

11 February 2021

Ref No: J01662 (Rev A)

The Bears Home Project Management Limited C/- The Golf Strategy Group

Attention: Mr D Moore

Dear David

RE: INTERIM ADVICE - Preliminary Geotechnical Appraisal Report and Groundwater Standpipe Installations at the Muriwai Downs Farm.

1 EXECUTIVE SUMMARY

The attached conceptual drawings show a possible golf routing and location of key buildings and water storage options for a new golf course at Muriwai Farms, namely:

- Clubhouse (nominally 1,500m2);
- Golf academy building (nominally 600m2); and
- Luxury lodge area;
- Golf maintenance facilities (nominally 2,300m2);
- The current preferred general locations for private residences; and
- Water storage pond (Option J preferred)

Lander Geotechnical have executed a Preliminary Geotechnical Appraisal Report (PGAR) involving a desktop review of geology maps, aerial photographs, council GIS contours, and a site walkover to observe geomorphology with respect to the above concept. In addition, 6 standpipes were installed to depths of up to 5m to facilitate measurement of the near surface groundwater table in the vicinity of preferred water storage Option J.

Pertinent findings that are present in the body of this report in relation to the key buildings and water storage options are summarised as follows:

- <u>Clubhouse / Golf Academy / Golf Maintenance Buildings</u>: The observed landform is gently rolling and has **no perceived geotechnical constraints** for buildings in this area (in terms of ground instability), provided they are set back from the edges of steep sided tributary gullies that are presence.
- <u>Luxury Lodge / Private Residences</u>: The landform here contains significant areas of **steeper** ground exhibiting soil creep / shallow seated slope instability, and there are perceived geotechnical constraints to development upon or close to these features. With appropriate engineering this does not preclude development upon or close to such areas. It will need to be assessed via ground proving site investigations and slope stability analysis to determine safe set back from the steeper ground. This is dependent on the earthworks proposals to provide building platforms and the platform final locations, but if safe set back distances cannot be achieved, then foundations may need to be specific designed and/ or



ground stabilisation measures employed to accommodate laterals loads associated with steep ground. These are outlined in the body of the report (Section 3.4.1).

• <u>Water Storage Options</u>: The geology encompassing most of the site is likely to be of sandy composition, such that any water storage ponds will need consideration to piping erosion failure / leakage induced by a head of impounded water / high hydraulic gradients. This can be overcome by impermeable liners (e.g. highly plastic clay liners, geosynthetics liners, PE liners, etc).

However, preferred Option J is located in a different geology and will likely comprise less sands and predominantly clays and silts (i.e. as evidenced by the attached boreholes records for the installed standpipes). The groundwater table is likely to be high here (refer attached standpipe records) and an 'in ground; pond excavated below current levels may be inundated by groundwater, thereby providing less live storage. Conversely, 'above ground' ponds in this terrain may impose loads onto potentially compressible deposits leading to impoundment 'dam; bund instability, or pond batter slope instability. Liquefaction potential will also be required for Option J. All these issues can be accessed via further site investigations and then addressed through engineering design.

• <u>Fairway Routing</u>: There are **no perceived geotechnical constraints** that would prevent the fairway routes, however where large scale earthworks may be required to change the landform to suit desired fairway / green geometric design, geotechnical analyses for adverse effects as a result of such works on land stability should be undertaken. This is a matter to address as part of the earthworks design process.

Ground proving site investigations will need to be commensurate with the golf course concept(s) and will likely involve several phases, which are outlined in the report (refer Section 3.5).

2 SCOPE OF SERVICES

The Principal (The Bears Home Project Management Limited) has commenced a project for development of an 18 hole golf course at Muriwai Downs Farm. The project extends to augmenting the golf course with buildings, practice facilities and any other amenities necessary or desired to produce an exceptional quality of outcome including club rooms, accommodation and associated infrastructure. The current preliminary concept of basic fairway alignments (as they currently stand) is shown in the attached drawings (as supplied to us). These will likely change as the concept evolves.

Lander Geotechnical have been engaged to provide a Preliminary Geotechnical Appraisal Report (PGAR) in relation to the Principal's land holding specifically included in records of title NA117B/168, NA134D/135, NA125C/442, NA125C/443, NA117B/171 and NA117B/172, known as Muriwai Downs Farm (the 'Site'). The extent of the Site is shown approximately on Council GIS plans Figure1 to 4 (attached).

Our primary scope of work for the PGAR comprises the following primary service objectives:

- A desktop study of available geological maps/ geotechnical data, site walkover of the locations of the proposed infrastructure (Clubhouse, golf academy building, lodge area, maintenance facilities, preferred private residence areas and water storage pond Option J area);
- b) Preliminary geomorphic observation of the proposed infrastructure areas and preparation of a preliminary geotechnical advice report, summarise the outcomes of the desktop/ walkover



assessment and provide key geotechnical considerations for development of the golf course site and likely subsequent geotechnical investigations that will be necessary as part of the resource/earthworks and building consent phases of the project.

A secondary (additional) scope of work was also commissioned as follows:

c) Install 6 No. (5m deep) PVC standpipes (Piezometers). Undertake 1 No. subsequent monitoring round approximately 7 days following installation. Prepare technical memorandum (incorporated within the PGAR) presenting boreholes logs with vane shear strength profiling and measured groundwater levels to inform preliminary foundation conditions for Pond J concept in this area.

3 GEOTECHNICAL DESKTOP APPRAISAL

3.1 Published Geology

There are five geological units beneath the Site which are briefly described below. Refer Figure 5 (attached) for delineation of each unit and more comprehensive descriptions.

- <u>Awhitu Group</u>: Fixed dune sands; prevails over most of the Site.
- <u>Kariotahi Group</u>: Mobile sand dunes; confined to the western extremity of the Site.
- <u>Nihotupu Formation (Waitakere Group)</u>: Sandstones and siltstones; isolated to small portions of the northern and southern extremities of the Site.
- <u>Tauranga Group</u>: Alluvial deposits; prevails over the majority of the eastern (lower lying) portion of the site.
- <u>Waiatarua Formation (Waitakere Group)</u>: Basalt flows and pillow lava; confined to a small, isolated area in the central eastern region of the site.

3.2 Site Walkover and Preliminary Geomorphic Observations

The Site is characterised by rolling terrain dipping in elevation from more elevated terrain in the south, towards lower lying terrain in the north, where a main dividing gully system defines the northern boundary. A number of incising features (watercourses and wetlands) form tributaries to the main dividing gully, with these features being far more significant and pronounced over the western half of the Site. Terrain relief and associated contours best illustrated this as shown on Figures 3 and 4 (attached).

Figure 6 (attached) presents oblique views across the Site sourced from Google Earth (displaying 3x vertical exaggeration), with photographs superimposed to illustrate certain typical geomorphic features from our site walkover (on 14/12/20). Detailed geomorphic mapping is recommended focussing on the golf course layout once the concept(s) is firmed up. From a preliminary sense the main geomorphic observations are summarised as follows:

- <u>Soil Creep</u>: shallow seated slope instability (also known as sheep tracks), commonly occurring on areas where slope gradients exceed 1(v) in 4(h). More prevalent over the western half of the site where the terrain is more severe than the central and eastern portions.
- <u>Basalt Rock outcrops</u>: isolated to a small area in the central region of the site (red shaded area on Figure 5 geology map).



- <u>Sandstone Rock outcrops</u>: isolated to the waterfall features within in the main dividing gully defining the central region of the northern boundary of the Site (orange shaded area on Figure 5 geology map). Unlikely to be developed over so is probably of little consequence.
- Low lying ground / wetland: generally located in the base of various incised watercourse / gully features, typically flanked by areas displaying soil creep (e.g. over the western half of the site where the gullies are more incised than the central / eastern portions). Low lying ground in the eastern part of the site may be prone to flooding (subject to confirmation by a specialist).
- <u>Gently Rolling to Flat Terrain</u>: The majority of the central and eastern portions of the Site and offers easy contours to develop over, but this terrain is less common over the western half of the site where the landform is more severe.

3.3 Existing Geotechnical Information

The New Zealand Geotechnical Database shows there is no existing geotechnical information held within the area encompassed by the Site, however there is data nearby as illustrated on Figure 7 (attached). This shows the locations of water bores and a shallow hand auger borehole. The logs of these tests are attached, and in particular the water bore information may be of interest to supplement any other water bore information held for the Site (i.e. not in the NZGS database).

3.4 Preliminary Geotechnical Considerations

3.4.1 Slope Stability Hazards

The western half of the site contains steep ground defined by significant incised gully systems forming tributaries to the main dividing gully on the northern boundary. There were no large geomorphic features observed, or apparent on the aerial photographs reviewed for this report, that would suggest deep seated slope instability prevails in this area, however there is much evidence of soil creep where slope gradients typically exceed 1(v) in 4(h). These are shallow seated modes of slope failure that occur slowly over time, as a result of seasonal wetting and drying of the surficial soils and gravity, exacerbated by livestock to form minor slump terraces (i.e. 'sheep tracks'). This may affect the luxury lodges and residences.

Earthworks in this area will require slope stability consideration to ensure the stability of the slopes are not compromised and achieve a minimum acceptable factor of safety commensurate for the proposed end use. The required minimum factors of safety are more stringent where infrastructure and buildings are to be sited, and less so where parklands / reserves (and arguably fairways) are sited. Where there is room, it is often best to adequately set back development areas from slopes where factors of safety do not meet minimum requirements (or slope showing signs of existing movement), thereby avoiding what can be expensive slope stabilisation engineering (e.g. palisade shear piles, retaining walls, bulk earthworks shear keys, counterfort / horizontally bored drainage, etc).

The central and eastern portions of the Site are gentler and do not appear to present the same inherent slope stability risks than the western side does.

3.4.2 Liquefaction Potential

The Tauranga Group alluvial deposits over the eastern side of the Site (refer Figure 5 geology map) may contain soft / weak ground with a high ground water table, which may be susceptible to liquefaction under earthquake shaking. Liquefaction can manifest at the surface as sand boils,



subsidence and/ or lateral spreading. This is a matter for consideration as part of further ground proving geotechnical investigations and analysis, if infrastructure, ponds, golf course, and/ or buildings are to be sited over this area.

The central and western portions of the sites are inferred from geology maps to contain predominantly fixed dune deposits (Awhitu Group), and a deeper groundwater regime is anticipated when compared to the lower lying eastern portion. Based on experience Awhitu Group is anticipated to have low susceptibility to liquefaction under seismic loadings.

3.4.3 Compressible Ground

The Tauranga Group alluvial deposits over the eastern side of the Site (refer Figure 5 geology map) may contain soft / weak ground that is prone to consolidation settlements under imposed loadings (e.g. from bulk fills and/ or building surcharges, etc). This is a matter for further investigation and analyses commensurate with a development proposal over such areas.

Consolidation settlements can be mitigated (where they cannot be tolerated) by preloading of the ground (with wick drainage to reduce the preloading time), ground improvement (e.g. undercutting and replacement, or deep stabilisation via lime/ cement soil mixing, etc), and/ or specific foundation design (e.g. pile foundations for buildings, etc).

3.4.4 Near Surface Rock

There is a relatively small area in the centre of the Site shown to contain Basalt Rock (refer Figure 5). This was observed to be outcropping during the site walkover (refer Figure 6) and appears to have the relict workings of a minor quarrying operation. Near surface rock presents constraints to bulk earthworks (e.g. cuts) using conventional prime movers (e.g. motor scrapers, bull dozers, excavators, etc) and may require blasting to remove, if this is a requirement. Deep pond excavations may also encounter rock (e.g. 'Pond J', in light of the borehole findings presented in Section 3 below) , and will be subject to specific design to help assess any design conflicts in this regard.

3.4.5 Foundations for Buildings and Infrastructure

Most buildings and Infrastructure at the locations shown in concept are anticipated to be located predominantly upon Awhitu Group geology, which should be suitable for NZS3604 shallow foundation systems having a geotechnical ultimate bearing capacity of 300 kPa. This subject to ground proving and soil strength profiling as part of future investigations.

The MBIE expansive site class of the foundation soils is likely to be Class S (slight) to H (High) and is subject to site investigations and specific laboratory testing. This is a matter for detailed structural design of foundations at a later stage, but would not preclude the use of shallow foundation solutions.

3.4.6 Pond Infrastructure

Ponds for irrigation / stormwater attenuation are likely to be required. Awhitu geology encompasses most of the site and is likely to be predominantly sandy, such that any ponds here will need consideration to piping erosion failure induced by a head of impounded water / high hydraulic leakage gradients. This can be overcome by impermeable liners (e.g. highly plastic clay liners, geosynthetics liners, PE liners, etc).

