HIGH WEATHERED ROCK
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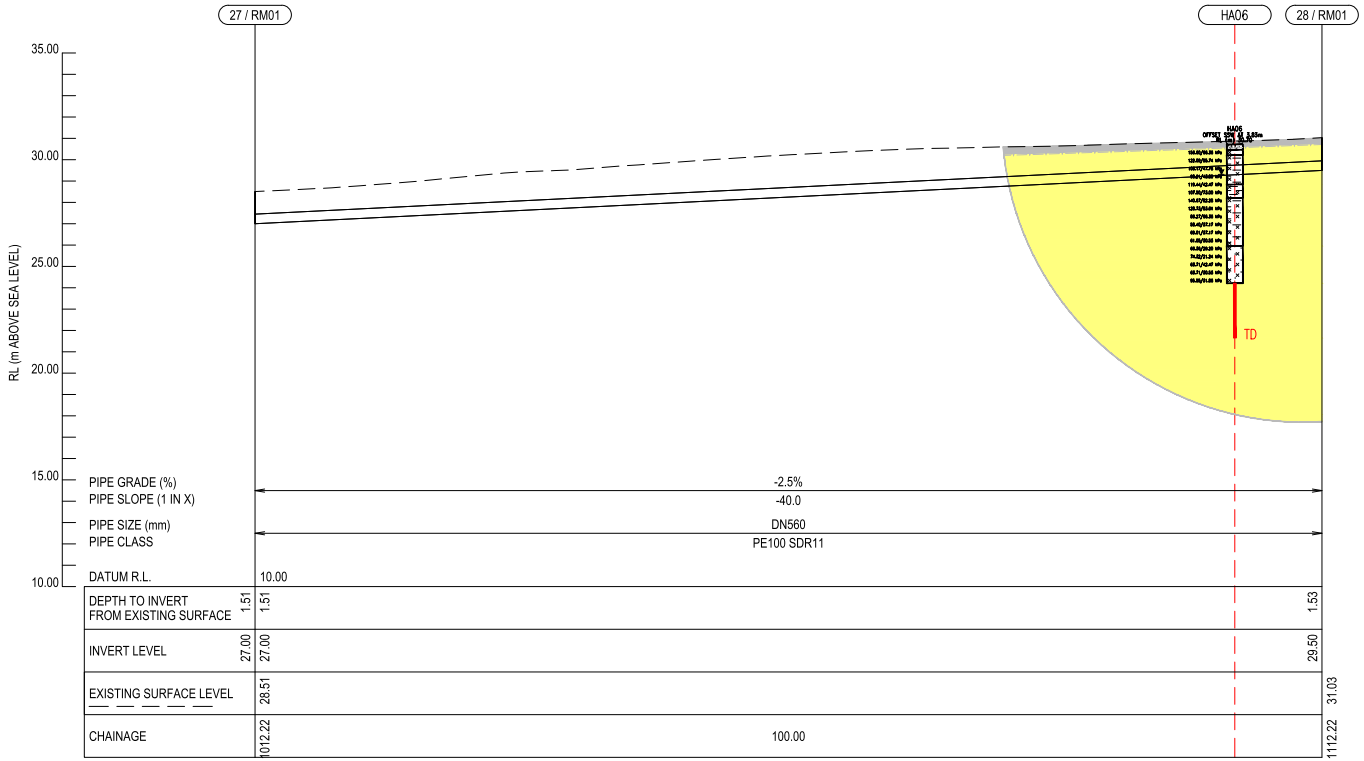
- INFERRED GEOLOGICAL UNIT BOUNDARY
- INFERRED GROUNDWATER
- LIMITS OF GEOLOGICAL INTERPRETATION
- FILL
- SANDY SILT
- SILTY CLAY
- SILTY SAND
- SILT
- SANDY CLAY
- CLAY
- CLAYEY SAND
- ORGANIC CLAY
- SANDY CLAY
- CLAYEY GRAVEL
- PEAT
- CORELOSS
- SAND
- 166/37 kPa — CORRECTED UNDRAINED/DRAINED SHEAR STRENGTH VALUE
- N > 50 — UNCORRECTED SPT N VALUE
- SCALA PENETROMETER
- R / TD — SCALA REFUSAL/TARGET DEPTH



Rev	Description	Checked	Approved	Date
A	FOR INTERNAL GHD REVIEW			15.03.2021

Author | Drafting Check

Designer | Design Check

VERTICAL 1:250 AT ORIGINAL SIZE

HORIZONTAL 1:500 AT ORIGINAL SIZE

0 2.5 5 7.5 10 12.5m

0 5 10 15 20 25m

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GHD Pty Ltd

Project No. 12508391

Client: WATER CARE

Project: WHENUAPAI REDHILLS

Status

Status Code

Drawing Title: GEOTECHNICAL LONG SECTION SHEET 8 OF 14

Size: A1

Drawing No. 12508391-C208

Rev: A

Plot Date: 23 March 2021 - 1:41 PM Plotted by: Paige Boyed

File Name: N:\NZ\Auckland\Projects\51\12508391\Tech\Geotech\Package 1 Whenuapai Redhills\02 GIR\Working Folder\Drawings\12508391-C201_C214 pb EDIT.dwg

PLAN

SCALE 1:250

LEGEND

- TOP SOIL/FILL (NON - ENGINEERED)
- TGA-P: ORGANIC CLAY/SILT & PEAT
- TGA-C/TGA-ST: CLAY & SILT DOMINATED ALLUVIUM
- TGA-S: SAND DOMINATED ALLUVIUM
- ECBF-RS: EAST COAST BAYS RESIDUAL SOIL
- ECBF-HW: EAST COAST BAYS HIGH WEATHERED ROCK
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- AL-CO HW-MW: ALBANY CONGLOMERATE HIGHLY TO MODERATELY WEATHERED
- AL-CO SW-UW: ALBANY CONGLOMERATE SLIGHTLY TO UNWEATHERED
- INFERRED GEOLOGICAL UNIT BOUNDARY
- INFERRED GROUNDWATER
- LIMITS OF GEOLOGICAL INTERPRETATION

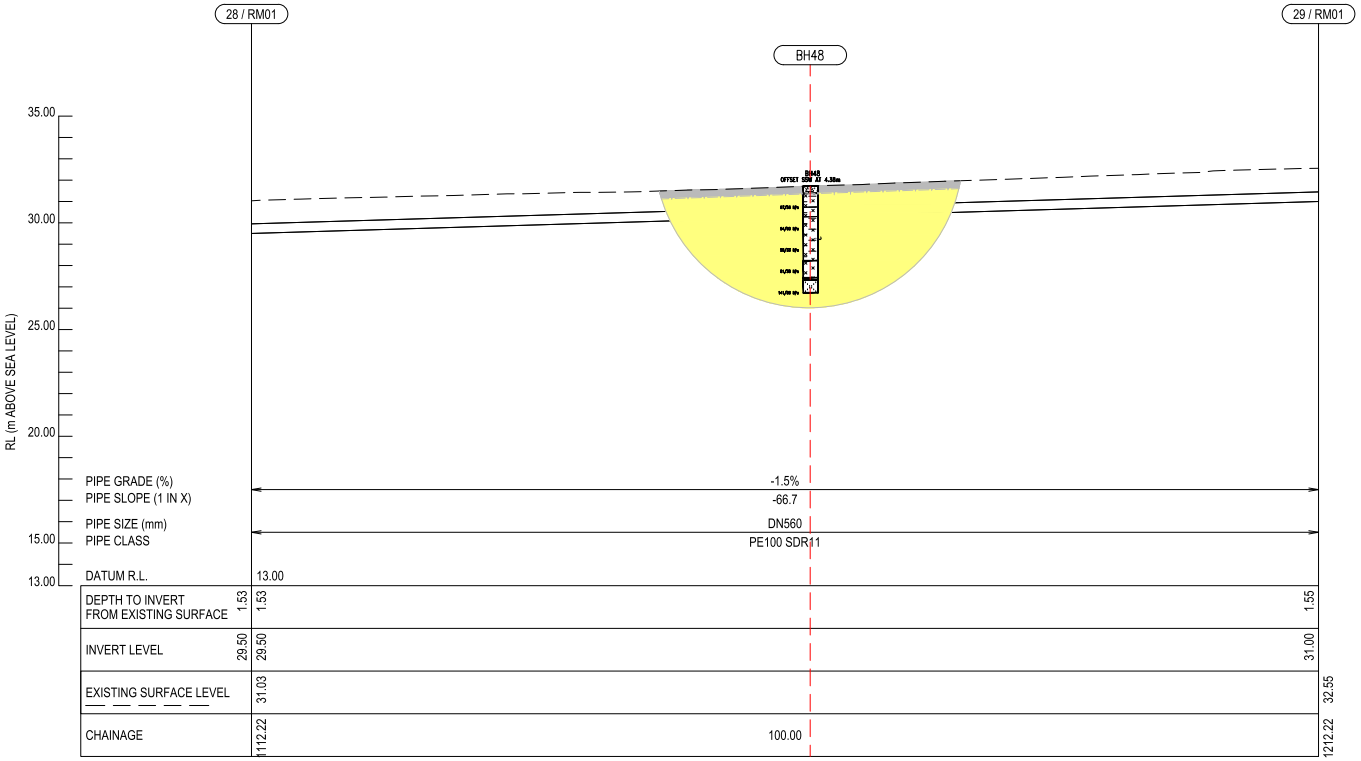
- FILL
- SANDY SILT
- SILTY CLAY
- SILTY SAND
- SILT
- SANDY CLAY
- CLAY
- CLAYEY SAND
- ORGANIC CLAY
- SANDY CLAY
- CLAYEY GRAVEL
- PEAT
- CORELOSS
- SAND

166/37 kPa CORRECTED UNDRAINED/DRAINED SHEAR STRENGTH VALUE

N > 50 UNCORRECTED SPT N VALUE

SCALA PENETROMETER

R / TD SCALA REFUSAL/TARGET DEPTH



A	FOR INTERNAL GHD REVIEW		15.03.2021
Rev	Description	Checked	Approved	Date

Author | Drafting Check

Designer | Design Check

VERTICAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

HORIZONTAL 1:500 AT ORIGINAL SIZE 0 5 10 15 20 25m

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GHD Pty Ltd

Project No. 12508391

Client WATER CARE

Project WHENUAPAI REDHILLS

Status | Status Code

Drawing Title: GEOTECHNICAL LONG SECTION SHEET 9 OF 14

Size A1

Drawing No. 12508391-C209

Rev A

Plot Date: 23 March 2021 - 1:42 PM Plotted by: Paige Boyed

File Name: N:\NZ\Auckland\Projects\51\12508391\Tech\Geotech\Package 1 Whenuapai Redhills\02 GIR\Working Folder\Drawings\12508391-C201_C214 pb EDIT.dwg

PLAN
SCALE 1:250

LEGEND

- TOP SOIL/FILL (NON - ENGINEERED)
- TGA-P: ORGANIC CLAY/SILT & PEAT
- TGA-C/TGA-ST: CLAY & SILT DOMINATED ALLUVIUM
- TGA-S: SAND DOMINATED ALLUVIUM
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- INFERRED GEOLOGICAL UNIT BOUNDARY
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- LIMITS OF GEOLOGICAL INTERPRETATION

