

Appendix B – Tonkin & Taylor Geotechnical Logs



Appendix B – Copies of T+T Machine Borehole Logs

Tonkin & Taylor Ltd. January 2021 (Version 1.0). Whenuapai-Redhills Wastewater Servicing Rising Main/Gravity Main and Interim Pump Station (Package 1), Geotechnical Ground Investigation Factual Report - Appendix C: Machine Borehole Logs¹

¹ Subsequent revisions made by T+T (March 2021) include PID readings in logs BH08 and BH117.

Appendix C: Machine Borehole Logs

BOREHOLE LOG

BOREHOLE No.:
BH05A

SHEET: 1 OF 4

DRILLED BY: Vincent
LOGGED BY: ROM
CHECKED: CBM
START DATE: 17/11/2020
FINISH DATE: 18/11/2020
CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926551.90 mN
(NZTM2000) 1743191.10 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 9.00m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS				Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
	SOIL: Classification, colour, consistency / density, moisture, plasticity	ROCK: Weathering, colour, fabric, name, strength, cementation									Fracture Spacing (mm)	RQD (%)	Description & Additional Observations						
Top	Sandy gravelly SILT, trace organics; brown & grey. Firm, moist, low plasticity; sand, fine to coarse, Quartz, gravel, fine to coarse, subangular, unweathered, Basalt & Concrete; organics, rootlets.				PQTT	46	1 @ 0.10m 1 x Glass Jar 1x plastic Jar												
	Silty CLAY, minor sand, trace organics; light brown mottled orange and dark brown, speckled black, homogeneous. Stiff, moist, high plasticity; sand, fine; organics, rootlets. 0.35 - 0.75m: CORE LOSS						7 @ 0.35m 1 x plastic Jar (Corrosivity)												
	Silty CLAY, minor sand, trace organics; light brown mottled orange & dark brown, speckled black, homogeneous. Stiff, moist, high plasticity; sand, fine; organics, rootlets.						0/- kPa												
	Sandy SILT, some clay; light brown mottled orange & dark brown speckled white and black, homogeneous. Stiff, moist, high plasticity; sand, fine.				SPT	86	2 @ 1.00m 1 x Glass Jar 1x plastic Jar												
	Silty CLAY, minor sand, trace organics; light brown mottled orange & dark brown speckled black & white, homogeneous. Stiff, moist; sand, fine; organics, rootlets.						93/44 kPa												
	Sandy SILT, trace organics; brown spotted black, homogeneous. Stiff, moist, low plasticity; sand, fine; organics, rootlets.				PQTT	124	0/1 1/0 1/1 N=3												
	SILT, some sand, minor clay, trace organics; light brown mottled orange, homogeneous. Stiff, moist, low plasticity; sand, fine; organics, rootlets.																		
	SILT, minor clay, trace organics; light green - grey, speckled black. Firm to stiff, moist, low plasticity; organics, fibrous. 2.00 - 2.17m: Grey-brown mottled brown, speckled black				SPT	100	3 @ 2.00m 1 x Glass Jar 1x plastic Jar 1 x Split 1 x Duplicate												
Tauranga Group	SILT, trace clay; grey-brown mottled brown, speckled black. Firm to stiff, moist, low plasticity.																		
	3.0 - 3.5 m: Push Tube				PQTT	0	8 @ 2.90m 1 x plastic Jar (Corrosivity)												
	SILT, trace clay; grey-brown mottled brown, speckled black. Firm, moist, low plasticity.						4 @ 3.00m 1 x Glass Jar 1x plastic Jar												
	SILT, trace clay; grey-brown mottled brown, speckled black. Firm, moist, low plasticity.				PT	173	9 @ 3.00m	28/9 kPa											
	SILT, trace organics; brown speckled black. Firm, moist, low plasticity; organics, fibrous. 3.65m: grades light brown						0/0 0/1 1/1 N=3												
	SILT, minor sand, trace organics and clay; light green, speckled black. Firm, moist, medium plasticity; sand, fine; organics, fibrous.																		
	4.03m: Light brown mottled brown, speckled black				PQTT	100	5 @ 4.00m 1 x Glass Jar 1x plastic Jar												
	Sandy SILT, trace organics; light brown mottled brown, speckled black. Stiff, moist, low plasticity; sand, fine; organics, fibrous.																		
	Silty SAND; green speckled black, homogeneous. Medium dense, moist, poorly graded; sand, fine.																		
	SAND, minor silt; light brown speckled black. Medium dense, moist, poorly graded; sand, fine.				SPT	100	19/4 kPa Core disturbed by drilling process	2/3 3/3 3/4 N=13											

COMMENTS: Piezometer installed with screened interval from 8.5 - 11.5 m.

Hole Depth 15.15m
Scale 1:25

Box 1, 0.0c-3.0m

BOREHOLE LOG

BOREHOLE No.:
BH05A

SHEET: 2 OF 4

DRILLED BY: Vincent
LOGGED BY: ROM
CHECKED: CBM
START DATE: 17/11/2020
FINISH DATE: 18/11/2020
CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926551.90 mN
(NZTM2000) 1743191.10 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 9.00m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS				Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
	SOIL: Classification, colour, consistency / density, moisture, plasticity	ROCK: Weathering, colour, fabric, name, strength, cementation									Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations					
Tauranga Group	4.95 - 5.35 m: CORE LOSS						6 @ 5.00m 1 x Glass Jar 1x plastic Jar												
	Organic clayey SILT, trace rootlets; dark brown speckled black. Stiff, moist, high plasticity. Organics; amorphous				PQTT	61			5.5										
	6.25 - 6.45 m: CORE LOSS				SPT	55	0/- kPa 1/0 0/1 0/1 N=2		6.0				6.00m: Shear Vane failed						
	PEAT (AMORPHOUS), minor sand; dark brown, homogeneous. Firm to stiff, moist; sand, fine.				PQTT	100			6.5										
Albany Conglomerate	Organic SILT; dark brown speckled black. Stiff, moist, low plasticity. Organics; amorphous				PQTT	100			7.0										
	PEAT (AMORPHOUS), minor sand; dark brown. Firm to stiff, moist; sand, fine.				PQTT	100			7.5										
	7.50m: Very stiff				SPT	106	116/29 kPa 0/1 2/2 3/4 N=11		8.0										
	Completely weathered, grey, SANDSTONE. Extremely Weak, (Recovered as SAND; grey. Medium dense, moist, poorly graded; sand, fine).				PQTT	23			8.5										
Albany Conglomerate	8.2 - 9.0 m: CORE LOSS				PQTT	23			9.0										
	9.0 - 9.45 m: Solid Cone SPT				SPT	0	UTP 3/3 5/5 5/6 N=21 Solid		9.0				9.00 - 10.50m: Re-drilled due to core loss						
	Completely weathered, brown-grey, massive, SANDSTONE. Extremely Weak, (Recovered as SAND, minor gravel; brown-grey. Medium dense, moist, poorly graded; sand, fine to coarse; gravel, fine to coarse, subangular, unweathered, Sandstone & Siltstone).				PQTT	23			9.5										

COMMENTS: Piezometer installed with screened interval from 8.5 - 11.5 m.

Hole Depth
15.15m

Scale 1:25

Rev.: A

BOREHOLE LOG

BOREHOLE No.:
BH05A

SHEET: 3 OF 4

DRILLED BY: Vincent
LOGGED BY: ROM
CHECKED: CBM
START DATE: 17/11/2020
FINISH DATE: 18/11/2020
CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926551.90 mN
(NZTM2000) 1743191.10 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 9.00m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		ROCK DEFECTS																
	SOIL: Classification, colour, consistency / density, moisture, plasticity ROCK: Weathering, colour, fabric, name, strength, cementation		Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
	10.05 - 10.5 m: CORE LOSS		UW		PQTT	57													
	Highly weathered, brown and dark grey, CONGLOMERATE. Extremely Weak. Very weakly cemented (Recovered as Gravelly SAND; brown & dark grey. Medium dense, moist; sand, fine to coarse; gravel, fine to coarse, subangular, unweathered).		UW		SPT	93	UTP 4/4 5/5 7/7 N=24	10.5											
	Highly weathered, grey, CONGLOMERATE. Extremely Weak, Very weakly cemented (Recovered as GRAVEL; grey. Moist; gravel, fine to coarse, subrounded to subangular, unweathered, Sandstone & Siltstone). Moderately weathered, grey, SANDSTONE. Extremely Weak, Weakly cemented. SAND; grey. Very dense, moist, poorly graded; sand, fine.		UW		PQTT	76		11.0											
	11.75 - 12.0 m: CORE LOSS																		
	12.0 - 12.25 m: Solid cone SPT				SPT	100	UTP 5/21 27/23 N>=50	12.0											
	Highly weathered, brown & grey, CONGLOMERATE. Extremely Weak, Very weakly cemented (Recovered as Sandy GRAVEL; brown & grey. Medium dense, moist, poorly graded; gravel, fine to coarse, subrounded to subangular, unweathered, Sandstone & siltstone; sand, fine to coarse).		UW		PQTT	56		12.5											
	Highly weathered, grey, CONGLOMERATE. Extremely Weak, Very weakly cemented (recovered as GRAVEL; grey. Gravel, fine to coarse, subrounded to subangular, unweathered, Sandstone & Siltstone). Moderately weathered, grey, SANDSTONE. Extremely Weak, very weakly cemented. (Recovered as SAND; grey. Very dense, moist, poorly graded; sand, fine).		UW					13.0											
	13.5 - 13.64 m: Solid Cone SPT				SPT	0	15/35 for 65mm N>=50 Solid	13.5											
	Unweathered, grey, SANDSTONE. Extremely Weak, Widely spaced fractures. (Recovered as SAND; grey. Very dense, moist, poorly graded; sand, fine). 13.96 - 13.98m: Slightly weathered, grey, SILTSTONE. Extremely Weak. SILT; grey. Hard, moist, low plasticity.				PQTT	129		14.0											
								14.5											

COMMENTS: Piezometer installed with screened interval from 8.5 - 11.5 m.

Hole Depth
15.15m

Scale 1:25

Rev.: A



Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.:

BH05A

SHEET: 4 OF 4

DRILLED BY: Vincent

LOGGED BY: ROM

CHECKED: CBM

START DATE: 17/11/2020

FINISH DATE: 18/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926551.90 mN
(NZTM2000) 1743191.10 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 9.00m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
	SOIL: Classification, colour, consistency / density, moisture, plasticity	ROCK: Weathering, colour, fabric, name, strength, cementation									Defect Log	Fracture Spacing (mm)	RQD (%)					
	15.0 - 15.14 m: Solid Cone SPT				SPT	0	13/37 for 70mm N>=50 Solid			X								
									15.5									
									16.0									
									16.5									
									17.0									
									17.5									
									18.0									
									18.5									
									19.0									
									19.5									

COMMENTS: Piezometer installed with screened interval from 8.5 - 11.5 m.

Hole Depth 15.15m

Scale 1:25

General Log - 21/11/2020 8:13:07 AM - Produced with Core-GS by GeRec

Rev.: A

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926551.90 mN 1743191.10 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 17/11/2020
R.L.:	9.00m	DRILL METHOD: RC	HOLE FINISHED: 18/11/2020
DATUM:	NZVD2016	LOGGED BY: ROM	CHECKED: CBM



0.00-3.00m



3.00-6.75m

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926551.90 mN 1743191.10 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 17/11/2020
R.L.:	9.00m	DRILL METHOD: RC	HOLE FINISHED: 18/11/2020
DATUM:	NZVD2016	LOGGED BY: ROM	CHECKED: CBM



6.75-10.50m



10.50-13.20m

CORE PHOTOS

BOREHOLE No.: **BH05A**

SHEET: 3 OF 3

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926551.90 mN 1743191.10 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 17/11/2020
R.L.:	9.00m	DRILL METHOD: RC	HOLE FINISHED: 18/11/2020
DATUM:	NZVD2016		DRILLED BY: McMillan Drilling
			LOGGED BY: ROM CHECKED: CBM



13.20-15.14m



Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.:

BH05B

SHEET: 1 OF 2

DRILLED BY: Vincent

LOGGED BY: ROM

CHECKED: CBM

START DATE: 18/11/2020

FINISH DATE: 18/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926553.70 mN
(NZTM2000) 1743191.30 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 9.20m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering <small>UW MW CW SW WW EW</small>	Rock Strength	Sampling Method Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Description & Additional Observations	Fluid Loss (%) <small>25 50 75</small>	Water Level	Casing	Installation	Core Box No
	SOIL: Classification, colour, consistency / density, moisture, plasticity ROCK: Weathering, colour, fabric, name, strength, cementation									Defect Log	Fracture Spacing (mm) <small>2000 500 100 20</small>	RQD (%)						
	Wash drilled to 7.0 m BGL. See BH05A for geology details						9.0											

01/12/2020

COMMENTS: 50 mm standpipe piezometer with screened interval from 3.5 - 5.5 m.

