

TO: Lobo Coutinho
 COPY TO:
 FROM: Grant Allen

Date: 14 January 2019
 Job No: 60337
 eTrack No: 200024146

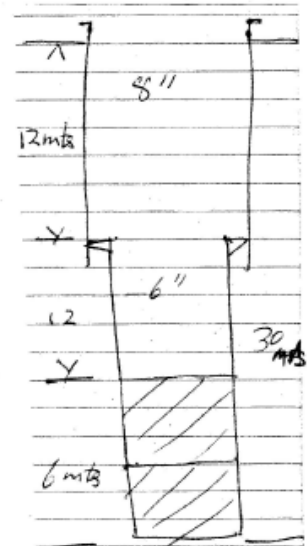
KARIOI PULP MILL BORE DETAILS

Table 1. Bore details

Item	Value	Source	Date
Static water level (mbgl)	10.26	Bore redevelopment report (below)	07/03/2011
Bore depth (mbgl)	31.5	Email from Paul Bing (below)	07/02/2012
Inline pump (mbgl)	20.4		
Top level switch (mbgl)	14.0		
Bottom level switch (mbgl)	20.0		
Pump suction (mbgl)	21.1		
Consistent flow rate (L/min)	110	Email from Paul Bing (below)	08/02/2012
Flow rate (L/min)	70-360	Email from Gustav Bam (below)	23/05/2018

Bore redevelopment report (excerpt)

1. Static water level 10.260 metres
2. Bore produced 12 cu with WPI original pump. Pump level 14.200 metres.
3. Removed very little sand, but a lot of schail (flaky rust).
4. Test pump at 31.800 cu/hr with WWD test pump. Water level at 14.500 metres.
5. Could not get anymore water with a bigger test pump (30 cu appears to be the maximum).
6. Attained 30 cu/hr with WPI second pump.
7. Pump is on 3 full lengths (6.5 metres per length) plus 2.5 metres of top pipe (22 metres to top of pump).
8. There appears to be 2 lengths or six metres of screen in the bore.



Pulp Mill Bore Location (from 1996 Pump Test Report)