- FILL
- SANDY SILT
- SILTY CLAY
- SILTY SAND
- SILT
- SANDY CLAY
- CLAY
- CLAYEY SAND
- ORGANIC CLAY
- SANDY CLAY
- CLAYEY GRAVEL
- PEAT
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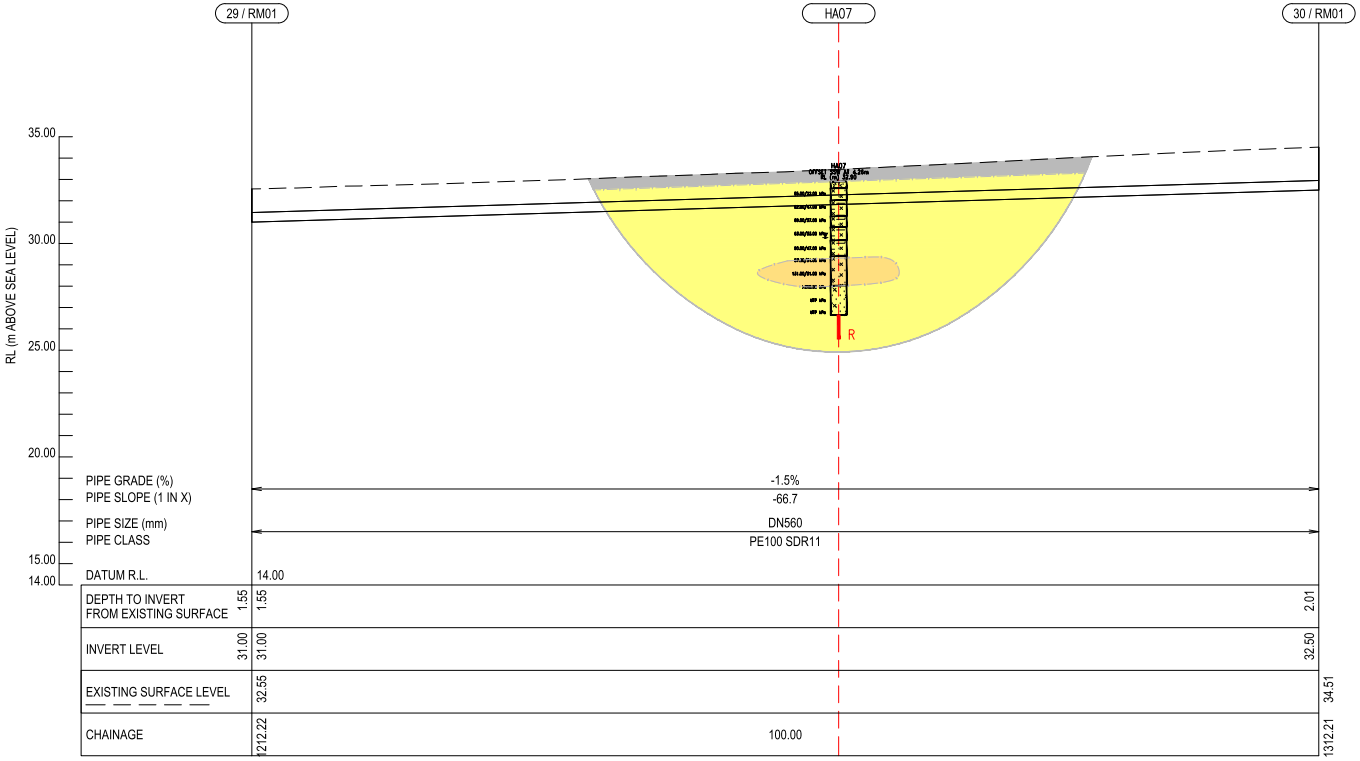
- 186/37 kPa — CORRECTED UNDRAINED/DRAINED SHEAR STRENGTH VALUE
- R > 50 — UNCORRECTED SPT N VALUE
- SCALA PENETROMETER
- R / TD — SCALA REFUSAL/TARGET DEPTH



Rev	Description	Checked	Approved	Date
A	FOR INTERNAL GHD REVIEW			15.03.2021

Author — Drafting Check
Designer — Design Check

VERTICAL 1:250 AT ORIGINAL SIZE
HORIZONTAL 1:500 AT ORIGINAL SIZE
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0 5 10 15 20 25m

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Project No. 12508391

Client WATER CARE
Project WHENUAPAI REDHILLS
Status
Status Code

Drawing Title
GEOTECHNICAL LONG SECTION
SHEET 10 OF 14

Size A1
Drawing No. 12508391-C210
Rev A

Plot Date: 23 March 2021 - 1:44 PM
Plotted by: Paige Boyed
File Name: N:\NZ\Auckland\Projects\51\12508391\Tech\Geotech\Package 1 Whenuapai Redhills\02 GIR\Working Folder\Drawings\12508391-C201_C214 pb EDIT.dwg

LEGEND

- TOP SOIL/FILL (NON - ENGINEERED)
- TGA-P: ORGANIC CLAY/SILT & PEAT
- TGA-C/TGA-ST: CLAY & SILT DOMINATED ALLUVIUM
- TGA-S: SAND DOMINATED ALLUVIUM
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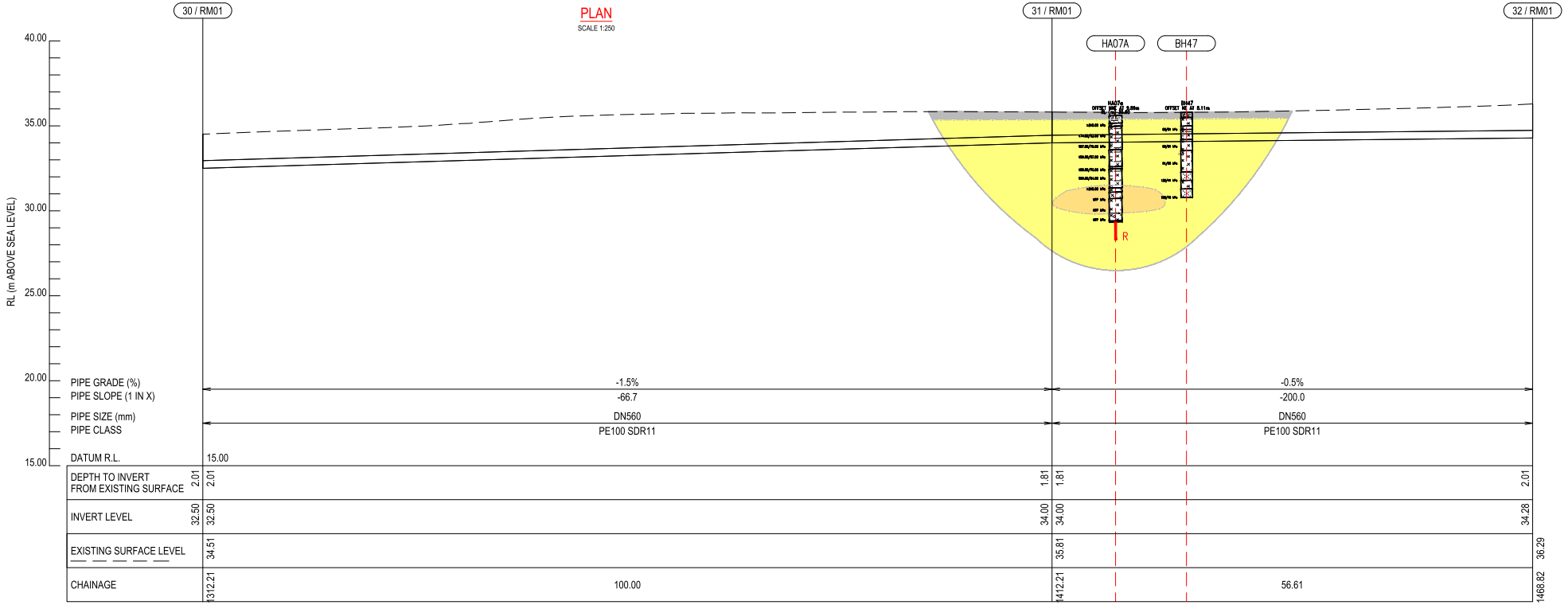
- FILL
- SANDY SILT
- SILTY CLAY
- SILTY SAND
- SILT
- SANDY CLAY
- CLAY
- CLAYEY SAND
- ORGANIC CLAY
- SANDY CLAY
- CLAYEY GRAVEL
- PEAT
- CORELOSS
- SAND
- 186/57 kPa — CORRECTED UNDRAINED/DRAINED SHEAR STRENGTH VALUE
- N > 50 — UNCORRECTED SPT N VALUE
- SCALA PENETROMETER
- R / TD — SCALA REFUSAL/TARGET DEPTH

PLAN
SCALE 1:250



PIPE GRADE (%)		-1.5%					-0.5%		
PIPE SLOPE (1 IN X)		-66.7					-200.0		
PIPE SIZE (mm)		DN560					DN560		
PIPE CLASS		PE100 SDR11					PE100 SDR11		
DATUM R.L.	15.00								
DEPTH TO INVERT FROM EXISTING SURFACE	2.01	2.01				1.81	1.81		2.01
INVERT LEVEL	32.50	32.50				34.00	34.00		34.28
EXISTING SURFACE LEVEL	34.51						35.81		36.29
CHAINAGE	1312.21	100.00				1412.21	56.61		1468.82

Rev	Description	Checked	Approved	Date
A	FOR INTERNAL GHD REVIEW			15.03.2021

Author — Drafting Check
Designer — Design Check

VERTICAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m
HORIZONTAL 1:500 AT ORIGINAL SIZE 0 5 10 15 20 25m

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Project No. 12508391

Client: WATER CARE
Project: WHENUAPAI REDHILLS
Status
Status Code

Drawing Title: GEOTECHNICAL LONG SECTION SHEET 11 OF 14
Size: A1
Drawing No. 12508391-C211
Rev: A

Plot Date: 23 March 2021 - 1:45 PM Plotted by: Paige Boyed
File Name: N:\NZ\Auckland\Projects\51\12508391\Tech\Geotech\Package 1 Whenuapai Redhills\02 GIR\Working Folder\Drawings\12508391-C201_C214 pb EDIT.dwg

LEGEND

TOP SOIL/FILL (NON - ENGINEERED)	FILL	SANDY CLAY	CLAYEY GRAVEL
TGA-P: ORGANIC CLAY/SILT & PEAT	SANDY SILT	CLAY	PEAT
TGA-C/TGA-ST: CLAY & SILT DOMINATED ALLUVIUM	SILTY CLAY	CLAYEY SAND	CORELOSS
TGA-S: SAND DOMINATED ALLUVIUM	SILTY SAND	ORGANIC CLAY	SAND
ECBF-RS: EAST COAST BAYS RESIDUAL SOIL	SILT	SANDY CLAY	
ECBF-HW: EAST COAST BAYS HIGH WEATHERED ROCK			
ECBF-MW: EAST COAST BAYS MODERATELY WEATHERED ROCK			
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168/37 kPa — CORRECTED UNDRAINED/DRAINED SHEAR STRENGTH VALUE

N > 50 — UNCORRECTED SPT N VALUE

SCALA PENETROMETER

R / TD — SCALA REFUSAL/TARGET DEPTH

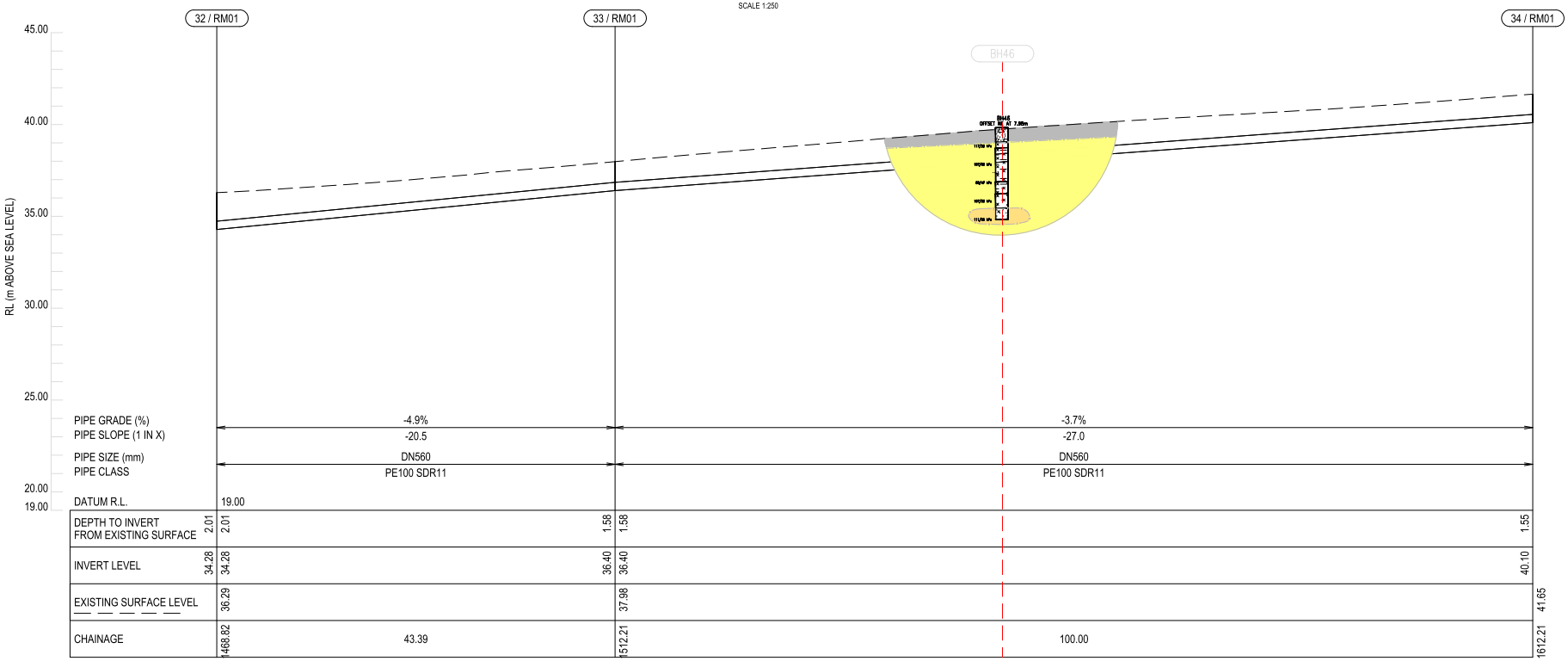
INFERRED GEOLOGICAL UNIT BOUNDARY

INFERRED GROUNDWATER

LIMITS OF GEOLOGICAL INTERPRETATION

PLAN

SCALE 1:250



PIPE GRADE (%)		-4.9%		-3.7%
PIPE SLOPE (1 IN X)		-20.5		-27.0
PIPE SIZE (mm)		DN560		DN560
PIPE CLASS		PE100 SDR11		PE100 SDR11
DATUM R.L.	19.00			
DEPTH TO INVERT FROM EXISTING SURFACE	2.01	2.01 / 1.58	1.58	1.55
INVERT LEVEL	34.28	34.28 / 36.40	36.40	40.10
EXISTING SURFACE LEVEL	36.29		37.98	41.65
CHAINAGE	1468.82	43.39	1512.21	100.00 / 1612.21

Rev	Description	Checked	Approved	Date
A	FOR INTERNAL GHD REVIEW			15.03.2021

Author — Drafting Check

Designer — Design Check

VERTICAL 1:250 AT ORIGINAL SIZE — 0 2.5 5 7.5 10 12.5m

HORIZONTAL 1:500 AT ORIGINAL SIZE — 0 5 10 15 20 25m

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www.ghd.com

GHD Pty Ltd

Project No.

