GEOTECHNICAL SPECIALISTS

FLETCHER RESIDENTIAL LIMITED

THE HILL – ELLERSLIE RACECOURSE

GEOTECHNICAL REPORT – FOR PLAN CHANGE

INITIA REF 1218 REV B

SEPTEMBER 2023

# Contents

1.	Intro	duction	3
2.	Site I	Description and Proposed Development	5
3.	Geot	echnical Investigation	6
	3.1	Historic Investigations	6
	3.2	Initia Site Investigations	6
4.	Subs	urface Conditions	8
	4.1	General	8
	4.2	Published Geology	8
	4.3	Site Stratigraphy	9
	4.4	Groundwater	11
5.	Geot	echnical Considerations	13
	5.1	General	13
	5.2	Soakage Testing and Considerations	13
	5.3	Seismic Considerations	13
		5.3.1 Subsoil Class	13
		5.3.2 Liquefaction Potential	13
	5.4	Earthworks	14
		5.4.1 General	14
		5.4.2 Surficial Stripping and Subgrade Preparation	14
		5.4.3 Re-use of Site Won Material as Engineered Fill	14
		5.4.4 Compaction	14
		5.4.5 Settlement for Filling	15
		5.4.6 Slope Stability	15
	5.5	Retaining Walls	18
	5.6	Foundation Considerations	18
		5.6.1 Residential Dwellings on New Fill or Natural Ground	18
		5.6.2 Residential Terraced Housing Apartment Buildings South of Pond	19
		5.6.3 Residential Terraced Housing Apartment Buildings Adjacent to Ladies Mile	20
	5.7	AUP – Residential Terraced Housing Apartment Buildings	21
	5.8	Floor Slabs and Pavements	21
	5.9	Further Work	22
6.	Cond	clusions and Recommendations	23
	6.1	Conditions	24
7.	Appl	icability	25



# 1. Introduction

Auckland Thoroughbred Racing has decided to divest approximately 6.2 hectares of land from the eastern corner of the Ellerslie Racecourse Precinct. FRL has purchased this area of land and has obtained resource consent (through the fast trach process to construct approximately 357 residential dwellings. The proposed 357 dwellings comprise a mix of detached, duplex and terrace houses, market apartments, and an apartment building for active retirement use. Building heights range from 1 to 7 storeys (above any basement levels). The Precinct is located at the western end of the racecourse site and is bound by Ladies Mile and Derby Downs Place. The area of land subject to this plan change is currently part of a Special Purpose – Major Recreation Facility Zone and a plan change is now proposed to recognise the consented residential development. The precinct is to be referenced as the Remuera Precinct.

The Precinct enables housing choice including both medium to high density living opportunities with development up to 25m in height provided within the THAB zones. Development of the Precinct is defined by identified publicly accessible open spaces, areas of private open space, existing mature Pohutukawa trees (combined with a 6m setback in their vicinity) and garden streets.

Movement through the precinct is provided two new public roads, one of which connects to Ladies Mile while the other connects to Derby Downs Place. Entry markers are proposed at these locations. A series of interconnected commonly owned access lots in combination with identified pedestrian routes provide internal linkages within and through the Precinct. An existing tunnel also connects Derby Downs Place with the infield of the racecourse.

Stormwater from the precinct is managed by the adopted Stormwater Management Plan for the precinct.

With regard to archaeological matters, FRL has obtained an authorisation from Heritage New Zealand for the earthworks required to prepare the site for development. The authorisation requires – [add brief summary]

The zoning of the land within the Remuera Precinct is Residential - Terrace Housing and Apartment Buildings and Residential – Mixed Housing Urban.

This Geotechnical Interpretive Report has been prepared to summarise the investigations undertaken and outlines the key geotechnical considerations that will need to be addressed for the proposed Plan Change at The Hill, Ellerslie Racecourse.

This report has been prepared to support the proposed Plan Change at The Hill, Ellerslie Racecourse as presented in Figure 1-1.

Our scope of work to date has comprised:

- At Due Diligence Stage:
  - o Review of historical geotechnical investigation data available for the site;
  - Supplementary geotechnical investigations predominantly for the purposes of assessing the feasibility for onsite soakage (for stormwater disposal);
  - Preparation of a Geotechnical Report highlighting the key geotechnical considerations to support due diligence that was being undertaken on the site.
- Resource Consent Stage:
  - Limited supplementary geotechnical investigations. These investigations were targeted south of the pond to better delineate ground conditions for the proposed multi-storey buildings in this area;
  - Review of the geohazards and mitigation measures pertinent to the conditions encountered during the investigations; and
  - o Preparation of this report.



#### • Plan Change Stage (Current):

• An assessment was previously provided for a fast track application. This assessment has been updated to address the relevant matters for a plan change to the same area of land, in order to accommodate the development envisaged in the resource consent application.



Figure 1-1: Proposed plan change



# 2. Site Description and Proposed Development

The site is situated on the eastern end of the Ellerslie Racecourse, bound by Ladies Mile in the north and east and Derby Downs Place to the south (refer Figure 2-1).

Contours sourced from the Auckland Council GIS indicate the site slopes from about RL55 at the northern boundary to about RL 40 at the southern boundary.

An existing pond is situated near the southern end of the site. We understand that the pond is to be decommissioned and infilled.



Figure 2-1: Indicative site location

We understand that the proposed plan change comprises a mix of zones:

- Residential Mixed Housing Urban Zones.
- Residential Terraced Housing Apartment Building Zones.
- Roads and associated infrastructure (storm and wastewater pipes).

Earthworks will be required to form building platforms and roads alongside a series of retaining walls. Design parameters for these walls are presented in Section 5.5, however detailed design and Building Consenting will be undertaken at a later stage.

The site is to be serviced by a series of new stormwater and wastewater pipes. It is understood that these services are to be installed using traditional battered excavations in combination with pipe jacking/thrusting techniques. The pipe jacking/thrusting methodology is outside the scope of this report and will be subject to a specific assessment. Temporary shafts that may be required are also outside the scope of this document.

An easement is proposed in the vicinity of the existing 1.9 m diameter stormwater pipe that traverses the central portion of the site.



# 3. Geotechnical Investigation

## 3.1 Historic Investigations

### SKM

Based on a review of the New Zealand Geotechnical Database, a series of historic machine boreholes have been undertaken across the site by SKM Consulting between 2006 to 2008. The depths of these investigations ranged between 12 m and 30 m below ground level. These investigations have been made available to us by Auckland Racing Club (ATR) and are attached in Appendix B.

#### Lander Geotechnical

In addition, Lander Geotechnical were commissioned by ATR to undertake a series of investigations across the site, comprising:

- 8 No. hand auger boreholes to refusal or 5 m depth below ground level (bgl);
- 6 No. machine boreholes to between 9.5 m and 24 m bgl; and
- 12 No. test pits to between about 1 m and 4.5 m bgl.

The results of the Lander investigations are summarised in Memo ref J01709-Rev1 dated 13 July 2021 attached in Appendix B. The locations of the historical investigations are presented in the site plan in Appendix A.

We note the ground level at the time of the Lander or SKM investigations is uncertain.

## 3.2 Initia Site Investigations

Initia undertook additional supplementary investigations between October 2021 and February 2022 comprising:

- 8 machine boreholes were drilled using rotary techniques to between about 9 m and 27 m below existing ground level (begl). Machine boreholes were completed by DCN Drilling (October 2021) and Geotech Drilling (February 2022). In situ strength testing comprising Standard Penetration Tests (SPTs) was undertaken at regular intervals within the majority of boreholes and shear vane testing was carried out where cohesive material was encountered. Soakage testing was undertaken within 3 machine boreholes (BH01, BH02 and BH03). Standpipe piezometers were installed within the boreholes to allow ongoing measurement of groundwater;
- 5 boreholes drilled using percussion techniques to between about 5.5 m and 13.5 m for soakage testing.

The locations of the investigations are shown on Figure 1218-001 and summarised in Table 3-1 below.

Investigation	Investigation Type	Coordin	ates (NZTM) <sup>1</sup>	Ground Surface
ID		Easting (mE)	Northing (mN)	Elevation <sup>2</sup> (m RL)
BH01 (Red)	Machine Borehole	1761459	5915826	55.0
BH01 (Blue)	Machine Borehole	1761368	5915940	54.5
BH02	Machine Borehole	1761339	5915799	46.7
BH03	Machine Borehole	1761234	5915691	42.6
SH01	Percussion Borehole	1761368	5915697	42.6
SH02	Percussion Borehole	1761228	5915686	42.7
SH03	Percussion Borehole	1761291	5915727	39.9

#### Table 3-1 - Summary of Initia Investigations



Investigation	Investigation Type	Coordin	ates (NZTM) <sup>1</sup>	Ground Surface
ID		Easting (mE)	Northing (mN)	Elevation <sup>2</sup> (m RL)
SH04	Percussion Borehole	1761280	5915768	42.1
SH05	Percussion Borehole	1761274	5915667	42.6
BH101	Machine Borehole	1761270	5915725	41.75
BH102	Machine Borehole	1761248	5915723	40.69
BH103	Machine Borehole	1761247	5915700	41.94
BH104	Machine Borehole	1761268	5915681	42.11

Note 1: Co-ordinate system – NZTM 2000. Test location coordinates are determined via hand-held GPS Survey +/- 5 m in plan and/or measured distance from existing structures.

Note 2: Datum – AUCKHT 1946. Ground surface elevations are based on interpretation from Auckland Council Contours and are expected to be accurate + or -0.5m.

The density and type of investigations undertaken are considered suitable for the purposes of a bulk earthworks consent. Recommendations for further investigation are outlined in Section 5.9.



# 4. Subsurface Conditions

## 4.1 General

The advice and recommendations presented in this report are based on the historic geotechnical investigations undertaken by other consultants and current geotechnical investigations undertaken by Initia. The nature and continuity of the ground conditions away from the investigation locations is inferred and it must be appreciated that actual conditions could vary from the assumed model.

# 4.2 Published Geology

Based on the published geological maps (refer Figure 4-1 below) and readily available geotechnical data from the New Zealand Geotechnical Database (NZGD), the site is expected to be underlain by three different geological units:

- The southern end of the site is underlain by Auckland Volcanic Field (pink unit), which was likely sourced from the nearby One Tree Hill Volcano. This material typically consists of clayey silt volcanic ash, volcanic tuff and basalt rock.
- In the centre of the site, Holocene river deposits are mapped. This material typically consists of sand, silt and clay with some local gravel and peat beds.
- In the northern portion of the site, East Coast Bays Formation (ECBF) soils and rock (orange unit) are mapped. The ECBF material typically consists of a clayey silt and sandy silt residual soils which are underlain by weathered interbedded siltstone and sandstone.



Figure 4-1: Published geological map sourced from GNS Science.





# 4.3 Site Stratigraphy

Based on the geotechnical investigations undertaken, subsurface conditions are generally consistent with the published geology. A transition zone in geology is apparent at/near the existing pond and therefore for the purposes of this report, the pond has been used to delineate the ground conditions.