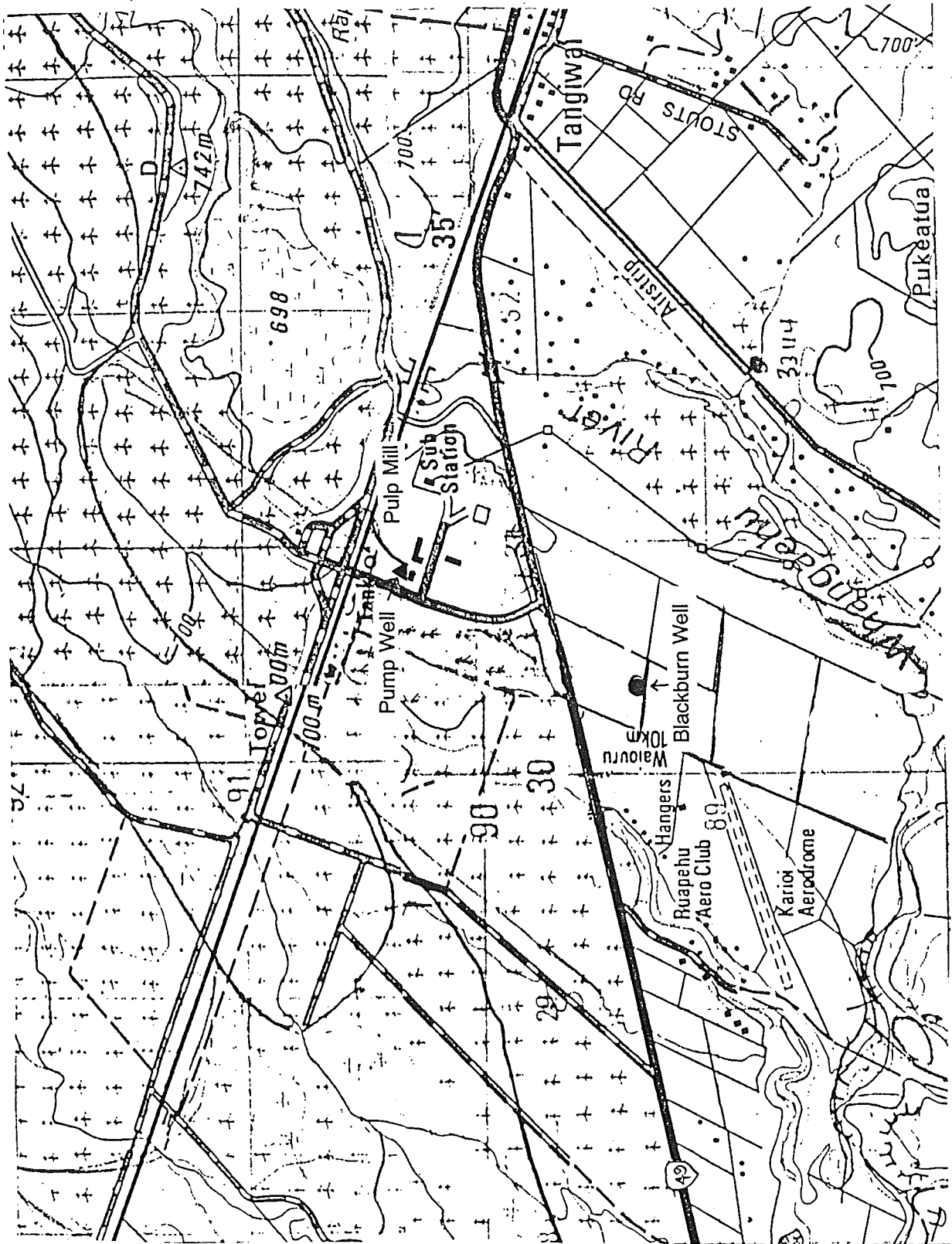


Figure 1: LOCATION MAP

Pulp Mill bore design (from 1996 Pump Test Report)