Client: WATER CARE

Project: WHENUAPAI REDHILLS

Status — Status Code

Drawing Title: GEOTECHNICAL LONG SECTION SHEET 12 OF 14

Drawing No.: 12508391-C212

Size: A1

Rev: A

Plot Date: 23 March 2021 - 3:15 PM Plotted by: Paige Boyed

File Name: \\ghdnetghd\NZ\Auckland\Projects\51\12508391\Tech\Geotech\Package 1 Whenuapai Redhills\02 GIR\Working Folder\Drawings\12508391-C201_C214 pb EDIT.dwg

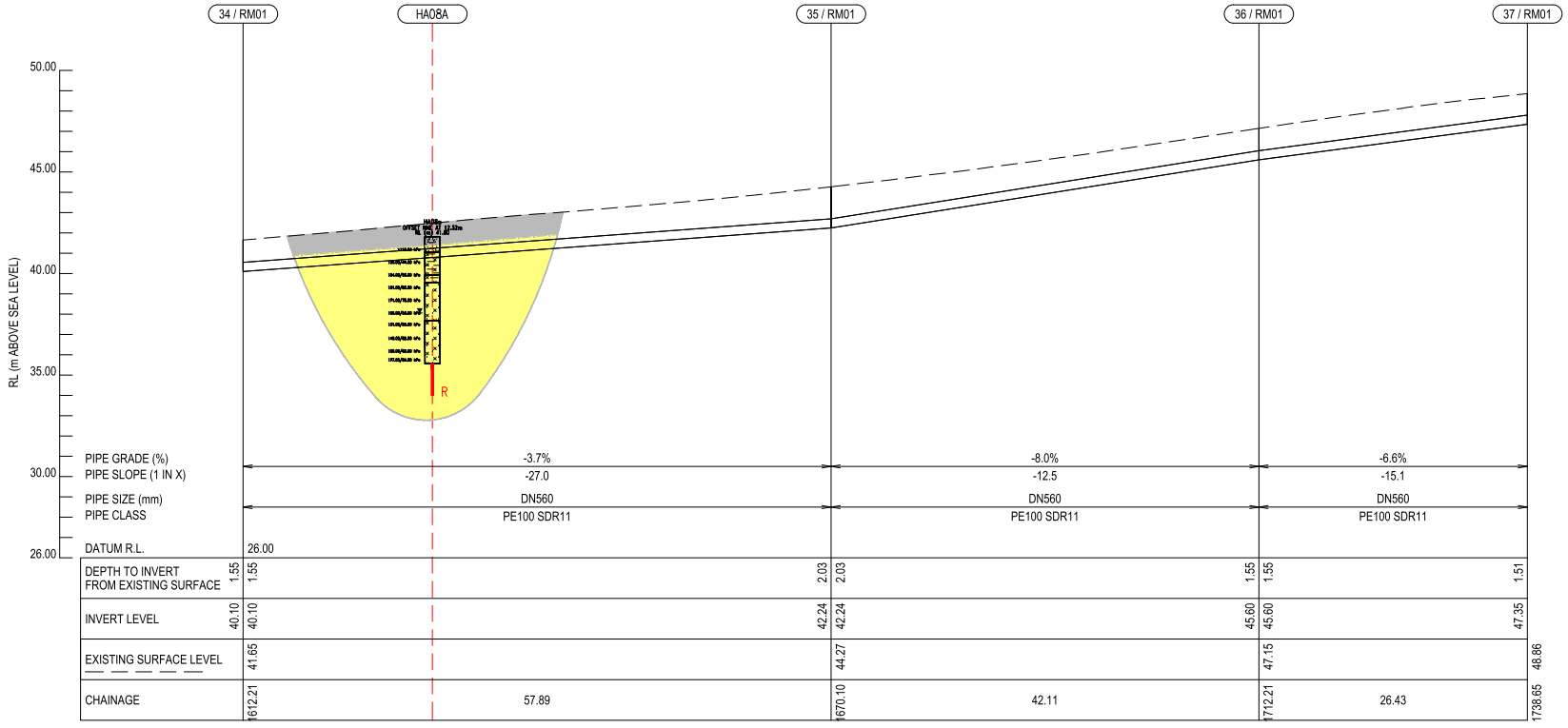
PLAN
SCALE 1:250

LEGEND

- TOP SOIL/FILL (NON - ENGINEERED)
- TGA-P: ORGANIC CLAY/SILT & PEAT
- TGA-C/TGA-ST: CLAY & SILT DOMINATED ALLUVIUM
- TGA-S: SAND DOMINATED ALLUVIUM
- ECBF-RS: EAST COAST BAYS RESIDUAL SOIL
- ECBF-HW: EAST COAST BAYS HIGH WEATHERED ROCK
- ECBF-MW: EAST COAST BAYS MODERATELY WEATHERED ROCK
- ECBF SW-UW: EAST COAST BAYS SLIGHTLY TO UNWEATHERED ROCK
- AL-CO CW: ALBANY CONGLOMERATE COMPLETELY WEATHERED
- AL-CO HW-MW: ALBANY CONGLOMERATE HIGHLY TO MODERATELY WEATHERED
- AL-CO SW-UW: ALBANY CONGLOMERATE SLIGHTLY TO UNWEATHERED
- INFERRED GEOLOGICAL UNIT BOUNDARY
- INFERRED GROUNDWATER
- LIMITS OF GEOLOGICAL INTERPRETATION

- FILL
- SANDY SILT
- SILTY CLAY
- SILTY SAND
- SILT
- SANDY CLAY
- CLAY
- CLAYEY SAND
- ORGANIC CLAY
- SANDY CLAY
- CLAYEY GRAVEL
- PEAT
- CORELOSS
- SAND

- 106/37 kPa — CORRECTED UNDRAINED/DRAINED SHEAR STRENGTH VALUE
- N > 50 — UNCORRECTED SPT N VALUE
- SCALA PENETROMETER
- R / TD — SCALA REFUSAL/TARGET DEPTH



Rev	Description	Checked	Approved	Date
A	FOR INTERNAL GHD REVIEW			15.03.2021

Author | Drafting Check
Designer | Design Check

VERTICAL 1:250 AT ORIGINAL SIZE
HORIZONTAL 1:500 AT ORIGINAL SIZE
0 2.5 5 7.5 10 12.5m
0 5 10 15 20 25m

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www.ghd.com
GHD Pty Ltd

Project No. 12508391

Client: WATER CARE
Project: WHENUAPAI REDHILLS
Status | Status Code

Drawing Title: GEOTECHNICAL LONG SECTION SHEET 13 OF 14
Size: A1
Drawing No.: 12508391-C213
Rev: A

Plot Date: 23 March 2021 - 1:47 PM Plotted by: Paige Boyed
File Name: N:\NZ\Auckland\Projects\51\12508391\Tech\Geotech\Package 1 Whenuapai Redhills\02 GIR\Working Folder\Drawings\12508391-C201_C214 pb EDIT.dwg

PLAN

SCALE 1:250

LEGEND

- TOP SOIL/FILL (NON - ENGINEERED)
- TGA-P: ORGANIC CLAY/SILT & PEAT
- TGA-C/TGA-ST: CLAY & SILT DOMINATED ALLUVIUM
- TGA-S: SAND DOMINATED ALLUVIUM
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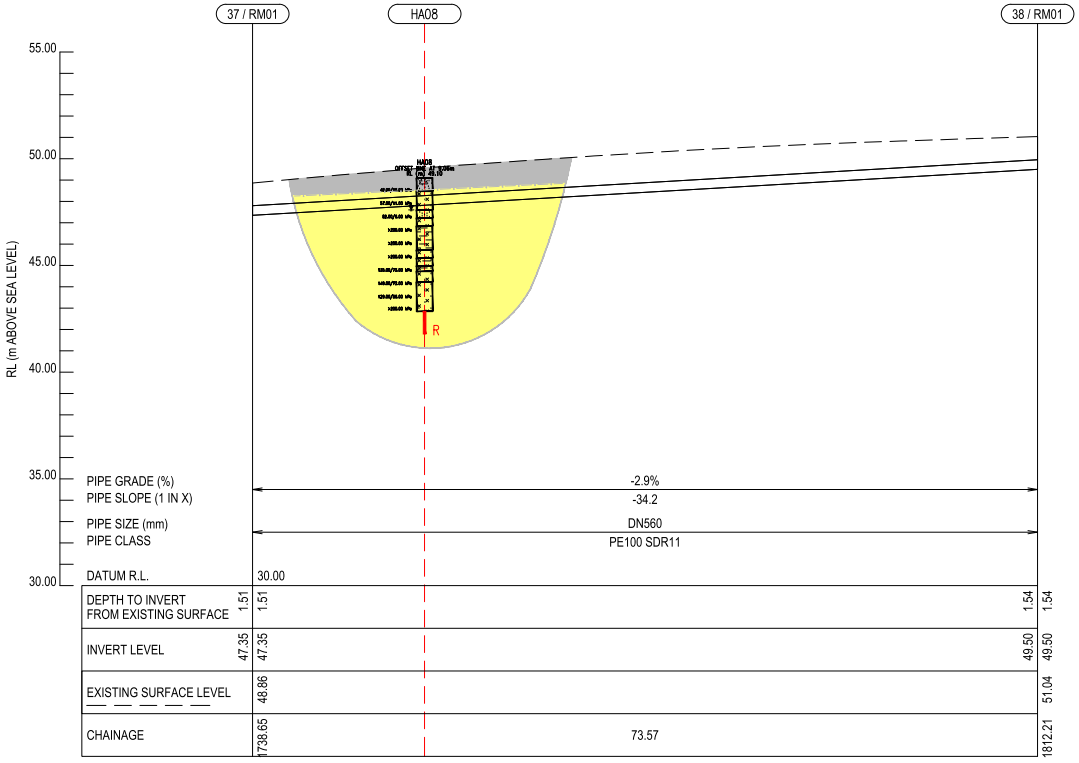
- AL-CO HW-MW: ALBANY CONGLOMERATE HIGHLY TO MODERATELY WEATHERED
- AL-CO SW-UW: ALBANY CONGLOMERATE SLIGHTLY TO UNWEATHERED
- INFERRED GEOLOGICAL UNIT BOUNDARY
- INFERRED GROUNDWATER
- LIMITS OF GEOLOGICAL INTERPRETATION
- FILL
- SANDY SILT
- SILTY CLAY
- SILTY SAND
- SILT
- SANDY CLAY
- CLAY
- CLAYEY SAND
- ORGANIC CLAY
- SANDY CLAY
- CLAYEY GRAVEL
- PEAT
- CORELOSS
- SAND
- 105/37 kPa — CORRECTED UNDRAINED/DRAINED SHEAR STRENGTH VALUE
- N > 50 — UNCORRECTED SPT N VALUE
- SCALA PENETROMETER
- R / TD — SCALA REFUSAL/TARGET DEPTH