Tauranga Group deposits (e.g. the eastern end of the site , where Option J may be sited) will likely comprise more clays and silts (i.e. as evidenced by the attached boreholes records for the installed standpipes). The groundwater table is likely to be high here (refer attached standpipe records) and



an 'in ground; pond excavated below current levels may be inundated by groundwater, thereby providing less live storage. Conversely, 'above ground' ponds in this terrain may impose loads onto potentially compressible deposits leading to impoundment 'dam; bund instability, or pond batter slope instability.

Of relevance for all ponds is consideration of conduits through pond impoundment structures (e.g. earth bunds) which will need to minimise the potential for seepages and piping erosion (e.g. cut off collars, seepage filters, etc).

All ponds will need site investigations, flow net analysis (or similar, depending on size) and specific design.

3.4.7 Bulk Earthworks

Earthworks in Awhitu Group geology are anticipated to comprise mainly sands, and should be relatively straightforward to execute using conventional earthworks machinery (e.g. motor scrapers, tipper trucks, compactors, graders, bull dozers, etc). In Awhitu group fixed dune deposits, cut slopes in sands when left unprotected from the elements can be prone to erosion and runnelling when exposed to rainfall and overland flows. Slopes here often perform best when cut near vertical (subject to their height / slope stability analysis) as this exposes a lesser face area to the elements.

Tauranga Group alluvial materials are situated in a lower lying area, and as such are likely to be wet of an optimum moisture content (e.g. of concern if ponds are excavated here and the materials borrowed for use as engineered filling elsewhere). They would likely require conditioning by air during or lime addition / mixing with dryer materials. Heavy earthworks machinery may also cause pumping of the subgrade (i.e. subgrade shear failure) on haul roads / in cut areas where the groundwater table is naturally high, and therefore find it difficult to repeatedly traffic over.

Once an earthworks model for the concept(s) is developed, areas requiring engineered filling can be determined and laboratory samples collected from borrow areas / insitu testing performed, in order to determine compaction control criteria for the specific materials (e.g. a sand will have a different criteria to clay).

3.5 Further Geotechnical Work

Further site investigations will be commensurate with the golf course concept(s) and will likely involve several phases, such as (but not limited to):

- 1. <u>Preliminary investigations</u> of preferred golf course, building / infrastructure and pond areas to inform concept / preliminary design and determine general land suitability, assess liquefaction potential, slope instability potential, consolidation settlement potential, etc
- 2. <u>Detailed investigations</u> once an earthworks model is developed for Resource / Earthworks Consent, and should inform compaction control criteria, detailed slope stability analysis, detailed settlement analyses, etc.
- 3. <u>Detailed investigations</u> of ponds once their locations, geometry and typology have been determined for specialist dam design and associated Consent(s), if required.
- 4. <u>Detailed investigations of future building platforms</u> to confirm bearing capacity, expansive site class, foundation type and inform structural design for Building Consent(s).



4 STANDPIPE INSTALLATIONS AND GROUNDWATER

In the vicinity of Pond J, six (6) PVC standpipes were installed (on 12/01/21) to depths of up to 5 mbgl in the locations shown on Figure 8 (attached). The standpipes were sleeved with geotextile filter sock and bentonite seal to facilitate long term monitoring (e.g. between summer and winter) should that be desired. One groundwater monitoring round was undertaken on 20/01/21. To the best of our knowledge the standpipes have been protected since our monitoring round by post and wire fences to minimise interference / destruction from farm livestock.

Full boreholes records containing descriptions of the materials encountered are also attached together with measured groundwater levels, which ranged from approximately 0.9 to 3.9m mbgl. The logged materials indicated a softer (more compressible) soil profile in the vicinity of P6. The other boreholes typically display firm to stiff soils. No peat or highly organic soils were identified. P1 and P5 encountered refusal conditions prior to reaching target depth and this may infer the top of the Nihotupu Formation (sandstone and siltstone) unit, at depths of 1.3 and 2.5m respectively. Deep ponds may encounter these inferred deposits, and this issue is subject to ground proving investigations.

5 LIMITATIONS

This report has been prepared solely for the use of our client, The Bears Home Project Management Limited, and its professional advisers in relation to the specific project described herein. No liability is accepted in respect of its use for any other purpose or by any other person or entity. All future owners of this property should seek professional geotechnical advice to satisfy themselves as to its ongoing suitability for their intended use.

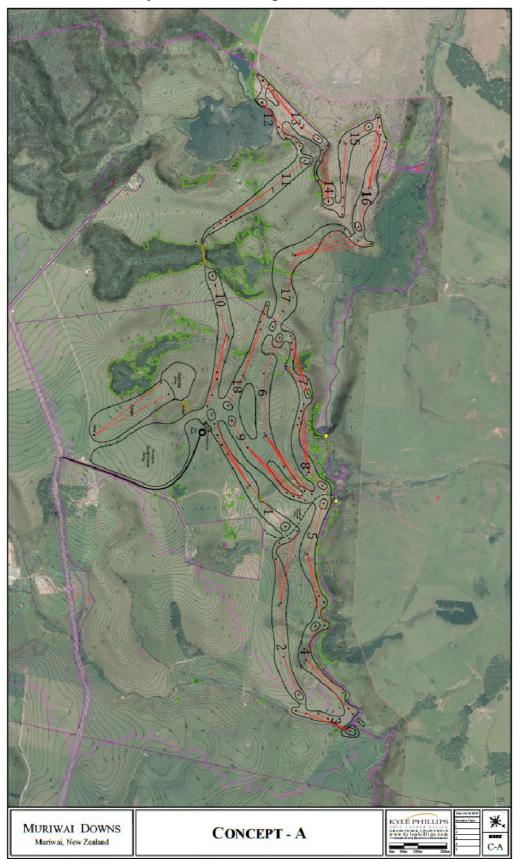
For and on behalf of Lander Geotechnical Consultants Limited

Alla de

S.G. Lander Principal Geotechnical Engineer

Attachments:

- > Current Preliminary Concept Plans (as supplied to us)
- Figures 1 to 4 (Various Auckland Council GIS plans)
- Figure 5 (Geology Overlay)
- Figure 6 (Geomorphic Features Plan)
- Figure 7 (NZGD Existing Test Location Plan)
- NZGD Existing Borehole Records
- Figure 8 (Standpipe Location Plan)
- Standpipe Borehole Records and Groundwater Measurements (taken on 12/01/21)



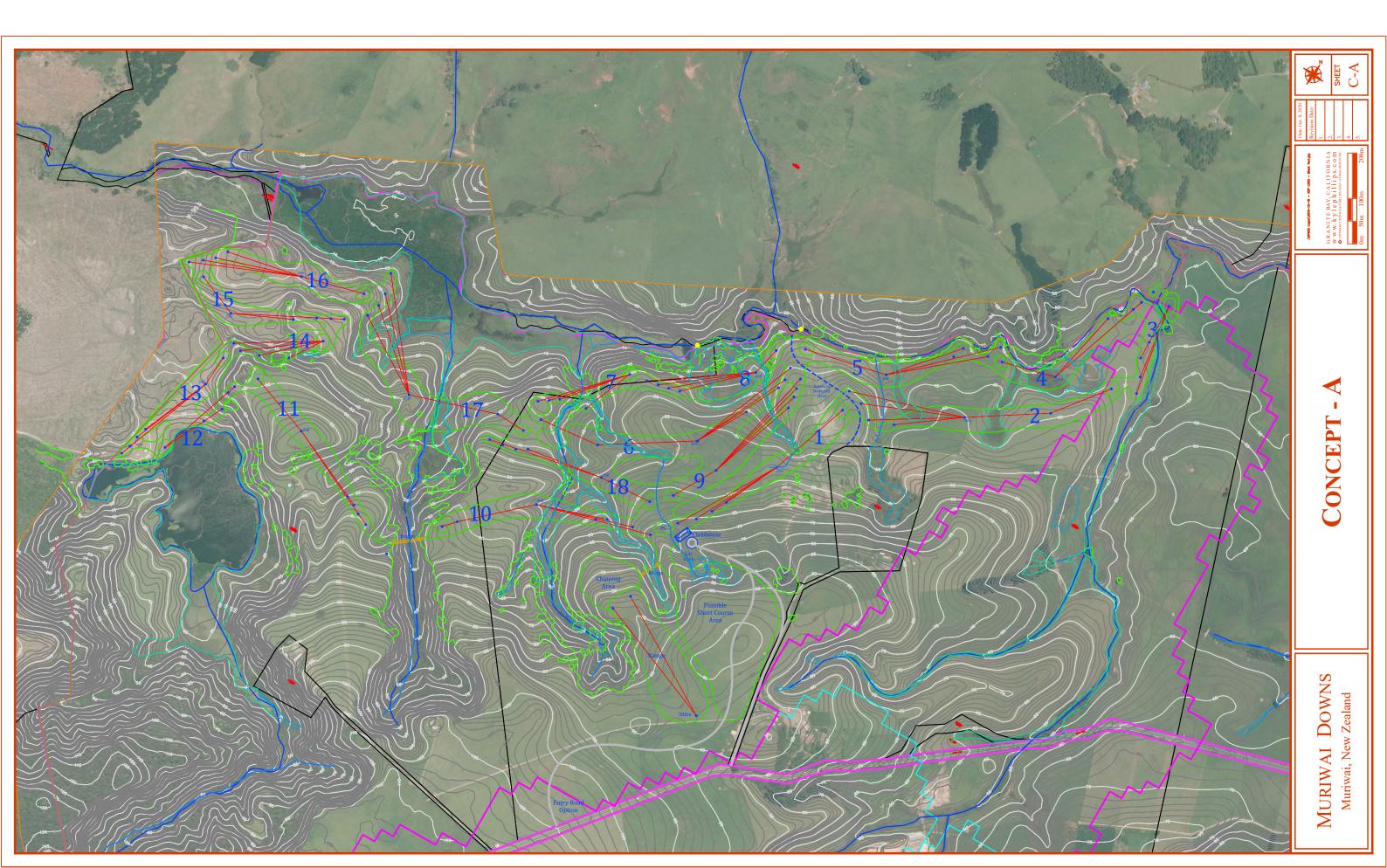
APPENDIX 1: Preliminary DRAFT Golf Routing Plan