Hole Depth
7m

Scale 1:25



BOREHOLE LOG

BOREHOLE No.:

BH05B

SHEET: 2 OF 2

DRILLED BY: Vincent

LOGGED BY: ROM

CHECKED: CBM

START DATE: 18/11/2020

FINISH DATE: 18/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926553.70 mN
 (NZTM2000) 1743191.30 mE

R.L. GROUND: 9.20m

R.L. COLLAR:

DATUM: NZVD2016

SURVEY: Total
 Station/Surveyed

DIRECTION:

ANGLE FROM HORIZ.: -90°

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering <small>UW MW CW SW WW EW</small>	Rock Strength <small>U50 U20 SW WW EW</small>	Sampling Method Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Description & Additional Observations	Fluid Loss (%) <small>25 50 75</small>	Water Level	Casing	Installation	Core Box No
	SOIL: Classification, colour, consistency / density, moisture, plasticity	ROCK: Weathering, colour, fabric, name, strength, cementation								Defect Log	Fracture Spacing (mm)	RQD (%)						
										<small>2000 500 100 50 20</small>								
	Wash drilled to 7.0 m BGL. See BH05A for geology details				W 0													
	7m: END OF INVESTIGATION																	

COMMENTS: 50 mm standpipe piezometer with screened interval from 3.5 - 5.5 m.

Hole Depth
7m

Scale 1:25

General Log - 21/11/2020 8:28:00 AM - Produced with Core-GS by GeRec

Rev.: A



Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.:

BH06

SHEET: 1 OF 4

DRILLED BY: Vincent

LOGGED BY: YCWA

CHECKED: CBM

START DATE: 19/11/2020

FINISH DATE: 19/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926435.00 mN
(NZTM2000) 1743208.20 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 12.60m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE					Rock Weathering <small>UW MW CW SW MV SW CW</small>	Rock Strength <small>UW MW CW SW MV SW CW</small>	Sampling Method Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Description & Additional Observations	Fluid Loss (%) <small>25 50 75</small>	Water Level	Casing	Installation	Core Box No
	SOIL: Classification, colour, consistency / density, moisture, plasticity	ROCK: Weathering, colour, fabric, name, strength, cementation	Defect Log	Fracture Spacing (mm) <small>2000 500 200 100 50 20</small>	RQD (%)																
TSoil	Organic SILT; brown. Hard, moist, non-plastic.									12.60	0.00										
	0.30 - 0.40m: Very stiff; [Recovered from next run].							POTT	40												
Tauranga Group	SILT, trace sand; light brown mottled orangish brown. Stiff, moist, low plasticity; sand, fine.									12.00	0.50				0.50m: PID - 0.1 ppm						
	0.6 - 0.75 m: CORE LOSS									11.50											
	SILT, trace sand; light grey mottled orangish brown. Stiff, moist, low plasticity; sand, fine.									11.00	1.00				1.00m: PID - 0.0 ppm						
	Clayey SILT, trace sand; light grey mottled orangish brown. Firm, moist, high plasticity; sand, fine.							POTT	140												
	SPT							100	36/5 kPa 0/0 0/1 1/1 N=3												
East Coast Bays Formation	SILT, some clay, trace organics; light grey. Firm, moist, medium plasticity; organics, rootlets.									10.50	1.50										
	Sandy SILT, trace organics; light grey mottled orangish brown. Firm, moist, low plasticity; sand, fine; organics, rootlets.									10.00	2.00										
	SILT, some clay and sand; grey. Stiff, moist, medium plasticity; sand, fine.									9.50	2.50										
	SAND; grey. Loose, moist; sand, fine.									9.00	3.00										
	SPT							100	34/8 kPa 1/0 1/1 1/1 N=4												
	3.45 - 3.55 m: CORE LOSS									8.50	3.50										
	SILT; grey. Stiff, moist, low plasticity.									8.00	4.00										
	Clayey SILT; grey. Stiff, moist, high plasticity.									7.50	4.50										
	Silty SAND; grey. Loose, moist; sand, fine.									7.00	5.00										
									6.50	5.50											
									6.00	6.00											

COMMENTS: Piezometer installed with screened interval from 3.5 - 5.0 m

Hole Depth 15.12m

Scale 1:25

General Log - 21/11/2020 8:31:50 AM - Produced with Core-GS by GeRec

Box 1, 0.0-2.7m

Rev.: A

BOREHOLE LOG

BOREHOLE No.:

BH06

SHEET: 2 OF 4

DRILLED BY: Vincent

LOGGED BY: YCWA

CHECKED: CBM

START DATE: 19/11/2020

FINISH DATE: 19/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926435.00 mN
 (NZTM2000) 1743208.20 mE

DIRECTION:
 ANGLE FROM HORIZ.: -90°

R.L. GROUND: 12.60m
 R.L. COLLAR:
 DATUM: NZVD2016
 SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Fluid Loss (%)	Water Level	Casing	Installation	Core Box No	
	SOIL: Classification, colour, consistency / density, moisture, plasticity	ROCK: Weathering, colour, fabric, name, strength, cementation									Defect Log	Fracture Spacing (mm)	RQD (%)						Description & Additional Observations
East Coast Bays Formation	[Cont.] Silty SAND; grey. Loose, moist; sand, fine.																		
	Highly weathered, grey, SILTSTONE. Extremely Weak. (Recovered as SILT, trace sand; grey. Very Stiff, moist; sand, fine.).				PQTT	100			5.5										
	Highly weathered, grey, SILTSTONE. Extremely Weak. (Recovered as Sandy SILT; grey. Very Stiff, moist, non-plastic; sand, fine).								6.0										
	Highly weathered, grey, SANDSTONE. Extremely Weak. (Recovered as SAND; grey. Loose, moist; sand, fine).				SPT	100	0/- kPa crumble soils 1/2 1/3 2/3 N=9		6.5										
	6.45 - 6.6 m: CORE LOSE								6.5										
	Highly weathered, grey, SILTSTONE. Extremely Weak. (Recovered as Sandy SILT; grey. Hard, moist, non-plastic; sand, fine). 6.90 - 6.95m: Silty SAND; grey. Loosely packed, moist; sand, fine. 6.95 - 7.17m: Very stiff.				PQTT	85			7.0										
	7.17 - 7.25m: Very stiff; carbonaceous.								7.5										
	Highly weathered, grey, SANDSTONE. Extremely Weak. (Recovered as SAND; grey. Medium dense, moist; sand, fine). 7.40 - 7.50m: Sandy SILT; light grey. Very stiff, moist, non-plastic; sand, fine. 7.50 - 7.95m: Sand, coarse.				SPT	100	0/- kPa crumble soils 2/2 2/3 3/3 N=11		8.0										
	7.95 - 8.1 m: CORE LOSS								8.5										
	Highly weathered, grey, SANDSTONE. Extremely Weak. (Recovered as SAND; grey. Medium dense, moist; sand, fine). Highly weathered, grey, SILTSTONE. Extremely Weak. (Recovered as Clayey SILT, minor sand; grey. Hard, moist, high plasticity; sand, fine).				PQTT	85			9.0										
Moderately weathered, grey, SANDSTONE. Extremely Weak. (Recovered as SAND; grey. Medium dense, moist; sand, fine). 9.00 - 9.20m: Sand, coarse.								9.5											
Moderately weathered, grey, SILTSTONE. Extremely Weak. (Recovered as SILT, trace sand; grey. Hard, moist; sand, fine).				SPT	100	0/- kPa crumble soils 2/3 4/5 6/7 N=22													
Moderately weathered, grey, SANDSTONE. Extremely Weak. (Recovered as SAND; grey. Tightly packed, moist; sand, fine). 9.54 - 9.57m: Highly weathered, grey, SILTSTONE. Extremely Weak, (SILT; grey. Hard, moist, low plasticity).																			

COMMENTS: Piezometer installed with screened interval from 3.5 - 5.0 m

Hole Depth
15.12m

Scale 1:25

BOREHOLE LOG

BOREHOLE No.:

BH06

SHEET: 3 OF 4

DRILLED BY: Vincent

LOGGED BY: YCWA

CHECKED: CBM

START DATE: 19/11/2020

FINISH DATE: 19/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926435.00 mN
 (NZTM2000) 1743208.20 mE

DIRECTION:
 ANGLE FROM HORIZ.: -90°

R.L. GROUND: 12.60m
 R.L. COLLAR:
 DATUM: NZVD2016
 SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		ROCK DEFECTS																
	SOIL: Classification, colour, consistency / density, moisture, plasticity	ROCK: Weathering, colour, fabric, name, strength, cementation	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
East Coast Bays Formation	[Cont.] Moderately weathered, grey, SANDSTONE. Extremely Weak. (Recovered as SAND; grey. Tightly packed, moist; sand, fine).		UW	2	PQTT	100	UTP	10.5	2	9/15	20/26	81							
	Moderately weathered, grey, SANDSTONE. Extremely Weak. (Recovered as SAND; grey. Dense, moist; sand, medium). - INTERBEDDED WITH - Moderately weathered, grey, SILTSTONE. Extremely Weak.		UW	2	SPT	100	4 for N>=50	10.5	2	4		0							
	Moderately weathered, grey, SANDSTONE. Extremely Weak. (Recovered as SAND; grey. Dense, moist; sand, medium).		UW	2				11.0											
	10.81 - 11.1 m: CORE LOSS							11.0											
	Unweathered, medium grained, SANDSTONE. Very Weak, very weakly cemented. 11.21 - 11.25m: Moderately weathered, SILTSTONE. Extremely Weak.		UW	1	PQTT	75		11.5				75		11.24m: BF, 0° dip, N, CN					
	11.50 - 11.57m: Unweathered, grey, SILTSTONE. Very Weak.		UW	1				11.5						11.44 - 11.48m: BF, 0° dip, MN, Sands					
	Unweathered, grey, medium grained, SANDSTONE. Very Weak.		UW	1				12.0						11.76m: BF, 0° dip, N, CN					
	11.78 - 11.84m: Unweathered, grey, SILTSTONE. Very Weak, Carbonaceous. 11.84 - 12.00m: Unweathered, grey, medium grained, SANDSTONE. Very Weak.		UW	1	SPT	0	25/25 for 45mm N>=50 Solid	12.0				0		11.88m: DD					
	12 - 12.12 m: SOLID SPT							12.0											
	12.12 - 12.6 m: CORE LOSS							12.5											
Unweathered, grey, medium grained, SANDSTONE. Very Weak.		UW	0	PQTT	65		13.0				28		12.76 - 12.80m: BF, 0° dip, MN, Sands						
13.18 - 13.26m: Unweathered, grey, SILTSTONE. Very Weak.		UW	0				13.0						12.90 - 12.93m: BF, 0° dip, MN, Sands						
13.5 13.65 m: SOLID SPT		UW	0	SPT	0	16/34 for 55mm N>=50 Solid	13.5				0		13.00 - 13.15m: BZ, 70° dip, N, CN						
13.63 - 13.8 m: CORE LOSS							13.5						13.18m: BF, 0° dip, VN, CN						
Unweathered, grey, medium grained, SANDSTONE. Very Weak.		UW	0				14.0				73		13.21m: DD						
13.80 - 13.84m: Unweathered, grey, SILTSTONE. Very Weak.		UW	0				14.0						13.34m: BF, 0° dip, VN, CN						
14.40 - 14.90m: medium to coarse grained SANDSTONE		UW	0	PQTT	87		14.5						13.41m: BF, 0° dip, VN, CN						
14.90 - 15.00m: Unweathered, grey, medium to coarse grained, SANDSTONE. Extremely Weak, Weakly cemented.		UW	0				14.5						13.86m: DD						
							14.5						14.09m: BF, 0° dip, N, CN						
							14.5						14.23m: BF, 0° dip, T, CN						
							14.5						14.26m: BF, 0° dip, VN, CN						
							14.5						14.41m: BF, 0° dip, VN, CN						
							14.5						14.57m: BF, 0° dip, T, CN						
							14.5						14.64m: BF, 0° dip, T, CN						
							14.5						14.79m: BF, 0° dip, T, CN						
							14.5						14.86m: BF, 0° dip, MN, CN						