North of the existing pond the ground conditions typically comprise:

- Topsoil;
- Non-Engineered Fill Within the non-engineered fill, pockets of brick, concrete, wood and other unsuitable material was encountered. In localised areas the non-engineered fill is as thick as 8 m. The indicative extent of deep fill is shown on the site investigation plan in Appendix A;
- Auckland Volcanic Field Ash (soil);
- Residually weathered ECBF soils; and
- Highly weathered to slightly weathered ECBF 'rock'

South of the existing pond the ground conditions typically comprise:

- Topsoil;
- Auckland Volcanic Field Ash over Basalt(rock);
- Puketoka Formation sediments;
- Residually weathered ECBF;
- Highly weathered to slightly weathered ECBF

A summary of the ground conditions is presented in Table 4-1 and Table 4-2 and illustrated on cross sections Figures 1218-02 to 1218-04 in Appendix A. Indicative depths to ECBF rock encountered during the investigations are summarised on the geological sections in Appendix A.



Geological Unit	Soil/Rock type	Depth to Top of Unit (m, bgl)	Layer Thickness (m)	In Situ St Parameter [Typical <sup>v</sup> Su (kPa) <sup>(2)</sup>	rength s Range Value] SPT 'N' Value
Non- engineered Fill <sup>(1)</sup>	Very stiff to hard clayey SILT with fragments of brick,	0	0.5 - 8	Not measured	6
Auckland Volcanic Field	Very stiff to hard clayey SILT (Volcanic Ash)	0.2 - 0.5	1	197- 215 [200]	-
Residually Weathered East Coast Bays Formation	Very stiff to hard clayey SILT and sandy SILT	0.0 - 3.0	4 - 10	102 - 215+ [150]	4 - 15 [8]
East Coast Bays Formation	Highly to Slightly Weathered Interbedded Siltstone and Sandstone	4.5 - 12.5	Unproven	-	12 - 50+ [35]

#### Table 4-1 - Ground Conditions north of the existing pond

Notes:

- 1. The approximate extent of non-engineered fill is shown on Figure 1218-001 in Appendix A. While it is expected that a large majority of the fill material will be suitable for re-use, it is recommended that supplementary test pit investigations be undertaken prior to construction.
- 2. Undrained shear strengths were measured at the end of the core barrel so may not be representative of in situ conditions.



Geological Unit	Soil/Rock type	Depth to Top of	Typical Layer	In Situ Strength Parameters Range [Typical Value]	
		Unit (m, bgl)	i nickness (m)	Su (kPa) <sup>(1)</sup>	SPT 'N'
olcanic Field	Volcanic ash – Very stiff to hard clayey SILT	0.0	1 - 3	215+	6
Auckland V	Basalt Rock	1 - 3	5 - 8	N/A	50+
Puketoka Formation	Stiff to very stiff silty CLAY with some organics	6 - 11	10 - 16	50 - 100 [70]	2 - 13 [6]
Residually Weathered East Coast Bays Formation	Very stiff to hard clayey SILT and sandy SILT	15.0 - 26	0.5 - 2	Not measured	7 - 17 [10]
East Coast Bays Formation	Highly to Slightly Weathered Interbedded Siltstone and Sandstone	19.0 - 23.0	Unproven	N/A	25 - 50+ [50+]

#### Table 4-2: Ground Conditions south of the existing pond

Note: Undrained shear strengths were measured at the end of the core barrel and may not be representative of in situ conditions.

### 4.4 Groundwater

Standpipe piezometers were installed in the four machine boreholes drilled by DCN drilling in October 2021. The standpipe piezometers have been manually measured over the course of the project to date. Groundwater was also measured in the soakage holes before the soakage tests commenced.

A summary of the groundwater readings to date is presented in Table 4-3. The lowest measured groundwater readings are also shown on geological cross sections in Appendix A.



Investigation	7/10/2021	13/10/2021	2/11/2021	23/11/2021	21/01/2022	6/04/2022
ID	(Following Investigations)	Depth below existing ground level	Depth below existing ground level	Depth below existing	Depth below existing ground level	Depth below existing
	Depth below existing ground level (m)	(m)	(m)	ground level (m) ground (m) level		
						(m)
BH01 (Red) – nested piezometer						
Upper screen between 3 and 6 m begl;	Not measured	2.8, 3.7	2.46, 3.31	2.65, 3.37	4, 5.3	4.3, 5.3
Lower Screen between 8 and 10 m begl						
BH01 (Blue)	2.9	5.8	Dry	5.85	6	6
BH02	Not measured	Not measured	1.57	1.29	2	2.1
BH03		2.15	1.63	2.28	3.5	3.7
SH01			Not encountered			
SH02			1.9	-		
SH03	Drilled subs	sequently	1.3	-	Not Measured	
SH04			Not measured	-		
SH05			2.7	-		

Table 4-3 - Summary of Groundwater Levels

The implications on the proposed development are discussed in Section 5.7 below.



# 5. Geotechnical Considerations

## 5.1 General

Based on the encountered ground conditions the following geotechnical considerations are considered pertinent for the proposed plan change:

- Site seismicity and liquefaction potential.
- Earthworks and fill placement.
- Foundation options.
- Basement and Auckland Unitary Plan considerations.
- Slope stability and retention considerations.
- Floor slab and pavement considerations.

In addition to the above commentary is provided on site soakage (for stormwater disposal). These considerations are discussed further in the following subsections.

# 5.2 Soakage Testing and Considerations

Soakage testing was attempted within all boreholes undertaken in October 2021, except BH01 (Blue). However, the testing indicated very minimal soakage both in the clayey silt soils to the north of the existing pond as well as the basalt south of the existing pond. The results of testing from the rotary boreholes are attached in Appendix B.

Soakage testing was attempted in the percussion boreholes SH01 – SH05, however no soakage was possible, and the holes overtopped during the 'pre-soak' phase of the test.

Based on the testing undertaken, disposal of stormwater through onsite soakage within the basalt in the southern half of the site is not considered feasible.

## 5.3 Seismic Considerations

### 5.3.1 Subsoil Class

On the basis of the depth to East Coast Bays Formation rock encountered in the investigations, the site subsoil class can be taken as Class C – shallow soil in accordance with NZS 1170.5:2004 amended in 2016.

### 5.3.2 Liquefaction Potential

Liquefaction susceptibility is a fundamental physical characteristic of the soil that describes how it responds to earthquake shaking. Liquefaction typically only occurs in soils which are saturated, non-cohesive, and low to moderate permeability. This includes the following broad soil types:

- Sands and low plasticity/non-plastic silts;
- Young, typically Holocene-Age (≤12,000 years old) deposits; and
- Gravels (if they have a low permeability or are confined by less permeable layers).

From the geotechnical investigations undertaken, the soils encountered generally comprised very stiff to hard Fill, Volcanic Ash, Puketoka Formation and ECBF residual soils. Theses soils are generally considered **cohesive (moderate to high plasticity silts and clays)**. Accordingly, the soils encountered at the site are not considered susceptible to liquefaction and quantitative analyses have not been undertaken nor are they considered necessary.

No specific design or detailing will be required to address liquefaction effects for any structures proposed for the site.

# 5.4 Earthworks

### 5.4.1 General

Earthworks should be undertaken in general accordance with the recommendations outlined in NZS 4431:1989 (Earth fills for residential development) and NZS4404:2010 (Land development and subdivision infrastructure).

### 5.4.2 Surficial Stripping and Subgrade Preparation

The development area should be cleared of any topsoil and weak deposits at the base of the existing pond prior to placement of new engineered fill or foundation elements. Sediment and erosion controls should be implemented following topsoil stripping.

All subgrade shall be inspected by a geotechnical engineer competent in understanding the design requirements in this report. Exposed subgrade surfaces shall be protected through placement of a blinding layer and water should not be allowed to pond on the surface.

### 5.4.3 Re-use of Site Won Material as Engineered Fill

As outlined in Section 4.3 Based on the geotechnical investigations undertaken, non-engineered fill was encountered north-west of the existing pond (refer Figure 1218-001 in Appendix A for approximate delineation of the zone). This material is locally up to 8 m thick. This material will need to be screened for unsuitables and approved material will need to be reworked in accordance with the specification below.

In areas where deep fill was not encountered, the near surface natural materials encountered across the site generally comprised very stiff to hard Auckland Volcanic Field (AVF) ash, Puketoka Formation and Residual ECBF Soils (clayey silts/silty clays). These soils are expected to be almost entirely suitable for re-use as engineered fill without prior conditioning or treatment.

It is noted that the AVF volcanic ash soils are considered sensitive and can have a low remoulded strength when disturbed, especially when saturated. Earthworks will need to be carefully managed to preserve the strength of the material. If winter earthworks are proposed, allowance should be made to lime stabilise the volcanic material.

Prior to commencement of bulk filling, it is recommended that standard laboratory testing be undertaken to confirm optimum water contents and solid densities of the soils proposed for re-use to assist with compaction quality assurance during earthworks. Preliminary compaction criteria provided – for inclusion within an overall earthworks specification – is provided below.

### 5.4.4 Compaction

All new engineered fill should be placed to meet or exceed the preliminary compaction control criteria provided below.

Fill materials shall be placed in approximately 300 mm thick (loose layers) and compacted to achieve the standards defined below:

- Cohesive materials (site-won Volcanic Ash and Puketoka soils):
  - Average undrained shear strength over 10 consecutive readings shall not be less than 140 kPa with no individual reading less than 120 kPa; and
  - o The air voids shall not exceed 8% (average of 5 readings).
- Cohesionless hardfill (e.g. GAP40 or GAP65) shall be placed in uniform layers not greater than 300 mm loose thickness and compacted to obtain the following standards:
  - The in-situ dry density shall be not less than 80% of the maximum solid density (95% of maximum dry density (MDD)), as determined by Test 2.7.1, NZS 4402; or



 Compaction testing shall be completed using a Clegg Hammer or other approved device. The minimum Clegg Impact Value (CIV) for any single test shall be 25 with an average of no less than 28 (5 consecutive tests).

It should be noted that prior to construction, bulk samples will need to be obtained for laboratory testing. This will allow the target for validation testing to be confirmed.

### 5.4.5 Settlement for Filling

Based on the strength of the underlying ground, consolidation settlement from any filling works is not expected to be significant. Nevertheless, it is recommended that where fill thicknesses exceed 3 m, that settlement pins be installed at the finished ground surface and monitored. Construction of services and buildings should only commence following a review of the settlement monitoring data by the geotechnical engineer.

### 5.4.6 Slope Stability

Temporary cut batter slopes are likely required to enable the construction of the basements for the buildings adjacent to Ladies Mile, up to a maximum height of about 3 m. In addition, fill batter slopes are proposed over a portion of the south-western boundary. Figure 5-1 shows the approximate locations of the proposed slopes.



Figure 5-1: Approximate extents of proposed fill and cut batter slopes and critical stability sections considered

Analyses have been undertaken to assess current and proposed (temporary and permanent) stability using limit equilibrium software Slide. The locations of the critical sections considered in our analyses are presented in Figure 5-1.

Parameters adopted in our analyses are based on the results of recent and historical investigations undertaken at the site and are presented in Table 5-1. These parameters have been derived based on correlations with in situ testing, our experience with similar material and the recommendations in Auckland Council Code of Practice.