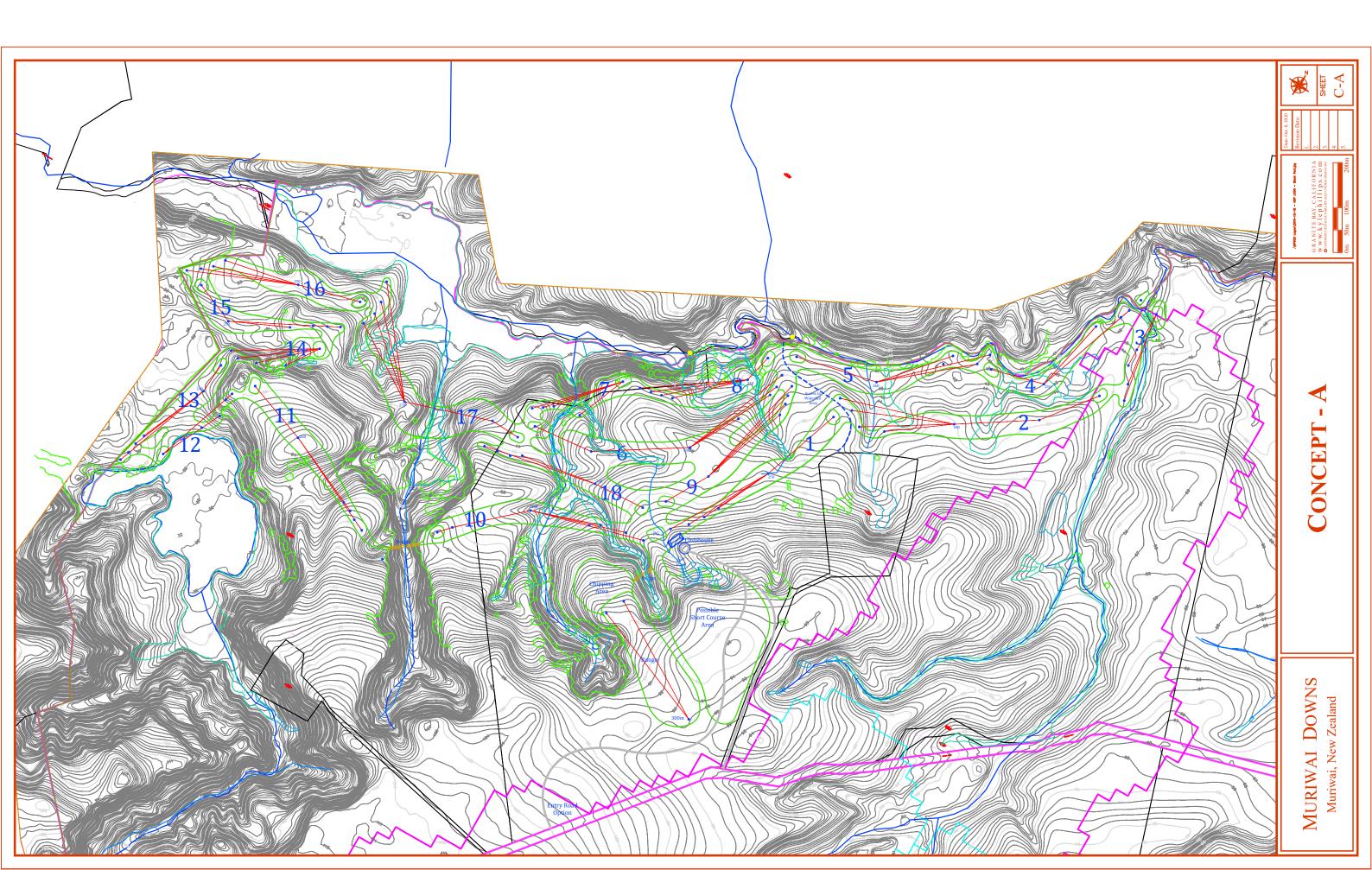


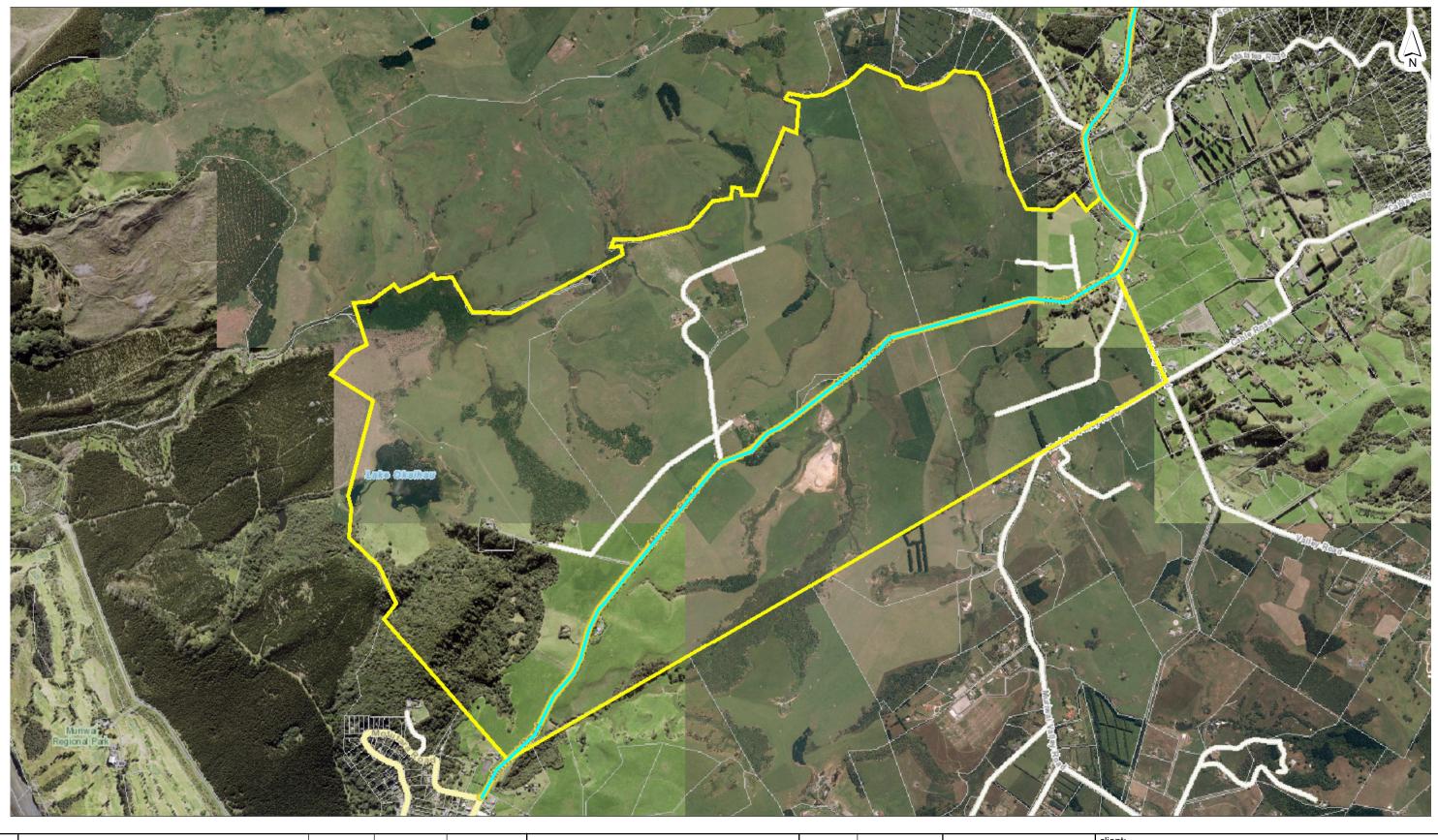
APPENDIX 2: Building Location Options (White Outlined Areas = Clubhouse, White Solid Areas = Golf Academy, Orange = Lodge Locations, Blue = Golf Maintenance, Stars = Dwellings











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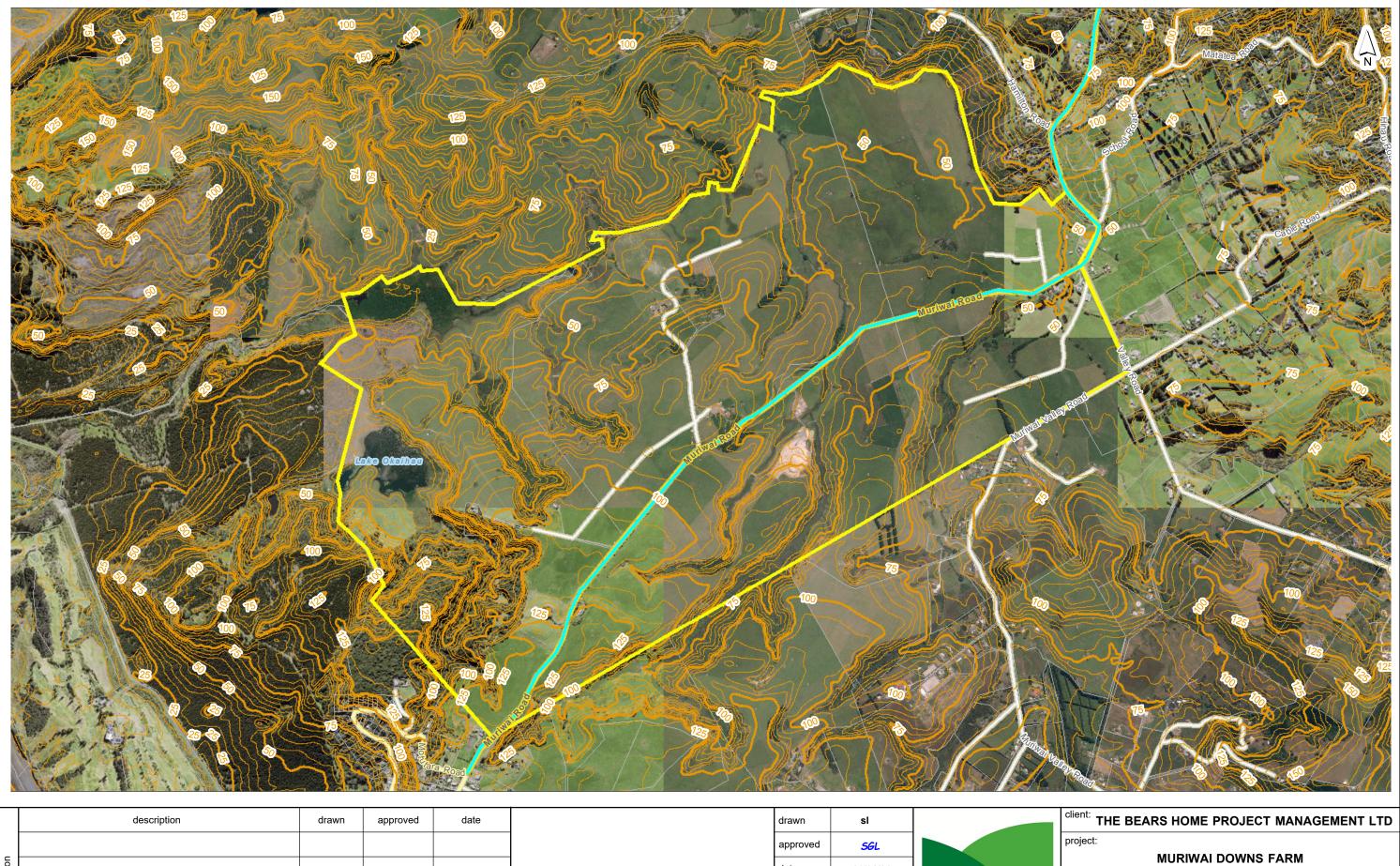
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AUCKLAND COUNCIL GIS AERIAL