Rev	Description	Checked	Approved	Date
A	FOR INTERNAL GHD REVIEW			15.03.2021

Author | Drafting Check

Designer | Design Check

VERTICAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

HORIZONTAL 1:500 AT ORIGINAL SIZE 0 5 10 15 20 25m

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www.ghd.com

GHD Pty Ltd

Project No. 12508391

Client: WATER CARE

Project: WHENUAPAI REDHILLS

Drawing Title: GEOTECHNICAL LONG SECTION SHEET 14 OF 14

Size: A1

Drawing No.: 12508391-C214

Rev: A

Status

Status Code

Plot Date: 23 March 2021 - 1:48 PM Plotted by: Paige Boyed

File Name: N:\NZ\Auckland\Projects\51\12508391\Tech\Geotech\Package 1 Whenuapai Redhills\02 GIR\Working Folder\Drawings\12508391-C201_C214 pb EDIT.dwg

Appendix E – Liquefaction Analysis Results

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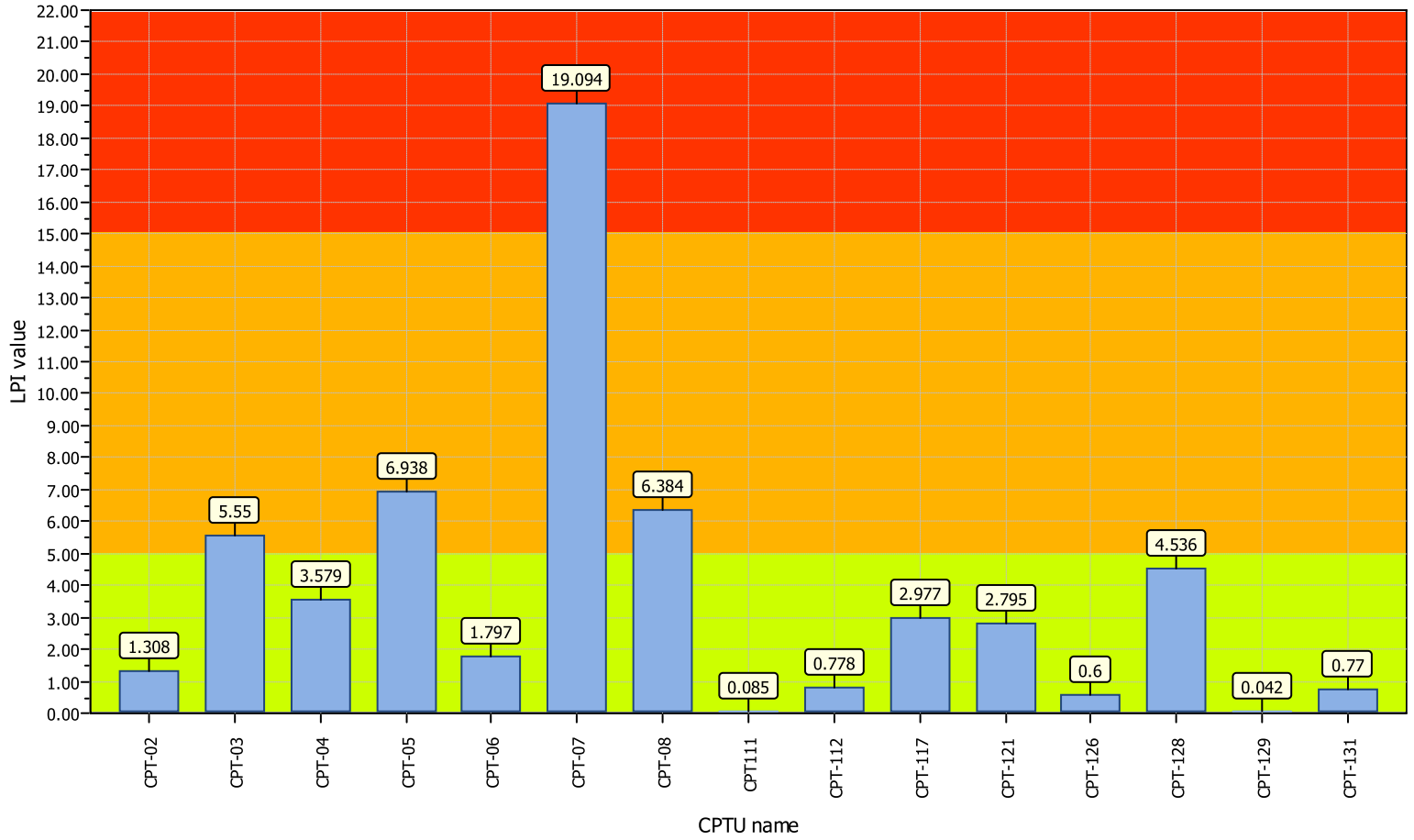
http://www.geologismiki.gr

Project title :

Location :

Overall Liquefaction Potential Index report



LPI color scheme

- Very high risk
- High risk
- Low risk

Basic statistics

Total CPT number: 15
73.33% low risk
20.00% high risk
6.67% very high risk

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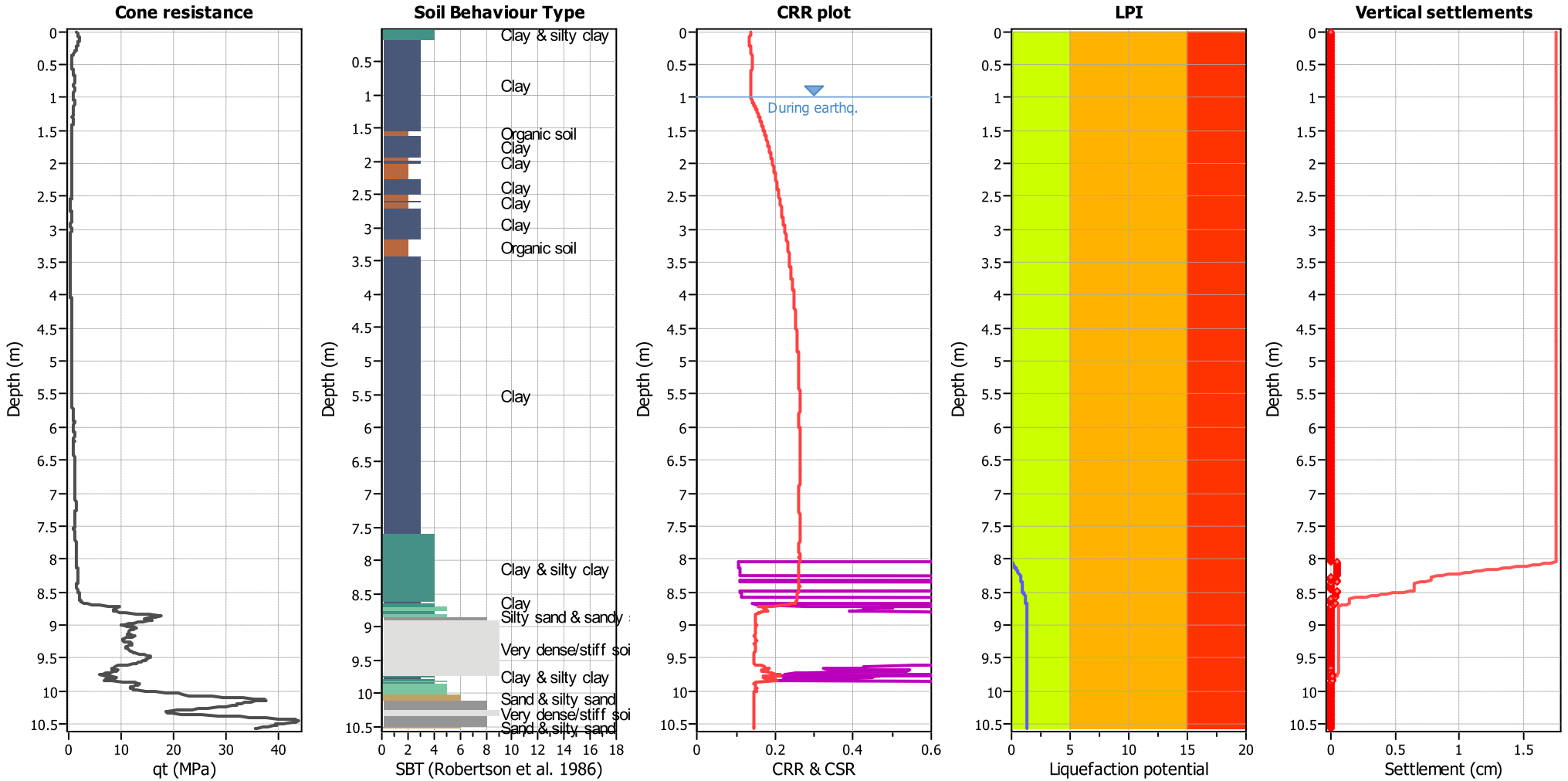
Project:
Location:

CPT: CPT-02
Total depth: 10.57 m



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Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	.		

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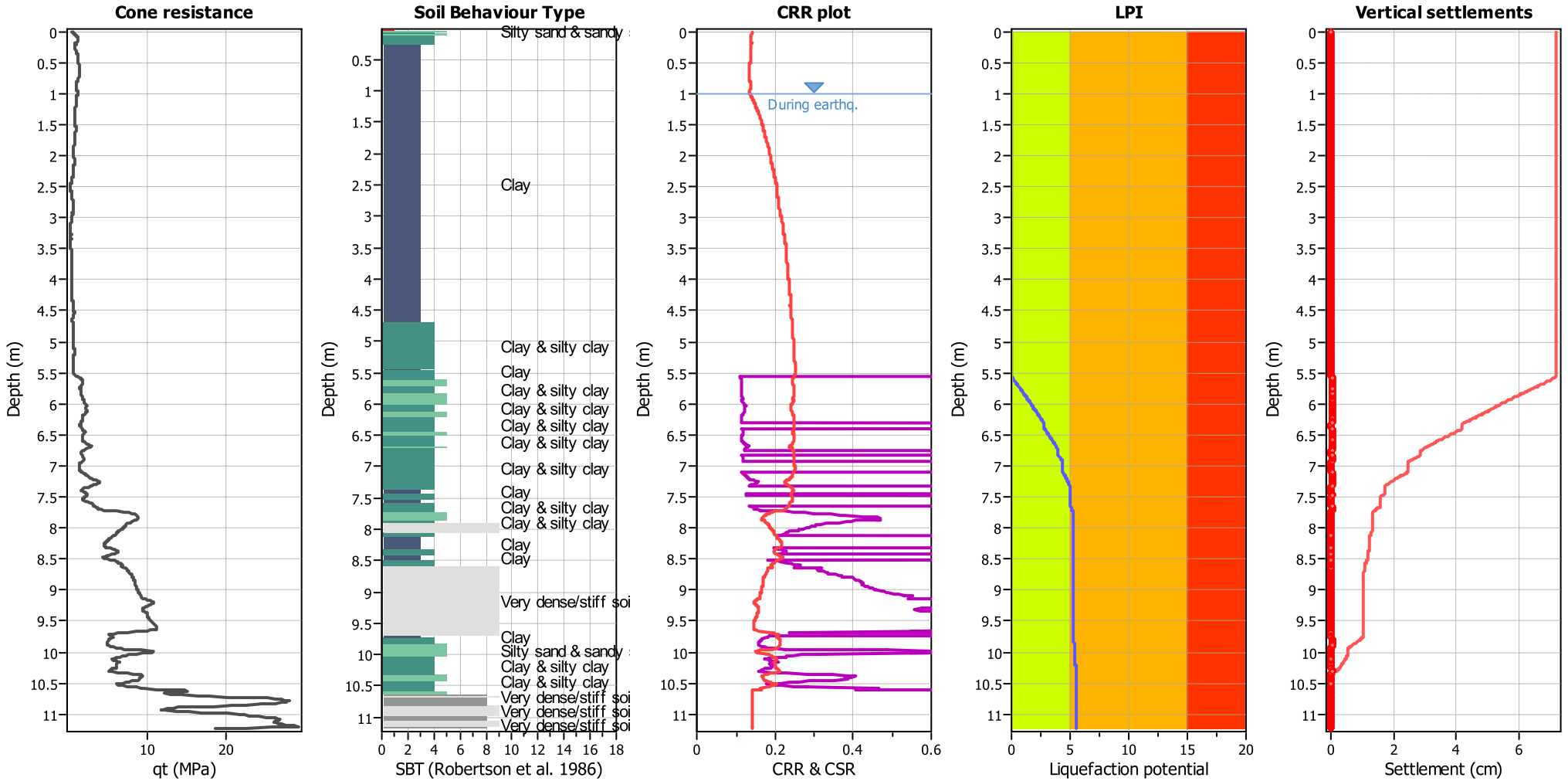
Project:
Location:

CPT: CPT-03
Total depth: 11.23 m



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Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	.		