COMMENTS: Piezometer installed with screened interval from 3.5 - 5.0 m

Hole Depth 15.12m

Scale 1:25

Box 4, 8.6-11.5m

Box 5, 11.5-14.3m



Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.:

BH06

SHEET: 4 OF 4

DRILLED BY: Vincent

LOGGED BY: YCWA

CHECKED: CBM

START DATE: 19/11/2020

FINISH DATE: 19/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926435.00 mN
(NZTM2000) 1743208.20 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 12.60m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering <small>UW MW CW SW WW EW</small>	Rock Strength	Sampling Method Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Fluid Loss (%) <small>25 50 75</small>	Water Level	Casing	Installation	Core Box No	
	SOIL: Classification, colour, consistency / density, moisture, plasticity ROCK: Weathering, colour, fabric, name, strength, cementation									Defect Log	Fracture Spacing (mm) <small>2000 500 100 50 20</small>	RQD (%)						Description & Additional Observations
	15 - 15.12 m: SOLID SPT				SPT	0	21/29 for 45mm N>=50 Solid		X		0	14.94m: BF, 10° dip, N, CN						
	15.12m: END OF INVESTIGATION																	

COMMENTS: Piezometer installed with screened interval from 3.5 - 5.0 m

Hole Depth
15.12m

Scale 1:25

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926435.00 mN 1743208.20 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 19/11/2020
R.L.:	12.60m	DRILL METHOD: RC	HOLE FINISHED: 19/11/2020
DATUM:	NZVD2016		DRILLED BY: McMillan Drilling
			LOGGED BY: YCWA
			CHECKED: CBM



0.00-2.70m



2.70-5.55m

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5926435.00 mN (NZTM2000) 1743208.20 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 19/11/2020	
R.L.: 12.60m	DRILL METHOD: RC	HOLE FINISHED: 19/11/2020	
DATUM: NZVD2016		DRILLED BY: McMillan Drilling	LOGGED BY: YCWA
			CHECKED: CBM



5.55-8.60m



8.60-11.48m

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926435.00 mN 1743208.20 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 19/11/2020
R.L.:	12.60m	DRILL METHOD: RC	HOLE FINISHED: 19/11/2020
DATUM:	NZVD2016	LOGGED BY: YCWA	CHECKED: CBM



11.48-14.26m



14.26-15.12m

BOREHOLE LOG

BOREHOLE No.:

BH07

SHEET: 1 OF 2

DRILLED BY: Vincent

LOGGED BY: YCWA

CHECKED: CBM

START DATE: 20/11/2020

FINISH DATE: 20/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926205.30 mN
 (NZTM2000) 1743224.80 mE

DIRECTION:
 ANGLE FROM HORIZ.: -90°

R.L. GROUND: 21.80m
 R.L. COLLAR:
 DATUM: NZVD2016
 SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
	SOIL: Classification, colour, consistency / density, moisture, plasticity	ROCK: Weathering, colour, fabric, name, strength, cementation									Defect Log	Fracture Spacing (mm)	RQD (%)					
TSoil	Organic SILT; brown. Stiff, moist, low plasticity; organics, amorphous and rootlets.																	
	0.35 - 0.50m: Light brown mottled orangish brown.				PQTT	100												
Tauranga Group	Clayey SILT; light grey mottled orangish brown. Very stiff, moist, high plasticity.																	
	1.95 - 2.40m: Stiff.																	
	2.40 - 3.00m: Firm to stiff.																	
	3.0 - 3.5 m: PUSH TUBE																	
East Coast Bays Formation	Clayey SILT; organish brown. Firm, moist, medium plasticity.																	
	Sandy SILT; grey. Firm, moist, non-plastic; sand, fine.																	
	Clayey SILT; grey. Firm, moist, high plasticity.																	
	Sandy SILT; grey. Firm, moist, low plasticity; sand, fine.																	

COMMENTS:

Hole Depth
6m

Scale 1:25

Box 1, 0.0-2.6m

20/11/2020



BOREHOLE LOG

BOREHOLE No.:

BH07

SHEET: 2 OF 2

DRILLED BY: Vincent

LOGGED BY: YCWA

CHECKED: CBM

START DATE: 20/11/2020

FINISH DATE: 20/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926205.30 mN
 (NZTM2000) 1743224.80 mE

DIRECTION:
 ANGLE FROM HORIZ.: -90°

R.L. GROUND: 21.80m
 R.L. COLLAR:
 DATUM: NZVD2016
 SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering <small>UW MW CW SW MV CV</small>	Rock Strength <small>CS OS SW EW</small>	Sampling Method Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Fluid Loss (%) <small>25 50 75</small>	Water Level	Casing	Installation	Core Box No	
	SOIL: Classification, colour, consistency / density, moisture, plasticity ROCK: Weathering, colour, fabric, name, strength, cementation									Defect Log	Fracture Spacing (mm) <small>2000 500 100 50 20</small>	RQD (%)						Description & Additional Observations
East Coast Bays Formation	[Cont.] Sandy SILT; grey. Firm, moist, low plasticity; sand, fine.		PQTT	100			16	5.5	[Yellow area with 'x' marks]								Box 2, 2.6-4.0m	
	SILT, some clay, minor sand; grey. Stiff, moist, low plasticity; sand, fine.																	
	6m: END OF INVESTIGATION						6.0											

COMMENTS:

Hole Depth
6m

Scale 1:25

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926205.30 mN 1743224.80 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 20/11/2020
R.L.:	21.80m	DRILL METHOD: RC	HOLE FINISHED: 20/11/2020
DATUM:	NZVD2016	LOGGED BY: YCWA	CHECKED: CBM



0.00-2.55m



2.55-6.00m

BOREHOLE LOG

BOREHOLE No.:

BH08

SHEET: 1 OF 3

DRILLED BY: Vincent

LOGGED BY: ROM

CHECKED: CBM

START DATE: 23/11/2020

FINISH DATE: 23/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926036.50 mN
 (NZTM2000) 1743457.30 mE

DIRECTION:
 ANGLE FROM HORIZ.: -90°

R.L. GROUND: 24.60m
 R.L. COLLAR:
 DATUM: NZVD2016
 SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
	SOIL: Classification, colour, consistency / density, moisture, plasticity	ROCK: Weathering, colour, fabric, name, strength, cementation									Defect Log	Fracture Spacing (mm)	RQD (%)					
Fill	Sandy SILT, trace organics; brown. Firm, moist, low plasticity; sand, fine; organics, rootlets.		UW WW CW CV	UW WW CW CV	PQTT	100	3 @ 0.10m 1 x Glass Jar 1 x Plastic Jar	24	0.5	[Graphic Log]	2000 600 200 50 20	0.50m: PID - 0.2ppm	25 50 75	01/12/2020	[Casing]	[Installation]	[Core Box No]	
	Silty sandy CLAY, trace organics; brown, orange & light grey mottled orange. Stiff, moist, medium plasticity; sand, fine; organics, rootlets.																	
Tauranga Group	Sandy SILT; brown mottled orange. Stiff, moist, low plasticity; sand, fine.		UW WW CW CV	UW WW CW CV	PQTT	100	4 @ 0.50m 1 x Glass Jar 1 x Plastic Jar	23	1.0	[Graphic Log]	2000 600 200 50 20	1.00m: PID - 0.8ppm	25 50 75	01/12/2020	[Casing]	[Installation]	[Core Box No]	
	Clayey sandy SILT; brown & orange mottled orange. Stiff, moist, medium plasticity; sand, fine.																	
	Silty CLAY, trace organics; light grey-grey mottled orange & brown. Stiff, moist, high plasticity; organics, rootlets.																	
	Clayey sandy SILT, trace organics; grey mottled orange. Stiff, moist, medium plasticity; sand, fine; organics, rootlets.																	
	1.95 - 2.05 m: CORE LOSS																	
	Clayey sandy SILT, trace organics; grey mottled orange. Stiff, moist, medium plasticity; sand, fine; organics, fibrous.																	
	Clayey SILT, minor sand, trace organics; light grey-brown mottled orange. Stiff, moist, medium plasticity; sand, fine; organics, fibrous.																	
	Sandy SILT, trace organics; light grey-brown mottled orange. Firm to stiff, moist, low plasticity; sand, fine; organics, fibrous.																	
Tauranga Group	SILT, minor sand, trace organics; light brown mottled orange, speckled black. Firm to stiff, moist, low plasticity; sand, fine; organics, fibrous.		UW WW CW CV	UW WW CW CV	SPT	122	7 @ 3.00m 1 x Glass Jar 1 x Plastic Jar	21	3.0	[Graphic Log]	2000 600 200 50 20	51/28 kPa	25 50 75	01/12/2020	[Casing]	[Installation]	[Core Box No]	
	SILT, minor clay and sand, trace organics; brown-grey spotted dark brown. Firm to stiff, moist, low plasticity; sand, fine; organics, fibrous.																	
	Sandy SILT, trace organics; brown-grey spotted dark brown. Firm to stiff, moist, low plasticity; sand, fine; organics, fibrous.																	
	Sandy SILT, trace organics; grey speckled black. Firm to stiff, moist, low plasticity; sand, fine; organics, fibrous.																	

COMMENTS: Piezometer installed with screened interval from 3.0 to 6.0 m

Hole Depth
10.95m

Scale 1:25



BOREHOLE LOG

BOREHOLE No.:

BH08

SHEET: 3 OF 3

DRILLED BY: Vincent

LOGGED BY: ROM

CHECKED: CBM

START DATE: 23/11/2020

FINISH DATE: 23/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926036.50 mN
 (NZTM2000) 1743457.30 mE

DIRECTION:
 ANGLE FROM HORIZ.: -90°

R.L. GROUND: 24.60m
 R.L. COLLAR:
 DATUM: NZVD2016
 SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
	SOIL: Classification, colour, consistency / density, moisture, plasticity	ROCK: Weathering, colour, fabric, name, strength, cementation									Defect Log	Fracture Spacing (mm)	RQD (%)						
Tauranga Group	[CONT] Sandy SILT, minor clay and organics; brown spotted black. Stiff, moist, low plasticity; sand, fine; organics, fibrous		[Symbol]	[Symbol]	PQTT	100	[Symbol]	10.5	14	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	Box 4, 8.4-11.0m
	Silty SAND, trace organics; light brown-grey spotted black. Loose to medium dense, moist, poorly graded; sand, fine; organics, fibrous. 10.88 - 10.93m: Decomposed wood 10.93m: Brown spotted black																		
	10.95m: END OF INVESTIGATION																		

COMMENTS: Piezometer installed with screened interval from 3.0 to 6.0 m

Hole Depth
10.95m

Scale 1:25

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926036.50 mN 1743457.30 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 23/11/2020
R.L.:	24.60m	DRILL METHOD: RC	HOLE FINISHED: 23/11/2020
DATUM:	NZVD2016	LOGGED BY: ROM	CHECKED: CBM