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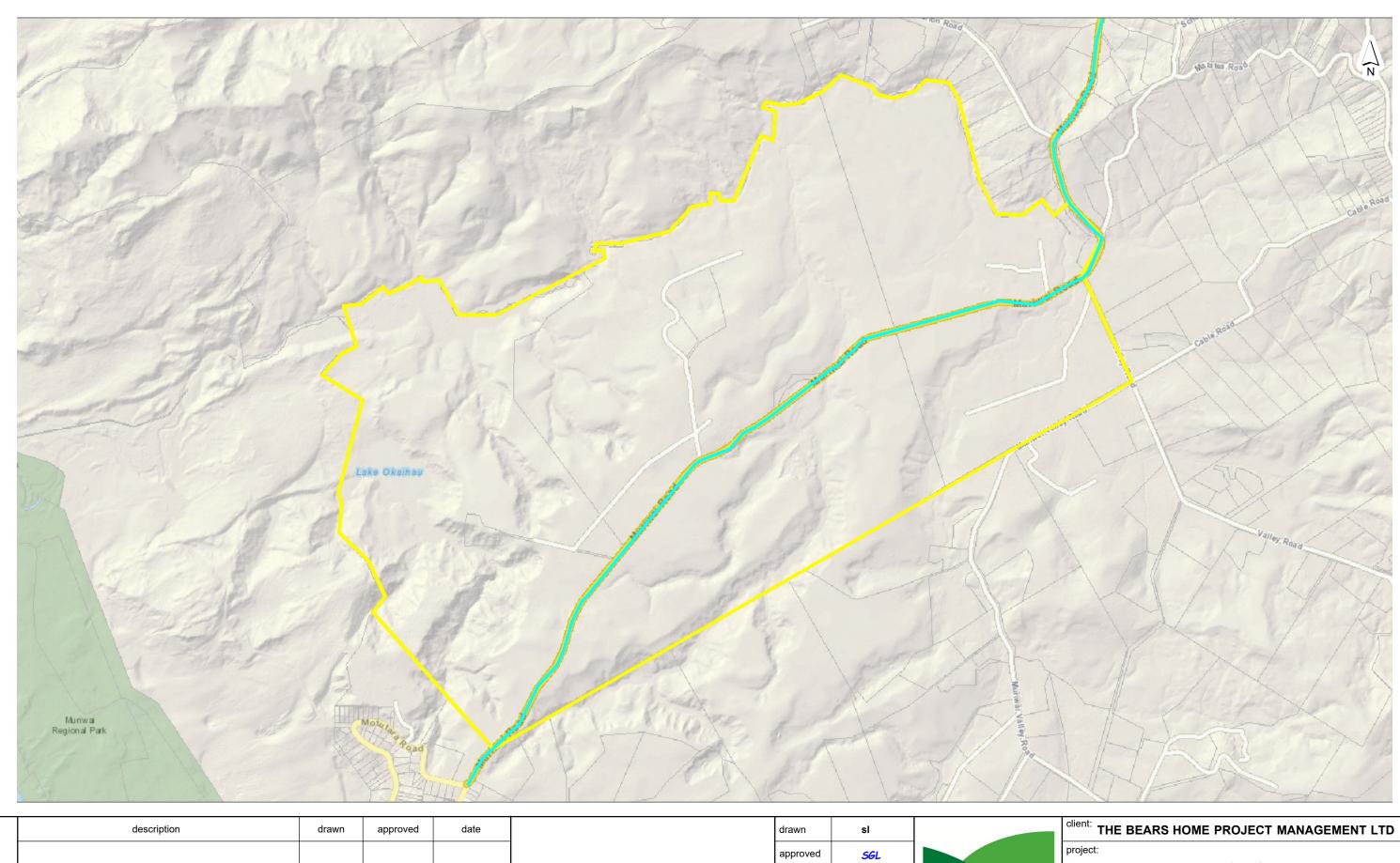
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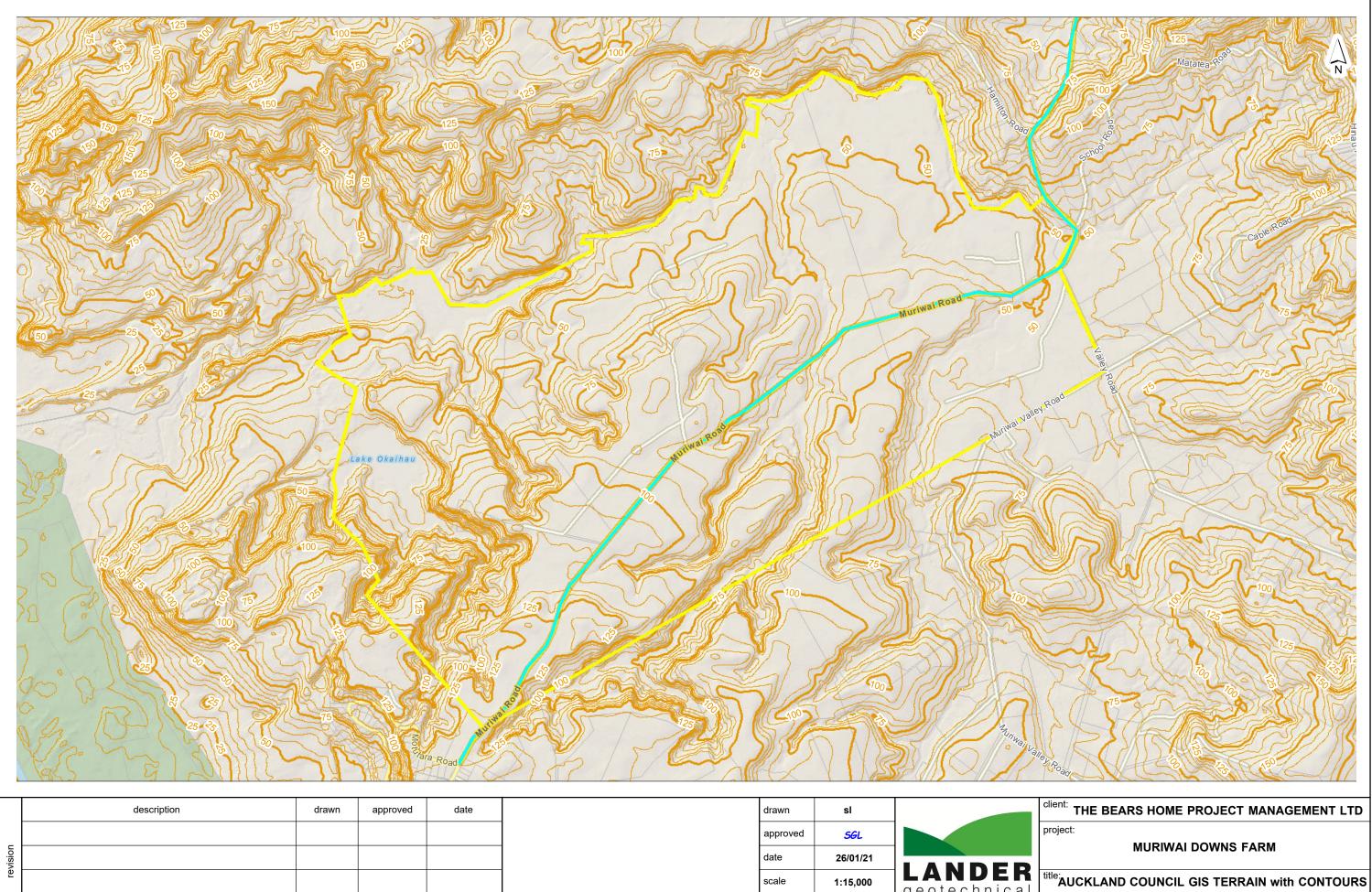
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- stratlex: Nihotupu Formation
- supergroup: Akarana Supergroup
- group_equi: Waitakere Group
- subgroup_e: Manukau Subgroup
 formation_: Nihotupu Formation
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- abs max: 23.8
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- rock_class: clastic sediment
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- group_equi: Karioitahi Group
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- vegetated dune fields and deflation zones.
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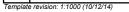
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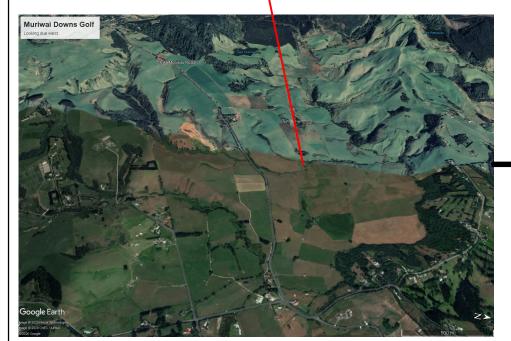
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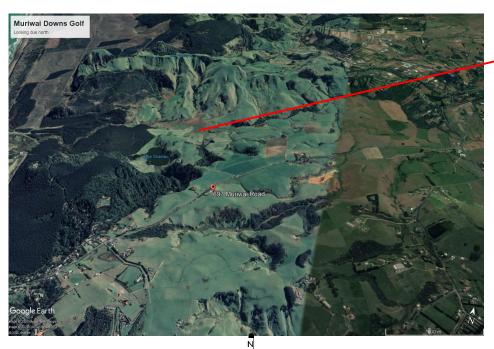
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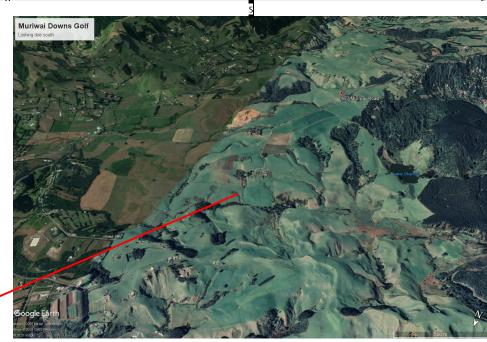
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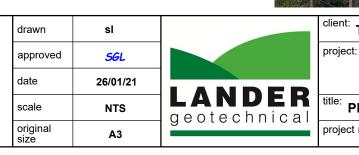




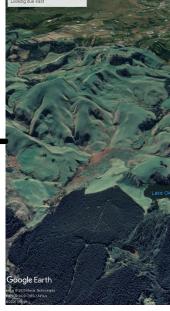




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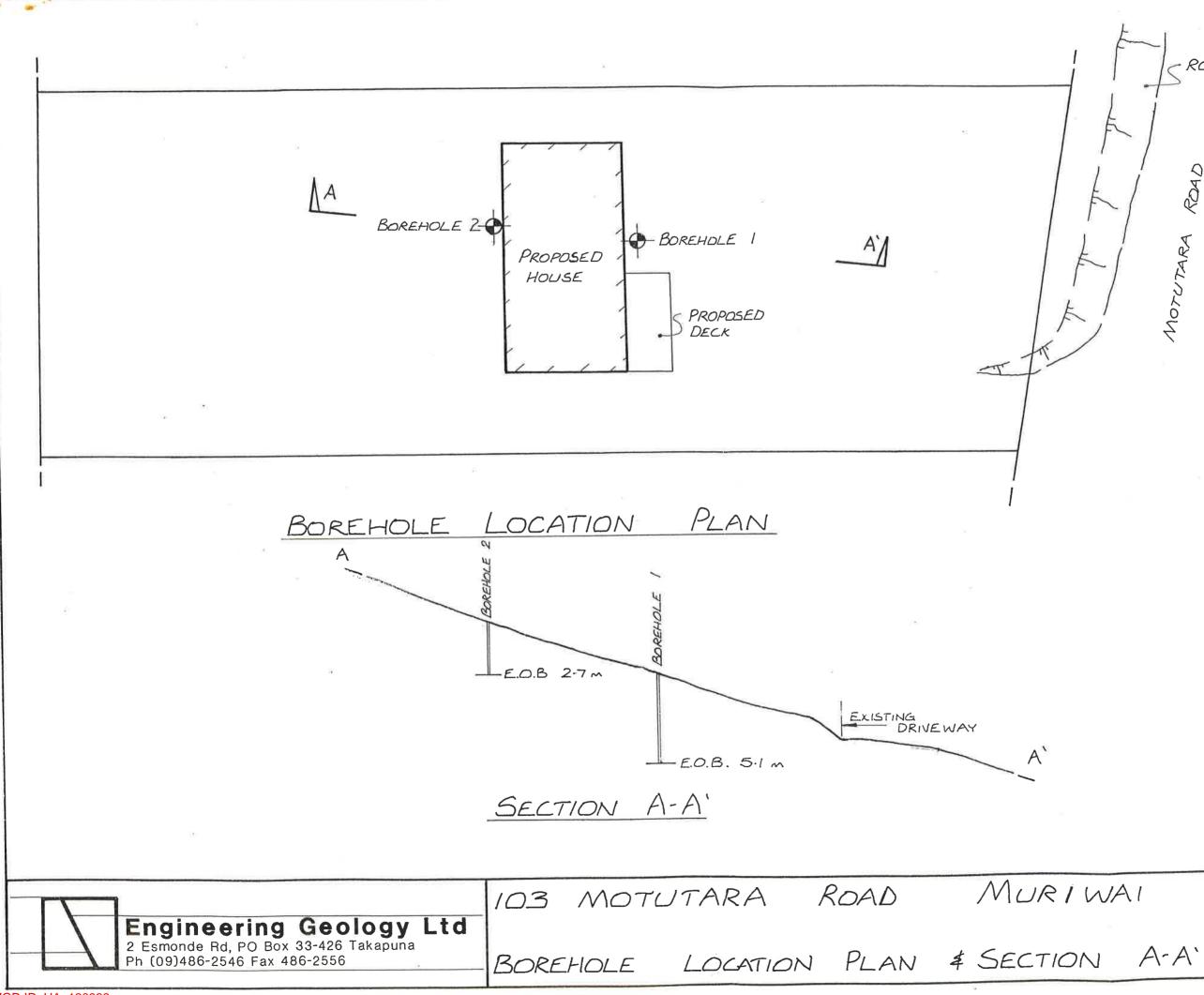


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Hens H	gineering Geology Ltd									B	OREHOLE N
SITE	: 103 Motutara Place, Muriwai					REF.	25	45		s	Sheet 1 of 1
REDUCED LEVEL STRATA INTERP.	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLES	WATER LEVEL	STR	ENG eld v ab. v	TH (ane ane	SHE kPa) (BS1 15	377)	Scala Penetrome Blows/100
-	SILT, sandy, firm, moist, friable, non-cohesive, dk brown		-								-
-	SAND(m), sl.silty, compact, occ. hard layer, moist, lt yellowish grey with occ. orange layers		-						•		
-	sl.clayey		- 1 -					-			
-	SILT, sandy, sl.clayey, stiff, moist, It yellow		-						•		-
ands	It yellowish grey		- 2 -	-	Dry 7-4-95						-
Awhitu Sands	SAND(m), sl.silty, compact, moist, lt yellow		- 3 -					•			-
	SAND(m), clayey, compact, moist, sl.plastic, lt yellowish grey							•			-
-	no clay, very compact layer		- 4 -								-
-	SAND(m), clayey, compact, dry, sl.cohesive, lt yellowish grey								•		-
_	SILT/CLAY, sandy, stiff, moist, sl.cohesive, lt yellowish grey		- 5						•		-
-	E.O.B. 5.1 m		-				-	-		_	