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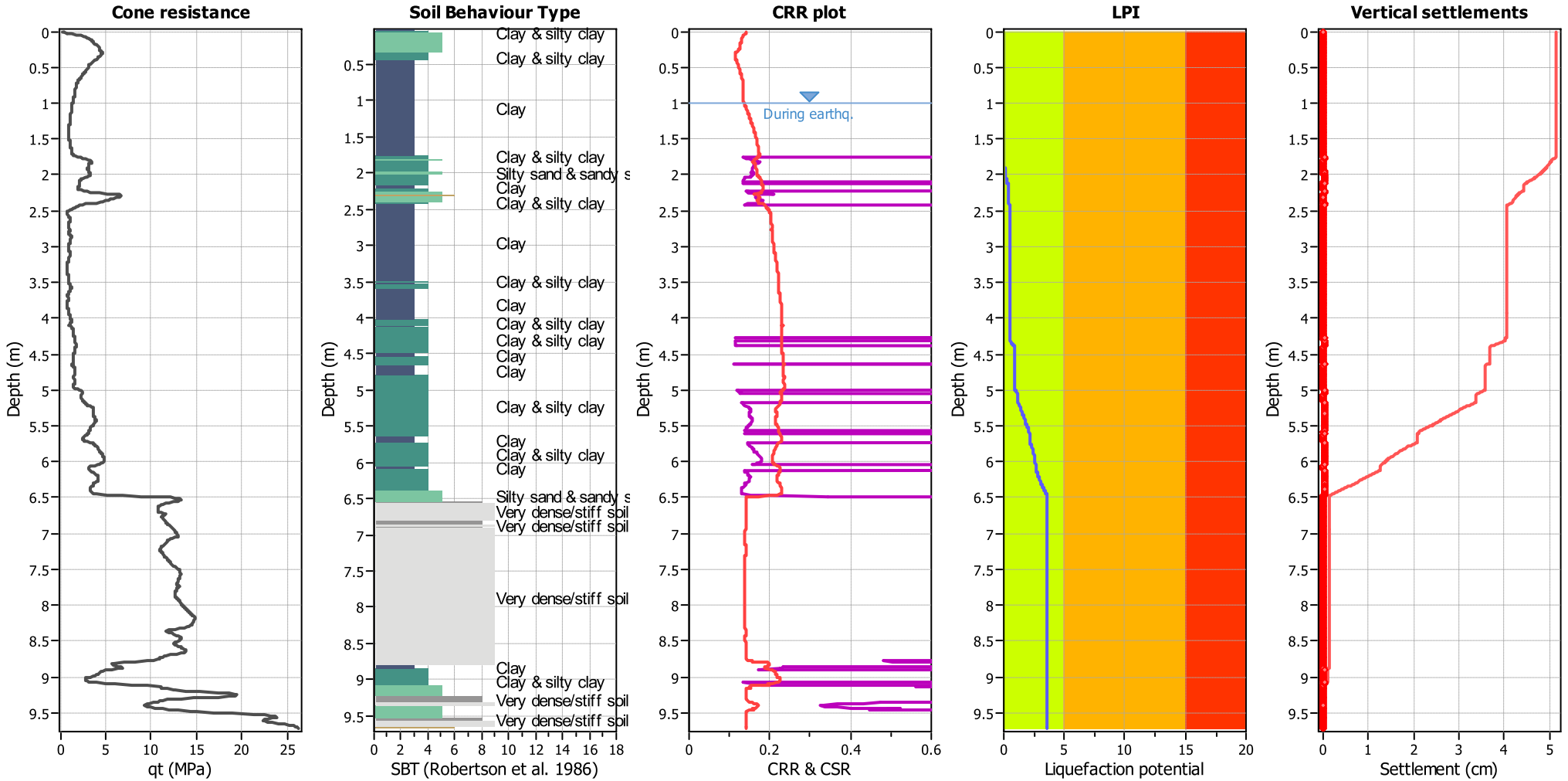
Project:
Location:

CPT: CPT-04
Total depth: 9.72 m



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Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	.		

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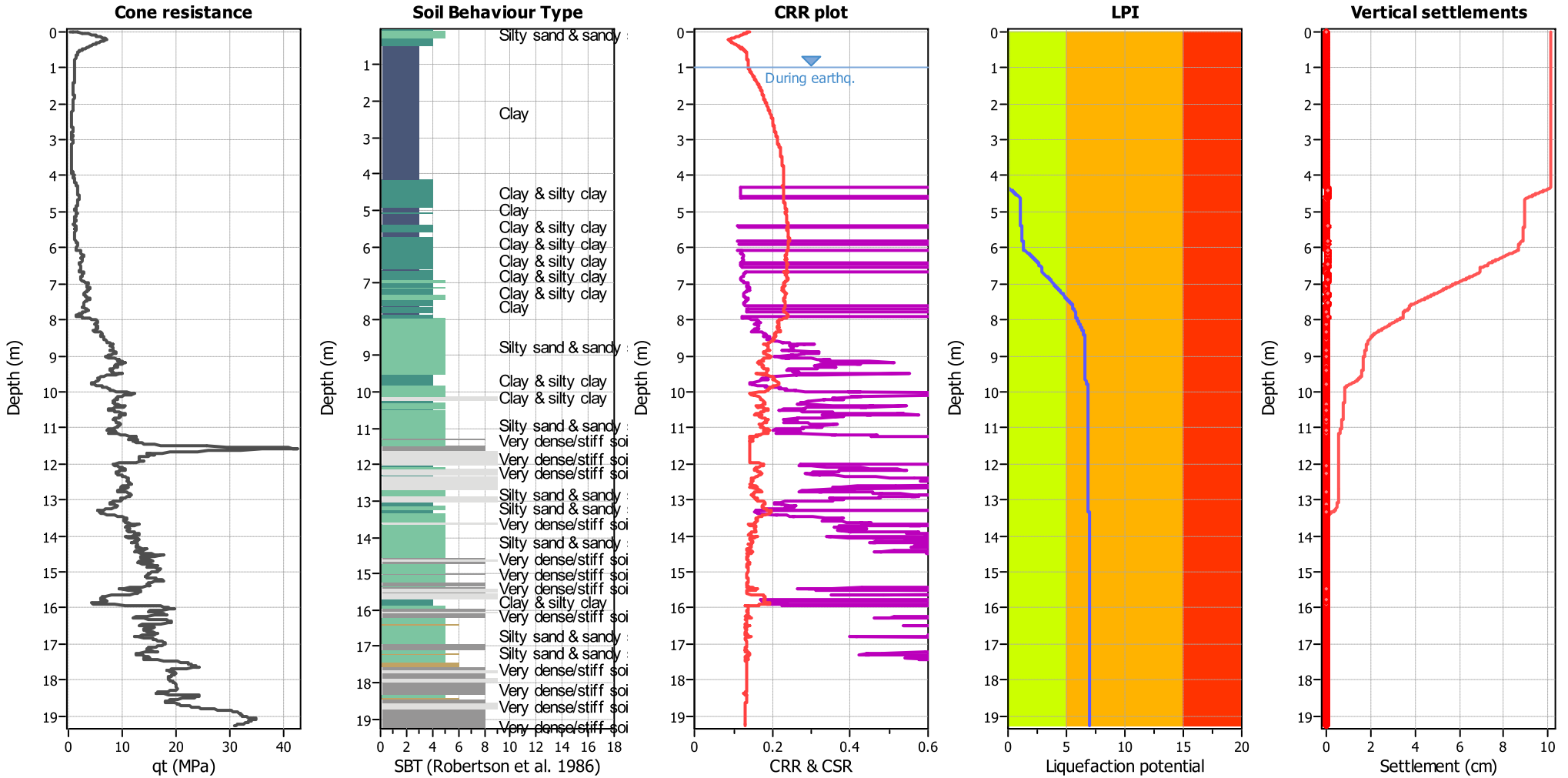
Project:
Location:

CPT: CPT-05
Total depth: 19.27 m



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Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	.		

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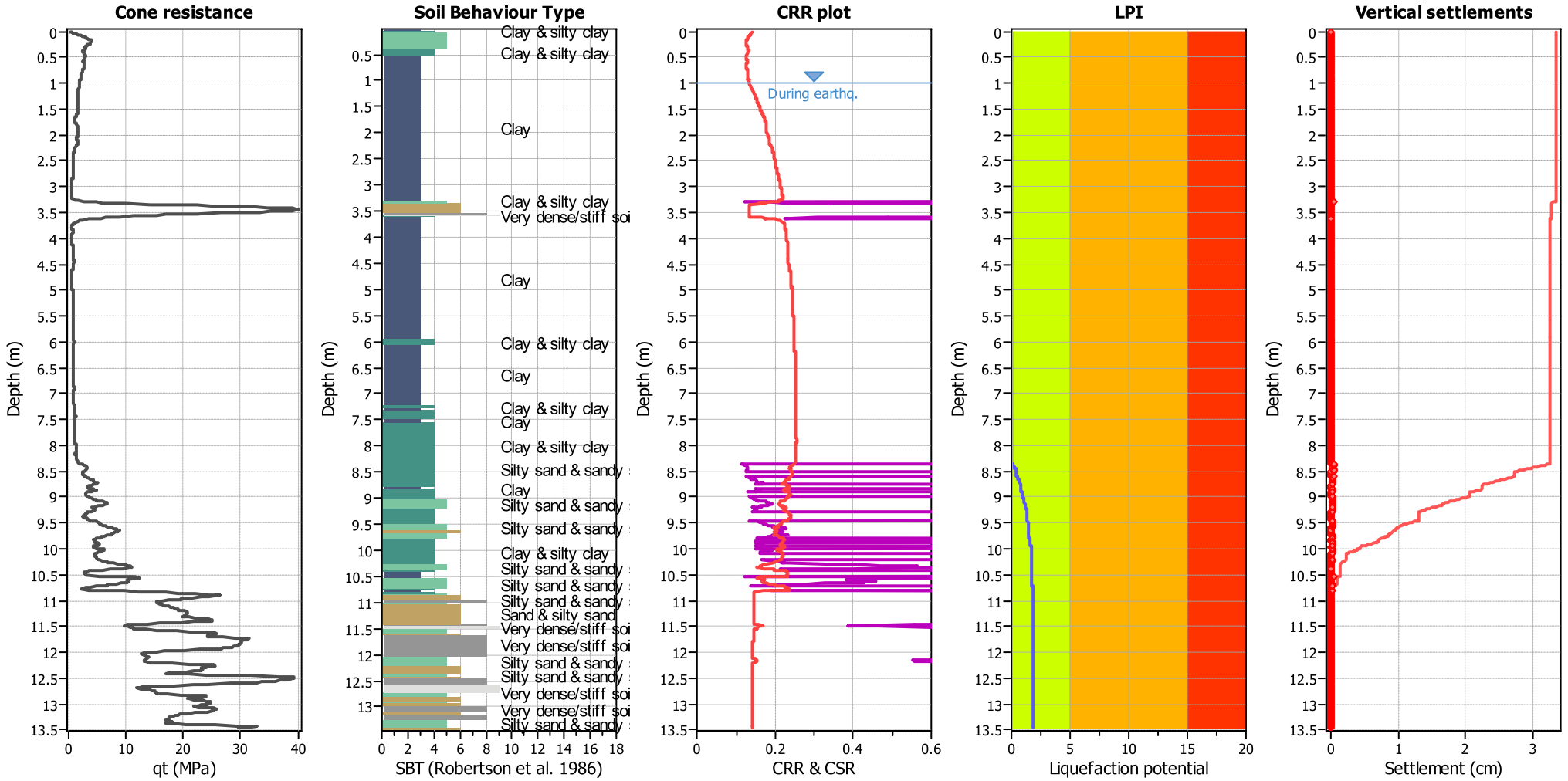
Project:
Location:

CPT: CPT-06
Total depth: 13.46 m



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Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	.		