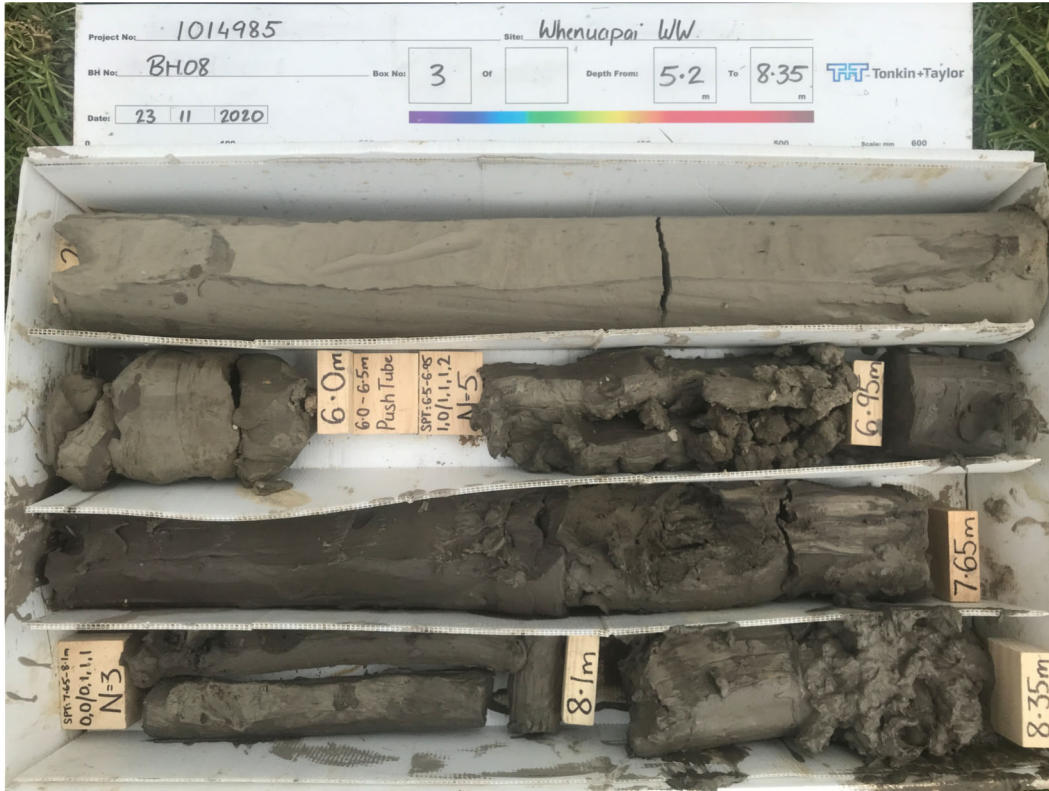


0.00-2.40m



2.40-5.20m

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926036.50 mN 1743457.30 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 23/11/2020
R.L.:	24.60m	DRILL METHOD: RC	HOLE FINISHED: 23/11/2020
DATUM:	NZVD2016	LOGGED BY: ROM	CHECKED: CBM



5.20-8.35m



8.35-10.95m

BOREHOLE LOG

BOREHOLE No.:
BH110

SHEET: 1 OF 4

DRILLED BY: Mackenzie, Vincent

LOGGED BY: YCWA

CHECKED: CBM

START DATE: 13/11/2020

FINISH DATE: 16/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926611.70 mN
(NZTM2000) 1743051.90 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 9.60m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
	SOIL: Classification, colour, consistency / density, moisture, plasticity	ROCK: Weathering, colour, fabric, name, strength, cementation									Defect Log	Fracture Spacing (mm)	RQD (%)					
TSoil	SILT, trace rootlets; brown. Stiff, moist, non-plastic.						1 @ 0.10m											
	SILT, trace sand; light brown mottled orangish brown. Stiff to very stiff, moist, low plasticity; sand, fine. <i>0.50 - 0.80m: Trace rootlets.</i>				PQTT	100	2 @ 0.50m											
Tauranga Group	Silty CLAY; light brown mottled orangish brown. Very stiff, moist, high plasticity. <i>0.80 - 0.90m: Trace rootlets.</i>						8 @ 0.80m 3 @ 0.90m											
	1.50 - 2.45m: Light brown.						4 @ 1.25m											
					SPT	84	153/59 kPa/1 2/1 3/2 N=8											
East Coast Bays Formation	Silty SAND; light brown mottled orangish brown. Loosely packed, saturated; sand, fine.						5 @ 1.95m											
	Sandy SILT; grey. Tightly packed, moist; sand, fine.						9 @ 2.30m											
	3.1 - 3.5 m: PUSH TUBE						96/16 kPa											
							6 @ 2.90m											
							0/- kPa crumble											
							Push Tube @ 3.10m											
	Sandy SILT; grey. Hard, moist, non-plastic; sand, fine.						5/10 15/17 18 for 65mm N>=50											
	3.87 - 4.0 m: CORE LOSS																	
	Moderately weathered, grey, SANDSTONE. Extremely weak. (Recovered as SAND, grey. Very dense, moist; sand fine)						7 @ 4.00m											
	Moderately weathered, grey, SILTSTONE. Extremely weak. (Recovered as Sandy SILT, grey. hard, moist, low plasticity; sand fine)						UTP 6/25 20/30 for 45mm N>=50 Solid											
4.77 - 4.87 m: CORE LOSS																		

COMMENTS: Piezometer installed with screened interval from 8.0 - 11.0 m

Hole Depth 15.11m

Scale 1:25

BOREHOLE LOG

BOREHOLE No.:
BH110

SHEET: 2 OF 4

DRILLED BY: Mackenzie, Vincent

LOGGED BY: YCWA

CHECKED: CBM

START DATE: 13/11/2020

FINISH DATE: 16/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926611.70 mN
(NZTM2000) 1743051.90 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 9.60m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE				ROCK DEFECTS													
	Soil: Classification, colour, consistency / density, moisture, plasticity Rock: Weathering, colour, fabric, name, strength, cementation	Rock Weathering	Rock Strength	Sampling Method Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No	
East Coast Bays Formation	Moderately weathered, grey, fine, SANDSTONE. Extremely Weak. (Recovered as SAND; grey. Tightly packed, moist; sand, fine)											5.16m: DD						
	Moderately weathered, grey, SILTSTONE. Very Weak.			PQTT			5.5			55	5.32m: BF, 0° dip, N, CN 5.40m: BF, 0° dip, N, CN 5.44m: DD 5.59m: DD							
	Moderately weathered, grey, fine SANDSTONE. Extremely weak. (Recovered as Silty SAND, grey. Very dense, moist; sand fine)			PQTT	91		6.0			0	0	5.90m: DD						
	Slightly weathered, grey, SANDSTONE. Extremely weak, very weakly cemented. (Recovered as Silty SAND, grey. Very dense, moist; sand fine)			SPT	0	10/25 35/15 for 10mm N>=50 Solid		6.5										
	6.93m: Carbonaceous			PQTT	100		7.0				67	6.60m: BF, 0° dip, N, CN 6.85m: BF, 0° dip, T, CN						
	Unweathered, grey, SANDSTONE. Very Weak.			PQTT			7.5				0	7.10 - 7.30m: BZ, 80° dip, N, CN						
	7.5 - 7.63 m: Solid SPT			SPT	0	11/39 for 55mm N>=50 Solid		8.0				7.91 - 7.93m: BF, 10° dip, N, CN 7.98m: BF, 0° dip, N, CN 8.07m: BF, 0° dip, VN, CN						
	Unweathered, grey, fine to coarse, SANDSTONE. Very Weak.			PQTT	89		8.5				45	8.42m: BF, 0° dip, N, CN						
	8.00 - 8.15m: Unweathered SILTSTONE. Very Weak.						9.0				0	8.65 - 8.67m: BF, 0° dip, N, coarse sands 8.70m: BF, 0° dip, VN, CN 8.73 - 8.77m: BZ, 30° dip, VN, CN						
	8.15 - 8.3 m: CORE LOSS						9.5				54	8.82m: BF, 0° dip, MN, medium grained sands 8.86m: BF, 0° dip, VN, CN 8.91m: BF, 0° dip, VN, CN 8.94m: BF, 0° dip, VN, CN 9.23m: DD 9.36m: BF, 10° dip, VN, CN 9.42m: BF, 0° dip, VN, CN						
	Unweathered, grey, fine to coarse, SANDSTONE. Very Weak.			SPT	0	5/21 50 for 25mm N>=50 Solid		9.0				9.61m: BF, 10° dip, VN, CN						
	Unweathered, grey, fine, SANDSTONE. Very Weak.						9.5					9.77m: BF, 0° dip, VN, CN						
9.0 - 9.18 m: SOLID SPT											9.90m: BF, 0° dip, VN, CN							
Unweathered, grey, fine, SANDSTONE. Very Weak.																		
9.30 - 9.40m: Unweathered SILTSTONE. Very Weak.																		
9.90 - 9.97m: Unweathered SILTSTONE. Very Weak.																		

COMMENTS: Piezometer installed with screened interval from 8.0 - 11.0 m

Hole Depth
15.11m

Scale 1:25

BOREHOLE LOG

BOREHOLE No.:
BH110

SHEET: 3 OF 4

DRILLED BY: Mackenzie, Vincent

LOGGED BY: YCWA

CHECKED: CBM

START DATE: 13/11/2020

FINISH DATE: 16/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926611.70 mN
(NZTM2000) 1743051.90 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 9.60m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE					ROCK DEFECTS													
	Soil: Classification, colour, consistency / density, moisture, plasticity Rock: Weathering, colour, fabric, name, strength, cementation	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No	
East Coast Bays Formation	Unweathered, grey, medium to coarse, SANDSTONE. Very Weak, Weakly cemented.	UW	VS	PQTT	100			10.13			54	10.13m: BF, 0° dip, VN, CN 10.22m: BF, 0° dip, N, CN 10.30m: BF, 0° dip, VN, CN 10.37m: BF, 0° dip, VN, CN							
	Unweathered, grey, SILTSTONE. Very Weak.							10.5			0								
	Unweathered, grey, fine, SANDSTONE. Very Weak.							11.0			48	10.74 - 10.77m: BF, 30° dip, N, CN 10.84m: BF, 0° dip, N, CN 10.94m: DD							
	11.22 - 11.23m: Unweathered SILTSTONE. Very Weak. 11.35 - 11.53m: SANDSTONE grades fine to medium grained							11.5				21	11.09m: DD 11.22m: BF, 0° dip, VN, CN 11.29m: BF, 0° dip, VN, CN 11.36m: BF, 20° dip, VN, CN						
	11.85 - 11.95m: Unweathered SILTSTONE. Very Weak							12.0				0	11.53 - 11.57m: BF, 0° dip, MN, Sands 11.65 - 11.73m: BZ, VN, CN 11.79m: BF, 0° dip, VN, CN 11.85m: DD						
	12.0 - 12.09 m: SOILD SPT Unweathered, grey, fine, SANDSTONE. Very Weak.							12.5				55	12.19m: BF, 0° dip, VN, CN 12.23m: DD 12.29m: BF, 10° dip, VN, CN						
	Unweathered, grey, SILTSTONE. Very Weak. 12.21 - 12.29m: Carbonaceous 12.29 - 12.35m: Carbonaceous 12.63 - 12.64m: SANDSTONE interbed 12.69 - 12.70m: SANDSTONE interbed							13.0				32	12.48m: BF, 0° dip, VN, CN 12.59m: BF, 0° dip, N, Sandstone gravels 12.64m: BF, 10° dip, N, CN 12.68m: BF, 0° dip, VN, CN 12.70m: DD 12.75m: DD 12.99m: DD						
	Unweathered, grey, fine, SANDSTONE. Very Weak, Weakly cemented.							13.5				0	13.17m: BF, 0° dip, VN, CN 13.29m: BF, 0° dip, VN, CN						
	13.37 - 13.46m: Unweathered SILTSTONE. Very Weak.							14.0				0	13.63m: BF, 10° dip, N, CN 13.74m: BF, 0° dip, MN, CN 13.77m: BF, 0° dip, N, CN 13.88m: BF, 0° dip, MN, CN						
	Unweathered, grey mottled light grey, fine to medium grained, SANDSTONE. Weak, Moderately cemented.							14.5				0	14.10m: DD 14.16m: BF, 0° dip, N, CN 14.25 - 14.29m: BF, VN, CN						
	Unweathered, grey, fine, SANDSTONE. Very Weak. 14.21 - 14.22m: Unweathered SILTSTONE. Very Weak.											0							
	14.4 - 14.75 m: CORE LOSS																		
Unweathered, grey, SANDSTONE. Very weak																			
Unweathered, grey, SILTSTONE. Very Weak.																			