Res II I	gineering Geology Ltd						E	BOREHOLE N
SITE	: 103 Motutara Road, Muriwai					REF. 2545		Sheet 1 of 1
REDUCED LEVEL STRATA INTERP.	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLES	WATER LEVEL	UNDRAINED SF STRENGTH (kP • Field vane (B: O Lab. vane 50 100 1	e)	Scala Penetromet Blows/100
-	TOPSOIL, silt, sandy, firm, moist, friable, non- cohesive, dk brown with many rootlets	\$2522	_					
-	SAND(m), sl.silty,compact, moist, it yellowish grey, occ.hard sand nodules(15 mm ϕ max)		-			•		-
-	sl.clayey		- 1 -			•	•	-
	SAND(m-c), very compact, dry, lt yellow						-	-
- sp	SILT, sl.clayey, stiff, dry, friable, non-cohesive, lt yellowish grey		- 2 -		7-4-95			
Awhitu Sands	SAND(m-c), sl.silty, compact, dry, lt yellowish grey				Dry	•		-
-	E.O.B. 2.7 m U.T.P.	<u>, 1- [] 1</u>	- 3				•	-
-			-					_
			-					_
			- 4	-				_
			_					_
_			- 5					_
			5					





NZGD ID: HA_120938

- ROAD CUTTING ROAD MOTUTARA Dwg. No. 2545-1 Date APRIL 1995 Drawn S.J.G. Scale 1:200

GD ID: Oth	ner_797	35		BC 1758	ON GTGS
SHEET No.	-	Q.1.1	GRID REF		AREA Mariwai
CATCHMENT	0				PERMIT No.
Vell lepth (m) 15	Bm.	Measured Reported	Well diameter (mn	Wellhead altitude (m)	LOCATION SKETCH
ield m ³ /day			Drawdown (m)	Specific 1/min/metre capacity m.²/day	
riller ob Pat	terson	·	Drilling date N	U, LC183, Jan Well status	
wher O	Ison			Address Muriway Valley Rd	
ump Type		x	Well Type	Type of development	
creen Type		Slot sizes		Set at	
ource of informati ell location, log, el				Date	
		STATIC	WATER	LEVELS (m below surface)	
HIGHEST	LOWEST	MEAN	RANGE	FREQUENCY OF MEASUREMENT	
			57		
ransmissivity (m²/	day)		AQUIFER Jes Storage	CHARACTERISTICS setflcient , Water Temperature(°C)	
ermeability (m ² /da	sy)		'66 Specific	ield 72	
TEST PU	MPING	RECO	VERY	REMARKS	OTHER DATA
Drawdown	After time (min)	Residual Drawdown (m)	After time		Pump Test
(metres)	Imini	Disampowit (111)	timity.	Bore abandoned - no water.	Chemical Analysis
100					Geophysical Data
- W.					Lithological Log
					Isotope Date
-					
					Card Type

. IN METRES w-m.s.L.	ETRES surface	LITHOLOGY < = drillwater gain > = drill water loss	E.	STATIC	LEVEL	IG	NE	te vield m ^{3/} day	pacity a) m2/day
REDUCED LEVEL IN METRES above + below - m.s.t. GRAPHIC LOG	DEPTH IN METRES Below ground surface	Reduced level of surface	COLOUR	(a) Related to ground surface	(b) Related to m.s.l.	CASING	SCREEN	Approximate yield (litres/mm) m ³ /day	Specific capacity (litres/mm/metre) m2/day
	-24	Very Soft. Cireen grey / white Clay. Soft green grey silty with limonite staining Soft cale. dark grey silty day Soft grey cale. siltstone. Soft green grey fine silty clay.							
GD ID: Oth	-	light calc. Siltstone with layers of "volonogenic calc. Sandy siltsone -high matriccontent shows secondary attention light grey calc. siltstone with less volcanogenic "Bandy siltstone Med. grey calc. fine sandy siltstone layers of dark grey mudstone. light grey calc. Sandy siltstone with less sandy							

CATCHMENT Catch Action Catch Action Personal Table Addression Maxana data Marten USE PERMIT No. Valid = Water Maxana data Marten USE PERMIT No. Valid = Water Democration Marten USE PERMIT No. Valid = Water Democration Seccle training No. Seccle training No. Data Democration Seccle training No. Seccle training No. Owner Addression Addression Seccle training No. Seccle training No. Seccle training No. Seccle training No. Seccle training No. Seccle training No. Seccle training No. Seccle training No. Seccle training No. Seccle training No. Seccle training No. Seccle training No. Seccle training No. Seccle training No. Seccle training No. Seccle training No. Seccle training No. Seccle training No. Seccle training No. Seccle training No. Seccle training No. Seccle training No. MARANA NAACE Machane training No. Seccle training No. Test FUM CHARACTENTS Seccle training No. Seccle training No. Seccle training No. Test FUM Remorten Intell training No. Seccle training No. Seccle training No. Se	SHEET No.			GRID REI	E.			G.S. WELL No.		1	AREA	
Net Note			1 1 1			1 1 1		11		15	Allea	
Walk Walk <th< td=""><td>CATCHMENT</td><td>T</td><td></td><td></td><td></td><td>WATER AU</td><td>JTHORITY</td><td></td><td>WATER USE</td><td></td><td>PERMIT No.</td><td>-</td></th<>	CATCHMENT	T				WATER AU	JTHORITY		WATER USE		PERMIT No.	-
depth ind		1.1.1		1.00	11 16			L17	L			1 1 1
Line One One <td>Well depth (m)</td> <td></td> <td>J 28 Measured Reported</td> <td>all and the second second second</td> <td>m)</td> <td></td> <td>Wellhead altitude (m) a.m.s.l.</td> <td></td> <td>33</td> <td>LO</td> <td>CATION SKETCH</td> <td></td>	Well depth (m)		J 28 Measured Reported	all and the second second second	m)		Wellhead altitude (m) a.m.s.l.		33	LO	CATION SKETCH	
Drifing Drifing data Weil status Ormer	Yield m ³ /day			Drawdown (m)			Specific 1/min/metre capacity m/2/day					
Address Purge Type View Strees Type Stret dives Strees Type MEAN NANCE PERIOD OF MEASUREMENT Add/UFER CHARACTERISTICS Tommstability (m7/day) Specific Vied Stress Type Address Other Data Address Address Comparison of final Residual Address OTHER DATA Permodown final Alter time final Drandown final Residual Address OTHER DATA Parendown final Alter time final Individual Alter time final <t< td=""><td>Driller</td><td>di sette</td><td></td><td></td><td></td><td></td><td>Well status</td><td></td><td></td><td></td><td></td><td></td></t<>	Driller	di sette					Well status					
Sereen Type Bet at at a at a at a at a at a at a at	Owner		-									
Berren Type Set at Source of information on wall location, tog, acc. Set at Source of information on wall location, tog, acc. Set at State Lowest HIGHEST LOWEST MEAN RANGE PREDUBTION OF Wall location, tog, acc. PREDUBTION OF MEASUREMENT ADUIFER CHARACTERISTICS Transmission/ty (m ² /day) Stocage or CHARACTERISTICS Test PUMPING RECOVERY Resolution (min) After time finith) Atter time (min) Resolution Dravedown (min) After time finith) Pergo Test (min) Resolution (min) After time finith) After time finith) Prog Deadown (min) After time finith) After time finith) After time finith)	Pump Type	1.81		Well Type				alopment				
Source of Information an well location, tog, etc. STATIC WATER STATIC WATER STATIC WATER LOWEST MEAN RANGE FREQUENCY OF MEASUREMENT	Screen Type		Slot sizes	50	Set at				The second			
HIGHEST LOWEST MEAN RANGE FREQUENCY OF MEASUREMENT Image: Storage conflicient Image: Storage conflicient <th< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>												
Highes Lowes Medde Medde <t< td=""><td></td><td>_</td><td>STATIC</td><td>WATER</td><td>the state of the s</td><td>That is a set of the set</td><td>CONTRACTOR DECEMBER</td><td></td><td></td><td></td><td></td><td></td></t<>		_	STATIC	WATER	the state of the s	That is a set of the set	CONTRACTOR DECEMBER					
AQUIFER CHARACTERISTICS Transmissivity (m²/day)	HIGHEST	LOWEST	-				78		63			
Transmissivity (m ² /dav) Storage coefficient Water Temperature(°C) Permeability (m ² /dav) Specific vield OTHER DATA TEST FUNG RECVERY REMARKS OTHER DATA Drawdown Innetreal After time Innin) After time Innin) After time Innin) Pump Test Drawdown Innetreal After time Innin) After time Innin) After time Innin) After time Innin) After time Innin) After time Innin) Innin Innin Innin Residual Innin) After time Innin) After time Innin After time Innin)		1			CHARACTERI	STICS			61			
Permaskility (n ² /dst) Specific vield OTHER DATA TEST FINE Rescuel After time (min) Pump Test Chemical Analysis Image: Specific vield Image: Specific vield Image: Specific vield Pump Test Geophysical Data Image: Specific vield Image: Specific vield <td< td=""><td>Transmissivity (n</td><td>m²/day)</td><td></td><td></td><td></td><td></td><td>, , , Water Te</td><td>mperature(°C)</td><td>-</td><td></td><td></td><td></td></td<>	Transmissivity (n	m²/day)					, , , Water Te	mperature(°C)	-			
Drawdown (metres) After time (min) After time (min) After time (min) After time (min) Punp Test Geophysical Data Geophysical Data Geophysical Data Geophysical Data Lithological Log, Intercent Intercent Intercent Lithological	Permeability (m ²	2/day)		'66 Specific	yield		12	<u> </u>	73			
Drawdown (metres) After time (min) Easter time (min) Image: After time (min) Drawdown (m) After time (min) Geophysical Data Geophysical Data Lithological Log, Imotope Date Imotope Date Imotope Date	TEST P	UMPING	RECO	VERY				REMARKS			OTHER DATA	
(metrea) (min) (min) (min) Image: Analysis Geophysical Data Geophysical Data Lithological Log, Lithological Log, Image: Analysis Image: Analysis Image: Analysis Image: Analysis <td< td=""><td>Drawdown</td><td>After time</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Pump Test</td><td>L</td></td<>	Drawdown	After time									Pump Test	L
Lithological Log.	(metres)	(min)	Drawdown (m)	(min)							Chemical Analysis	L
Inotope Date											Geophysical Data	1
											Lithological Log	1
											Isotope Date	L
												1
	and the				•							
Card Type									U		Card Type	· · · ·

rres.			LITHOLOGY		STATIC	EVEL				lay
vel in MET	GRAPHIC LOG	DEPTH IN METRES Below ground surface	< = drillwater gain > = drill water loss	COLOUR	LS		CASING	SCREEN	Approximate yield (litres/mm) m ^{3/dev}	Specific capacity (litres/mm/metre) m2/day
REDUCED LEVEL IN METRES above + below m.s.l.	GRAPH	DEPTH IA Below grou	Reduced level of surface	CO	(a) Related to ground surface	(b) Related to m.s.l.	2	S(Approx (litres/or	Specifi /litres/mm/
		-	light grey calc." siltstone							
			with less sandy layers (fincr).							
			& getting more dark grey mudstone layers.							
		140-	light grey, very Fine, calc.							
			Sandstone with light tan/ brown non-cede. mudstone (silicious ?.)							
		-152	Park grey calc. mudstone/light grey calc. sandy-siltstare							
		-158	EOB.							
		÷								
		-								
		-								
		-								
		-								
		1								-
		-								
		-								
		-								
		-								

SD ID: OT	nei_/9/		GRID REF	418878	G.S. WELL NO.	1756	AREA	ON GTGS
OFFICE I NO.		. P. 1. 1	_1 ,		JII G.S. WELL NO.	L 1 1	115 Ray	rare
CATCHMENT		STOLES!	1	WATER AUTHORITY	B Lu	WATER USE	PERMIT No.	
Vell lepth (m) /	52	Measured Reported	Well diameter (mm	Wellhead altitude (m) a.m.s.l.		lan and	LOCATION SKETCH	
ield m ³ /day	1, or, 2,	1 1 10	Drawdown (m)	Specific 1/min/metre capacity m ² /day				
riller Pata,	-502-		Drilling date	3, 1, 1, 2, 0, Well status		1.00		
wner	A	tchiso	~ ~	Address Warmanter W/ca		24		
ump Type			Well Type	Type of	development			
creen Type	772.2	Slot sizes		Set at		1 52		
ource of information, log,	etc.				Date			
		STATIC	WATER	LEVELS (m below surface)				
HIGHEST	LOWEST	MEAN	RANGE	FREQUENCY OF MEASUREMENT	L	1 53		
			57	PERIOD OF MEASUREMENT	L_1_1_1_	l et		
ansmissivity (m	7. dui 3		AQUIFER	CHARACTERISTICS	Temperature(°C)			
ermeability (m ² /			Specific y	1 1 1 1				
TEST PL	IMPING	RECO	VERY		REMARKS	3 73		OTHER DATA
)rawdown	After time	Residual	After time				Pump Test	
(metres)	(min)	Drawdown (m)	(min)				Chemical Analysis	
							Geophysical Data	
101							Lithological Log	L
							Isotope Date	
1.1								
1.								
1								
1		2						
							Card Type	L