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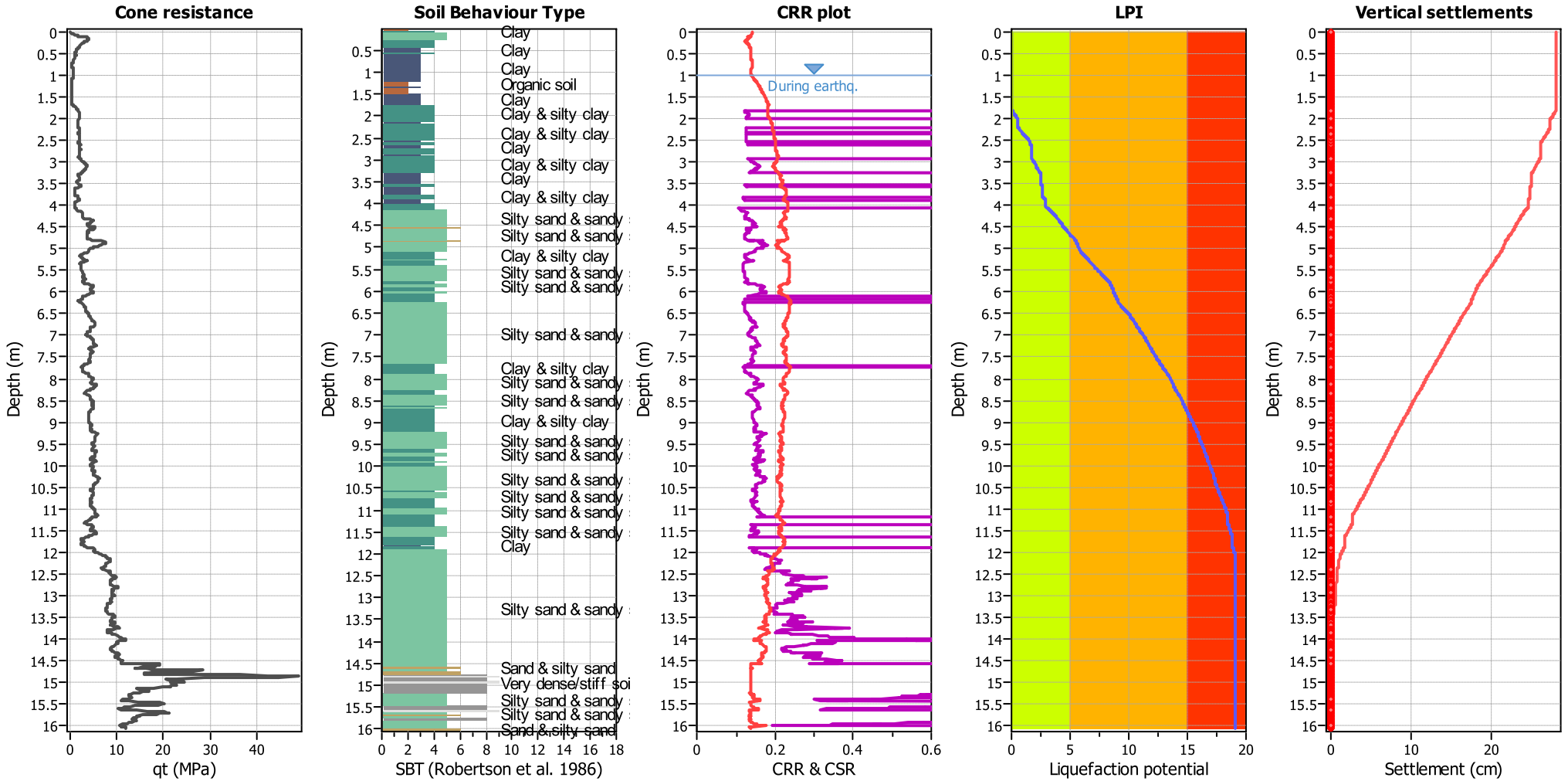
Project:
Location:

CPT: CPT-07
Total depth: 16.06 m



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Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	.		

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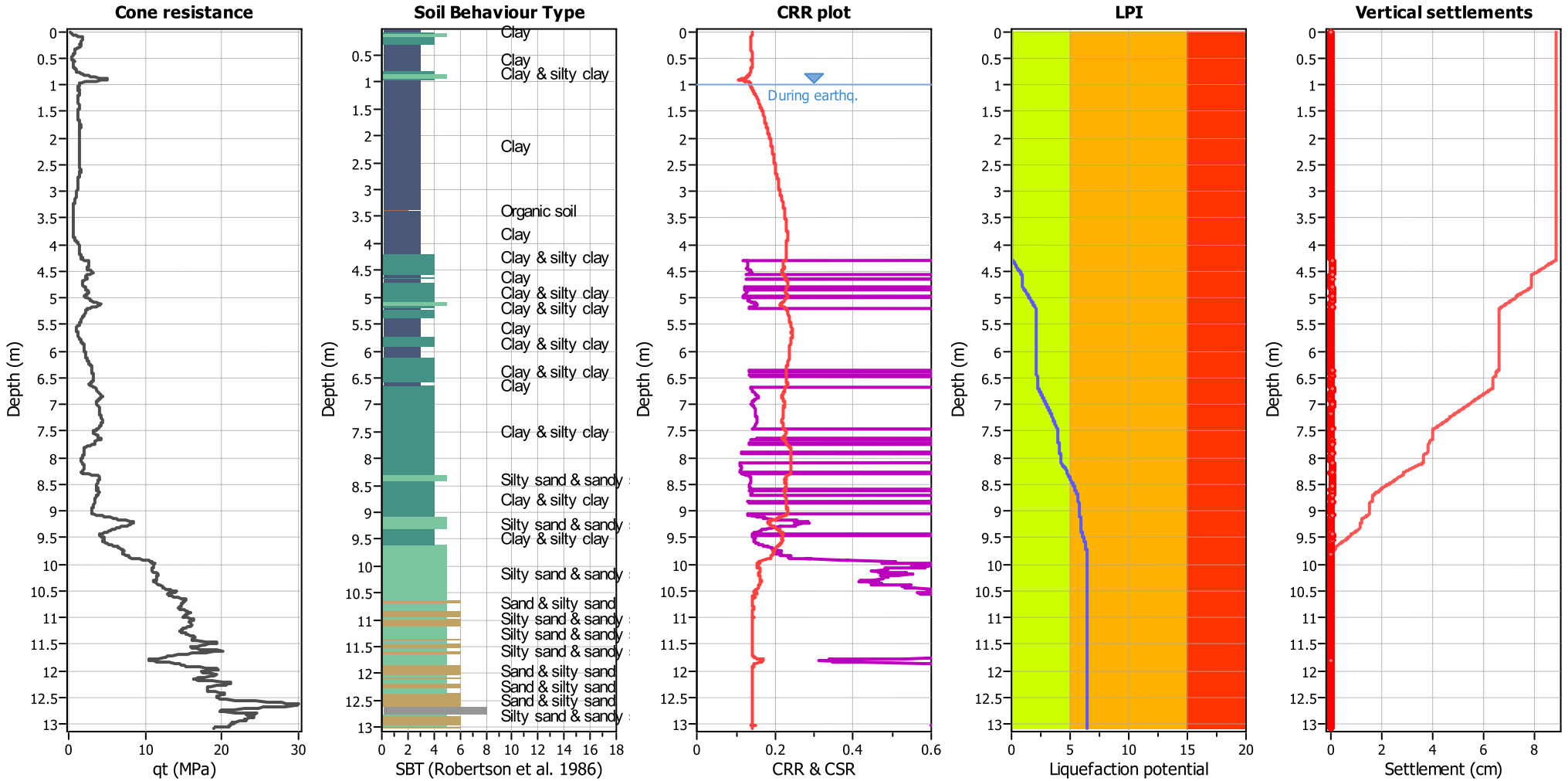
Project:
Location:

CPT: CPT-08
Total depth: 13.08 m



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Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	.		

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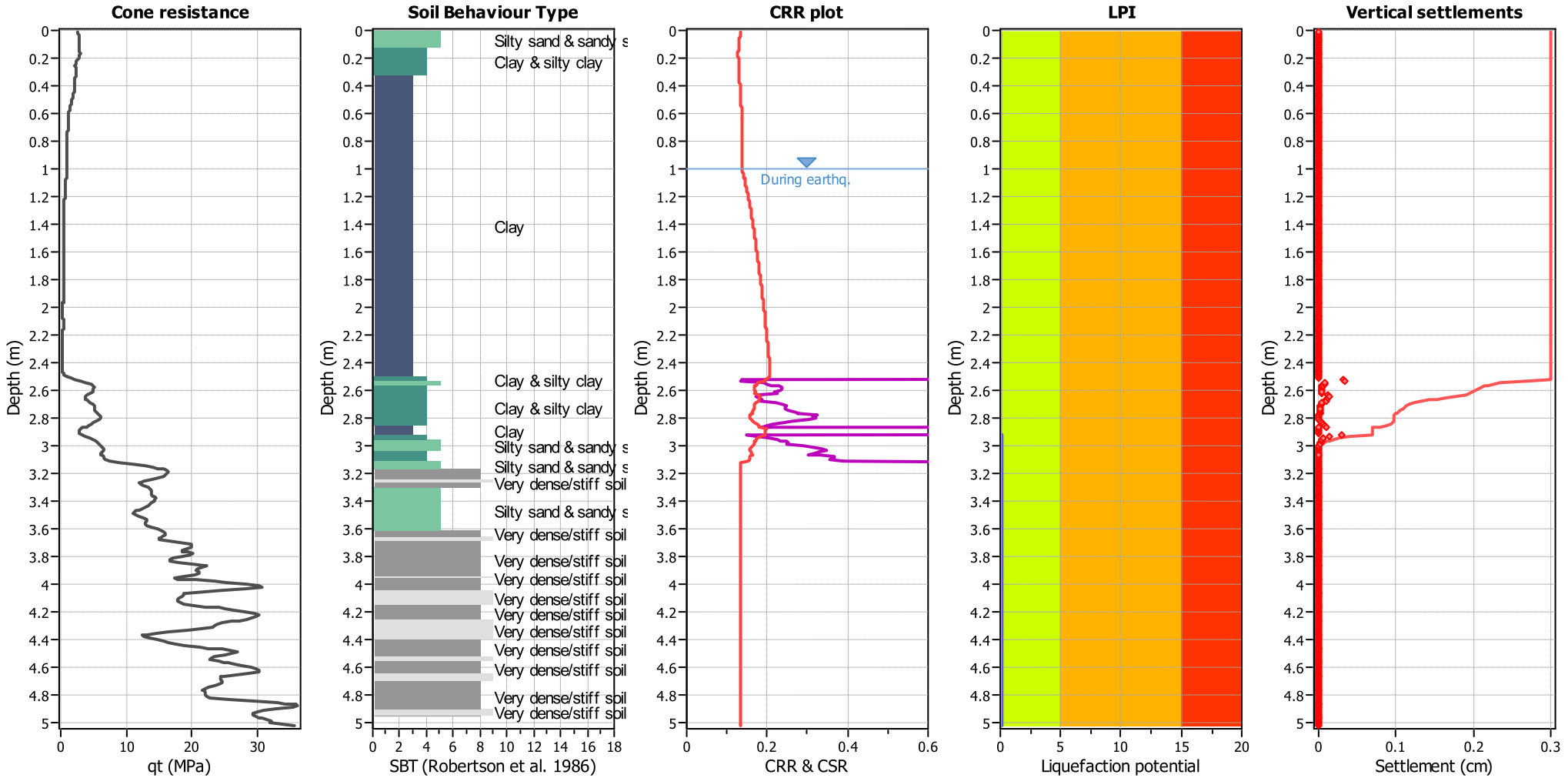
Project:
Location:

CPT: CPT111
Total depth: 5.02 m



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Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	.		

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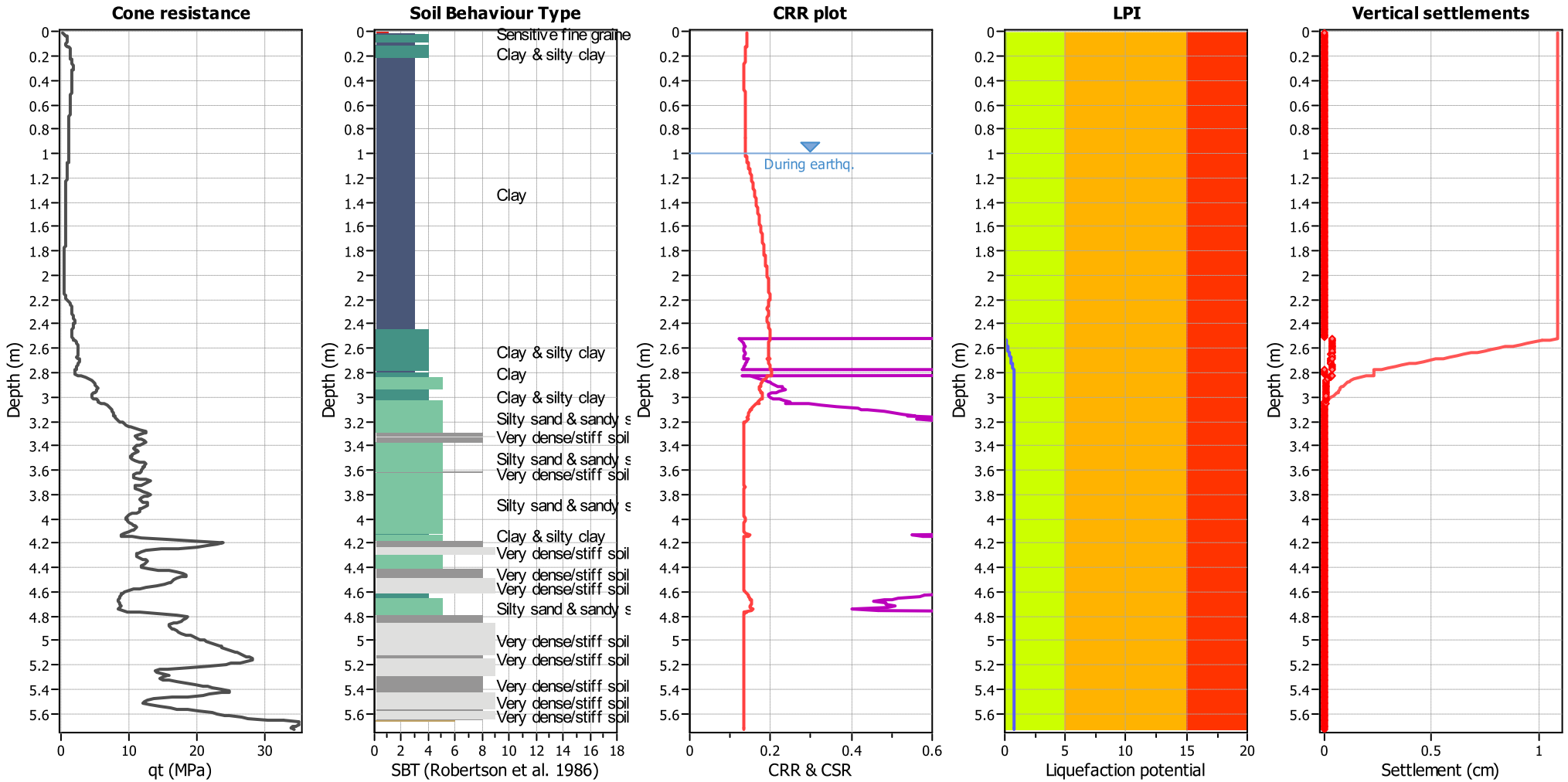
Project:
Location:

CPT: CPT-112
Total depth: 5.73 m



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Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	.		