COMMENTS: Piezometer installed with screened interval from 8.0 - 11.0 m

Hole Depth 15.11m

Scale 1:25



BOREHOLE LOG

BOREHOLE No.:

BH110

SHEET: 4 OF 4

DRILLED BY: Mackenzie, Vincent

LOGGED BY: YCWA

CHECKED: CBM

START DATE: 13/11/2020

FINISH DATE: 16/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926611.70 mN
 (NZTM2000) 1743051.90 mE

DIRECTION:
 ANGLE FROM HORIZ.: -90°

R.L. GROUND: 9.60m
 R.L. COLLAR:
 DATUM: NZVD2016
 SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering <small>UW MW CW SW WW EW</small>	Rock Strength	Sampling Method Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Fluid Loss (%) <small>25 50 75</small>	Water Level	Casing	Installation	Core Box No				
	SOIL: Classification, colour, consistency / density, moisture, plasticity ROCK: Weathering, colour, fabric, name, strength, cementation									SPT	Core Recovery (%)	Testing						Defect Log	Fracture Spacing (mm) <small>2000 500 100 50 20</small>	RQD (%)	Description & Additional Observations
	15.0 - 15.11 m: SOLID SPT				SPT	0	23/27 for														
	15.11m: END OF INVESTIGATION						35mm N>=50 Solid														

COMMENTS: Piezometer installed with screened interval from 8.0 - 11.0 m

Hole Depth
15.11m

Scale 1:25

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5926611.70 mN (NZTM2000) 1743051.90 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 13/11/2020	
R.L.: 9.60m	DRILL METHOD: RC	HOLE FINISHED: 16/11/2020	
DATUM: NZVD2016		DRILLED BY: McMillan Drilling	LOGGED BY: YCWA
			CHECKED: CBM



0.00-2.50m



2.50-5.10m

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926611.70 mN 1743051.90 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 13/11/2020
R.L.:	9.60m	DRILL METHOD: RC	HOLE FINISHED: 16/11/2020
DATUM:	NZVD2016	LOGGED BY: YCWA	CHECKED: CBM



5.10-7.10m



7.10-9.61m

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926611.70 mN 1743051.90 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 13/11/2020
R.L.:	9.60m	DRILL METHOD: RC	HOLE FINISHED: 16/11/2020
DATUM:	NZVD2016	LOGGED BY: YCWA	CHECKED: CBM



9.61-11.90m



11.90-14.10m

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926611.70 mN 1743051.90 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 13/11/2020
R.L.:	9.60m	DRILL METHOD: RC	HOLE FINISHED: 16/11/2020
DATUM:	NZVD2016		DRILLED BY: McMillan Drilling
			LOGGED BY: YCWA CHECKED: CBM



14.10-15.11m

BOREHOLE LOG

BOREHOLE No.:
BH111

SHEET: 1 OF 4

DRILLED BY: Vincent
LOGGED BY: YCWA
CHECKED: CBM
START DATE: 10/11/2020
FINISH DATE: 11/11/2020
CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926614.20 mN
(NZTM2000) 1743088.20 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 9.90m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
	SOIL: Classification, colour, consistency / density, moisture, plasticity	ROCK: Weathering, colour, fabric, name, strength, cementation									Defect Log	Fracture Spacing (mm)	RQD (%)						
Top	Clayey SILT, some organics; brown. Very stiff, moist, high plasticity; organics, rootlets.						BH111 Sample 1 @ 0.05m												
Tauranga Group	Clayey SILT, trace sand; light brown. Stiff, moist, high plasticity; sand, fine. 0.3 - 1.4 m: CORE LOSS				PQTT	26			9										
	Clayey SILT, trace sand; light brown mottled brown. Stiff, moist, high plasticity; sand, fine.				SPT	100	73/31 kPa 1/1 0/1 1/2 N=4		1.5										
	Clayey SILT, minor organics, trace sand; brown. Firm, moist, high plasticity; sand, fine; organics, rootlets.				PQTT	100	BH111 Sample 2 @ 2.00m BH111 Sample 3 @ 2.20m		2.0										
	Sandy SILT; grey mottled orangish brown. Firm, moist, non-plastic; sand, fine.				PQTT	100			2.5										
East Coast Bays Formation	Silty SAND; grey. Medium dense, moist; sand, fine.				SPT	100	BH111 Sample 4 @ 3.0m 2/3 5/6 7/7 N=25		3.0										
	3.45 - 3.7 m: CORE LOSS								3.5										
	Moderately weathered, grey, fine grained, SANDSTONE. Extremely Weak, (Recovered as Silty SAND; grey. Medium dense, moist; sand, fine) 3.90 - 4.05m: Recovered as GRAVEL				PQTT	76	BH111 Sample 5 @ 3.70m BH111 Sample 6 @ 3.90m		4.0										
	Moderately weathered, grey fine grained SANDSTONE; Extremely weak. (Recovered as fine grained SAND; grey. Dense, moist.) Moderately weathered, grey SILTONE; Extremely weak. (Sandy SILT; grey. Hard, moist, low plasticity; sand, fine.) 4.70 - 4.72m: SILT; light brown. Moist, low plasticity. 4.85m: 2 mm thick SILT; light brown. 4.90 - 4.95m: SAND; grey. Dense, moist; sand, fine.				SPT	100	0/- kPa Crumble. 6/5 5/9 15/21 N>=50 Solid		4.5										

COMMENTS: 50 mm standpipe piezometer installed with screened interval from 3.0 - 5.0 m.

Hole Depth
18.04m

Scale 1:25

Rev.: A

BOREHOLE LOG

BOREHOLE No.:
BH111

SHEET: 4 OF 4

DRILLED BY: Vincent
LOGGED BY: YCWA
CHECKED: CBM
START DATE: 10/11/2020
FINISH DATE: 11/11/2020
CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926614.20 mN
(NZTM2000) 1743088.20 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 9.90m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		ROCK DEFECTS																	
	SOIL: Classification, colour, consistency / density, moisture, plasticity ROCK: Weathering, colour, fabric, name, strength, cementation		Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No	
East Coast/Bays Formation	[CONT] Unweathered, grey, fine grained SANDSTONE. Very Weak.		UW	20/30 for 45mm N>=50 Solid	SPT	100	20/30 for 45mm N>=50 Solid		15.5			0	15.27m: DD 15.35m: DD 15.40m: DD							
	15.65 - 15.75 m: CORE LOSS																			
	Unweathered, grey, coarse grained SANDSTONE. Very Weak.		UW		PQTT	84			16.0			38	15.89m: DD 15.96m: DD 16.13m: DD 16.22m: DD 16.28m: DD 16.40m: DD							
	16.62 - 16.77 m: CORE LOSS																			
	Unweathered, grey, coarse grained SANDSTONE. Weak.		UW		PQTT	100	16/34 for 40mm N>=50 Solid		16.5			52	16.93m: DD 17.10m: DD 17.16m: DD							
	17.25 - 17.4 m: CORE LOSS																			
	Unweathered, grey, SILTSTONE. Very Weak.		UW		PQTT	76			17.5			66	17.60m: BF, 0° dip, N, CN							
	Unweathered, grey, fine grained SANDSTONE. Very Weak. 17.46 - 17.48m: SILTSTONE 17.51 - 17.55m: SILTSTONE 17.67 - 17.86m: SILTSTONE		UW		PQTT	80			18.0			44	18.00m: SPT calibration undertaken between 10.5 - 18.0m							
Unweathered, grey, medium grained SANDSTONE. Very Weak.		UW						18.0			0									
18.0 - 18.04 m: Soil SPT																				
18.04m: END OF INVESTIGATION																				

COMMENTS: 50 mm standpipe piezometer installed with screened interval from 3.0 - 5.0 m.

Hole Depth
18.04m

Scale 1:25

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926614.20 mN 1743088.20 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 10/11/2020
R.L.:	9.90m	DRILL METHOD: RC	HOLE FINISHED: 11/11/2020
DATUM:	NZVD2016	LOGGED BY: YCWA	CHECKED: CBM



0.00-3.45m



3.45-6.00m

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5926614.20 mN (NZTM2000) 1743088.20 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 10/11/2020	
R.L.: 9.90m	DRILL METHOD: RC	HOLE FINISHED: 11/11/2020	
DATUM: NZVD2016		DRILLED BY: McMillan Drilling	LOGGED BY: YCWA
			CHECKED: CBM



11.45-13.60m



13.60-16.50m

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926614.20 mN 1743088.20 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 10/11/2020
R.L.:	9.90m	DRILL METHOD: RC	HOLE FINISHED: 11/11/2020
DATUM:	NZVD2016		DRILLED BY: McMillan Drilling
			LOGGED BY: YCWA CHECKED: CBM



16.50-18.00m

BOREHOLE LOG

BOREHOLE No.:

BH111A

SHEET: 1 OF 1

DRILLED BY: Vincent

LOGGED BY: YCWA

CHECKED: CBM

START DATE: 12/11/2020

FINISH DATE: 12/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926614.20 mN
 (NZTM2000) 1743090.20 mE

DIRECTION:
 ANGLE FROM HORIZ.: -90°

R.L. GROUND: 9.90m
 R.L. COLLAR:
 DATUM: NZVD2016
 SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
	SOIL: Classification, colour, consistency / density, moisture, plasticity	ROCK: Weathering, colour, fabric, name, strength, cementation									Defect Log	Fracture Spacing (mm)	RQD (%)					
Tauranga Group	SILT, minor rootlets; brown. Stiff to very stiff, low plasticity.																	
	Clayey SILT; light brown mottled orangish brown. Stiff, moist, high plasticity. 0.60 - 0.80m: Trace rootlets. Firm.																	
	Clayey SILT, minor organics, trace sand; brown. Firm, moist, high plasticity; organics, fleck; sand, fine.																	
	1.75 - 2.0 m: CORE LOSS																	
	2.0 - 2.5 m: PUSH TUBE																	
	2.5m: END OF BOREHOLE																	

COMMENTS: Drilled 1.5 m from BH111 to recover core in the upper 2.5 m.

Hole Depth
2.5m

Scale 1:25

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926614.20 mN 1743090.20 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 12/11/2020
R.L.:	9.90m	DRILL METHOD: RC	HOLE FINISHED: 12/11/2020
DATUM:	NZVD2016		DRILLED BY: McMillan Drilling
			LOGGED BY: YCWA CHECKED: CBM



0.00-2.50m



Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.:

BH113

SHEET: 1 OF 4

DRILLED BY: Mackenzie

LOGGED BY: ROM

CHECKED: CBM

START DATE: 04/11/2020

FINISH DATE: 05/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926965.50 mN
(NZTM2000) 1743286.20 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 12.20m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
	SOIL: Classification, colour, consistency / density, moisture, plasticity	ROCK: Weathering, colour, fabric, name, strength, cementation									Defect Log	Fracture Spacing (mm)	RQD (%)					
Top	Sandy SILT, trace organics; dark brown. Firm, saturated, low plasticity; Sand, fine grained; sand, fine; organics, rootlets.						2 @ 0.10m	12	12	TS								
	Sandy SILT, minor clay, trace organics: brown mottled orange & dark brown. Stiff, dry to moist, low plasticity; Sand, fine; organics, rootlets						3 @ 0.50m	0.5	0.5									
	0.55 - 1.5 m: CORE LOSS				PQTT	36		1.0	1.0									
	SILT, minor clay, minor sand, trace organics: brown mottled orange. Stiff, moist, low plasticity; Sand, fine; organics, rootlets						0/- kPa Shear vane failed - core recovered 1/1 0/1 1/1 N=3	1.5	1.5									
	1.65 - 2.2 m: CORE LOSS				SPT	33		2.0	2.0									
Tauranga Group	Sandy SILT, trace organics; brown mottled orange, speckled white & black. Firm, moist, low plasticity; Sand, fine; organics, rootlets						16/0 kPa Soil shear strength value 1/1 1/1 1/2 N=5	2.5	2.5									
	Fine to coarse SAND, some gravel, minor silt; green-grey speckled white. Loose, saturated, moderately well graded; gravel, fine to medium grained, sub-rounded gravel.						5 @ 3.50m	3.0	3.0									
	4.17 - 14.20m: SILTSTONE gravel				PQTT	80		3.5	3.5									
	4.3 - 4.5 m: CORE LOSS						6 @ 4.50m	4.0	4.0									
	SILT, some clay, trace organics; grey-green. Stiff, moist, moderate plasticity; organics, rootlets						0/- kPa No shear vane - Cohesionless 0/0 0/1 1/0 N=2	4.5	4.5									

COMMENTS: 50 mm standpipe piezometer installed with screened interval from 2.0 - 4.0 m. SPT calibration undertaken between 13.5 - 18.0 m.