N METRES - m.s.l.	90	r RES urface	LITHOLOGY <= drillwater gain >= drill water loss	~	STATIC	LEVEL		7	yield	acity 1 m²/day
REDUCED LEVEL IN METRES above + below - m.a.l.	GRAPHIC LOG	DEPTH IN METRES Below ground surface	Reduced level of surface	COLOUR	(a) Related to ground surface	(b) Related to m.s.l.	CASING	SCREEN	Approximete yield (litres/mm) m ³ /day	Specific capacity (fitres/mm/metre) m2/day
		1 1 1								
		- 30	No Record							
		-								
			×							
		* 1								
		60.9	2+ Grey calc sst & dk blue grey mst							
			Greycale sandy zst. Dk 6/gr mst							
		-79.2	It Gr calculates st occas scoria, greycald sdy Zst. Dk grey/blue mst. Jame.							
	-	853	Dance, But decreases inst.							
		-97.53	V DKGry (volc?) agg 6msst 4 Gry calc sdy zst DE Grey Mst.							
		103-6	V OKGry (volc?) agg busst 4 Gry calc sdy 2st DE Grey Mst. V. DE Gry agg busst. Lt Grey calcody 2st. ubme							
		709.7	ione	2						
		-115.8	Brany calc 25t, medging calc 25t De Ciny non calc mist							
		-12.8								
		4 I 4	ISE EOB							
		t								
		-								
		Ē								

NZGD ID: Other_79740	BROWN BROS (N.Z.) LTD The Well Drilling Engine
	s wells went beilling Engine
	BROWN BROS (N.Z.) LTD The Well Drilling Logic
	Client Houcitous Busi Camp Date 18/1/83
	Address MuRAWAI
	RIG. Noq
	S 1#.5 0
J 478510	Size & purpose of bore hole 4" WATER BORE Client's bore No.
pt 478-8570	
011 389802	MORE LOG
Q11 389862 BC 1730 ONGTGS	$\alpha = 2$
BC FISC	2 - 15.4 SILTY SAND
NGTGS	15.4 - 19.00 Pumice
0/~	19 - 42.48 SILTY CLA-15 SANDS
	42:48 - 65.88 SILFA GREEN CLAY SANDS
	6588 · 72.98 GRED SIET CLAT
	72.98 - 134.2 Revs Curry SILT 134 2 - 140.25 GRAJOS.
	MATER LOST were level en 105.9m
	UNSURE IF THIS IS ABANDONED BORE
	Contract rates today BUT IS CASED TO
	Rig hours chargeable today $134.2 M - 100 mm$
	Total rig hours worked today
	No. of loads of water carted today
	MATERIALS USED (or REMARKS)
1	134 M / H" (1113
	2 KOLLS TAPE
	N///K
	Driller's Signature

26379

KIWI WELLDRILLERS N.Z.

PH. 0800 822 822

ISO 9002 CERTIFED

KEVIN BROWN LTD.

MEMBER NZ. DRILLERS FED

5

Result

Airline

Bore

BRANCHES:

BAY OF ISLANDS WARKWORTH **GLENBROOK**

PO BOX 400 OREWA FAX 09 425 0228

Driller PETER BECK

Drilling Method ROT.- N

Purpose of Bore CAMP

Date 21.2.2002

WELL CONSTRUCTION

E-Mail kiwinz@.xtra.co.nz

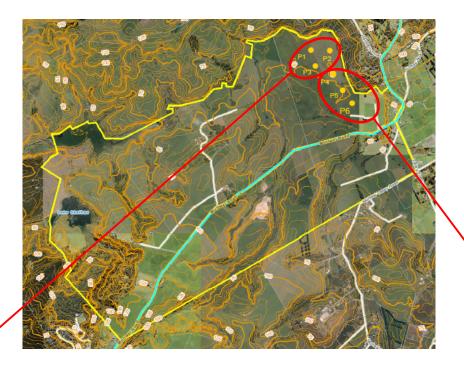
BORE LOG FORM

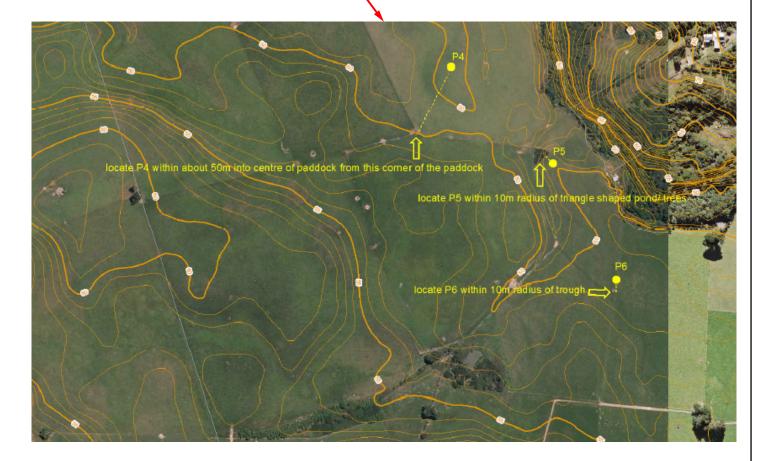
Client PRESBYTERIAN CHURCH OF AOTEAROA HOUGHTONS BUSH CAMP Ph. 09 411 8570 Address 75 MOTUTARA RD. MURIWAI Grid Reference Q11 3897 8612 Permit C512 12 2856 Bore I.D.21616

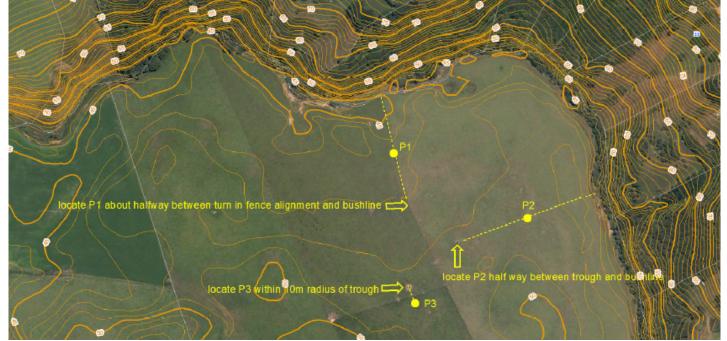
BORE LOG

Depth from Top	i Surface Bottom	Description of Ground Passed Through		All measurements from Depth of bore (o of the casing 204.00		No: 2161	Permit No:	Consents D-b Bore Log D-b	
0	1.0	TOPSOIL YELLOW BROW	٧N	Depth of casing	g (M)	88.00	Hold	mit	, I I I I I I I	Consents Rore Log	1
		SILTY CLAY		Diameter of Ca	asing	PVC 100	Consent Holder	Bore Bermit	sr Pe	Ö å	
1.0	2.0	YELLOW BROWN SAND	Y SILT	Screens: N/R			Cons	Bore	Water	Date	
2.0	6.0	FIRM BROWN SAND		From	m to		m		-		
6.0	19.0	MULTI COLOUR TUFF SA	ND	Slot size and ty	ype '	•					
19.0	44.0	MED. BROWN TUFF		Grouting	12	Bags					
44:0	50.0	GREY MUDST. & BR. SA	NDS	Pump Tests:							
50.0	60.0	BR. YELLOW FINE SAND	DS	Method of deve	elopm	nent AIR	R & SUE	BMER	. PU	MP	
60.0	70.0	SOFT CONGLOMERITES		Static water lev	vel 1(+00.00	m				
70.0	72.0	MED. GREY SANDSTON	Ξ	Duration of tes	st	10	HOUR	S			
72.0	90.0	FIRM RED GREY MUDST	ONE	Max 2000		ltrs p/h	r				
90.0	98 .0	YELLOW GREY MUDSTO)NE	Test discharge	(m³/h	ir) 1.3					
98.0	110.0	MULTI COLOUR MUDST	S/S	Drawdown leve	el 124	4.00 m					
110.0	118.0	COARSE GREY SANDSTO	ONE	PUMP DEPT	<u>H</u>	130.00	m				
		EMERALD GREEN CHIPS		PUMP VOLU	ME L	up to 130)0 ltrs	p/hr			
118	204.0	COARSE GREEN SANDS	FONE	Type pump to suit of	construct	tion of bore	for client				
				GRUNDFOS S	SP 2A	.27					
REMAR	<u>KS</u>			100mm SUBM	1ERSI	IBLE PU	MP SE	Г			
CIRULA	ATION	LOSS 30% @ 45m 88.m		AT 130.00	m.	FOR 13	00 l	ph			
100%@) 137.0	n 50% @ 150 - 204m		Water Quality Bas	sic on	site taste	test				
PUT PA	CKER	TO 69.m AND GROUTED		GOOD - SWEI	ET TA	ASTE					
FULLY	ТО ТН	E SURFACE OF THE OLD									

BORE, HAD 60m OF CASING, IRON HAD BEEN COMING IN FROM 24m







	description	drawn	approved	date	drawn	sl	
_					approved	SGL	
vision					date	26/01/21	
ē					scale	NTS	LANDEF geotechnica
					original size	A3	

Template revision: 1:1000 (10/12/14)

Legend and/or Notes:

THE BEARS HOME PROJECT MANAGEMENT LTD									
MURIWAI DOWN	S FARM								
STANDPIPE BOREHOLE LOCATION PLAN									
^{t no:} J01662	figure no:	8							

Client :	THE BEARS HOME CO		ED		Aug	er Bo	oreho	le No.	•	P01
Project Locatio	n: MURIWAI DOWNS GOL	F PROJECT						:	Sheet	1 of 6
Job Number:	J01662			Vane H		Logge	-	Process		
				278			<u>ب</u>	PL		12.01.21
Borehole MN Location: Description		ound R.L.		- pue	Depth (m)	ding Leve	ne (kPa esidua	ii tivity		ple and ory / Other
	SOIL DESCRIPTION			Legend	Dept	Standing Water Level	Vane Shear(kPa) _{peak / residual}	Soil Sensitivity	Т	est etails
 plasticity, moderately se silty CLAY, orange strea becoming wet, high plast becoming very stiff, satur clayey SILT, dark grey. V EOB at 1.3m. Too hard to 	ne sand, orange/brown streaked da nsitive [ALLUVIUM] ked dark grey. Stiff, moist, medium	plasticity perate locations. S	Scala				64/27 188+	2.4	Piezome Clay Sea 0.0m-0.5 Screenec 0.5m-1.3 Standing Groundw as on 20 (0.94m) Scala	ter Details I - m d - m vater Level .01.21 neter Test .00mm)
-					- 5.5 - - -					
-	1	· · · · · ·		Ļ	-6.0					
	Comments:	Borehole Diameter:	Topsoil	Sa	and		Sandston	<u> </u>	Plutonic	· · + + +
	Groundwater encountered at 1.0m.	50mm	Fill	G	avel		Siltstone	2 Z Z Z	No Core	,
LANDER geotechnical	UTP = unable to penetrate.	Checked:	Clay –	- <u></u> On	ganic	<u>www</u> www ‱&&	Limeston	· <mark>│ · · · · · · · · · · · · · · · · · ·</mark>	井	
90000000000	EOB = end of borehole.	RG	Silt X	××× ××× Pu	mice	~~~~~ `&&&&	Volcanic		~	