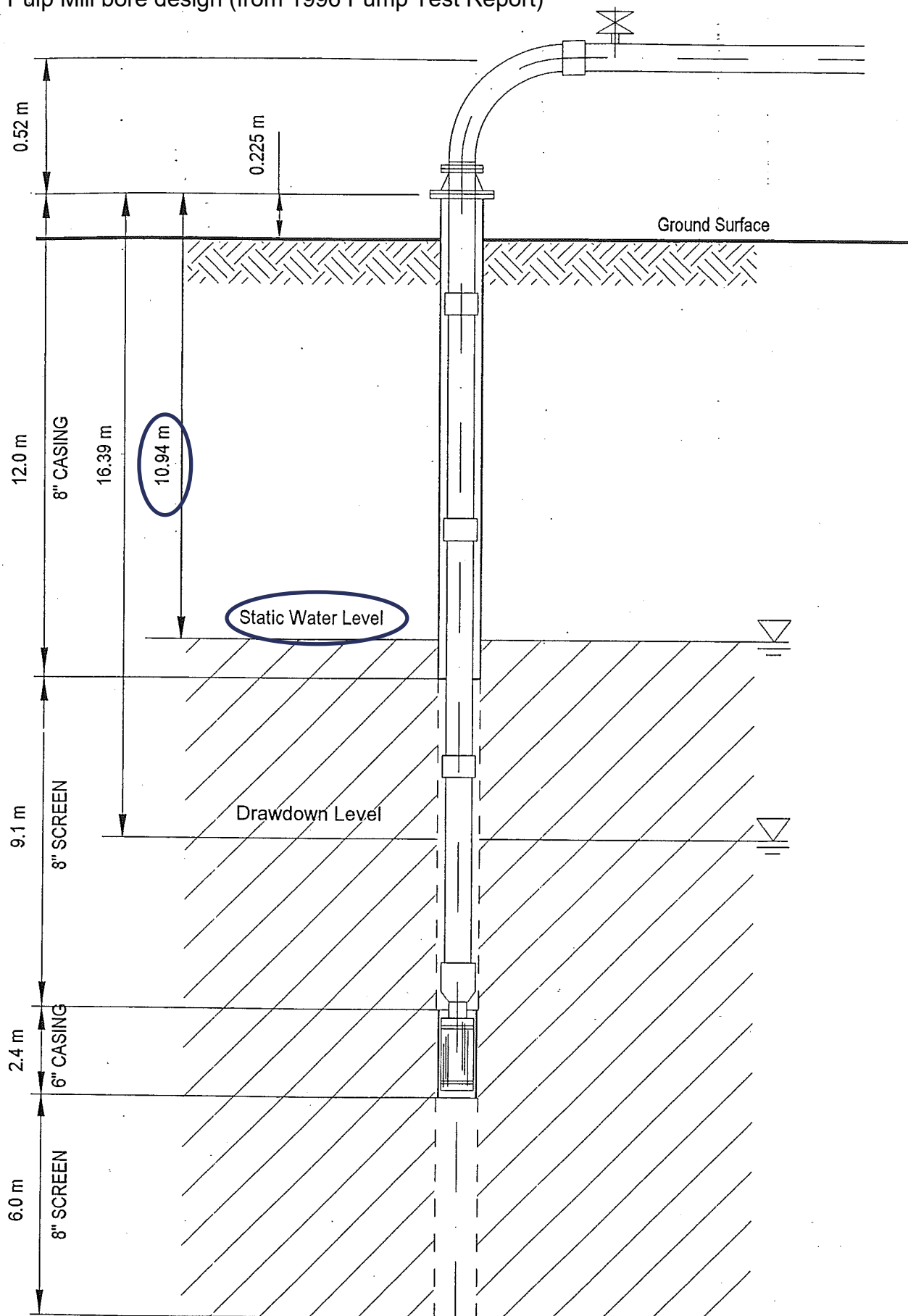


Figure 2 : PUMP WELL DETAILS

[illegible]



SUMMARY OF SOIL PROFILE & TESTING

JOB No. 60337#GE01

PROJECT:

WPI Karioi Pulp Mill

HOLE No.

BH1

DATE STARTED: 28/09/2021

METHOD: OB/SPT/TT

RIG: Trailer Mounted Rig

SHEET 3 of 7

DATE FINISHED: 29/09/2021

DRILLED BY: DCN Drilling Ltd.

FLUID: Water/Drilling Mud

LOGGED BY: RTS

DEPTH (m)		SOIL/ROCK DESCRIPTION*				SAMPLES RECOVERED & TEST RESULTS												DEPTH (m)											
		SOIL SYMBOL	ELEVATION DATUM: N/A EASTING: NORTHING: SURFACE ELEVATION: For an explanation of the terms & symbols used see attached sheets.	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	MOISTURE CONTENTS = ●						OTHER TESTS												
											LIMITS: PLASTIC = X			LIQUID = +			Corrected Shear Vane Result **												
											IN SITU VANE (kPa) = ※									U = peak / R = remoulded									
								50 100 150						SPT / Scala Penetrometer															
11.00			10.5m - 10.65m Recovered as Fine to coarse SAND with minor gravel; dark grey to black with dark brown specks. 'Very dense'; gravel, fine. 10.81m-10.95m: thin (140mm) lense of fine gravelly sand	WAIMARINO FORMATION [Q4H]			D	TT	93									28 / 22 for 55mm N>50	11										
12.00			Fine grained, moderately weathered, weakly cemented SANDSTONE. Very weak to weak, mass bedded. SAND with some silt and trace of clay; dark grey with trace brownish grey specks. Very dense.	WAIMARINO FORMATION [Q4H]			D	TT	90									38 / 12 for 15mm N>50	12										
13.00			Highly weathered, dark grey matrix, weakly cemented, CONGLOMERATE. Very Weak to weak, mass bedded. Sandy SILT with some gravel and minor clay. hard, non plastic; gravel, fine to medium, volcanoclastic	WAIMARINO FORMATION [Q4H]														19 / 26 // 25 / 21 for 30mm N>50	13										
14.00			Fine to coarse grained, moderately weathered, weakly cemented SANDSTONE. Very weak; mass bedded. SAND with minor silt, trace of gravel and trace of clay; dark grey. Very dense; mass bedded; gravel, fine.	WAIMARINO FORMATION [Q4H]			D	TT	69									24 / 26 for 60mm	14										
15.00				WAIMARINO FORMATION [Q4H]															15										

Remarks: Drilling Fluid: SBM. *: Measured by DCN post drilling. Driller noted difficulty with ground water measurement due to viscosity of drill fluid.
SPT: // represents end of seating blows (i.e. x/x//)