Hole Depth 20m

Scale 1:25

Box 1, 0.0-4.0m

Rev.: A

General Log - 21/11/2020 9:09:47 AM - Produced with Core-GS by GeRoc



Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.:

BH113

SHEET: 2 OF 4

DRILLED BY: Mackenzie

LOGGED BY: ROM

CHECKED: CBM

START DATE: 04/11/2020

FINISH DATE: 05/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926965.50 mN
(NZTM2000) 1743286.20 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 12.20m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		ROCK DEFECTS																
	SOIL: Classification, colour, consistency / density, moisture, plasticity ROCK: Weathering, colour, fabric, name, strength, cementation		Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
Tauranga Group	[CONT] SILT, some clay, trace organics; grey-green. Stiff, moist, moderate plasticity; organics, rootlets																		
	5.50m: Grades: Light brown				PQTT	100			5.5										
	Organic SILT, minor clay, trace organics; brown speckled black. Firm, moist, low plasticity; organics, rootlets																		
	6.0 - 6.5 m: Push Tube				PT	0	96/10 kPa 1 @ 6.00m		6.0										
	SILT, trace clay, trace organics; grey speckled black. Firm to stiff, moist, low plasticity; organics, carbonaceous.					SPT	100	0/0 0/0 0/1 N=1		6.5									
	Clayey SILT, trace organics; grey-green speckled black. Stiff, moist, moderate plasticity; organics, rootlets.					SPT	111	0/- kPa 0/0 1/0 0/1 N=2		7.5									
9.00 - 9.05m: Brown mottled grey-green, speckled black.					PQTT	100			8.5										
9.50m: Grey-brown speckled black.					SPT	148	79/30 kPa 0/1 2/0 1/1 N=4		9.0										

COMMENTS: 50 mm standpipe piezometer installed with screened interval from 2.0 - 4.0 m. SPT calibration undertaken between 13.5 - 18.0 m.

Hole Depth 20m

Scale 1:25

Box 2, 4.0-7.3m

Box 3, 7.3-9.8m

General Log - 21/12/2020 9:09:47 AM - Produced with Core-GS by GeRoc

Rev.: A



Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.:

BH113

SHEET: 3 OF 4

DRILLED BY: Mackenzie

LOGGED BY: ROM

CHECKED: CBM

START DATE: 04/11/2020

FINISH DATE: 05/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926965.50 mN
(NZTM2000) 1743286.20 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 12.20m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE				ROCK DEFECTS												
	Soil: Classification, colour, consistency / density, moisture, plasticity Rock: Weathering, colour, fabric, name, strength, cementation	Rock Weathering	Rock Strength	Sampling Method Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
Tauranga Group	[CONT] Clayey SILT, trace organics; grey-green speckled black. Stiff, moist, moderate plasticity; organics, rootlets.			POTT 100		2											
	Clayey SILT, minor sand, trace organics; light green speckled black. Stiff, moist, moderate plasticity; Sand, fine; organics, rootlets.			SPT 122	78/38 kPa 1/1 1/2 1/3 N=7	10.5											
	SILT, trace organics; grey, brown & light green. Firm, moist, low plasticity; organics, rootlets.					11.0											
	Clayey SILT, trace organics; grey-brown & light green speckled black. Stiff, moist, moderate plasticity; organics, rootlets.			POTT 100		11.5											
	SILT, trace organics; brown, grey-brown & light green. Firm - stiff, moist, low plasticity; organics, rootlets.					12.0											
East Coast Bays Formation	Clayey SILT, trace organics; grey-brown & light green speckled black. Stiff, moist, moderate plasticity; organics, rootlets.			SPT 128	44/10 kPa 0/1 3/3 3/3 N=12	12.0											
	Sandy SILT, trace organics; grey & grey-green. Stiff, moist, low plasticity; Sand, fine; organics, wood fragments.					12.5											
	13.05m: Grey			POTT 100		13.0											
	Silty fine to coarse SAND, trace gravel, trace organics; grey & grey-green. Medium dense, moist, well graded; Gravel, fine to coarse grained, sub-angular Siltstone & Sandstone; organics, wood fragments.			SPT 124	UTP 5/5 6/12 10/12 N=40	13.5											
	Moderately weathered, grey and grey-green, fine, SANDSTONE. Extremely Weak, bedded, thin. - INTERBEDDED WITH - Moderately weathered, grey and grey-green, SILTSTONE. Extremely Weak, thin, (recovered as Gravelly SAND).			POTT 100		14.5											
	Moderately weathered, grey SILTSTONE; Extremely weak (Recovered as, Clayey SILT, some sand; grey. Hard, moist, low plasticity).					14.53					37	14.53m: BF, 15° dip, VN, CN					
	Slightly weathered, grey, SANDSTONE; EW					14.70						14.70m: BF, 15° dip, VN, CN					
						14.73						14.73m: BF, 12° dip, VN, CN					

COMMENTS: 50 mm standpipe piezometer installed with screened interval from 2.0 - 4.0 m. SPT calibration undertaken between 13.5 - 18.0 m.

Hole Depth 20m

Scale 1:25

General Log - 21/12/2020 9:09:47 AM - Produced with Core-GS by GeRoc

Box 4, 9.8-12.5m

Box 5, 12.5-14.9m

Rev.: A

BOREHOLE LOG

BOREHOLE No.:

BH113

SHEET: 4 OF 4

DRILLED BY: Mackenzie

LOGGED BY: ROM

CHECKED: CBM

START DATE: 04/11/2020

FINISH DATE: 05/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926965.50 mN
 (NZTM2000) 1743286.20 mE

DIRECTION:
 ANGLE FROM HORIZ.: -90°

R.L. GROUND: 12.20m
 R.L. COLLAR:
 DATUM: NZVD2016
 SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering		Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
	SOIL: Classification, colour, consistency / density, moisture, plasticity ROCK: Weathering, colour, fabric, name, strength, cementation		UW LW MW HW CW	UW LW MW HW CW	CS SS MS WS WS EW	SPT						Fracture Spacing (mm)	RQD (%)	Description & Additional Observations	25 50 75				
East Coast Bays Formation	15.0 - 5.37 m: Core Loss					SPT	0	2/5 10/17 24 for 75mm N>=50 Solid	-3				0						
	Slightly weathered, grey SILTSTONE; Very weak					PQTT	100		15.5				36	15.66m: BF, 12° dip, VN, CN					
	15.65m: Very weak								16.0					15.85 - 15.87m: BZ 15.90m: BF, 18° dip, VN, CN 15.98m: BF, 15° dip, VN, CN					
	16.5 - 16.91m: Solid cone SPT					SPT	0	2/4 6/8 23/13 for 35mm N>=50 Solid	-4				0	16.10 - 16.19m: BZ 16.25 - 16.32m: BZ 16.35m: BF, 12° dip, VN, CN					
	Unweathered, grey, SILTSTONE. Weak, laminated. - INTERBEDDED WITH - Unweathered, grey, SANDSTONE. Weak.					PQTT	100		16.5				28	17.15m: BF, 15° dip, VN, CN 17.26m: BF, 0° dip, VN, CN 17.30m: BF, 15° dip, VN, CN 17.45m: BF, 13° dip 17.49m: BF, 12° dip, VN, Brown veneer					
	18.0 - 18.28 m: Solid cone SPT					SPT	0	12/25 30/20 for 50mm N>=50 Solid	-5				0	17.51 - 18.00m: BZ 17.55m: J, 55° dip, N 17.60m: J, 55° dip, VN 17.88m: J, 55° dip, VN					
								17.0											
								17.5											
								18.0											
								18.5											
								19.0											
								19.5											

COMMENTS: 50 mm standpipe piezometer installed with screened interval from 2.0 - 4.0 m. SPT calibration undertaken between 13.5 - 18.0 m.

Hole Depth
20m

Scale 1:25

Rev.: A

General Log - 21/11/2020 9:09:47 AM - Produced with Core-GS by GeRec

Box 6, 14.9-17.4m

Box 7, 17.4-18.3m

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926965.50 mN 1743286.20 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 04/11/2020
R.L.:	12.20m	DRILL METHOD: RC	HOLE FINISHED: 05/11/2020
DATUM:	NZVD2016	LOGGED BY: ROM	CHECKED: CBM



0.00-4.00m



4.00-7.30m

CORE PHOTOS

BOREHOLE No.: **BH113**

SHEET: 2 OF 4

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926965.50 mN 1743286.20 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 04/11/2020
R.L.:	12.20m	DRILL METHOD: RC	HOLE FINISHED: 05/11/2020
DATUM:	NZVD2016	LOGGED BY: ROM	CHECKED: CBM



7.30-9.75m



9.75-12.45m

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926965.50 mN 1743286.20 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 04/11/2020 HOLE FINISHED: 05/11/2020
R.L.:	12.20m	DRILL METHOD: RC	DRILLED BY: McMillan Drilling
DATUM:	NZVD2016		LOGGED BY: ROM CHECKED: CBM



12.45-14.90m



14.90-17.40m

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926965.50 mN 1743286.20 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 04/11/2020
R.L.:	12.20m	DRILL METHOD: RC	HOLE FINISHED: 05/11/2020
DATUM:	NZVD2016		DRILLED BY: McMillan Drilling
			LOGGED BY: ROM CHECKED: CBM



17.40-18.28m



Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.:

BH116

SHEET: 1 OF 4

DRILLED BY: Mackenzie

LOGGED BY: ROM

CHECKED: CBM

START DATE: 02/11/2020

FINISH DATE: 03/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926934.40 mN
(NZTM2000) 1743342.70 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 13.60m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE				ROCK DEFECTS												
	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
Fill	UW MV CW	U5 M5 C5			1 @ 0.10m	13.60	0.10					0.10m: PID - 0.1ppm	25 50 75	18/11/2020			
					2 @ 0.50m	13.10	0.50					0.50m: PID - 0.0ppm					
Tauranga Group			PQTT	56	3 @ 1.00m	12.10	1.00					1.00m: PID - 0.0ppm		03/11/2020			
			SPT	77	0/- kPa Geo not present - service clearance	11.60	1.50					2.00m: PID - 0.2ppm					
			PQTT	138	1/0 1/1 1/1 N=4	11.10	2.00										
			SPT	11	0/- kPa Geo not present - service clearance	10.60	3.00										
		PT	0	0/1 0/1 0/1 N=2	10.10	3.45											
		PQTT	100	5 @ 3.45m	9.60	4.00											
		PT	0	8 @ 4.00m	9.10	4.50											
		PQTT	100	6 @ 4.50m	8.60	5.00											
		PT	0	0/- kPa Geo not present - service clearance	8.10	5.00											

COMMENTS: 50 mm standpipe piezometer installed with screened interval from 2.0 - 5.0 m.