Client : THE BEARS HOME COMPANY LIMITED Project Location : MURIWAI DOWNS GOLF PROJECT				Auger Borehole No. P02 Sheet 2 of 6							
				Vane H		Logge	-	Process	sor : Date:	-	
				19			RG	PL	12.01.2	1	
Borehole mN Location: Description	mE Refer to site plan	Ground R.L.		Legend	Depth (m)	ding Leve	ne (kPa) _{esidual}	il tivity	Sample and Laboratory / Otł	hor	
						Standing Water Level	Vane Shear(kPa) _{peak / residual}	Soil Sensitivity	Test Details		
									Piezometer Deta	ails	
Clayey SILT, orange stre	aked light grey/brown. Very stif th trace limonite [ALLUVIUM]	f, moist, medium pla	sticity,		- - - - - -	7,1,1,1,1,1,1, 1,1,1,1,1,1,1,1,1,1,	171/69	2.5	Clay Seal - 0.0m-0.5m Screened - 0.5m-5.0m		
- with trace fine sand -					- - - -		163/72	2.3			
- - - -					- - - -		108/50	2.2			
- - - becoming orange, withou -	ut trace fine sand				- - -		109/28	3.9	Standing		
► ► ► ► becoming dark grey, satu	urated				- - - -		133/52	2.6	Groundwater Lev as on 20.01.21 (2.43m)	/el	
					- 		130/39		Standing Groundwater Le∖ as on 12.01.21	vel	
- - -					- 		160/41	3.9	(3.20m)		
- - - - -				1x1x1x1x1x1x1x1x1x1x1x1x1x1x1x1x1x1x1x	- - - -		193+				
- - -					- - - -		138/41	3.4			
at 5.0m, becoming sensi							133/28	4.8			
_ EOB at 5.0m. Target De	pth.				F		-				
- - - - - -					- - - - - - - - - - - -						
	Comments:	Borehole Diameter:	Topsoil	Sa	and		Sandston		Plutonic +	┝╫	
	Groundwater encountered at 2.8m.	50mm	Fill		ravel	***	Siltstone	2 Z Z	No Core		
LANDER geotechnical	UTP = unable to penetrate. EOB = end of borehole.	Checked: RG	Clay – – – – – – – – – – – – – – – – – – –	zzk	rganic Imice	<u>***</u> •000	Limeston Volcanic		₹		

Client : THE BEARS HOME COMPANY LIMITED Project Location : MURIWAI DOWNS GOLF PROJECT					Auger Borehole No. P03 Sheet 3 of 6								
-	-			Vane H 27		Logged By: PL		Process	sor : Date:				
					21			i	PL	. 12.	01.21		
Borehole Location:	mN Description:	mE Bofor to site plan	Ground R.L.		Ъ	Depth (m)	Standing Water Level	Vane Shear(kPa) _{peak / residual}	l ivity	Sample			
	Description.				Legend	Dept	Stano ater	Vane hear(kF ak / resid	Soil Sensitivity	Laboratory Test	t		
	SOIL DESCRIPTION						~ 3	೧೯	S	Detai	ls		
	I OPSOIL					╞	FIE			<u>Piezometer</u> Clay Seal -	<u>Details</u>		
		ne sand, orange streaked lig nsitive [ALLUVIUM]	nht brown. Very stiff, mo	oist, low		F	FIE			0.0m-0.5m			
– –	ouclately sel					-		100/10		Screened - 0.5m-5.0m			
	orango and h	rown streaked grey. Very st	tiff moist modium plast	ticity	[XXX 	- 0.5		180/46	3.9	0.011 0.011			
_ insensitive	orange and b	iowii sileakeu giey. Vely si	un, moist, medium plas	licity,									
 becoming hi 	igh plasticity					}							
-						— 1.0		137/86	1.6				
Ł						F							
F						F							
— -						-1.5		105/64	1.6				
-					-x-x-x-	╞							
					-x-x-x-	F							
-						- 2.0		118/73	1.6				
					-x-x-x-	F	l:=:						
L						E							
-						- 2.5		129/67	1.9				
- - becoming lic	nht arev oran	nge streaked brown/orange,	wet with trace fine sar	hd	-x-x-x-					Standing Groundwate	er Level		
-	gin groy, oran	ige streaked blown/orange,			-x-x-x-	╞				as on 12.01 (2.7m)	.21		
- S becoming m	noderately se	nsitivo			-x-x-x-x- -x-x-x-x-	- 3.0		124/35	3.5	(2.711)			
_	-	ed grey/blue. Very stiff, satu	rated. low plasticity. wit	h trace fine		- 3.0		124/00	0.0				
		t clast inculsions, with trace				F							
-						-		400.					
-						- 3.5		188+					
						F				Standing			
-						╞	¦₽¦			Groundwate			
becoming se	ensitive					-4.0		134/30	4.5	as on 20.01 (3.91m)	.21		
-						E							
-						╞							
 becoming m 	oderately ser	nsitive				-4.5		177/70	2.5				
-					$\begin{bmatrix} \overline{X} \\ \overline{X} $	-							
						F							
_ EOB at 5.0m	n. Target Dep	oth.			<u>fxīxī</u> xī	-5.0		188+					
\mathbf{F}	- '				1	F							
F						F							
-					1	- 5.5							
F					1	F							
t						E							
						-6.0							
		Comments:	Borehole Diameter:	Topsoil	Si	and		Sandston	•••	Plutonic	· + + +		
		Groundwater encountered 3.1m.	at 50mm	Fill	G	ravel		Siltstone	2 Z Z	Z No Core			
LAND geotech		UTP = unable to penetrate	Checked:	Clay		ganic	<u>. ~ ~ ~</u> 	Limeston		∄			
		EOB = end of borehole.	RG		XXX XXX ^{Pu}	umice		Volcanic	$ \psi \psi \psi $	\sim			

Job Number: Joi 602 Vare Head: Docessor: Rol: Tot: Tot: <tht< th=""><th colspan="4">Client : THE BEARS HOME COMPANY LIMITED Project Location : MURIWAI DOWNS GOLF PROJECT</th><th colspan="8">Auger Borehole No. P04 Sheet 4 of 6</th></tht<>	Client : THE BEARS HOME COMPANY LIMITED Project Location : MURIWAI DOWNS GOLF PROJECT				Auger Borehole No. P04 Sheet 4 of 6							
Inst. mel: Ground RL. Description: Refer to sale plan SOL DESCRIPTION TOPSOLL SBLT, orange. Medium dense, dry, no plasticity (ALLUVILM) chape sale. chape sale. moderately sensitive. becoming orange. wet becoming orange, wet becoming dark grey/blue, very stiff, saturated at 5.0h. becoming hard EXB to make the plan. Support or and the plan. Support or and the plan. Support or and the plan. standard grey class 5.0m standard grey becoming orange. wet becoming dark grey becoming dark grey/blue, very stiff, saturated at 5.0m. Target Depth. Standard grey table at 5.0m. Target Depth.												
TOPSOIL Bit.T, arrage. Medium dense, dry, no plastoly [ALLUVIUM] Image: sensitive dense impairs of the sensit dense impairs of the sense dense impairs of th			ound R.L.		13			r				
TOPSOIL Placomater Datas SiLT, orange. Medium dense, dry, no plasticity [ALLUVIUM] 1000000000000000000000000000000000000	Dorenoie				gend	pth (n	anding er Lev	/ane ar(kP; / residu	soil sitivity	Laboratory	/ Other	
SUT. orange. Medium dense. dry, no plasticity [ALLUVIUM] Image: straked light brownigrey. Very stiff, moist, medium plasticity. Image: straked light brownigrey. Very stiff, moist, medium plasticity. Image: straked light grey. Stiff, moist, mediu		SOIL DESCRIPTION			Le	Del	Sta Wate	She <	Sen			
- St. 1, forange, Mealuin delige, By, ID plasticity, including plasticity, including plasticity, with trace linearity, with	TOPSOIL				$\overline{\mathcal{N}}$	-					Details	
closey SUL orange streaked light browning: Very stift, moist, medium plasticity. 160-52 3.2 0.5m-5.0m silly CLAY, orange streaked light groy. Stift, moist, medium to high plasticity. 10 83/38 1.4 silly CLAY, orange streaked light groy. Stift, moist, medium to high plasticity. 10 83/38 1.4 closey SUL 7. with trace fine sand, orange motiled light grey. Stift, moist, medium plasticity. 10 83/38 1.4 closey SUL 7. with trace fine sand, orange motiled light grey. Stift, moist, medium plasticity. 1.5 99/44 1.6 becoming orange, wet 64/28 2.3 0.5m-10 64/28 2.3 becoming insensitive 66/47 1.4 66/47 1.4 becoming dark grey 52.0 1.7 52.0 1.7 close it 5.0m. Target Depth. 5.0 1.7 52.0 1.7 close it 5.0m. Target Depth. 5.0 1.7 5.0 1.7 close it 5.0m. Target Depth. 5.0 1.7 5.0 1.7 close it 5.0m. Target Depth. 5.0 1.7 5.0 1.7 close it 5.0m. Target Depth. 5.0 1.7 5.0 1.7 <	SILT, orange. Medium de	ense, dry, no plasticity [ALLUVIUM]		$\frac{\mathbf{x} \mathbf{x} \mathbf{x}}{\mathbf{x} \mathbf{x}}$	F						
Indecately destance, kink lack in include Impact and y destance, kink lack in include Impact and y destance, kink lack in include silly CLAY, orange streaked light grey. Stiff, moist, medium bigh plasticity, with trace fine sand, orange motiled light grey. Stiff, moist, medium plasticity Impact and y destance, kink lack in include Impact and y destance, kink lack include clayey SiLT, with trace fine sand, orange motiled light grey. Stiff, moist, medium plasticity Impact and y destance, kink lack include Impa	clayey SILT, orange strea	aked light brown/grey. Very stiff, m	oist, medium plas	sticity,		- 0.5		168/52	32			
insensitive, with trace limonite 1.4 clayey SILT, with trace limonite 1.4 becoming orange, wet 2.5 becoming moderately sensitive 2.3 becoming insensitive 2.3 becoming dark grey 4.3 becoming dark grey 4.4 becoming hard 5.0 EOB at 5.0 Target Depth. EXPENDENT Target Depth. EXPENDENT Target Depth. EXPENDENT Target Depth. EXPENDENT Target Depth.	 moderately sensitive, wit 	h trace limonite						100/02	0.2			
insensitive, with trace limonite 1.4 clayey SILT, with trace limonite 1.4 becoming orange, wet 2.5 becoming moderately sensitive 2.3 becoming insensitive 2.3 becoming dark grey 4.3 becoming dark grey 4.4 becoming hard 5.0 EOB at 5.0 Target Depth. EXPENDENT Target Depth. EXPENDENT Target Depth. EXPENDENT Target Depth. EXPENDENT Target Depth.	-					F						
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becoming orange, wet 9/52 1.8 becoming orange, wet 9/52 1.8 becoming moderately sensitive 9/52 1.8 becoming insensitive 9/52 1.8 becoming dark grey 9/52 1.8 becoming dark grey/blue, very stiff, saturated 9/52 1.8 at 5.0m, becoming hard 9/52 1.7 EOB at 5.0m. Target Depth. 9/52 1.8 Standing 06/47 1.4 Borrede Dameer 9/52 1.7 Comments: 500 103+ Comments: 50mm 103+ Comments: 50mm 100	F					F						
becoming orange, wet becoming moderately sensitive becoming insensitive becoming dark grey becoming dark grey becoming dark grey becoming dark grey becoming dark grey becoming dark grey becoming hard t 5.0m, becoming hard EOB at 5.0m. Target Depth.	- clavey SILT, with trace fit	ne sand orange mottled light grav	Stiff moist med	ium plasticity	-x-x-x- -x-x-x- . X X X	F						
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becoming orange, wet -2.5 99/44 1.6 Standing Groundwater Level as on 20.01.21 (2.68m) becoming insensitive -3.0 64/28 2.3 becoming insensitive -3.5 66/47 1.4 becoming dark grey 52/30 1.7 becoming hard 52/30 1.7 EOB at 5.0m. Target Depth. -6.0 EOB at 5.0m. Target Depth. -5.5 Comments: Standing Groundwater ecountered at UTP = unable to penetrate. Comments: Comments: Comments: Comments: <td></td> <td></td> <td></td> <td></td> <td></td> <td>-</td> <td></td> <td></td> <td></td> <td></td> <td></td>						-						
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becoming orange, wet becoming moderately sensitive becoming insensitive becoming insensitive becoming dark grey becoming dark grey becoming dark grey/blue, very stiff, saturated at 5.0m, becoming hard EOB at 5.0m. Target Depth. Comments: Groundwater encountered at 4.0 Comments: Groundwater encountered at Comments: Groundwater encountered at R Groundwater encountered at R Groundwatere encountered at R Groundwater encountered at R Gr	-					F						
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becoming insensitive becoming dark grey becoming dark grey becoming dark grey/blue, very stiff, saturated at 5.0m, becoming hard EOB at 5.0m. Target Depth. Comments: Com	 becoming orange, wet 					F					.21	
becoming dark grey becoming dark grey/blue, very stiff, saturated at 5.0m, becoming hard EOB at 5.0m. Target Depth. Comments: Groundwater encountered at 4.4m. UTP = unable to penetrate. Borehole Diameter: Somm Checked: Caru Checked: Caru Checked: Caru Checked: Caru Company Comments: Co	 becoming moderately set 	nsitive				-3.0		64/28	2.3			
becoming dark grey becoming dark grey/blue, very stiff, saturated at 5.0m, becoming hard EOB at 5.0m. Target Depth. Comments: Groundwater encountered at 4.4m. UTP = unable to penetrate. Borehole Diameter: Somm Checked: Caru Checked: Caru Checked: Caru Checked: Caru Company Comments: Co	E				ţxxx	L						
becoming dark grey becoming dark grey/blue, very stiff, saturated at 5.0m, becoming hard EOB at 5.0m. Target Depth. Comments: Groundwater encountered at 4.4m. UTP = unable to penetrate. Borehole Diameter: Somm Checked: Caru Checked: Caru Checked: Caru Checked: Caru Company Comments: Co	-					+						
becoming dark grey/blue, very stiff, saturated at 5.0m, becoming hard EOB at 5.0m. Target Depth. Comments: Groundwater encountered at 4.m. UTP Comments: Groundwater encountered at 4.m. Comments: Groundwater encountered at 4.m. Comments: Groundwater encountered at 4.m. Comments: Comme	 becoming insensitive 					- 3.5		66/47	1.4			
becoming dark grey/blue, very stiff, saturated at 5.0m, becoming hard EOB at 5.0m. Target Depth. Comments: Groundwater encountered at 4.5 Comments: Groundwater encountered at 4.4 Comments: Groundwater encountered at 4.4 Checked: Clay Checked: Clay Comments: Groundwater encountered at Checked: Clay Comments: Groundwater encountered at Checked: Clay Checked: Clay Comments: Checked: Clay Checked: Checked: Clay Checked:	 becoming dark grey 					-						
becoming dark grey/blue, very stiff, saturated at 5.0m, becoming hard EOB at 5.0m. Target Depth. Comments: Groundwater encountered at 4.5 Comments: Groundwater encountered at 4.4 Comments: Groundwater encountered at 4.4 Checked: Clay Checked: Clay Comments: Groundwater encountered at Checked: Clay Comments: Groundwater encountered at Checked: Clay Checked: Clay Comments: Checked: Clay Checked: Checked: Clay Checked:	-				ţxxx	- 		52/30	1.7			
at 5.0m, becoming hard Standing EOB at 5.0m. Target Depth. 5.0 FOB at 5.0m. Target Depth. -5.5 Groundwater Level as on 12.01.21 (4.9m) -5.5 Groundwater encountered at 4.4m. UTP Sandstone Groundwater encountered at 4.4m. UTP = unable to penetrate. Somm Fill Checked: Clay Checked: Clay Checked: Clay Checked: Clay Companic Checked: Clay Checked: Clay Companic Companic Companic Checked: Clay Clay Clay Clay Clay Companic Clay												
at 5.0m, becoming hard Standing EOB at 5.0m. Target Depth. 5.0 FOB at 5.0m. Target Depth. -5.5 Groundwater Level as on 12.01.21 (4.9m) -5.5 Groundwater encountered at 4.4m. UTP Sandstone Groundwater encountered at 4.4m. UTP = unable to penetrate. Somm Fill Checked: Clay Checked: Clay Checked: Clay Checked: Clay Companic Checked: Clay Checked: Clay Companic Companic Companic Checked: Clay Clay Clay Clay Clay Companic Clay	- becoming dark grov/blue	yony stiff saturated				_						
at 5.0m, becoming hard Groundwater Level as on 12.01.21 (4.9m) EOB at 5.0m. Target Depth. -5.0 -5.5 -5.5 -5.5 -5.5 -6.0 -6.0 Plutonic +++ Groundwater encountered at 4.4m. Sand UTP Siltstone 2 Z Z No Core Checked: Clay	-					-4.5		193+				
at 5.0m, becoming hard Groundwater Level as on 12.01.21 (4.9m) EOB at 5.0m. Target Depth. -5.0 -5.5 -5.5 -5.5 -5.5 -6.0 -6.0 Plutonic +++ Groundwater encountered at 4.4m. Sand UTP Siltstone 2 Z Z No Core Checked: Clay	F					F						
EOB at 5.0m. Target Depth. File Image: Solution of the solution o	at 5.0m becoming hord					F				Groundwate		
Comments: Groundwater encountered at 4.4m. UTP = unable to penetrate. Somm Groundwater encountered at 4.4m. UTP = unable to penetrate. Somm Checked: RG Sand Clay Clay Clay Correction Clay Clay Clay Clay Clay Correction Correction Correction Clay Clay Correction Clay Clay Clay Clay Correction Clay		oth.			$ \times \times \times$	- 5.0	'	UTP			.21	
Comments: Groundwater encountered at 4.4m. UTP = unable to penetrate. Somm Groundwater encountered at 4.4m. UTP = unable to penetrate. Somm Checked: RG Sand Clay Clay Clay Correction Clay Clay Clay Clay Clay Correction Correction Correction Clay Clay Correction Clay Clay Clay Clay Correction Clay	<u>L</u>					F						
Comments: Groundwater encountered at 4.4m. UTP = unable to penetrate. Somm Groundwater encountered at 4.4m. UTP = unable to penetrate. Somm Checked: RG Sand Clay Clay Clay Correction Clay Clay Clay Clay Clay Correction Correction Correction Clay Clay Correction Clay Clay Clay Clay Correction Clay	Ł					- 						
Comments: Groundwater encountered at 4.4m. Borehole Diameter: Topsoil Sand Sandstone Plutonic + + + UTP = unable to penetrate. 50mm Fill Gravel Siltstone Z Z Z Z No Core RG Clay Organic VWWW Limestone Umestone	E					-5.5						
Comments: Groundwater encountered at 4.4m. Borehole Diameter: Topsoil Sand Sandstone Plutonic + + + UTP = unable to penetrate. 50mm Fill Gravel Siltstone Z Z Z Z No Core RG Clay Organic VWWW Limestone Umestone	F					F						
Comments: Groundwater encountered at 4.4m. Borehole Diameter: Topsoil Sand Sandstone Plutonic + + + UTP = unable to penetrate. 50mm Fill Gravel Siltstone Z Z Z Z No Core RG Clay Organic VWWW Limestone Umestone	-					-6.0						
LANDER geotechnical 4.4m. UTP = unable to penetrate. SP = unable to penetrate. Checked: RG Clay Organic UTP = Unable to penetrate.				Topsoil	S.	and				▝▋┥─────┥	· + + +	
geotechnical UIP = unable to penetrate.		4.4m.		<u> </u>		<u> </u>	YYY		<u> </u>	Z No Core		
	geotechnical				ਨੋਨੀ	-	<u>.</u>	Limestone Volcanic	° <mark>┟┶┶┙</mark> ┝╺╲╺	┦──┤		