Table 5-1: Summary of geotechnical parameters adopted in analyses

Geological Unit	Unit weight, γ (kN/m³)	Effective cohesion, c' (kPa)	Effective friction angle, φ' (degrees)
Existing Fill	17.5	5	30
Engineered fill (cohesive)	18.5	5	32
Residual East Coast Bays Formation (ECBF) Soil	17.5	6	32
ECBF rock	22	50	40



Note: No volcanic material is expected over the critical sections considered.

Stability analyses have been undertaken for the following:

#### Section A

- Current topography
- Proposed conditions cut slope (permanent along northwestern boundary). Sensitivity analyses was undertaken to assess the maximum allowable slope angle.

#### Section B

- Current topography
- Proposed Conditions:
  - Cut batters for basements adjacent to Ladies Mile (1V:1H, temporary while the basements are constructed)
  - o Lower fill slope, adjacent to the racetrack (permanent).

#### Section C

- Current topography not assessed section is currently generally level
- Proposed conditions, cut batter adjacent to Ladies Mile (1V:1H, temporary while the basements are constructed)

The following target factors of safety FoS for different design cases were considered in accordance with generally accepted standard practice:

- Temporary conditions:
  - o Static (normal groundwater) FoS ≥ 1.3
  - o Static (elevated groundwater) FoS ≥ 1.2
- Permanent conditions:
  - o Static (normal groundwater) FoS ≥ 1.5
  - o Static (elevated groundwater) FoS ≥ 1.2
  - o Seismic FoS ≥ 1.0

The following assumptions were adopted in our analyses:

- The static normal groundwater level has been derived based on groundwater at the site, and is below the proposed batters (ie. batters have been modelled as dry);
- For elevated groundwater conditions we have modelled a near saturated slope (piezometric line approximately 1 m below the slope surface) to simulate conditions following periods of heavy rainfall;
- A seismic load case has only been considered for current and permanent stability analyses. The seismic load has been derived based on recommendations presented in MBIE Module 1 and 6. A PGA of 0.19 g has been applied based on these recommendations.

The results of the stability analyses are presented below for the current, temporary and proposed permanent cases.



Analysis description	Analysis case	FoS criteria	Calculated FoS
Current conditions	Static – normal groundwater	>1.5	1.7
	Static – elevated groundwater	>1.2	1.3
	Seismic – normal groundwater	>1.0	1.3
Proposed conditions	Static – normal groundwater	>1.5	1.5
(permanent): 1V:1.5H cut	Static – elevated groundwater	>1.2	1.2
siope	Seismic – normal groundwater	>1.0	1.2

#### Table 5-2: Summary of stability analysis results for Section A

#### Table 5-3: Summary of stability analysis for Section B

Analysis description	Analysis case	FoS criteria	Calculated FoS
	Static – normal groundwater	>1.5	3.5
Current conditions	Static – elevated groundwater	>1.2	3.5
	Seismic – normal groundwater	>1.0	2.0
Adjacent to Ladies Mile (temporary):	Static – normal groundwater	>1.3	1.7
1V:1H cut batter	Static – elevated groundwater	>1.2	1.5
Lower fill along adjacent to the reastrook	Static – normal groundwater	>1.5	1.6
(nermanent): 1V:3H slope	Static – elevated groundwater	>1.2	1.6
	Seismic – normal groundwater	>1.0	1.4

Table 5-4: Summary of stability analysis results for Section C

Analysis description	Analysis case	FoS criteria	Calculated FoS
Proposed conditions, adjacent to Ladies	Static – normal groundwater	>1.5	1.8
Mile (temporary): 1V:1H cut batter	Static – elevated groundwater	>1.2	1.6

The current site meets generally acceptable factors of safety and proposed works under a proposed plan change are unlikely to exacerbate this.

Adjacent to Ladies Mile, assessed factors of safety imply negligible displacement due to proposed cuts.

Recommendations regarding slope stability on the proposed development is as follows:

#### **Temporary Cut Slopes**

Based on our understanding of the strength of the near surface soils at the site a maximum temporary batter of 1V:1H may be adopted up to a maximum height of 3 m.

Suitable drainage should be provided to all slopes and surface water diverted to a suitable outlet connection.

We note that localised frittering/instability of the batter face may occur, particularly during heavy periods of rainfall. To mitigate this risk, the following could be considered:

- Using an observational approach and providing measures to ensure the batters remain dry. This method is ideally limited to a short period (< 6 months), and when weathered is likely to be more favourable; and/or
- Installing reinforcing elements with mesh (soil nails, mantaray anchors or similar).



#### Permanent Cut Slopes

The permanent lower slope (Section A) may be formed to a maximum slope angle of 1V:1.5H. This slope will need to be planted with flax, kanuka, manuka or similar to prevent erosion.

### Fill Slopes

Analyses undertaken on the 1V:3H slope along a portion of the north west boundary, as proposed, achieve generally acceptable factors of safety. Steeper fill slopes may be achievable, however these will require some form of reinforcement (eg. geogrids) to maintain long term stability. Supplementary, analyses should be undertaken if these are preferred.

## 5.5 Retaining Walls

A series of retaining walls will be required. Retaining walls are likely to comprise, masonry block (gravity) or timber pole (embedded) walls with lagging between the piles and are likely be suitable up to 4 m height. Steel UCs with timber lagging or Bored Cast in situ reinforced concrete walls could be considered for walls with larger retained heights. Walls will be subject to detailed design and building consenting prior to construction. If required, fall protection barriers will be provided. Appropriate analyses will be undertaken to demonstrate stability at Building Consent stage.

Parameters considered appropriate for use in retention analyses are presented below. These parameters can be amended on review of ground conditions and during detailed design.

Soil Type	Unit Weight (kN/m³)	Deformation Modulus, MPa	At Rest Earth Pressure Coefficient, K <sub>o</sub>	Active Earth Pressure Coefficient, Ka	Passive Earth Pressure Coefficient, Kp
Existing Fill	17.5	15	0.5	0.33	3
Engineered fill (cohesive)	18.5	30	0.47	0.3	3.3
Engineered Fill (granular)	18.5	30	0.42	0.27	3.7
AVF Ash	18	20	0.47	0.3	3.3
Puketoka Formation soils	18	20	0.47	0.3	3.3
Residual East Coast Bays Formation (ECBE) Soil	17.5	25	0.5	0.33	3

#### Table 5-5 - Retention Parameters

Note the parameters do not allow for surcharges, groundwater pressure or wall friction. Appropriate allowances should be made during detailed design.

In addition, drainage should be included behind all retaining walls.

Providing the above is undertaken, it is considered that the risk of instability can be adequately mitigated.

# 5.6 Foundation Considerations

### 5.6.1 Residential Dwellings on New Fill or Natural Ground

For lightweight dwellings (up to 2 storeys) and podium type structures across the site, shallow foundations are likely to be feasible. These foundations could comprise NZS3604 type foundations or reinforced concrete raft type foundations bearing on either natural soils or engineered fill.

Where significant thicknesses of non-engineered fill are currently present, material will need to be reworked to form a crust of engineered fill as per the recommendations in Section 5.4.



Foundations will need to detailed to accommodate seasonal volume change (soil expansivity), however this risk can be mitigated through adequate foundation embedment or suitable reinforcement (use of reinforced concrete raft type foundations). Based on our experience with similar materials the soils will like be Class H (Highly Expansive).

Bearing capacities and soil expansivity will be confirmed in the geotechnical completion report, following completion of the earthworks completion.

### 5.6.2 Residential Terraced Housing Apartment Buildings South of Pond

For the residential terraced housing apartment buildings south of the pond, shallow raft type foundations bearing on either very stiff to hard AVF ash or basalt are likely to be suitable. The recommended bearing capacity values to adopt for design are presented in Table 5-6 below. These values are based on the following assumptions:

- Should the foundation system be founded into the ash layer (very stiff to hard silt and clay), a minimum undrained shear strength of 120 kPa is considered for the Auckland Volcanic Field soils.
- Although higher bearing capacities, of up to 6 MPa, can usually be achieved when shallow
  footings are founded directly onto competent basalt rock, lower values are recommended for
  design as this will result in a reduced requirement to prove highly competent material during
  construction. If higher capacities are required, additional proof drilling during construction may
  be necessary to demonstrate competent basalt and a lack of cavities.
- The founding layer should be proof rolled and visually inspected prior to casting the shallow foundations to confirm the ground conditions.
- Significant inclined loading of the foundations has not been considered. Specific bearing capacity calculations in accordance with the New Zealand Building Code Verification Method B1/VM4 should be carried out for these loading scenarios, if required, to confirm capacities.
- The allowable bearing pressure values are based on a maximum foundation width of 2 m and are based on allowable long-term settlement of approximately 25 mm. Wider foundations will need to be specifically considered.

Geotechnical Unit ID	Geotechnical Ultimate Bearing Capacity q <sub>u</sub> (kPa)	Geotechnical Design Bearing Capacity <sup>1</sup> - For ULS design (kPa)	Allowable Bearing Capacity (kPa)
Ash (with interbedded layers of gravels and boulders)	600	300	150
Basalt (Fractured, Competent)	1,500 <sup>2</sup>	700	500

Table 5-6: Bearing Capacity Values for Shallow Foundations

Notes:

1. 'Geotechnical Design Bearing Capacity – For ULS design' includes a strength reduction factor of 0.5.

 Should bearing capacities higher than recommended be required to accommodate large magnitude structural loads, proof drilling at each foundation location to 5.0 m depth below the founding level will be required during or just prior to construction. Should voids be encountered below the foundation level, the voids will need to be infilled with grout.

Preliminary spring stiffness values for use in the structural building model are presented in Table 5-7 below. These values depend on the overall foundation layout and load distribution beneath the building and may vary across the buildings' footprint. Accordingly, these values will need to be confirmed during detailed design. Specifically, design bearing pressures and spring displacements from structural model will need to be reviewed and analysed by Initia. Updated spring stiffnesses will then be provided as required.



Table 5-7: Preliminary spring stiffness values for shallow foundations (2 m width)

Geotechnical Unit ID	Long term static spring value	Short term spring value (e.g.
(Founding Material)	(kPa/mm)	wind, seismic) (kPa/mm)
Ash	7.5 to 15	25 to 50

If the shallow foundations are required to resist uplift loads, grouted ground anchors or passive bars into the basalt could be considered.

Anchors can be sized during detailed design if required once design loads are known. Due to the nature of the basalt at the site, grout loss during anchor installation is a possibility and the contractor will need to allow for measures to limit this (e.g. grout socks, pre-grouting etc).

During construction, the ground conditions along the anchors' length should be logged and recorded during drilling of the holes in order to confirm rock thickness and quality to validate the design assumptions. Each anchor should be load tested to verify load capacity and load deformation behaviour prior to being put into service. Load test requirements can be provided at detailed design stage.

### 5.6.3 Residential Terraced Housing Apartment Buildings Adjacent to Ladies Mile

#### **Deep foundations**

All piling options can be considered (bored cast in situ reinforced concrete piles, screw piles or driven UC piles). However, given the relatively shallow depth to ECBF rock bored cast in situ piles are likely to be economical and provide adequate vertical and lateral load carrying capacity with negligible settlement risk. Accordingly, bored cast in situ concrete piles are recommended for the multistorey buildings to the adjacent to Ladies Mile.