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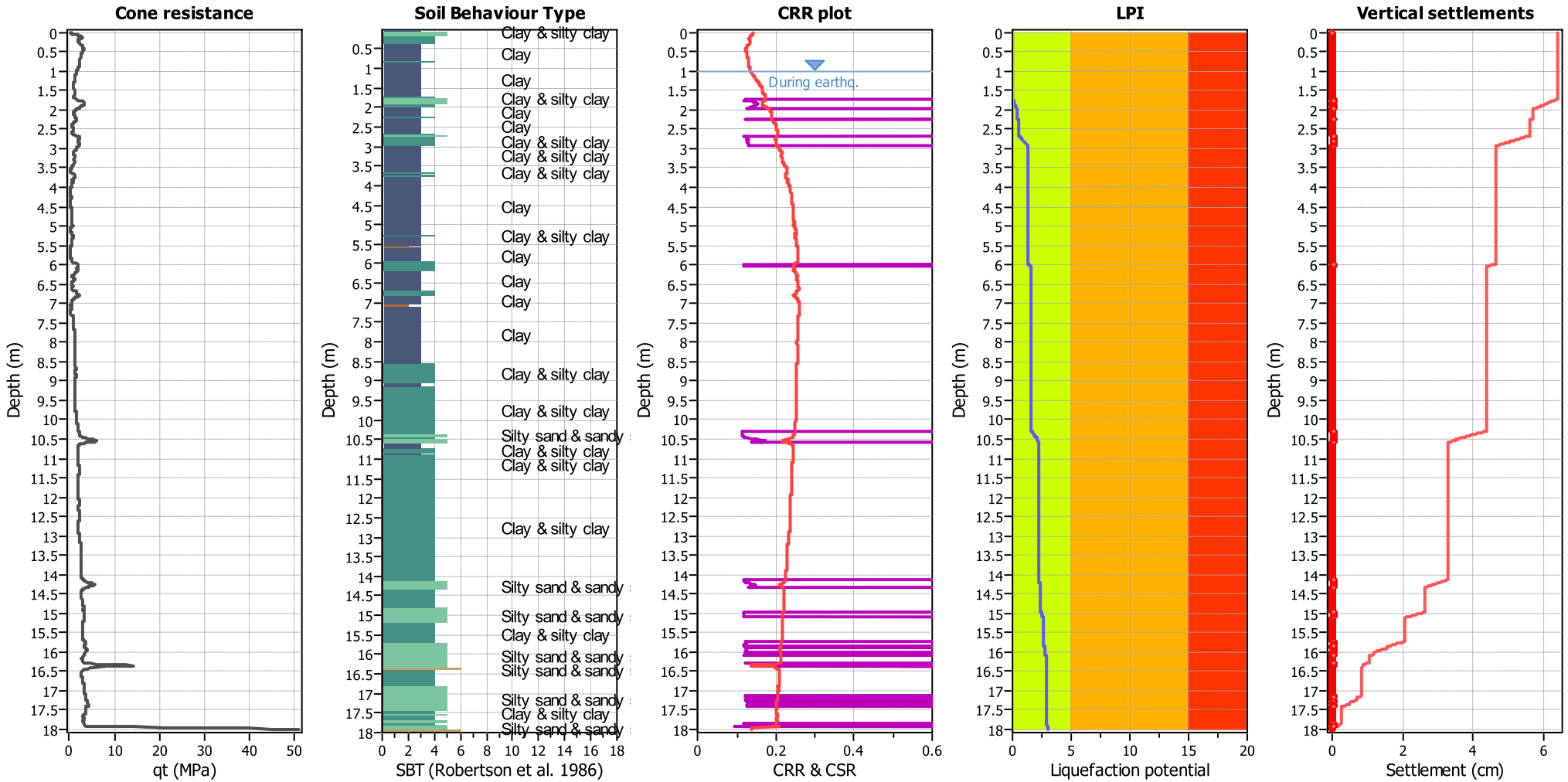
Project:
Location:

CPT: CPT-117
Total depth: 18.00 m



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Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
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Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	.		

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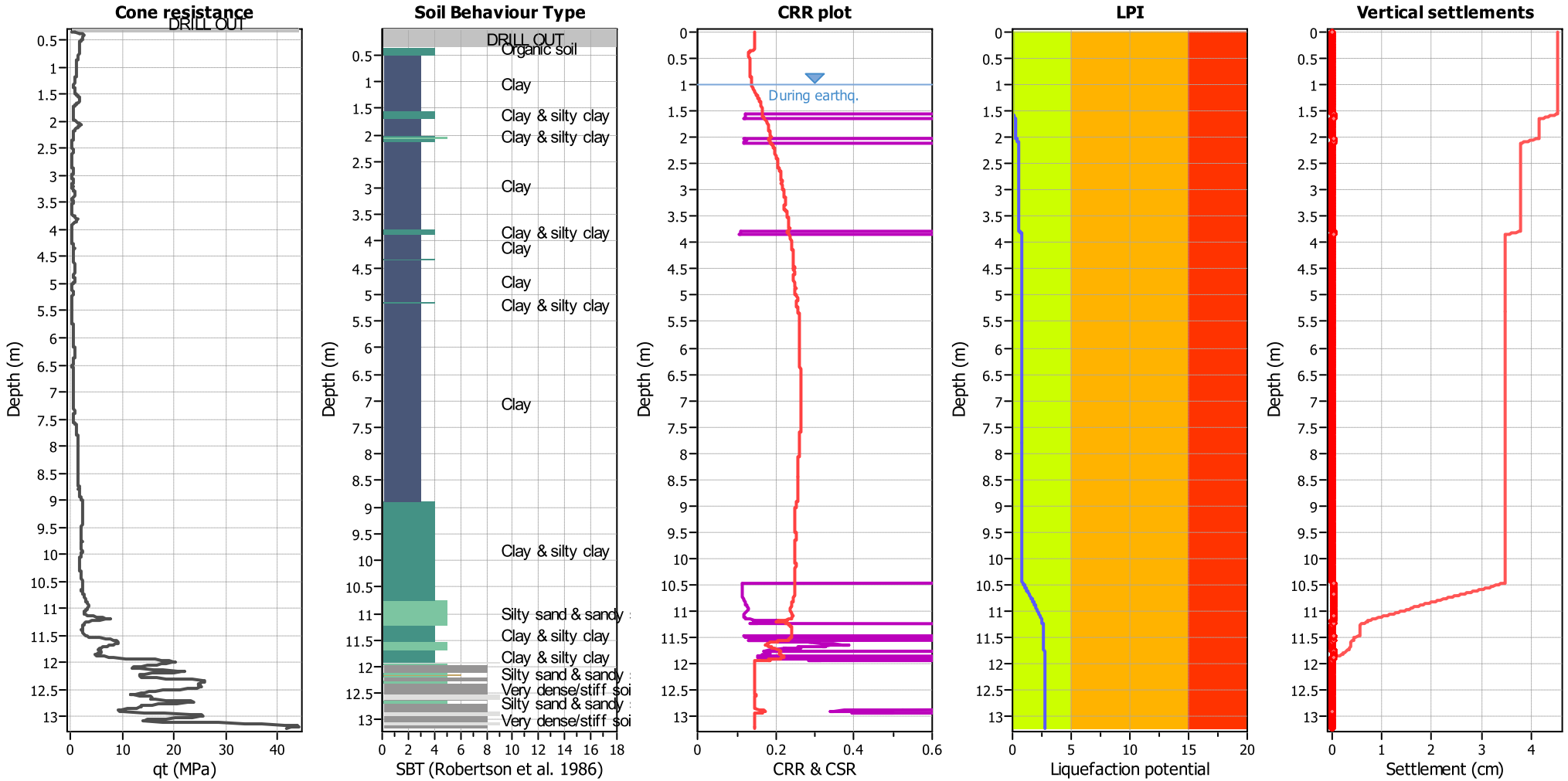
Project:
Location:

CPT: CPT-121
Total depth: 13.22 m



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Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
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Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	.		

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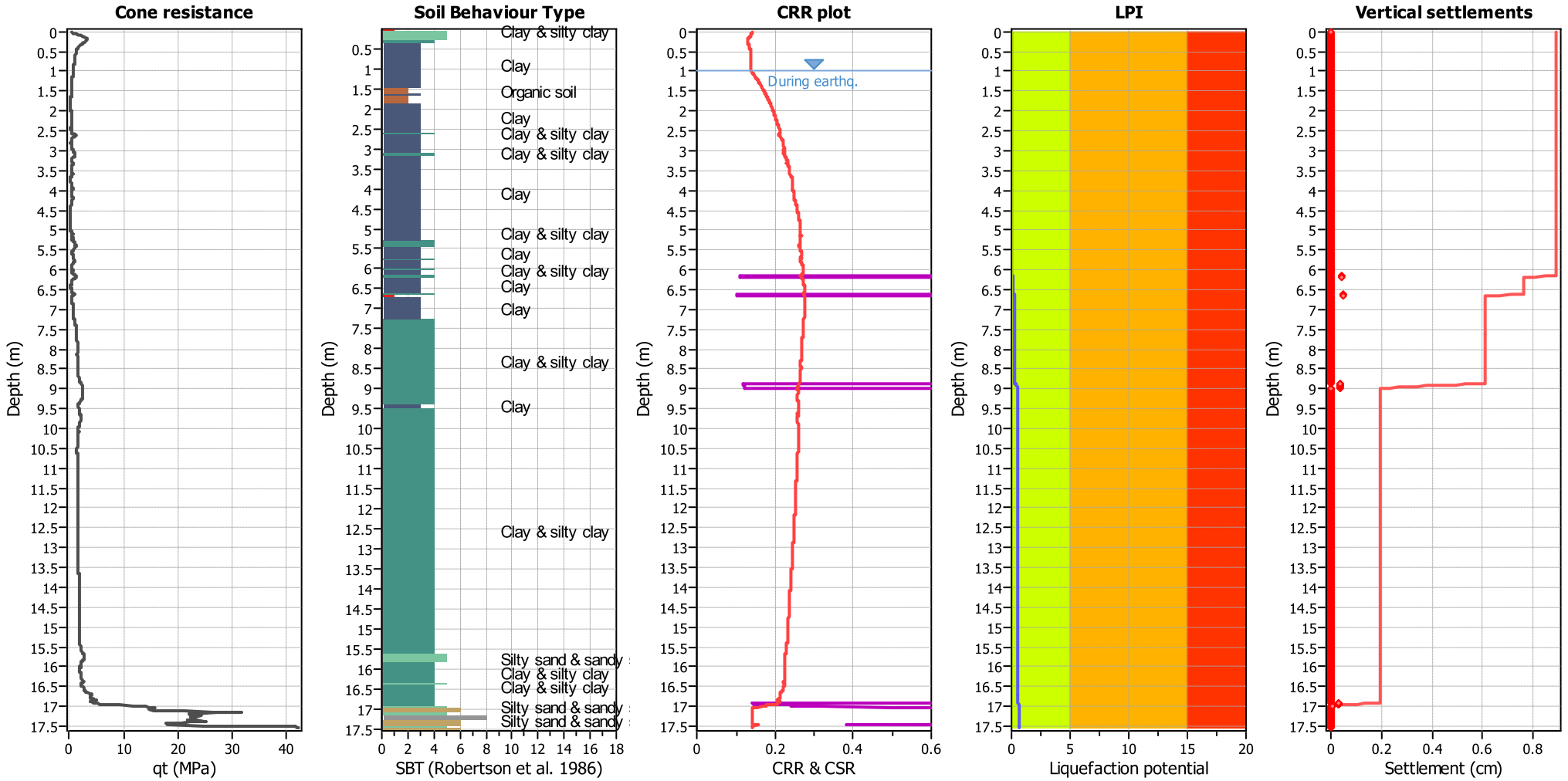
Project:
Location:

CPT: CPT-126
Total depth: 17.54 m



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Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	.		