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	SOIL SYMBOL	ELEVATION DATUM: N/A EASTING: NORTHING: SURFACE ELEVATION: For an explanation of the terms & symbols used see attached sheets.	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	MOISTURE CONTENTS = ● LIMITS: PLASTIC = X LIQUID = + IN SITU VANE (kPa) = *						OTHER TESTS Corrected Shear Vane Result ** U = peak / R = remoulded SPT / Scala Penetrometer N>50
										20	40	60				
16.00		15.27m - 15.37m: Becomes with minor fine to medium gravel. Probable CL Location				D	TT	93								50 for 60mm N>50
		15.95m - 16.2m Slightly weather, redish purple, SCORIA BOULDER. Very strong, angular.														
		16.2m: 100mm CL likely between boulders.														
		16.3m - 16.4 Slightly weathered, dark grey to black ANDESITE COBBLE. Very strong, angular.														
		16.4m - 16.5m Slightly weather, redish purple, SCORIA BOULDER. Very strong, angular.														
17.00		Highly weathered, dark grey to black matrix, weakly cemented, CONGLOMERATE. Very Weak to weak, mass bedded. Sandy gravelly SILT with minor clay. hard, non plastic; sand, fine to coarse; gravel, fine.					SPT									
		Fine to coarse grained, moderately weathered, weakly cemented SANDSTONE. Very weak; mass bedded. SAND with minor silt, trace of gravel and trace of clay; dark grey. Very dense; mass bedded; gravel, fine.				D	TT	93								
		Highly weathered, dark grey to black matrix, weakly cemented, CONGLOMERATE. Very Weak to weak, mass bedded. Sandy gravelly SILT with minor clay. hard, non plastic; sand, fine to coarse; gravel, fine.														
18.00							SPT									34 / 16 for 25mm N>50
		18.48m - 19.2m: Slightly weather, dark grey, ANDESITE BOULDER. Very strong, angular.				D	TT	95								
19.00		19.20 - 19.40m: Recovered as GRAVEL in sandy silty matrix; dark grey to black. Gravel, fine to coarse, angular to sub-angular.					SPT									50 for 60mm N>50
		19.70m - 20.0m Slightly weather, reddish purple, SCORIA BOULDER. Very strong, angular.														
20.00																

Remarks: Drilling Fluid: SBM. *: Measured by DCN post drilling. Driller noted difficulty with ground water measurement due to viscosity of drill fluid.
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SHEET 5 of 7

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FLUID: Water/Drilling Mud

LOGGED BY: RTS

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		SOIL SYMBOL	ELEVATION DATUM: N/A EASTING: NORTHING: SURFACE ELEVATION: For an explanation of the terms & symbols used see attached sheets.	GEOLOGIC UNIT	GROUND WATER	CONDITION	TYPE	METHOD	RECOVERY (%)	PENETRATION RESISTANCE	MOISTURE CONTENTS = ● LIMITS: PLASTIC = X LIQUID = + IN SITU VANE (kPa) = ※						OTHER TESTS Corrected Shear Vane Result ** U = peak / R = remoulded								
																	SPT / Scala Penetrometer								
21.00			20.0m - 20.48m Recovered as GRAVEL in a Sandy SILT with trace clay matrix; dark greyish brown. 'Very dense'; poorly sorted; gravel, angular, fine to coarse, dark grey, andersite. 20.37m - 20.45m: Slightly weathered, dark grey to black ANDESITE COBBLE. Very strong, angular. 20.72m - Becomes Fine to medium Gravelly SILT with silty clay matrix.	WAIMARINO FORMATION [Q4H]			D	TT	77								28 / 22 for 25mm N>50	21							
		21.0m: Recovered as Fine to medium gravelly SAND with some silt; dark grey. Tightly packed; significant CL at start of run.							SPT																
22.00			22.5m - Becomes fine to coarse gravel								D	TT	80									23 / 27 for 65mm N>50	22		
23.00			23.4m - Becomes fine gravel with occasional oversize medium gravel.																				24		
24.00			Fine to coarse SAND with trace of gravel; dark grey. 'well packed', gravel, fine. 24.67m - 24.8m: Grades to minor fine gravel; normally graded. 24.80m - 25.0m: Grades to some fine to coarse gravel.																						
25.00																									

Remarks: Drilling Fluid: SBM. *: Measured by DCN post drilling. Driller noted difficulty with ground water measurement due to viscosity of drill fluid.
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										LIMITS: PLASTIC = X			LIQUID = +			Corrected Shear Vane Result **			
										IN SITU VANE (kPa) = ※						U = peak / R = remoulded			
										50 100 150						SPT / Scala Penetrometer			
		25.0m: Grades to minor fine to medium GRAVEL. Average particle size of 1-2cm.	WAIMARINO FORMATION [Q4H]																
		25.5m - 26.02m: Slightly weathered, dark grey to black ANDERSITE COBBLE. Very strong, angular.					SPT											50 for 70mm N>50	
26.00		Gravelly SAND with some silt; dark grey. 'Loosely packed', sand, fine to coarse; gravel, fine to medium (average particle size <1cm)			D	TT	67												26
		Recovered as fine to medium GRAVEL with trace of SILT and trace of sand; dark grey. Very dense.																	
27.00		Gravelly SAND with some silt; dark grey. 'Loosely packed', sand, fine to coarse; gravel, fine to medium (nominal size <1cm)			D	TT	53											50 for 60mm N>50	27
28.00																			28
		Highly weathered, dark grey matrix, poorly consolidated, CONGLOMERATE. Very Weak, mass bedded. Sandy gravelly SILT with minor clay. hard, non plastic, gravel, fine to medium with oversize coarse (up to 30mm).					SPT											50 for 65mm N>50	
29.00						D	TT	100											29
30.00																		50 for 55mm	30