The following geotechnical ultimate parameters are considered appropriate for use in preliminary design of piles embedded in ECBF rock:

- Geotechnical Ultimate End Bearing 6 MPa;
- Geotechnical Ultimate Skin Friction (Smooth) 500 kPa;
- Geotechnical Ultimate Skin Friction (Grooved) 750 kPa.

A strength reduction factor of 0.5 should be adopted for ULS design.

For steel UC piles, indicative geotechnical ultimate capacities for a range of UC sections are as follows:

- 250 UC 73 1800 kN
- 310 UC 97 2350 kN
- 310 UC 137 3300 kN.

Final pile embedment's will be dependent on structural layouts and form.

It is recommended that supplementary investigations be undertaken to confirm the consistency of the rock profile for bored piles.

#### Shallow foundations with ground improvements

For the multistorey buildings adjacent to Ladies Mile, shallow raft type foundations in conjunction with ground improvements could be considered subject to checks of total and differential settlement during detailed design. Ground improvements could comprise:

- Driven timber poles;
- Rammed Aggregate Piers; or
- Rigid Inclusions (unreinforced concrete columns).



Ground improvements will be separate from the structural foundation elements and will require a gravel load transfer platform. Depending on the selected ground improvement the load transfer platform could range between 500 mm and 800 mm. Localised uplift resisting elements can be incorporated into the ground improvements if required.

Given the relatively shallow depth to ECBF rock to the north of the pond, ground improvements are unlikely to provide a reduction in risk comparable to the cost compared with deep foundations. However, it does provide a possible mechanism to expedite construction.

If preferred, ground improvements will need to be assessed in careful collaboration with the project structural engineer.

# 5.7 AUP – Residential Terraced Housing Apartment Buildings

It is understood that one to two level basements are proposed beneath the multi storey buildings along the northern boundary of the site, adjacent to Ladies Mile and for the Vivid living building. 'Stepped excavations' are proposed to form the basement levels, with maximum cuts about 3 m. The proposed excavations are shown on Figures 1218-002 and 1218-003 through 006 in Appendix A.

Based on groundwater monitoring between October 2021 to April 2022, the lowest measured groundwater levels (summarised in Table 5-8) are below the minimum subgrade levels for the proposed basements. Accordingly, proposed excavations to form the basements should meet the permitted activity criteria for groundwater under Section E7 of the Auckland Unitary Plan.

Table 5-8: Summary of minimum basement subgrade levels compared with minimum groundwater levels measured

Development	Relevant groundwater monitoring location	Minimum subgrade level (m RL)	Minimum measured groundwater level (m RL)
Apartment B	BH01 (red)	51.65	49.7
Apartment C1 & C2	BH01 (blue)	49.3	48.5
Vivid Living	BH03	40.95	38.9

In addition, we consider that drained basements are feasible and the effects of the proposed drained basements on the groundwater will be negligible. It is considered prudent however to allow for groundwater control such as drainage (free draining granular material, scoria or similar) behind all permanent retaining walls and beneath the floor slabs. The drainage should be connected to an open sump in the basement slab and discharged to the public stormwater system either via a gravity fed line or by pumping from the sump.

## 5.8 Floor Slabs and Pavements

For floor slabs and pavements bearing on the natural soils, a California Bearing Ratio (CBR) of 3% is considered suitable for use in design.

For slabs and pavements bearing on engineered fill a higher CBR will be possible. However, this will need to be assessed once the fill source is confirmed.



## 5.9 Further Work

The following further geotechnical inputs are recommended to support future building consent applications and construction activities on site.

#### Supplementary Investigations

We recommend that further investigations be considered to address the following:

- Earthworks:
  - o Refine quantities of unsuitable material;
  - o To develop compaction criteria for placement of engineered fill;
  - o Where specific retention measures may be required for service installations
- Detailed design of the multistorey buildings adjacent to Ladies Mile:
  - Supplementary boreholes will be required to confirm the depths to ECBF rock to support the design of foundation and retention options; and

#### Detailed Design

- Analyses and design of permanent retaining walls;
- Additional analyses to support pile foundations, including lateral pile analyses;
- Preparation of an earthworks specification; and
- Review of the geotechnical aspects of the civil and structural drawings.

#### **Construction Stage**

Construction stage inputs will be confirmed following detailed design along with acceptance criteria. However, the geotechnical inputs in Table 5-9 are likely to be required.

Tabla E O	Likoby	onstruction	ctago	acotochnical	innute
1 4018 3-9-	LIKEIVU	JUNSTRUCTION	Staue	ueotechinicai	IIIDULS
				9	

Stage	Observation Point	Specification / Acceptance Criteria					
Earthworks	Following topsoil stripping prior to any fill placement	Confirmation that the exposed subgrade is free of organics.					
	Bulk filling	Review of compaction test results to ensure material is placed and compacted in accordance with prepared specification.					
	Cut batters/Retention of trenches	Confirmation that batters are cut and retention installed in accordance with design recommendations.					
Shallow Foundations	Pad and strip footing preparation	Confirmation that in situ strengths in footing excavations are consistent with design assumptions					
Deep foundations	Driven Pile Installation or Observation of pile shafts	Confirmation that embedment is in accordance with the design requirements.					
Other Slab on	Preparation of floor slab subgrade	Confirmation that pavements are					
grade & Pavement	Preparation of subgrade (prior to placement of basecourse)	prepared and constructed in accordance with design assumptions.					
	Placement of basecourse layer						



# 6. Conclusions and Recommendations

Based on the information obtained from the subsoil investigations, and our experience with similar materials, we consider the site can be satisfactorily and economically engineered for the proposed development.

Our conclusions and recommendations are summarised as follows:

#### Subsurface Conditions

- 1. To the north of the existing pond, ground conditions typically comprise Non Engineered Fill or Ash overlying residually weathered East Coast Bays Formation soils and rock;
- 2. To the south of the existing pond, ground conditions typically comprise Ash overlying basalt. Further investigations will need to be undertaken to delineate the basalt and confirm thickness/consistency below building foundations.

#### Seismic Considerations

- 3. Based on the depths to East Coast Bays Formation rock, the site subsoil class is considered to be Class C – shallow soil in accordance with NZS1170.5. This is based on estimated depths to rock.
- 4. The site subsoils are cohesive and accordingly not considered susceptible to liquefaction.

#### Earthworks

- 5. Non-engineered fill will need to be reworked to create a crust of material under the building platforms.
- 6. A large volume of existing fill is likely to be suitable for re-use on site following screening and removal of unsuitable material (bricks, concrete etc.).
- 7. Stability analyses for the current site development indicates that there is not an existing stability issue.
- 8. Temporary slopes for the formation of the proposed basements (up to 3 m high) should be limited to 1V:1H with adequate mitigation of surface runoff. Localised instability and/or surficial frittering of these slopes may occur over the temporary earthworks phase (up to 18 months). Stabilisation measures should be considered to mitigate this risk including provision of PVC facing and installation of mantaray or similar soil nail options.
- 9. Permanent slopes cut slopes should be limited to 1V:1.5H with adequate mitigation of surface runoff. For slopes greater than 1V:3H, these will need to be planted as opposed to topsoiled and grassed.
- 10. Permanent fill slopes up to 1V:3H meet actable factors of safety. Steeper slopes may be considered, however reinforcement (eg. geogrid) is likely to be required and additional analyses will need to be undertaken if these are preferred.

#### AUP Groundwater Considerations

11. Groundwater monitoring indicates that lowest measured levels are below proposed basement subgrade levels and as such any effects of the proposed development on the groundwater level will be negligible. Effects on adjacent services and structures (including public roads) is considered negligible based on the lowest measured groundwater levels. The proposed earthworks to form the basements are considered a permitted activity as defined by Section E7 of the Auckland Unitary Plan.

#### Foundations

12. For lightweight residential buildings and podium type structures, shallow foundations bearing on engineered fill or natural soils are likely to be suitable. Due to significant earthworks



proposed below these structures, bearing capacities and soil expansivity will be confirmed in the geotechnical earthworks completion report.

- 13. For the multi storey buildings to the south of the existing pond, raft foundations are likely to be suitable, bearing on the AVF ash or basalt.
- 14. For multistorey buildings adjacent to Ladies Mile, shallow foundations in conjunction with ground improvement could be considered subject to assessments of total and differential settlement. However, given the relatively shallow depth to ECBF rock, bored cast in situ reinforced piles are recommended. All piling options could also be considered.

#### **Pavements**

- 15. A subgrade CBR of 3% can be assumed for design of building ground floor slabs and external pavement design.
- 16. For slabs and pavements bearing on engineered fill a higher CBR will be possible. However, this will need to be assessed once the fill source is confirmed.

#### Conclusion

17. Based on the above analysis and the ongoing applicability of the AUP groundwater provisions to any development of the site that there are no specific geotechnical related specific provisions are considered to be required for this plan change.

#### 6.1 Conditions

September 2023

INITIA

We have reviewed the proposed conditions. We are comfortable from a geotechnical perspective that these conditions address the recommendations contained in this report.

While these conditions relate to the resource consent and not the plan change they are relevant in ensuring the rezoning of the site is appropriate as they confirm that the residential development of the site can be undertaken in accordance with sound construction and development methodologies.



# 7. Applicability

This report has been prepared for our client, Fletcher Residential Limited, with respect to the brief provided to us. The advice and recommendations presented in this report should not be applied to any other project or used in any other context without prior written approval from Initia Limited.

This report was prepared to support a Resource Consent application to undertake subdivision and bulk earthworks. Further work is required to support the detailed design of multi-storey buildings.

Report prepared by:

Alex McDonald Geotechnical Engineer

Report reviewed by:

Andy Pomfret Senior Geotechnical Engineer, Director



#### Document control record

Report Tit	le	THE HILL – ELLERSLIE RACECOURSE										
		Geotechnical Report – For Plan Change										
Initia Proj	ect Reference	1218										
Client		FLETCHER RESIDENTIAL LIMITED										
Revision	Date	Revision detail	Author	Reviewer	Approved by							
А	August 2023	For Plan Change.	A. McDonald	A. Pomfret	A. Pomfret							
В	Sep 2023	Client's review	B. Souza	A. Pomfret	A. Pomfret							
Current R	evision	В										









© Document copyright of Initia Ltd 2018 and may only be used for its intended purpose.