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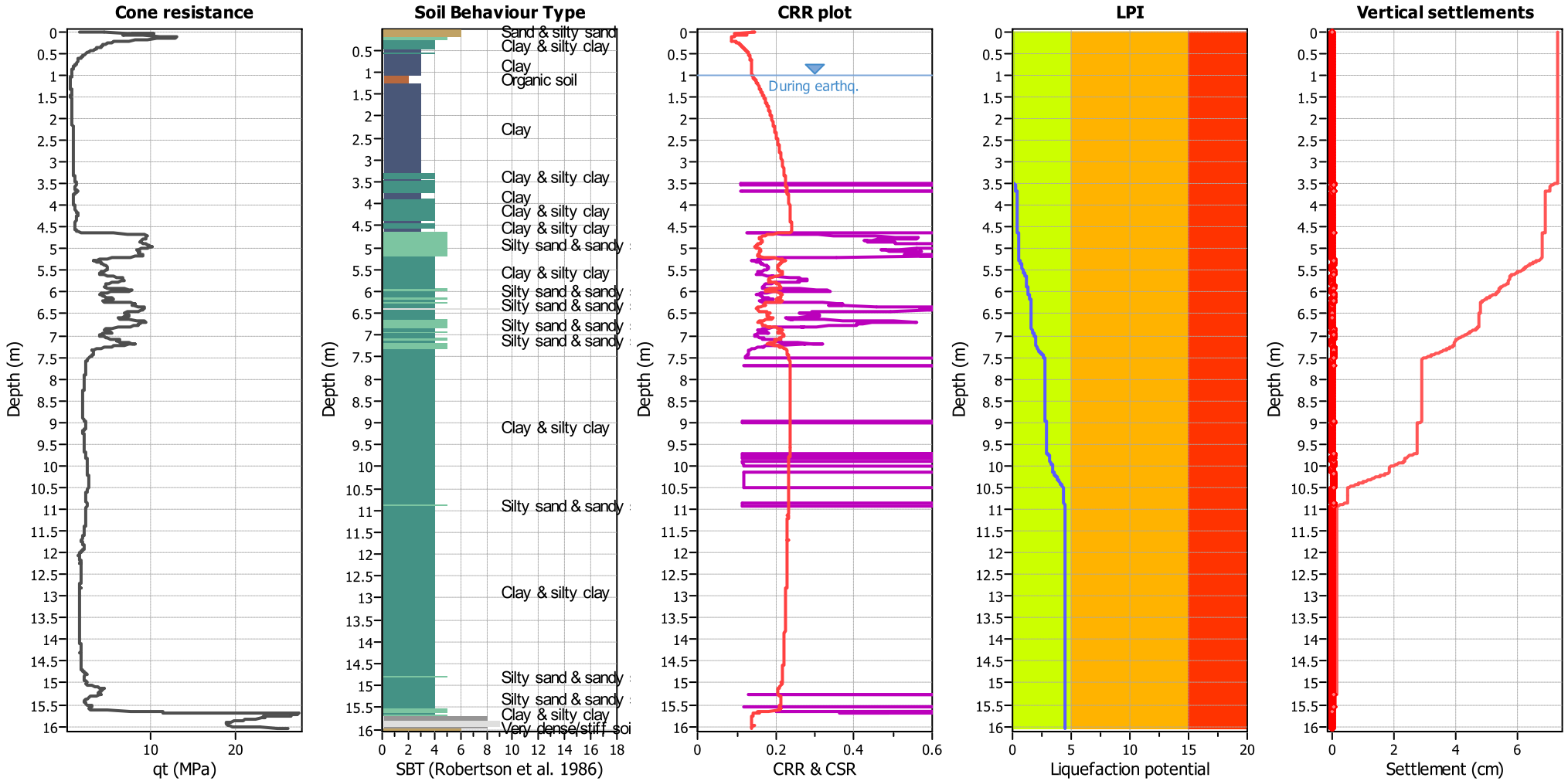
Project:
Location:

CPT: CPT-128
Total depth: 16.05 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	.		

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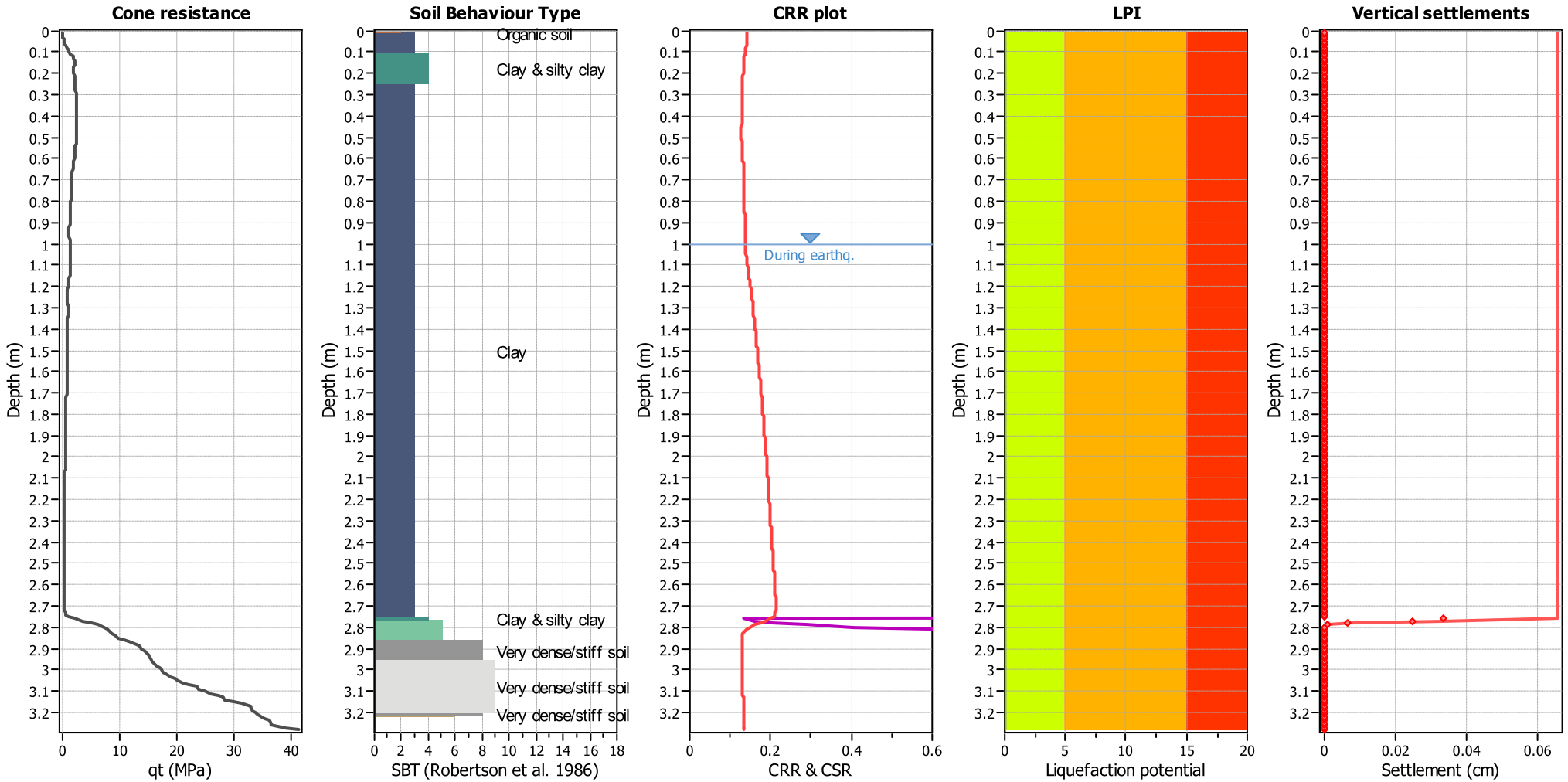
Project:
Location:

CPT: CPT-129
Total depth: 3.28 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	.		

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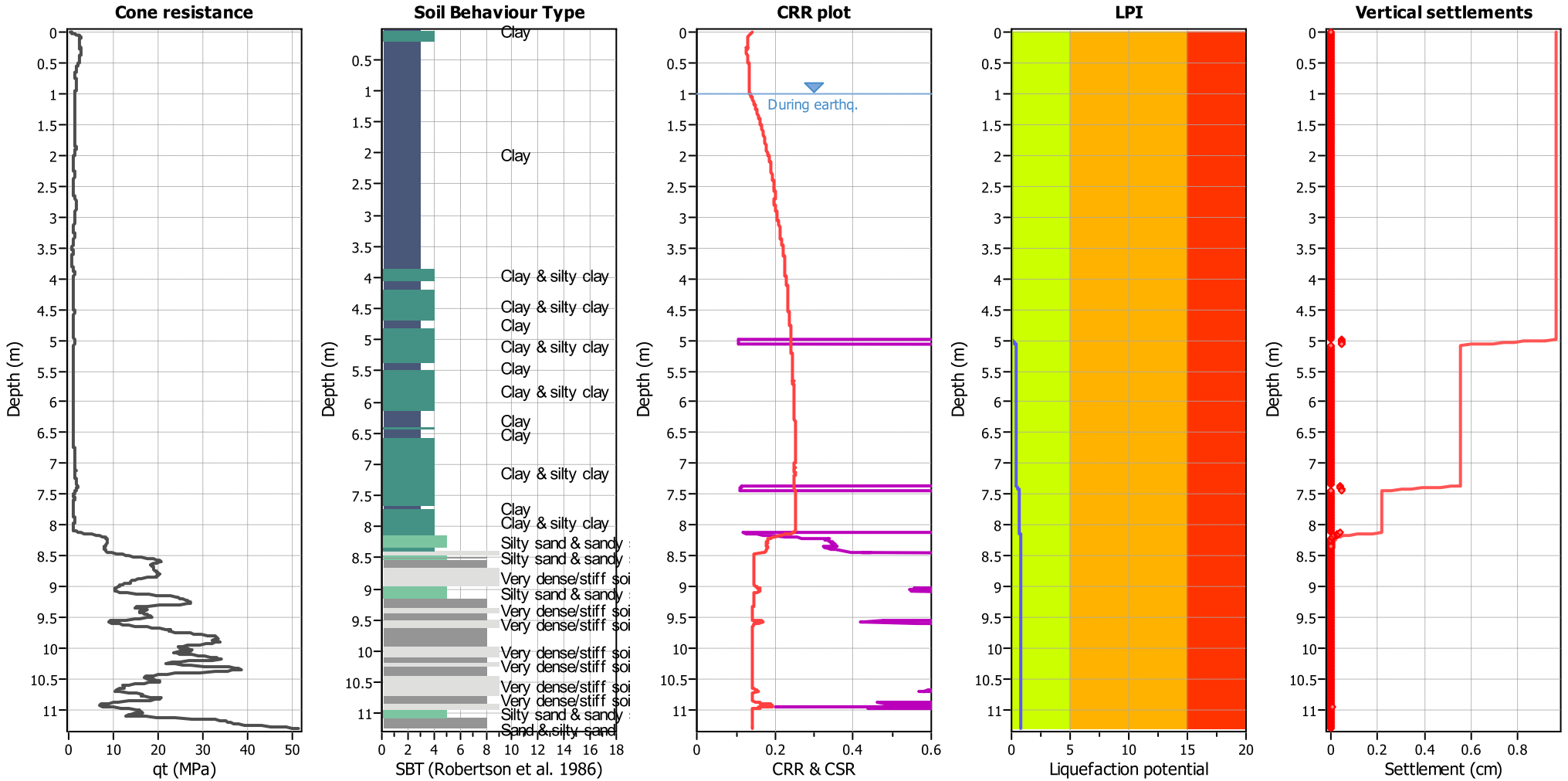
Project:
Location:

CPT: CPT-131
Total depth: 11.29 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	.		

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
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