Hole Depth 18.23m

Scale 1:25

Box 1, 0.0-2.8m



Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.:

BH116

SHEET: 2 OF 4

DRILLED BY: Mackenzie

LOGGED BY: ROM

CHECKED: CBM

START DATE: 02/11/2020

FINISH DATE: 03/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926934.40 mN
(NZTM2000) 1743342.70 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 13.60m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		ROCK DEFECTS														
	SOIL: Classification, colour, consistency / density, moisture, plasticity ROCK: Weathering, colour, fabric, name, strength, cementation	Rock Weathering UW MV MW CW SW WV EW	Rock Strength CU UC SW WV EW	Sampling Method Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	Fracture Spacing (mm)			Description & Additional Observations	Fluid Loss (%) 25 75	Water Level	Casing	Installation	Core Box No
									2000	500	20						
Tauranga Group	[CONT] Organic Silty CLAY, trace organics; dark brown speckled black, Firm, moist, high plasticity; organics, carbonaceous			SPT	140	9 @ 5.00m 0/0 0/0 1/1 N=2	5.5					5.00 - 5.45m: Core extended					
	Silty CLAY, trace organics; grey speckled black. Stiff, moist, high plasticity; organics, rootlets			PQTT	100		6.0										
	6.00m: Grades: green speckled black			SPT	106	0/- kPa 1/1 1/1 0/1 N=3	6.5										
	6.90m: Grades: brown speckled black			PQTT	100		7.0										
	Grades to: Clayey SILT; grey-green. Firm to stiff, moist, moderate plasticity.			SPT	100	69/31 kPa 0/0 1/0 1/1 N=3	7.5										
	Grades to: SILT; grey. Soft to firm, moist, low plasticity, slightly sensitive.						8.0										
	Grades to: Clayey SILT; grey-green. Stiff, moist, moderate plasticity, slightly sensitive.			PQTT	60		8.5										
	Grades to: SILT, minor clay; brown. Firm to stiff, moist, low plasticity, slightly sensitive.						9.0				9.00m: Shear vane indicates material is sensitive. Minimal sensitivity recognized during tactile remoulding						
	Silty CLAY, grey-green. Stiff, moist, high plasticity.			SPT	133	53/9 kPa 1/1 1/1 1/2 N=5	9.5										
	SILT; grey-brown & grey-green. Soft to firm, moist, low plasticity, slightly sensitive.																
	SILT, minor clay; grey-green & brown-grey. Firm to stiff, moist, low plasticity, slightly sensitive.																

COMMENTS: 50 mm standpipe piezometer installed with screened interval from 2.0 - 5.0 m.

Hole Depth
18.23m

Scale 1:25

General Log - 21/11/2020 9:52:52 AM - Produced with Core-GS by GeRoc

Box 2, 2.9-6.8m

Box 3, 6.8-9.5m

Rev.: A

BOREHOLE LOG

BOREHOLE No.:
BH116

SHEET: 3 OF 4

DRILLED BY: Mackenzie
LOGGED BY: ROM
CHECKED: CBM
START DATE: 02/11/2020
FINISH DATE: 03/11/2020
CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926934.40 mN
(NZTM2000) 1743342.70 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 13.60m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Fluid Loss (%)	Water Level	Casing	Installation	Core Box No	
	SOIL: Classification, colour, consistency / density, moisture, plasticity	ROCK: Weathering, colour, fabric, name, strength, cementation									Defect Log	Fracture Spacing (mm)	RQD (%)						Description & Additional Observations
Tauranga Group	Silty CLAY, grey-green. Stiff, moist, high plasticity.		UW		PQTT	100		10.5											
	Sandy CLAY, some silt, trace organics. Grey-green speckled black. Stiff, moist, moderate plasticity; Sand, fine; organics, carbonaceous		UW		SPT	142	98/32 kPa 1/1 2/1 2/3 N=8	11.0											
	12.6 - 13.5 m: CORE LOSS		UW		PQTT	100		11.5											
			UW		SPT	128	85/31 kPa 0/1 2/1 2/2 N=7	12.0											
Albany Conglomerate	Completely weathered, grey speckled black, SANDSTONE. Extremely Weak, (Recovered as Fine SAND, some silt, trace carbonaceous material; grey speckled black. Medium dense, moist, poorly graded)		UW		SPT	115	119/57 kPa 2/2 3/4 3/4 N=14	13.5											
	14.70m: Sand, fine to medium grained 14.85m: SILTSTONE coarse gravel-sized clasts x2		UW		PQTT	100		14.0											
	Completely weathered, grey-green, SANDSTONE. Extremely Weak, (Recovered as Gravelly SAND).		UW		PQTT	100		14.5											

COMMENTS: 50 mm standpipe piezometer installed with screened interval from 2.0 - 5.0 m.

Hole Depth
18.23m

Scale 1:25

Box 4, 9.5-11.9m

BOREHOLE LOG

BOREHOLE No.:

BH116

SHEET: 4 OF 4

DRILLED BY: Mackenzie

LOGGED BY: ROM

CHECKED: CBM

START DATE: 02/11/2020

FINISH DATE: 03/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926934.40 mN
 (NZTM2000) 1743342.70 mE

DIRECTION:
 ANGLE FROM HORIZ.: -90°

R.L. GROUND: 13.60m
 R.L. COLLAR:
 DATUM: NZVD2016
 SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		ROCK DEFECTS																
	SOIL: Classification, colour, consistency / density, moisture, plasticity ROCK: Weathering, colour, fabric, name, strength, cementation		Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
Albany Conglomerate	[CONT] Completely weathered, grey-green, SANDSTONE. Extremely weak (Recovered as Gravelly SAND)		UW		SPT	100	4/3 6/12 13/20 for 40mm N>=50		15.5										
	Slightly weathered, grey fine to medium grained SANDSTONE; Very weak				PQTT	100			15.5 - 16.0			12	15.42 - 15.53m: J, 35° dip, VN, CN 15.50m: BF, 6° dip, VN, CN 15.57m: BF, 6° dip, VN, CN 15.63m: BF, 15° dip, VN, CN 15.63 - 15.75m: J, VN, CN 15.74 - 15.84m: BZ, CN						
	15.92 - 15.94m: Slightly weathered, grey SILTSTONE; Extremely weak 16.00 - 16.50m: Recovered as: Gravelly SAND due to core drop-out and re-drilling.				SPT	0	8/14 18/16 16 for 75mm N>=50 Solid		16.5			0	16.00 - 16.50m: Core disturbed due to drilling process (fell out of barrel)						
	16.5 - 16.88 m: Solid cone SPT				PQTT	84			17.0			36	16.88m: BF, 6° dip, VN, CN 16.94m: BF, 6° dip, VN, CN 16.95m: BF, 4° dip, VN, CN 16.97m: BF, 12° dip, VN, CN 17.11m: BF, 25° dip, VN, CN 17.11 - 17.28m: J, 45° dip, VN, CN 17.15m: BF, 4° dip, VN, CN 17.28m: BF, 10° dip, VN, CN 17.49m: BF, 10° dip, VN, CN						
	17.83 - 18.0 m: CORE LOSS				SPT	0	11/22 45/5 for 5mm N>=50 Solid		18.0			0	17.80m: DD						
	18.23m: END OF INVESTIGATION								18.5										

COMMENTS: 50 mm standpipe piezometer installed with screened interval from 2.0 - 5.0 m.

Hole Depth
18.23m

Scale 1:25

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926934.40 mN 1743342.70 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 02/11/2020
R.L.:	13.60m	DRILL METHOD: RC	HOLE FINISHED: 03/11/2020
DATUM:	NZVD2016	LOGGED BY: ROM	CHECKED: CBM



0.00-2.90m



2.90-6.75m

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926934.40 mN 1743342.70 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 02/11/2020
R.L.:	13.60m	DRILL METHOD: RC	HOLE FINISHED: 03/11/2020
DATUM:	NZVD2016		DRILLED BY: McMillan Drilling
			LOGGED BY: ROM CHECKED: CBM



6.75-9.45m



9.45-11.85m

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926934.40 mN 1743342.70 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 02/11/2020 HOLE FINISHED: 03/11/2020
R.L.:	13.60m	DRILL METHOD: RC	DRILLED BY: McMillan Drilling
DATUM:	NZVD2016		LOGGED BY: ROM CHECKED: CBM



11.85-15.42m



15.42-18.23m

BOREHOLE LOG

BOREHOLE No.:
BH117

SHEET: 1 OF 5

DRILLED BY: Mackenzie
LOGGED BY: ROM
CHECKED: CBM
START DATE: 06/11/2020
FINISH DATE: 09/11/2020
CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926691.00 mN
(NZTM2000) 1743092.70 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 10.90m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total
Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
	SOIL: Classification, colour, consistency / density, moisture, plasticity	ROCK: Weathering, colour, fabric, name, strength, cementation									Defect Log	Fracture Spacing (mm)	RQD (%)					
TSoil	Sandy SILT, trace organics; dark brown. Firm, saturated, low plasticity; Sand, fine; organics, rootlets [TOPSOIL].						2 @ 0.10m											
	Sandy SILT, some clay, trace organics; Brown mottled orange. Stiff, moist, moderate plasticity; Sand, fine; organics, rootlets 0.55m: Brown mottled orange speckled white				PQTT	52	3 @ 0.50m		0.5				0.10m: PID - 0.0ppm 0.50m: PID - 0.5ppm					
Tauranga Group	0.78 - 1.5m: Core Loss								1.0									
	Silty fine grained SAND, minor organics; brown-grey. Medium dense, moist, poorly graded; organics, wood.				SPT	84	1/3 4/5 5/5 N=19		1.5									
	Clayey SILT, minor sand, trace organics; grey-brown speckled black. Stiff, moist, moderate plasticity; Sand, fine; organics, rootlets				PQTT	64	4 @ 2.00m		2.0									
	2.63 - 3.0m: Core Loss									2.5								
	Organic SILT, some clay, trace organics; dark grey - brown. Stiff, moist, low plasticity; organics, wood.				SPT	100	5 @ 3.00m 1/1 1/1 N=4		3.0									
Grades to: Organic Clayey SILT, trace organics; dark grey-brown. Stiff, moist, low plasticity; organics, wood.				PQTT	83	6 @ 4.00m		4.0										
4.5 - 5.0m: PUSH TUBE				PT	0	1 @ 4.50m		4.5										

COMMENTS: 50 mm standpipe piezometer with screened interval from 2.0 - 4.0 m.

Hole Depth
21.15m

Scale 1:25



BOREHOLE LOG

BOREHOLE No.:
BH117

SHEET: 2 OF 5

DRILLED BY: Mackenzie
LOGGED BY: ROM
CHECKED: CBM
START DATE: 06/11/2020
FINISH DATE: 09/11/2020
CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926691.00 mN
(NZTM2000) 1743092.70 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 10.90m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Fluid Loss (%)	Water Level	Casing	Installation	Core Box No	
	SOIL: Classification, colour, consistency / density, moisture, plasticity	ROCK: Weathering, colour, fabric, name, strength, cementation									Defect Log	Fracture Spacing (mm)	RQD (%)						Description & Additional Observations
Tauranga Group	Organic Clayey SILT; dark grey-brown. Stiff, moist, low plasticity; organics, wood. 5.20m: grey-brown, mottled brown speckled black		UW	CU	SPT	100	7 @ 5.00m 0/0 1/1 2/1 N=5	5.5	5.5	[Graphic Log]									
	Sandy organic SILT; dark brown speckled black. Stiff, moist, low plasticity; Sand, fine; organics, fibrous 6.85m: Sand inclusions (5%); dark brown, speckled black spotted grey 7.10m: Grades: grey-brown		UW	CU	PQTT	100	0/0 1/1 1/1 N=4	6.0	6.5	[Graphic Log]									
	Sandy SILT, trace organics; light grey-green, speckled black. Stiff, moist, low plasticity; Sand, fine; organics, fibrous 8.10m: Grades: grey-brown, mottled brown, speckled black		UW	CU	SPT	100	0/0 2/1 2/2 N=7	7.5	8.0	[Graphic Log]									
	8.90 - 9.00m: Fine to medium grained SAND; grey. Medium dense, moist, poorly graded.		UW	CU	PQTT	100		8.5	9.0	[Graphic Log]									
	Sandy SILT, trace organics; grey speckled black. Stiff, moist, low plasticity; Sand, fine; organics, fibrous 9.28 - 9.29m: Wood (10mm) 9.34 - 9.35m: Wood (10mm)		UW	CU	SPT	100	1/2 2/3 4/3 N=12	9.0	9.5	[Graphic Log]									
	Fine to coarse SAND, minor silt, trace organics; grey. Medium dense, moist, poorly graded; organics, wood.		UW	CU				9.5		[Graphic Log]									
	Sandy SILT, some clay, trace organics; grey speckled black. Stiff, moist, low plasticity; sand, fine; organics, fibrous.		UW	CU						[Graphic Log]									

COMMENTS: 50 mm standpipe piezometer with screened interval from 2.0 - 4.0 m.