# Appendix B Site Investigation Logs



												G					E	BHC	)1		
1			CLIENT: PROJEC	Fletch T: The	er Livii e Hills.	ng Ellers	slie		SIT	ELOC	ATIO		Project Ref.: P-001218								
G	EO	N I T I A	CO-ORDIN Co-ordina Location r	CO-ORDINATES: 1761459.4mE, 5915826.8mN Co-ordinate system: NZTM Location method: GPSH ORIENTATION (°): Vertical							ON: 5 UCK⊦ thod: 1ON (	4m IT1946 солто (° <b>):</b> 90	DCN Drilling Rig	START DATE: 07/10/2021 END DATE: 07/10/2021 LOGGED BY: BSS CHECKED BY: QS							
				ы	RING		GTH			S	D	2		INSITU	DISCONTINUITI	ES		NO	5	(ES	
TINIT	5	MATERIAL DESCRIPT (See Classification & Symbology shee	TION at for details)	GRAPHI	SW WEATHER	ew vw	MS STREN	DEPTH	RL	SAMPLE	метно	55 TCF 50 (%)	- 25 RQI 50 (%)	TESTING SPT 'N' Vane shear strength	DESCRIPTION	WATER		INSTALLAT		CORE BO)	
Tops		SILT, with trace rootlets; black. Firm; low plasticity; moist. Clayey SILT; orange brown.		/ <sup>—</sup> ТS ш Б <sup>—</sup> шш — — — —							OB	90						200000			
	nic Field	Hard; high plasticity; moist.		< × × × × × × × × × × × × × × × × × × ×										● 215+ kPa				000000			-
Ē	d Volca	0.8m - 1.0m: Core loss									OB	-09		407 ( 70   D.				00000			
E	Aucklan	Clayey SILT; orange brown with light brown mottles. Very stiff; high plasticity; moist.	brown and								OB	100		9 197772 KPa							
E	`	Clayey SILT, with trace sand; orange with light grey mottles and brown spe	brown eckles .					 			_			🕒 163 / 96 kPa				entonite			-
Ę		Very stiff; high plasticity; moist; sand,	fine.	$\frac{\times}{\times} \frac{\times}{\times} \frac{\times}{\times}$				 										B		.5m	
Ē				× × × × ×				-2- 			B	00						200000		1, 0.0-2	
Ē				× × × ×							0					1000/0	1202/	000000		Box	-
Ē		2.60m: grades to with minor sa	and, fine.	× × × ×				 									0// 10				
Ē		3.00m: grades	s to hard					3 	51.0		ΡŢ	00		215+ kPa 3, 2 / 4, 3, 3, 3			-	3m 🗙			
Ē		CLAY, with some silt, with trace sand;	greyish	< × × ×					· ·		S	4		V <sup>N=13</sup>				04-04-04 C			.
Ē		speckles. Hard; high plasticity; moist.	jobionii															1.140 H 10 1			
E								4 -	50.0		OB	.06						0.000			
	thered)	Silty CLAY with trace sand: light grey	with /	×				 	 									and			-
Ē	ally Wea	orange brown mottles. Very stiff; high plasticity; moist; sand,	fine.	× × × ×	De						SPT	77		2, 2 / 2, 3, 3, 4 N=12				·			
Ē	Residua	grey with geyish pink and orang	je brown mottles.	× × × ×				- 5 -	49.0					Ň				600000000		Bm	
Ę	ECBF (	SILT, with some sand; light greyish br	rownwith	× * × × ×				 			OB	90						14 - 14 - 14 - 14 - 14 - 14 - 14 - 14 -		, 2.5-5.	
Ē		orange brown mottles. Very stiff; low plasticity; moist; sand, f	fine.	× × × ××, × × ×																Box 2	
F		5.90m - 6.00m: with grey	ish pink.	* * * * * * * * *				6-6-	48.0		μ			120 / 50 kPa 2, 2 / 2, 2, 2,			-	6m			
06 am				× × × × × × × × ×							SP	ø		V N=8				200000			
10:51:				× `x ` × x ×, × * ×														000000			
/2021		Very stiff; low plasticity; moist; sand, f	fine.	× × × × × × × × ×				- 7 -	47.0		OB	85						80000			-
26/11		Sandy SILT: light orange brown with o	organics.	× × × ×														200000			
Initia -		mottles. Hard; low plasticity; moist; sand, fine.									SPT	100		215+ kPa 4, 4 / 6, 8, 8, 10				00000			
- Ilhole		7.40m - 7.50m: CLAY, with some with light orange brown Hard; high plasticit	silt; grey mottles. y; moist.	× ×× × × × × ×				- 8 -	46.0		-			V N=32				entonite			$\left  \right $
				× × × ×				 			Г	0						9 000000		m	
A Gero	ed)	Hard; moist; sand, fine, lenses. 8.40m - 8.60m: Silty CL	AY; grey.					  			ЮH	J6						00000		3, 5.8-9.	
	Veather	Hard; high plasticit - INTERBEDDEE Silty CLAY; orangi	y; moist. D WITH - e brown.					- · ·	-45.0-									200000		Box	+
CORE	Highly V	Hard; high plasticit 8.60m - 8.80m: Sandy SILT; orangu Very stiff: low plasticity mainter	y; moist.		HW						SPT	100		4, 4 / 5, 9, 10, 10 N=34						E.	
ed with	ECBF (I	9.00m - 9.50m: Silty SAN Medium dense: non-plastic: moi	ND; grey.	× × × ×							Ц	33		ľ				×		, 9.0-14	ŀ
enerate		9.8m - 10.5m: Core loss	fine.	C/L							Ħ							2000		Box 4	

		DRILLHOLE LOG								HOLE NO.: BH01				-					
		CLIENT: PROJEC	Fletch T: The	er Livin e Hills,	g Ellerslie		SIT	SITE LOCATION: Ellerslie Racecourse Hill							Project Ref.: P-001218				
GEC	N I T I A	CO-ORDIN Co-ordina Location	CO-ORDINATES: 1761459.4mE, 5915826.8mN Co-ordinate system: NZTM Location method: GPSH ORIENTATION (°): Vertical						ON: UCK thod	54m HT1946 солтон (°): 90	CC 6 RIC JR DR	DCN Drilling tig	START DATE: 07/10/2021 END DATE: 07/10/2021 LOGGED BY: BSS CHECKED BY: QS						
				DNI	ТН			<i>"</i>					DISCONTINUITI	ES		NO	ES		
UNIT	MATERIAL DESCRIPT (See Classification & Symbology shee	TION et for details)	GRAPHIC	ww sw hw Hw cw	W W MS STRENC	DEPTH	RL	SAMPLES	METHOD	55 TCR 50 (%)	25 RQD 50 (%)	TESTING SPT 'N' Vane shear strength	DESCRIPTION	2 WATER		INSTALLATI	CORE BOX	-	
F (Highly athered)	[CONT] 9.8m - 10.5m: Core loss			HW					натт	33	σ	<b>N</b> = = (7 = 7 = 0						-	
ECB ECB	Hard; high plasticity; moist; sand, fine Slightly weathered; grey; SILTSTON	e. E; very					43.0		SPT	400-		V N=31							
-	weak.						42 0		НОТТ	400-	47								
tion									SPT	33		7, 13 / 14, 13, 15, 8 for 30mm N=50+ for 255mm			tonite	tonite		-	
st Bays Forma	Slightly weathered; grey; SANDSTONE; very weak.		very		àm	¥WY13	-41.0-		натт	100	38					Ber			
East Coe							SPT	22		Q 24, 26 for 50mm N=50+	13.30m, 1No. 20° , JT , PL , SM	JT			4, 9.0-14.1m	-			
						-14	40.0			00.00	4						.1m Box		
-	EOH: 15.13m					-15-	-39.0-		HOH	4	¢	19, 31 for 50mm N=50+			15	5.13m	Box 5, 14.1-15		
REM	ARKS:																		




		N	CLIENT: F	-letch	er Livin	DRI	LLŀ	HO sit			G N: Elle	erslie R	acecourse Hill		HOLE E Projec	NC BH( ct F	D.: D1 ( Ref.:	Red	I)	
	GEC	N I T I A	PROJECT CO-ORDINA Co-ordinate Location m ORIENTAT	The ATES: e syst nethoo ION (	e Hills, I : 1761368 em: NZ <sup>-</sup> d:GPSH °): Vertic	Ellerslie .0mE, 591594 TM :al	0.3mN	ELI Dat Lev	EVATIO tum: A vel met	DN: 5 JCKF hod: ION (	5m IT1946 солтоі ° <b>):</b> 90	CO RIC JR DR	NTRACTOR: E 3: JD tracked R ILLER: Kurt	DCN Drilling lig	START I END DA LOGGEI CHECKI	P-( DA1 TE: D B ED	001: 7E: 0 08/ <sup>2</sup> Y: B: BY:	<b>218</b> 08/10 10/20 SS QS	)/202 )21	1
	LINU	MATERIAL DESCRIPT (See Classification & Symbology shee	I <b>ON</b> t for details)	GRAPHIC	uw sw ww WEATHERING cw	etv vw Ms STRENGTH s s s s s s s s s	DEPTH	RL	SAMPLES	METHOD	25 50 75 (%)	50 50 75 (%)	INSITU TESTING SPT 'N' Vane shear strength	DISCONTINUITI	WATER		INSTALLATION		CORE BOXES	
	Topso il	SILT, with trace rootlets; black with bro speckles. Stiff; low plasticity; moist.	own	≝TS₩ ₩₩₩ ₩×××						OB	80									T
		brown with light grey mottles. Hard; high plasticity; moist; sand, fine					  			OB	06		<ul> <li>215+ kPa</li> <li>215+ kPa</li> </ul>							
-			< v					· ·		OB	00		215 L kPa				onite			
-										SPT	11		V 213+ KPa 2, 1 / 2, 2, 2, 3 N=9				Bent			
		Sandy SILT, with some clay; light orar with light grey mottles. Very stiff; low plasticity; moist; sand, f	ige brown							OB	76				13/10/2021	1202/01/01				
-	(þ	2.8m - 3.um: Core loss	×	× × × × ×			3	-52.0-		SPT	77		102 / 17 kPa 1, 2 / 2, 2, 2, 1 N=7		5		3m X		, 0.0-3.6m	
	y Weathere	3.80m - 4.00m: Silty SAND; ligh brown with light grey Loose; non-plastic; moist; sand	orange mottles. I, fine to nedium.	× × × × × ×			 	· ·					V		13/11/20	71110			Box	-
-	F (Residual	4.20m - 4.30m: Clayey SILT, w sand; pinkish grey with light grey Hard; high plasticity; moist; sa	ith trace mottles. nd, fine.	* *	R\$		- 4	51.0		OB	85.									
-	ECB	<ul> <li>4.3m - 4.5m: Core loss</li> <li>Silty SAND; light pinkish grey with ligh mottles.</li> <li>Loose; low plasticity; moist; sand, fine</li> </ul>	nt grey					   		SPT	88		111 / 29 kPa 1, 0 / 1, 0, 1, 2 N=4				Sand			
			- - - - - - - - - - - - - - - - - - -	× × ×						OB	100									
-				* *			6-	49.0	·	SPT	88		1, 2 / 1, 2, 2, 3 N=8				6m :			
		Sandy SIL1; orange brown. Very stiff; low plasticity; moist; sand, f Clayey SILT, with minor sand; orange with light grey speckles. Hard; high plasticity; moist; sand, fine	brown						•	OB	85		,				Bentonite		_	-
-		7.3m - 7.5m: Core loss Clayey SILT, with trace sand; grey. Hard; high plasticity; moist; sand, fine								ЪТ	100		UTP 3, 3 / 4, 2, 2, 4						: 2, 3.6-8.0n	
-	(1)		¢.	× × × × × × × × × × × × × × × × × × ×			- 8 -	47.0		0,			V <sup>N=12</sup>			-	8m 🖇		Box	+
-	(Highly Weatherec				HŴ			   		OB	400						and			
	ECBF		¢							SPT	100		2, 2/2, 3, 4, 4 N=13				й		11.0m	
			< - -							OB	100					,	10m		Box 3, 8.0-1	
R	EM	ARKS:																		