Remarks: Drilling Fluid: SBM. *: Measured by DCN post drilling. Driller noted difficulty with ground water measurement due to viscosity of drill fluid.
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										LIMITS: PLASTIC = X			LIQUID = +			Corrected Shear Vane Result **		
										IN SITU VANE (kPa) = ※						U = peak / R = remoulded		
										20	40	60		SPT / Scala Penetrometer N>50				
31.00		30.0m - 30.3m: Recovered as Fine gravelly SAND; dark grey. 'Well packed'; sand, fine to coarse; gravel fine.	WAIMARINO FORMATION [Q4H]			D	TT	87							50 for 65mm N>50	31		
32.00		Fine to coarse SAND with minor gravel; dark greyish black. 'Well packed'.				D	TT	67									32	
33.00		CLAY with minor silt; light greenish grey. 'Very stiff to hard', highly plastic. Non-conformity. Very low recovery of sample from 32.7m - 34.5m [MATEMATEAONGA FORMATION] 33.0m: Grades to 'firm to stiff' (field assesment).	MATEMATEAONGA FORMATION												14 / 19 // 26 / 24 for 50mm N>50	33		
34.00						D	TT	17									34	
35.00		End of Borehole at 34.5 m														35		

Remarks: Drilling Fluid: SBM. *: Measured by DCN post drilling. Driller noted difficulty with ground water measurement due to viscosity of drill fluid.
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Sawmill bore details (from 2020 Pump Test Report)

3 BORE DETAILS

3.1 Overview

The existing water permit refers to one bore “approximately 35 m deep”. However, according to bore logs obtained from WPI (Appendix A), there are two bores on site (identified on the logs as owned by WPI) that were drilled in the 1990s by Whanganui Well Driller Limited (WWD). Neither Horizons nor WMD were able to provide bore logs or pump test data.

A third bore log also provided by WPI relates to a bore on a neighbour’s block to the east of the site (referred to as “the neighbouring bore”). This bore log is also provided in Appendix A.

The location of the two bores on site are shown on Figure 2 along with the location of the neighbouring bore. The bore on site that was drilled to 24 m before collapsing (accordingly to the log) will be referred to as Bore 1 from now on while the other bore on site will be referred to as Bore 2². Distances between bores are given in Table 1 along with the distance from each bore to the nearest stream.

Table 1. Distances* (m) between tested, observation bores and surface water.

Location	Bore 1 (In use)	Bore 2 (Unused)	Neighbouring bore	Waitangi Stream	Whangaehu River
Bore 1 (In use)		170	400	260	1,200
Bore 2 (Unused)	170		570	270	1,050
Neighbouring bore	400	570		150	1,400
Waitangi Stream	260	270	150		1,300
Whangaehu River	1,200	1,050	1,400	1,300	

Notes: *shortest distance in metres; Bore 1 is Horizons Bore 745003; Bore 2 is 745002 and neighbouring bore is 745004.

3.2 Site Bores

3.2.1 Introduction

The information known about the two bores on site is outlined in Sections 3.2.2 and 3.2.3, respectively, and summarised in Table 2. With very little historical data available, much of the information presented was obtained during the pump tests undertaken as part of this assessment.

Table 2. Details of tested production bores.

Bore number	SWL* (mbgl)	Screen top (mbgl)	Screen length (m)	Depth (m bgl)	Diameter (mm)
Bore 1	7.04	41 ¹	-	47 ¹	150
Bore 2	6.95	29 ²	6	35 ²	150

Notes: *SWL = static water level, measured during pump tests; -: no data available; mbgl = metres below ground level; ¹: depth estimated by pump placement; and ²: depth estimated from bore log and pump placement.

² Horizons confirmed in an email to Babbage dated 7 January 2020 that Bore 1 is Horizons Bore 745003 and Bore 2 is 745002.



60337	EN0802	-	Winstone Pulp International
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Bore Locations

26/03/2019 LC

SCALE @ A4 1:5000

Sawmill Pump Tests

Legend

- | | | | |
|---|------------------|---|-------------------|
|  | Railway |  | Groundwater Bores |
|  | Waitangi Stream |  | 745002 |
|  | Site Boundaries |  | 745003 |
|  | Stormwater Drain |  | Neighbours Bore |

Babbage 

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