Hole Depth
21.15m

Scale 1:25

BOREHOLE LOG

BOREHOLE No.:
BH117

SHEET: 3 OF 5

DRILLED BY: Mackenzie
LOGGED BY: ROM
CHECKED: CBM
START DATE: 06/11/2020
FINISH DATE: 09/11/2020
CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926691.00 mN
(NZTM2000) 1743092.70 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 10.90m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
	SOIL: Classification, colour, consistency / density, moisture, plasticity	ROCK: Weathering, colour, fabric, name, strength, cementation									Defect Log	Fracture Spacing (mm)	RQD (%)					
Tauranga Group	Fine SAND, some silt, trace organics; grey & brown. Loose, moist, poorly graded; organics, wood		UW	CU	PQTT	100												
	Fine SAND, some silt, some organics; grey. Loose, moist, poorly graded; organics, wood 9.75 - 9.80m: Wood		UW	CU					10.5									
	Clayey SILT, trace organics; light green. Stiff, moist, moderate plasticity; organics, fibrous. 10.34 - 10.39m: Wood		UW	CU	SPT	113	1/2 1/2 2/2 N=7											
	Sandy SILT, some clay, trace organics; light grey-green. Stiff, moist, low plasticity; organics, fibrous. 10.40m: brown		UW	CU														
	Silty SAND, trace organics; brown mottled grey. Medium dense, moist, poorly graded; sand, fine; organics, fibrous. 11.03 - 11.07m: Wood		UW	CU	PQTT	80												
	Silty SAND, some clay, trace organics; brown. Medium dense, moist, poorly graded; sand, fine; organics, wood.		UW	CU	SPT	108	1/2 3/4 4/4 N=15											
	SAND, some silt, trace organics; grey. Medium dense, moist, poorly graded; sand, fine; organics, wood.		UW	CU	SPT	108												
	Grades to: Sandy SILT, minor clay, trace organics; grey. Very stiff, moist, low plasticity; Sand, fine; organics, wood		UW	CU	PQTT	90												
13.50m: Grey & brown, speckled black		UW	CU															
13.90m: Grey		UW	CU	SPT	124	1/1 2/2 3/3 N=10												
Sandy SILT, some clay, trace organics. Grey & brown speckled black. Very stiff, moist, low plasticity; Sand, fine; organics, carbonaceous.		UW	CU	PQTT	100													

COMMENTS: 50 mm standpipe piezometer with screened interval from 2.0 - 4.0 m.

Hole Depth
21.15m

Scale 1:25

Box 4, 9.8-12.6m

Box 5, 12.6-15.0m

BOREHOLE LOG

BOREHOLE No.:
BH117

SHEET: 4 OF 5

DRILLED BY: Mackenzie
LOGGED BY: ROM
CHECKED: CBM
START DATE: 06/11/2020
FINISH DATE: 09/11/2020
CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926691.00 mN
(NZTM2000) 1743092.70 mE

DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 10.90m
R.L. COLLAR:
DATUM: NZVD2016
SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Fluid Loss (%)	Water Level	Casing	Installation	Core Box No	
	SOIL: Classification, colour, consistency / density, moisture, plasticity	ROCK: Weathering, colour, fabric, name, strength, cementation									Defect Log	Fracture Spacing (mm)	RQD (%)						Description & Additional Observations
East Coast Bays Formation	Sandy SILT, some clay, trace carbonaceous. Grey & brown speckled black. Very stiff, moist, low plasticity; Sand, fine		UW	CU	SPT	144	2/2 3/3 3/5 N=14		15.5	Yellow with black speckles	0	0							
	Fine to medium grained SAND, some silt, trace carbonaceous; light green & brown. Medium dense, moist, poorly graded		UW	CU	PQTT	85			16.0	Yellow with black speckles	0	0							
	16.35 - 16.5m: Core Loss																		
	Sandy SILT, some clay, trace carbonaceous light green. Stiff, moist, low plasticity; Sand, fine		UW	CU	SPT	128	2/3 2/4 3/4 N=13		16.5	Yellow with black speckles	0	0							
	Fine SAND, some silt, trace carbonaceous; light green - grey. Loosely packed, moist, poorly graded		UW	CU	PQTT	80			17.0	Yellow with black speckles	0	0							
	17.30m: minor silt.																		
	17.60m: some silt																		
	18.10 - 18.14m: Wood (40mm)																		
	Slight weathered, brown, fine grained SANDSTONE; Very weak		UW	CU	SPT	100	6/6 4/4 4/6 N=18		18.0	Yellow with black speckles	0	0							
	Highly weathered, grey-green speckled white, coarse, SANDSTONE. Extremely Weak, (Recovered as fine to coarse SAND, minor gravel; grey-green speckled white, red, brown & green. Medium dense, moist, poorly graded).		UW	CU	PQTT	28			18.5	Yellow with black speckles	0	0							
18.75 - 19.5m: Core Loss																			
Highly weathered, grey-green speckled white, red, brown & green, coarse, SANDSTONE. Extremely Weak, (Recovered as Fine to coarse SAND, minor gravel; grey-green speckled white, red, brown & green. Very dense, moist, poorly graded).		UW	CU	SPT	77	4/4 5/7 21/18 for 50mm N>=50		19.5	Yellow with black speckles	0	0								

COMMENTS: 50 mm standpipe piezometer with screened interval from 2.0 - 4.0 m.

Hole Depth
21.15m

Scale 1:25



BOREHOLE LOG

BOREHOLE No.:

BH117

SHEET: 5 OF 5

DRILLED BY: Mackenzie

LOGGED BY: ROM

CHECKED: CBM

START DATE: 06/11/2020

FINISH DATE: 09/11/2020

CONTRACTOR: McMillan Drilling

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

CO-ORDINATES: 5926691.00 mN
 (NZTM2000) 1743092.70 mE

DIRECTION:
 ANGLE FROM HORIZ.: -90°

R.L. GROUND: 10.90m
 R.L. COLLAR:
 DATUM: NZVD2016
 SURVEY: Total Station/Surveyed

GEOLOGICAL UNIT	DESCRIPTION OF CORE		Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS			Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
	SOIL: Classification, colour, consistency / density, moisture, plasticity ROCK: Weathering, colour, fabric, name, strength, cementation										Defect Log	Fracture Spacing (mm)	RQD (%)						
East Coast Bays Formation	Moderately weathered, grey, fine SANDSTONE; Extremely weak, weakly cemented (Recovered as Fine grained SAND, trace silt; grey. Very dense, moist, poorly graded)		UW	US															
	20.38 - 21.0 m: Core Loss				PQTT	42			20.5				0						
	Moderately weathered, grey, fine SANDSTONE; Extremely weak, weakly cemented (Recovered as Fine grained SAND, trace silt; grey. Very dense, moist, poorly graded)		UW	US	SPT	100	17/33 for 30mm N>=50		21.0				0						
	21.15m: END OF INVESTIGATION								21.5										
									22.0										
									22.5										
									23.0										
									23.5										
									24.0										
									24.5										

COMMENTS: 50 mm standpipe piezometer with screened interval from 2.0 - 4.0 m.

Hole Depth 21.15m

Scale 1:25

Rev.: A

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5926691.00 mN (NZTM2000) 1743092.70 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 06/11/2020	
R.L.: 10.90m	DRILL METHOD: RC	HOLE FINISHED: 09/11/2020	
DATUM: NZVD2016		DRILLED BY: McMillan Drilling	LOGGED BY: ROM
		CHECKED: CBM	



0.00-3.75m

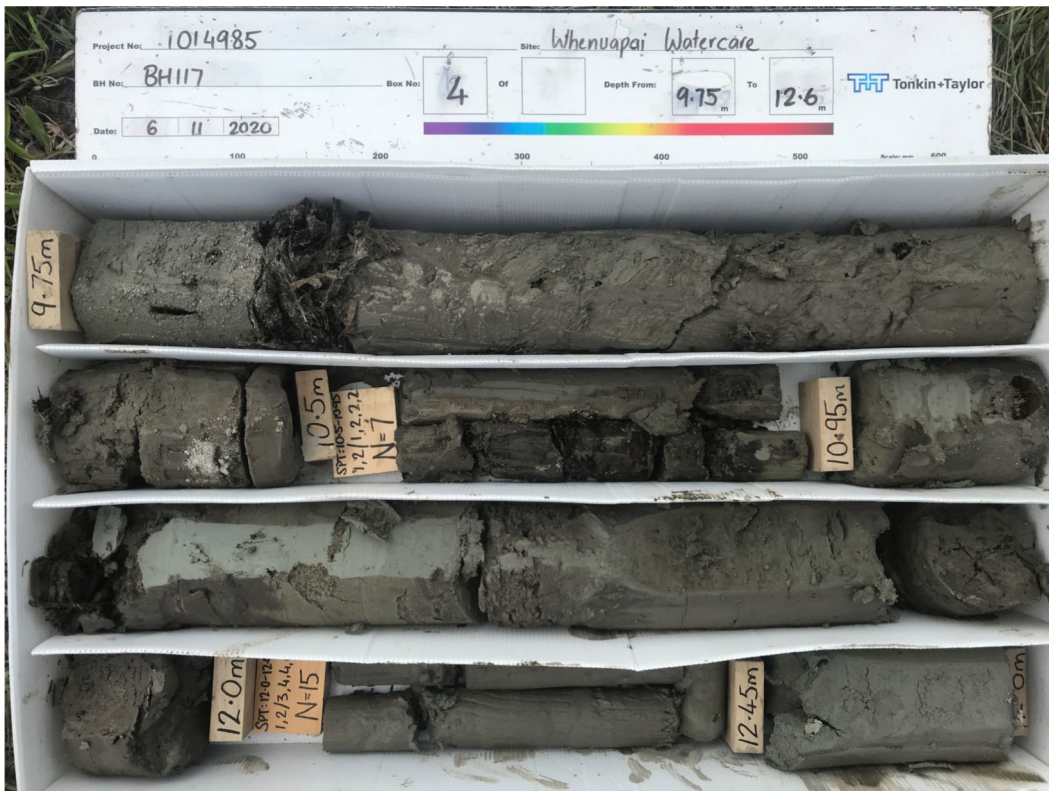


3.75-7.05m

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: 5926691.00 mN (NZTM2000) 1743092.70 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 06/11/2020	
R.L.: 10.90m	DRILL METHOD: RC	HOLE FINISHED: 09/11/2020	
DATUM: NZVD2016		DRILLED BY: McMillan Drilling	LOGGED BY: ROM
			CHECKED: CBM



7.05-9.75m



9.75-12.60m

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926691.00 mN 1743092.70 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 06/11/2020 HOLE FINISHED: 09/11/2020
R.L.:	10.90m	DRILL METHOD: RC	DRILLED BY: McMillan Drilling
DATUM:	NZVD2016		LOGGED BY: ROM CHECKED: CBM



12.60-15.00m



15.00-17.80m

CORE PHOTOS

BOREHOLE No.: **BH117**

SHEET: 4 OF 4

PROJECT: Watercare Whenuapai-Redhill GI		LOCATION: Whenuapai	JOB No.: 1014985.0000
CO-ORDINATES: (NZTM2000)	5926691.00 mN 1743092.70 mE	DRILL TYPE: Track-mounted	HOLE STARTED: 06/11/2020 HOLE FINISHED: 09/11/2020
R.L.:	10.90m	DRILL METHOD: RC	DRILLED BY: McMillan Drilling
DATUM:	NZVD2016		LOGGED BY: ROM CHECKED: CBM



17.80-21.15m



Appendix B – Copies of T+T Hand Auger Logs

Tonkin & Taylor Ltd. January 2021 (Version 1.0). Whenuapai-Redhills Wastewater Servicing Rising Main/Gravity Main and Interim Pump Station (Package 1), Geotechnical Ground Investigation Factual Report - Appendix E: Hand Auger Logs²

² Subsequent revisions made by T+T (March 2021) include PID readings in logs HA108, HA109, HA111, HA114, HA115, and HA119.