								D	DR	IL	.Lł	10	LE	LC	G					н	OLE N BH	.0.: 101	(Red	I)	
			CLIENT: PROJEC	Fletch T: The	ner e H	Livi Iills,	ing , Ell	lers	lie			SIT	ELO	CATIO	DN: Elle	ersli	e R	acecourse Hill		P	roject P	Ref -00	.: 1218	,	
G	EO	N I T I A	CO-ORDIN Co-ordina Location ORIENTA	NATES ite syst methoo TION (	ten d:(°):	76136 n: N SPSI	68.0r ZTN H tical	mE, : 1	5915	940	).3mN	EL Da Le <sup>v</sup> IN(	EVAT tum: / vel me CLINA	ION: { AUCK ethod	55m HT1946 : contor (°): 90	6 UR	CO RIC DR	DITRACTOR: [ G: JD tracked F ILLER: Kurt	DCN Drilling tig	ST/ EN LO CH	ART DA D DATE GGED I ECKED	.TE: 3: 08 BY: 0 BY	: 08/10 3/10/20 BSS 7: QS	/202 )21	1
						Ű		ļ	Ľ										DISCONTINUITI	IES			NO	ß	
UNIT	5	MATERIAL DESCRIPT (See Classification & Symbology shee	T <b>ION</b> et for details)	GRAPHIC	MU MU		CW EW		MS <b>DIRENC</b> S VS	ES	DEPTH	RL	SAMPLES	METHOD	- <sup>25</sup> TCR 50 75 (%)	- 25 25 RQD	. 75 (%)	SPT 'N' Vane shear strength	DESCRIPTION	N	WATER		INSTALLATI	CORE BOX	
(Hiahlv	hered)	[CONT] Clayey SILT, with trace sand; Hard; high plasticity; moist; sand, fine Sandy SILT; grey.	grey. e.			HŴ				-	· ·			OB	100	0								-11.0m	
ECBF	Weat	Hard; low plasticity; moist; sand, fine.		× ×× × × × × × × × ×								44.0		SPT	400-			4, 3 / 5, 5, 6, 7 N=23						Box 3, 8.0	
-		Signity weathered, grey; SANDSTO weak.	NE; Very											Натт	400-										
-											12	43.0		SPT	100			5, 6 / 8, 12, 15, 15 N=50+				lite			Ī
	st Coast Bays Formation					SW		λ	/₩			42.0		НОТТ	100				12.50m, 1No. 20°, , ST, RG 12.60m, 2No. 45°, , ST, RG 12.90m, 1No. 45°, , PL, RG 13.00m, 1No. 45°, , PL, SM	, JT , JT , JT , JT		Benton		źm	
	Ea										14	41.0-		Натт				15, 35 for 55mm N=50+	13.90m, 1No. 30° , , PL , SM 14.20m, 1No. 30° , , PL , SM 14.40m, 2No. 10° , , PL , IR	, JT , JT , JT				4.2-15.1m Box 4, 11.0-14.2	-
		EOH: 15.11m									-15-	40.0		Ed.	0			22, 28 for 35mm N=50+	14.90m, 1No. 20° , , PL , SM	, JT		15.11		Box 5, 1 <sup>,</sup>	╞
RE	- MA	ARKS:																							





						DF	RILLI	Ю	LE	LC	G				HOLE I B	NO.: H02	(Red	i)	
			CLIENT:	Fletch	er Liv e Hille	ing Ellerslie		SIT		CATIC	N: Elle	erslie F	Racecourse Hill		Project		.:	-	
G	EC	N I T I A	CO-ORDIN Co-ordina Location ORIENTA	NATES: nte syst method TION (	: 17613 :em: N d:GPS °): Ver	, Ellershe 39.1mE, 59 ZTM H tical	15799.5mN	EL Da Le <sup>v</sup> IN(	EVATI tum: A vel me CLINA1	ON: 4 UCKI thod:	ют 171946 солто (° <b>):</b> 90	CC 6 RIC JR DR	DNTRACTOR: E G: JD tracked R RILLER: Dave	DCN Drilling lig	START D END DAT LOGGED CHECKE	ATE: E: 13 BY: I D BY:	13/10, /10/20 3SS : QS	/2021 121	
					SNIC	GTH			s				INSITU	DISCONTINUITI	ES		NO	B	
TINIT		MATERIAL DESCRIPT (See Classification & Symbology shee	<b>ION</b> et for details)	GRAPHIC		EW EW MS STRENO	DEPTH	RL	SAMPLE	METHOD	- 25 TCR 50 (%)	25 RQD 50 (%)	TESTING SPT 'N' Vane shear strength	DESCRIPTION	WATER		INSTALLAT	CORE BOX	
-	S S	SILT, with minor rootlets; brown. GRAVEL, with minor silt; grey. Loose; moist; gravel, fine to medium. Clayey SILT, with trace sand and grav brownish orange with light grey motth black speckles. Hard; high plasticity; moist; sand, fine coarse, gravel, fine. 1.0m - 1.5: Core loss	vel; light es and e to							натт	88					tonite			-
-	E	1.6m - 1.95m: Core loss					2	44.0		SPT	22		N=6			Ben			
-		concrete 2.5m - 3.0m: Core loss								натт	47				▲ 14/10/2021	Зm			.
-	ually Weathered)	Clayey SILT, with trace sand; light ora brown with light grey mottles. Stiff; moist; sand, fine.	inge		R\$					SPT HQTT SPT	100		1, 1 / 1, 1, 1, N=5			Sand		0.0-5.1m	-
	ECBF (Resi	Clayey SILT, with minor sand; grey. Hard; high plasticity; moist; sand, fine	э.	× × × × × × × × × × × × × × × × × × ×			- 5 - - - - - - - - - - - - - - - - - -	41.0-		рт натт	30		V 2, 2/3, 4, 4, 4			6m		Box	-
		Slightly weathered; grey; SANDSTO weak; with interbedded Siltstone.	NE; very				- 7 -			натт	400	99	V <sup>N=15</sup>	7.40m, 1No. 45°, J	т,				-
-	ormation						- 8 -	38.0		SPT	400-		8, 8 / 9, 11, 15, 15 for 65mm N=50+ for 290mm	UN , RG		tonite		_	
	East Coast Bays F	8.7m - 9.0m: Core loss			SW	V.V.				натт	400					Ben		Box 2, 5.1-8.7n	-
							- 9 -			SPT	100		15, 17 / 18, 18, 14 for 50mm N=50+ for					0.9m	
										Нат	100	47	200mm	9.60m, 1No. 45° , J PL , RG	Τ,			Box 3, 8.7-1	
RE	M	ARKS:																	

[							DF	RIL	_Lŀ	10	LE	LO	G				н	OLE N BH	0.: 102 (Rec	4)	
			CLIENT: PROJEC	Fletch T: Th	ner Livir e Hills.	ng Elle	rslie			SIT	ELOC	CATIO	N: Elle	erslie F	acecourse Hill		Pr	oject	Ref.:	-,	
	GEC	N I T I A	CO-ORDIN Co-ordina Location	NATES ite sys metho TION (	: 1761339 tem: NZ d:GPSH (°): Vertig	9.1ml TM I cal	E, 591	5799	9.5mN	ELE Dat Lev	EVATI tum: A vel me CLINAT	ON: 4 UCK⊦ thod: ⊺ION (	6m IT194 солто (° <b>):</b> 90	CC 6 RIC UR DR	DNTRACTOR: [ G: JD tracked F RILLER: Dave	DCN Drilling tig	ST/ ENI LOC	ART DA D DATE GGED I ECKED	ATE: 13/10 : 13/10/20 BY: BSS BY: QS	, )/202 021	1
Ī					SNI		ЗTH				S	•			INSITU	DISCONTINUIT	ES		NO	ES	
	UNIT	MATERIAL DESCRIPT (See Classification & Symbology shee	TION et for details)	GRAPHIC	SW WEATHER	EW	MS STRENC	VS ES	DEPTH	RL	SAMPLE	МЕТНОГ	+ 25 50 75 (%)	- 25 RQD - 75 (%)	TESTING SPT 'N' Vane shear strength	DESCRIPTIO	N	WATER	INSTALLATI	CORE BOX	
-	East Coast				SW		VW					зрт натт	100-100	47	5, 8 / 11, 15, 16, 8 for 35mm N=50+ for	10.40m, 1No. 45° , , PL , RG	JT		Bentonite	× 3, 8.7-10.9	
Generated with CORE-GS by Geroc - Drillhole_Initia - 26/11/2021 10:51:13 am	REMA	EOH: 10.91m										AS									



							DR	ILLI	10	LE	LC	G				HOLE	NO.: H03	(Re	d)
			CLIENT: PROJEC	Fletch	er Liv e Hills	ing , Elle	erslie		SIT	E LO	CATIC	DN: Elle	erslie R	Racecourse Hill		Projec	t Rei <b>-00</b>	f.: )1218	8
	GEC	N I T I A	CO-ORDIN Co-ordina Location ORIENTA	NATES ate syst methoo TION (	: 17612 :em: N d:GPS °): Ver	<sup>34.2m</sup> ZTM H tical	IE, 5915	692.0mN	EL Da Lev	EVATI tum: A vel me CLINA	ON: 4 UCKI thod:	I3m HT1940 солто (°): 90	CC 6 RIC JR DR	ONTRACTOR: [ G: JD tracked F RILLER: Dave	DCN Drilling lig	START D END DAT LOGGED CHECKE	ATE E: 1 BY: D BY	: 11/1 1/10/2 BSS 7: QS	0/2021 2021
					Ŋ Ŋ		E							INCITU	DISCONTINUITI	ES		Z	S.
	UNIT	MATERIAL DESCRIPT (See Classification & Symbology shee	TION et for details)	GRAPHIC	UW SW MW WEATHERI HW	CW EW	MS STRENG	DEPTH	RL	SAMPLES	METHOD	. <sup>25</sup> TCR : <sup>50</sup> (%)	<sup>25</sup> RQD <sup>50</sup> (%)	SPT 'N' Vane shear strength	DESCRIPTION	2 WATER		INSTALLATIO	CORE BOXI
	ii p	SILT, with minor rootlets; black. Stiff; moist. SILT, with some clay, with trace grave brown. Hard: low plasticity: moist: gravel, fin	il; dark								OB	100		140+ kPa					
-	ш.	coarse. 0.8m - 1.0m: Core loss Clayey SILT, with trace organics; orar	nge brown					- - - - - -	42.0		B	99		140+ kPa					
-		with light grey mottles and black spectration black spectra black, high plasticity; moist.	ckles.								OB	06		UTP 28, 22 for			entonite		
-		moderately strong; moderately vesicu 1.50m - 1.60m: GRAVE Very dense; moist; gravel, fine to	ular. EL; black. medium.					- 2 -	41.0					20mm N=50+		▲ 13/10/2021	ā		
-					MN2V		Mß				Нан	400-	-90						
		Slightly weathered; black; BASALT; s slightly vesicular.	strong;						40.0								3m		0.0-3.6m
-		3.00m: grades to less v 3.50m: grades to slightly to no v	vesicular. / vesicular								μq	100	60		3.70m, 1No. , JT , I	JN			Box 1,
								4	39.0 39.0						4.10m, 3No. 70° , . PL , RG , Silt	ΙТ,	T.		
-																	Sano		
	/olcanic Field										Нат	100	99						
-	Auckland \							- 6 -	37.0						5.60m, 1No. 30° , . ST , RG 6.00m, 4No. 80° , .	IT,	6m		3.6-6.4m
					SW		¢0								CRV , RG , Silt				Box 2,
								- 7 -	36.0		Ц	400	20		6.70m, 1No. 45°, , PL, RG, FeO 6.80m, 1No. 45°, , PL, RG 6.90m, 1No. 60°, ,	IT, IT, IT,			
															PL , RG 7.00m, 2No. 85° , . CRV , RG 7.50m, 3No. 90° , . CRV , RG	IT, IT,			
								- 8 -			Ц	100	26		8.10m, 1No. 45° , , PL , RG 8.20m 1No. 45°	ΙТ,	Bentonite		
S by Geroc															PL , SM 8.30m, 1No. 45° , . ST 8.40m, 1No. 45° , . PL , RG	іт, іт,			<u>9.4m</u>
								9 — 9 —	-34.0- - - -		F	0	8		9.30m, 1No. 15° , , PL , SM	ΙТ,			Box 3, 6.4-
erated wit											ΗÖ	40	ø		9.40m, 2No. 45° , PL , PLSH , Silt	ΙТ,			80X 4, 9.4- 12.4m