Client : THE BEARS HOME COMPANY LIMITED Project Location : MURIWAI DOWNS GOLF PROJECT					Auger Borehole No. P05 Sheet 5 of 6							
Job Number: J01662			Vane Head: 1900		Logged By: RG		Process	sor : Date:				
					19				PL	12.01.21		
Borehole mN Location: Descr	. ,.	mE	Ground R.L.		p	Depth (m)	Standing Water Level	Vane Shear(kPa) _{peak / residual}	vity	Sample and		
Location: Descr	iption:	Refer to site plan			Legend	epth	stanc ater I	Van iear(^{ak / re}	Soil Sensitivity	Laboratory / Other Test		
SOIL DESCRIPTION							0 ×	ਨੁਬ	Š	Details		
_ TOPSOIL					\overline{N}	-	티티			Piezometer Details		
clayey SILT, brown	/orange. Very	stiff, moist, medium p	plasticity [ALLUVIUM]							Clay Seal - 0.0m-0.5m Screened -		
 becoming grey mot - 	tled brown/ora	nge, with trace fine s	and		dxlxlxlxlxlxlxlxlxlxlxlxlxlxlxlxlxlxlxl	- 0.5 - - - - 1.0		193+ 193+		0.5m-2.5m		
- - - becoming low plasti ━ becoming insensitiv -	-					- - - - - 1.5		124/94	1.3	Standing Groundwater Level as on 20.01.21 (2.3m) Note: Standpipe		
- - - becoming stiff, mod - -	-				12121212121212121212121212121212121212	- - - - -		69/30	2.3	was damaged and level may be affected through surface water infiltration Scala		
slightly clayey SILT	with trace fine	e sand, brown. Very s	tiff, moist, low plastici	ty		F				Penetrometer Test (Blows/100mm)		
EOB at 2.5m. Too t found effective refu			meter test commence	ed and		- 2.5 - - -		UTP		—5 —10 —13 —20+ (ER)		
-						-3.0						
-						-						
- -						- 3.5 -						
-						-						
- - -						- 4.0						
						- -						
-						-4.5 -						
- -						- - 						
-						- ^{3.0}						
-						- -						
-						- 5.5 - -						
-						- - 6.0						
	Comm	ents:	Borehole Diameter:	Topsoil		and		Sandston		Plutonic ++++		
	Ground	lwater not encountere		Fill	$\rightarrow \rightarrow +$	ravel		Siltstone	2 Z Z	<u>\$</u> ┤─── <u>┝</u> ★★★		
LANDER		unable to penetrate.	Checked:	Clay _	Or	ganic	inter Alternation	Limeston		3		
geotechnical	EOR =	end of borehole.	RG	Silt	ਨਿਨੋਨੀ	ımice		Volcanic		* -		

Client : Project Locatio	Client : THE BEARS HOME COMPANY LIMITED Project Location : MURIWAI DOWNS GOLF PROJECT				Auger Borehole No. P06 Sheet 6 of 6								
					Vane Head: Logg 2784			Process	or : Date:				
				27			2	PL	12.01.21				
Borehole mN Location: Description		ound R.L.		- pu	Depth (m)	Standing Water Level	Vane Shear(kPa) _{peak / residual}	ii ivity	Sample and				
Description	· · · · · · · · · · · · · · · · · · ·			Legend	Dept	Stan /ater	Vane hear(kP eak / resid	Soil Sensitivity	Laboratory / Othe Test				
70000	SOIL DESCRIPTION					\$	0 ē	ە س	Details				
TOPSOIL - -					-				<u>Piezometer Details</u> Clay Seal - 0.0m-0.5m				
clayey SILT, orange and [ALLUVIUM] 	brown streaked grey. Very stiff, m	oist, low plasticity,	, sensitive		- - 0.5		140/35	4.0	Screened - 0.5m-5.0m				
	ed brown/grey. Stiff, moist, medium	n plasticity, moder	ately		- - 		94/38	2.5					
-	streaked brown/grey, high plastici	ty											
 becoming insensitive becoming wet, with trace 	e black carbonaceous inculsions, w	ith trace orgainic :	staining	-x-x-x- -x-x-x- -x-x-x- -x-x-x-x- -x-x-x-x-	- - -		67/56	1.2					
 becoming firm 		Ū	Ū		- - - -		30/24	1.3					
 becoming moderately se becoming dark grey/blue 				-x-x-x -x-x-x-x -x-x-x-x -x-x-x-x	- - - 2.5 -		46/19	2.4	Standing Groundwater Leve				
– − ー becoming stiff −					- - 		99/27	3.7	as on 12.01.21 (3.0m) Standing				
 clayey SILT, blue/grey s gravel sized silt clast inc	treaked dark grey. Very stiff, wet, lo ulsions	ow plasticity, with	minor fine		- - - 3.5		188+		Groundwater Leve as on 20.01.21 (3.17m)				
- becoming saturated -				XXXXXXXX XXXXXXX XXXXXXXX	-								
- - -					- - -		188+						
- - -					- 		188+						
EOB at 5.0m. Target De	oth.				- - 		188+						
-					-								
_					-5.5								
- - -					- - -								
-					-6.0	<u> </u>		 • • •					
	Comments: Groundwater encountered at	Borehole Diameter: 50mm	Topsoil Fill	\rightarrow	and ravel		Sandston Siltstone	e 2 Z Z					
LANDER geotechnical	3.7m. UTP = unable to penetrate.	Checked: RG	Clay -	Or	ganic	<u></u> 	Limeston	┢┯┯					
	EOB = end of borehole.		Silt	XXX Pu	imice	<u>. Č Č Č</u>	Volcanic	4~~	<u> </u>				