						DRII	LLł	10	LE	LO	G				HOLE	NO.: H03 (Red	d)
			CLIENT: PROJEC	Fletch T: Th	ner Livin e Hills, I	g Ellerslie		SIT	ELO	CATIO	N: Elle	erslie R	acecourse Hill		Project	t Ref.: P-001218	3
G	EO	N I T I A	CO-ORDIN Co-ordina Location I ORIENTA	NATES ite sys metho TION (	: 1761234 tem: NZ d:GPSH (°): Vertic	.2mE, 591569; TM cal	2.0mN	ELI Dat Lev	EVATI tum: A /el me CLINA1	ON: 4 UCK⊦ thod: ⊓ON (	3m IT1946 солтоц (° <b>):</b> 90	CO RIC JR DR	NTRACTOR: D B: JD tracked R ILLER: Dave	DCN Drilling ig	START D END DAT LOGGED CHECKE	ATE: 11/10 E: 11/10/20 BY: BSS D BY: QS	0/2021 021
				<u>ں</u>	RING	бТН			s	0	~ ~	0 -	INSITU	DISCONTINUITI	ES	NOI	(ES
TINIT	5	MATERIAL DESCRIPT (See Classification & Symbology shee	TION at for details)	GRAPHI	UW SW MW WEATHEF HW CW	Max STREN	DEPTH	RL	SAMPLE	метно	50 50 75 (%)	50 RQI 50 (%)	TESTING SPT 'N' Vane shear strength	DESCRIPTION	- WATER	INSTALLAT	CORE BOX
- - - -		[CON1] Slightly weathered; black; B. strong; slightly vesicular.	ASALI;							натт	100	88					
	Auckland Volcanic Field				S\W		-11-			натт	100			10.70m, 1No. 45°, , ST , SM 10.90m, 1No. 20°, , CRV , IR 11.50m, 1No. 30°, , PL , IR 11.70m, 1No. 45°, , PL , PLSH	TL TL TL		.4-12.4
- - - - - - - -		Highly weathered; black; BASALT; w moderately vesicular.	eak;		HŴ	w				QTT	<del>00</del>	26				ntonite	Box 4, 9
		12.9m - 13.5m: Core loss 12.80m - 12.90m: Clayey SILT, w organics; brown with black s Hard; high plasticit	vith trace peckles. y; moist.							н						B	-
	Puketoka Formation	Hard; high plasticity; moist.	in mouloo.				14			натт							
		EOH: 15.45m					—15— 	- 28.0		SPT	400		2, 2 / 3, 4, 5, 5 N=17			15.45m	Box 5, 12.4
srated with CORE-GS by Geroc - Drillhole_Initia - 26/11/2021 10:51:17 am																	
Baner	EM/	ARKS:														1	



Generated with CORE-GS by Geroc - Drillhole\_Initia - 26/11/2021 10:51:17 am



I		CLIENT: PROJEC CO-ORDIN Co-ordina	Fletch T: The IATES te syst	er Livin e Hills,   : 1761270 em: NZ	g Ellerslie 0.4mE, 591	5725.5mN	HO SIT ELI Dat	LE E LOC	LO ATIO DN: 4	<b>G</b> N: Elle 1.8m IT1946	rslie Ra COI RIG	acecourse Hill NTRACTOR: C :: Track mount	Geotech Driiling ed rig	HOLE N Project F START D/ END DAT	IO.: BH101 Ref.: -001218 ATE: 21/02 E: 21/02/20	<b>)</b> 2/2022 022
GEO	TECHNICAL SPECIALISTS	Location	nethoo ГІОN (	l: GPSH °): Vertio	cal		Lev INC	vel me LINA1	hod: ION (	солтоц ° <b>): 90</b>	ir <b>DRI</b>	LLER: Ben		LOGGED CHECKEI	BY: BSS BY: MDF	H
UNIT	MATERIAL DESCRIPT (See Classification & Symbology shee	ION It for details)	GRAPHIC	UW SW MW HW CQW	EW VW MS STRENGTH s	DEPTH	RL	SAMPLES	METHOD	- 25 50 75 (%)	- 25 50 75 <b>(%)</b>	INSITU TESTING SPT 'N' Vane shear strength	DISCONTINUITI	MATER	INSTALLATION	CORE BOXES
Auckland Volcanic Field pis	SILT, with minor gravel; dark brown. Stiff; moist; gravel, fine, basalt. Clayey SILT, with minor gravel, with tr cobbles; dark orange brown. Hard; high plasticity; moist; gravel, ba cobbles, basalt. 0.7m - 1.3m: Core loss Slightly weathered; black; BASALT; s moderately vesicular. 2.60m: grades to slightly v	ace salt; trong; esicular.		SW.	,s							UTP UTP 10, 20 / 50 N=50+	1.90m, 1No. 60° , J CRV , RG 2.50m, 1No. 15° , J UN , RG , Oxides 4.30m, 1No. 45° , J PL , SM	т, т, т, 2202/2022	Bentontie	2, 3.3-6.2m Box 1, 0.0-3.3m
	Highly weathered; dark grey; BASAL	Γ; weak.		HVY	w	6										Box 2, 3.
	Firm, nign plasticity; moist. 7.0m - 7.5m:Core loss		× × × × × × × E/L E/ E/L I S/L E/													
Puketoka Formation	7.95m - 9.0m: Core loss		× × × × × × × × × × × × C/L C/ C/L C/ C/L C/ C/L C/ C/L C/ C/L C/	RS								0,0/0,2,2, 2 N=6				× × × × × × × × ×
	Clayey SILT, with minor sand; purplish orange brown stainning. Firm; high plasticity; moist; sand, fine.	n grey with				- 9 - 9     						48 / 16 kPa 0, 1 / 0, 0, 0, 2 N=2				ox 3, 6.2-12.0m

<b> </b> GEO	N I T I A TECHNICAL SPECIALISTS	CLIENT: PROJEC CO-ORDIN Co-ordina Location r ORIENTAT	Fletch T: The IATES te syst nethoo	er Livin e Hills, E : 1761270 <b>tem:</b> NZ <sup>-</sup> I: GPSH °): Vertic	DRII g Ellerslie .4mE, 591572 TM	<b>F</b>	HOI SITI ELE Dat Lev INC	LE E LOC EVATIO um: A rel met	LO ATIO DN: 4 UCKH thod: 10N (	<b>G</b> N: Elle 1.8m IT1946 CONTOL °): 90	CO CO RIG JR DRI	acecourse Hill NTRACTOR: G :: Track mounte ILLER: Ben	Seotech Driiling ed rig	Project F START D END DAT LOGGED CHECKE	BH101 Ref.: P-001218 ATE: 21/02/20 BY: BSS D BY: MDH	<b>3</b> 2/2022 022 H
UNIT	MATERIAL DESCRIPT (See Classification & Symbology shee	TON et for details)	GRAPHIC	UW SW MW HW CW	EW WW MS S S S S S S S S S S S S S S S S	DEPTH	RL	SAMPLES	METHOD	- 25 50 - 75 (%)	25 RQD 50 (%)	INSITU TESTING SPT 'N' Vane shear strength	DISCONTINUITI	WATER	INSTALLATION	CORE BOXES
	[Cont] Clayey SILT, with minor sand grey. Firm; low plasticity; moist; sand, fine. 10.2m - 10.5m: Core loss 10.50m: grade	l; purplish es to soft.										0, 0 / 0, 0, 0, 0, 0 N=0				6.2-12.0m
_	Clayey SILT, with some sand; light gr Firm; high plasticity; moist; sand, fine 12.50m - 13.00m: Clayey sandy SI Stiff, moist; si	ey. LT; grey. and, fine.	×   ×   ×   ×   ×   ×   ×   ×   ×   ×									0, 0 / 0, 0, 2, 2 N=4				Box 3,
uketoka Formation	13.95m - 15.0m: Core loss											0, 0 / 0, 1, 3, 4 N=8			nite	
ĨĊ -	Clayey SILT, with minor sand; grey. Very stiff; moist; sand, fine.			199 170		15     16 						0, 0 / 0, 0, 3, 3 N=6			Bento	E
-	Sandy SILT, with trace organics; grey speckles. Very stiff; low plasticity; moist; sand, f Clayey SILT, with some sand; grey. Hard; high plasticity; moist; sand, fine	with black ine.					-25.0					0, 2 / 2, 2, 4, 4 N=12				Box 4, 12.0-17.2
CBF (Residually Weathered)	19.00m - 19.10m: with trace Sandy SILT; grey with black speckles Very stiff; low plasticity; moist; sand, f	organics.										↓ 4 N=11 1, 2 / 3, 4, 5, 6 N=18				xx 5, 17.2-22.4m

						DRI	LLł	10	LE	LC	G				но	DLE N	0.: 3H101	
			CLIENT:	Fletch	er Livin Hills	g -Ilerslie		SIT	ELOC	ATIC	<b>N</b> : Elle	erslie R	acecourse Hill		Pro	oject I P	Ref.:	
6	GEO	N I T I A	CO-ORDIN Co-ordina Location	NATES ite syst method TION (	: 1761270 tem: NZ 1: GPSH °): Vertic	.4mE, 591572 ГМ	5.5mN	ELI Dat Lev	EVATI tum: A vel me CLINAT	ON: 4 UCKI thod:	41.8m HT1946 солтоц (°): 90	CO RIG JR DR	NTRACTOR: 0 3: Track mount ILLER: Ben	Geotech Driiling ed rig	STA END LOG CHE	RT DA DATE GED E	TE: 21/02/20 : 21/02/20 SY: BSS BY: MDH	/2022 22
				0	RING	бТН			s		~		INSITU	DISCONTINUITI	ES		NOI	ES
		MATERIAL DESCRIPT (See Classification & Symbology shee	TON et for details)	GRAPHI	UW SW MW WEATHEF HW CW	MS STREN	DEPTH	RL	SAMPLE	МЕТНОГ	- 25 - 50 - 75 (%)	- 25 <b>RQI</b> - 50 (%) - 75 (%)	TESTING SPT 'N' Vane shear strength	DESCRIPTION	N	WATER	INSTALLAT	CORE BO)
	eathered)	[Cont] Sandy SILT; grey with black Very stiff; low plasticity; moist; sand, f 20.1m - 21.0m: Core loss	speckles. ine.	C/L C/ C/L C/ C/L C/ C/L C/ C/L C/ C/L C/ C/L C/														-
	ECBF (Residually W	Clayey SILT, with some sand; grey. Stiff; high plasticity; moist; sand, fine.			RS								0, 0 / 2, 1, 6, 5 N=14				Bentonite	Box 5, 17.2-22.4m
	ered)	Clayey SILT, with some sand; grey. Hard; moist; sand, fine; Residual wea	thered.				-23-	  - 19.0- 					53 / 21 kPa 1, 3 / 6, 6, 10, 9 N=31					-
	ECBF (Highly Weathe			<pre></pre>									1, 3 / 5, 5, 7,					, 22.4-24.5m
Ē		EOH: 24.45m		× × × × × × × × × × × ×									N=25				24.45m	Box 6,
RE		ARKS:																

Ver 3.0; Generated with CORE-GS by Geroc - Drillhole\_Initia - 4/03/2022 12:35:00 PM





Generated with CORE-GS by Geroc - Drillhole\_Initia - 4/03/2022 12:35:00 PM

Image: Normal System       Image: Normal System         GEOTECHNICAL SPECIALIST         Image: Normal System       MATERIAL DESCRI (See Classification & Symbology state)         Image: Normal System       Clayey Sil T, with minor rootlets, v dark orange brown. Description         Image: Normal System       Clayey Sil T, with minor rootlets, v dark orange brown with light gre black speckles. Hard; high plasticity; moist; sand, fine, basalt.         Image: Normal System       Slightly weathered; grey; BASALT moderately vesicular.         Image: Normal System       Slightly weathered; grey; BASALT         Image: Normal System	Co-ordin Location ORIENT/ PTION heet for details) rith trace sand; nd sand and y mottles and ine, gravel, ; strong;		n: NZ SPSH Vertiu MEATHERING		STRENGTH s s s s s s s s s s s s s s s s s s s	8 8 		tum: A vel mee	UCKH thod: TION GOHLIJW	11946 CONTOL (°): 90 (%) (%) (%) (%) (%)		E: Track mount ILLER: Ben INSITU TESTING SPT 'N' Vane shear strength 192+ kPa 192+ kPa		END DAT LOGGED CHECKE ES NUM	E: 2 BY: D B	22/02/20 : BSS Y: MDH NOLLAIN	
B       MATERIAL DESCRI (See Classification & Symbology s         Image: Clayey SILT, with minor rootlets, v dark orange brown. Firm; low plasticity; moist.         Clayey SILT, with trace organics a gravel; orange brown with light gre black speckles. Hard; high plasticity; moist; sand, fine, basalt.         1.1m - 1.5m: Core loss         Slightly weathered; grey; BASALT moderately vesicular.         2.8m - 3.0m: Core loss         4.0m - 4.5m: Core loss	PTION heet for details) with trace sand; and sand and y mottles and ine, gravel, ; strong;			OW EW	STRENGTH	۶ ۵ 		SAMPLES	METHOD	50 (%)	75 RQD	INSITU TESTING SPT 'N' Vane shear strength 192+ kPa	DISCONTINUITI	WATER			
B       Clayey SILT, with minor rootlets, with dark orange brown.         Firm; low plasticity; moist.       Clayey SILT, with trace organics a gravel; orange brown with light greblack speckles.         Hard; high plasticity; moist; sand, fine, basalt.       1.1m - 1.5m: Core loss         Slightly weathered; grey; BASALT moderately vesicular.         2.8m - 3.0m: Core loss         4.0m - 4.5m: Core loss	ith trace sand; nd sand and y mottles and ine, gravel, ; strong;					- 1 -						<ul> <li>192+ kPa</li> <li>192+ kPa</li> </ul>					0000000
8.3m - 9.0m: Core loss 8.3m - 9.0m: Core loss Clayey SILT; light grey. Stiff; high plasticity; moist.		ГЛ [ ГЛ ] ГЛ ]	\$WY		.5							192+ kPa 1, 1 / 1, 11, 23, 15 for 50 mm N=50+ for 275mm 0, 0 / 0, 1, 2, 2 N=5	1.90m, 3No. 85°, F UN, RG 2.40m, 1No. 85°, IS CRV, RG, Z cl 3.10m, 1No. 45°, J PL, IR 3.40m, 2No. 30°, J CRV, RG 3.60m, 1No. 45°, J PL, RG 3.70m, 1No. 80°, IS ST, RG, Z cl 5.60m, 1No. 30°, J ST, RG, Z cl 5.60m, 1No. 30°, J ST, RG, Z cl 6.30m, 1No. 45°, J PL, SM 7.40m, 1No. 85°, IS UN, IR, Z cl 7.80m, 1S, Z cl	с.	Bentomite Bentomite		
EOH: 9.45m							-31.0-										



 Geo	N I T I A DTECHNICAL SPECIALISTS	CLIENT: Fle PROJECT: CO-ORDINA Co-ordinate Location me ORIENTATIO	etche The TES: syste thod	er Living Hills, E 1761247 em: NZT GPSH ): Vertic	DR g Ellerslie .5mE, 5915 TM	700.4mN	HOI SIT ELE Dat Lev INC	E LOC E LOC EVATIO cum: A rel me i:LINAT	LO ATIO DN: 4 UCKH thod:	р <b>G</b> N: Elle 1.9m IT1946 сомтоц °): 90	CON CON RIG JR DRI	ITRACTOR: ( Track mount LLER: Ben	Geotech Driiling ed rig	HOLE N Project F START D END DAT LOGGED CHECKE	NO.: BH103 Ref.: P-001218 ATE: 22/02 E: 22/02/2 BY: BSS DBY: MD	<b>B</b> 2/2022 022 H
UNIT	MATERIAL DESCRIPT (See Classification & Symbology shee	TON et for details)	GRAPHIC	UW SW WEATHERING HW CW	w w s s s s s s s s s s s s s s s s s s	DEPTH	RL	SAMPLES	METHOD	25 TCR 50 (%)	- 25 - 50 - 75 (%)	INSITU TESTING SPT 'N' Vane shear strength	DISCONTINUITI	NATER		CORE BOXES
	Firm; low plasticity; moist. Clayey SILT, with trace sand; orange light brown mottles. Hard; high plasticity; moist. Clayey SILT, with trace gravel; light b Very stiff; high plasticity; moist; grave basalt. 0.50m - 0.60m: Moderately weather grey; BASALT; strong; moderately of 1.3m - 1.5m: Core loss Slightly weathered; grey; BASALT; si moderately vesicular. 2.70m - 2.80m: highly we 3.00m - 3.10m: highly we during the sign of the sign	Trong; Pathered. Trong; Pathered. Trong; Pathered. Trong; Pathered. Trong; Pathered. Trong; Pathered. Pathere		SVÝ	S				натт натт натт натт натт spr натт	400         93         100	46	<ul> <li>192+ kPa</li> <li>192+ kPa</li> <li>192+ kPa</li> </ul>	2.50m, 1No. 30°, J PL, RG 3.00m, 1No. 20°, J PL, RG 3.30m, 1No. 20°, J PL, RG 4.10m, 1No. 30°, J PL, RG 4.30m, 1No. 65°, J PL, RG 4.30m, 1No. 45°, J PL, RG 4.80m, 1No. 45°, J PL, RG 7.80m, 1No. 50°, J PL, SM 8.40m, 1No. 45°, J PL, SM 8.40m, 1No. 45°, J PL, SM 8.40m, 1No. 45°, J PL, SM 8.80m, 1No. 45°, J PL, SM 8.80m, 1No. 45°, J PL, SM	T. T. T. T. T. T. T. T. T. T.	Bertonite	Box 4, 9.3- 12.5m 12.5m

Checked By: MDH

 GEC	N I T I A	CLIENT: PROJEC CO-ORDIN Co-ordina Location r	Fletch T: The IATES te syst nethoc	er Livin e Hills,   : 1761247 tem: NZ d: GPSH °): Vertic	DRII 9g Ellerslie 7.5mE, 591570 TM	LLF 10.4mN	HO SIT ELI Dat	LE EVATION tum: A yel met	LO ATIO DN: 4 UCKH thod:	N: Elle 1.9m IT1946 CONTOL 29): 90	CO CO RIC JR DR	Racecourse Hill <b>DNTRACTOR</b> : G G: Track mount <b>ILLER</b> : Ben	Seotech Driiling ed rig	HOLE N Project F START D END DAT LOGGED CHECKE	NO.: BH103 Ref.: 2-001218 ATE: 22/02 E: 22/02/20 BY: BSS DBY: MDE	<b>}</b> 2/2022 022 H
			<u>ں</u>	RING	ЮТН	_		S	0	¥ ~	9.0	INSITU	DISCONTINUITI	ES	NOL	XES
UNIT	MATERIAL DESCRIPT (See Classification & Symbology shee	ION t for details)	GRAPHI	UW SW MW MW HW CW	MS STREN	DEPTH	RL	SAMPLE	METHO	<sup>25</sup> 50 75 (%	25 50 75 <b>RQ</b>	TESTING SPT 'N' Vane shear strength	DESCRIPTION	WATE	INSTALLA.	CORE BO
Volca	[Cont] Slightly weathered; dark grey; strong; slightly to non vesicular.	BASALT;	× × × ×	svý	s				натт	100			10.00m, 1No. 30° , , CRV , SL	JT		
	with dark grey mottles. Very stiff; high plasticity; moist. Clayey SILT, with trace organics and s vellowich brown grey.	sand;							SPT	1:00		42 / 16 kPa 0, 0 / 0, 1, 2, 3 N=6				
· · · · · · · · · · · · · · · · · · ·	Very stiff; moist; sand, fine.		× × × × × × × × × × × × × × × × × × ×						натт	855		V				.5
- - -	12.00m: grade:	s to stiff.	$ \begin{array}{c} \times \times$			- 12 - 12 	30.0  		SPT	160		50 / 18 kPa 0, 0 / 0, 2, 3, 2				xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
- - - - - -	12.45m - 13.5m: Core loss		× × × C/L C/ C/L C/ C/L C/ C/L C/ C/L C/ C/L C/						натт			V				
Formation	Clayey SILT, with trace organics and s yellowish brown grey. Very stiff; moist, sand, fine.	sand;				    			SPT	100		106 / 29 kPa 0, 1 / 1, 1, 2, 2 N=6				
Puketoka	Clayey SILT, with some organics; dark black speckles. Stiff; high plasticity; moist.	c grey with	×  ×  ×  ×  ×  ×  ×  ×  ×  ×  ×  ×  ×  ×				27.0		натт	36		101/32 / 40			bnite	
-	Clayey SILT, with trace sand; grey. Very stiff; high plasticity; moist; sand, f	fine.	× × × × × × × × × × × × × × × × × × ×				 		SPT	100		0,0/0,0,4, 2 N=6			Ben	
-	16.00m - 16.30m: with son	ne sand.					-26.0		НОТТ	-100						17.0m
-	16.50m: grade:	s to stiff.							SPT	100		98 / 32 kPa 1, 5 / 3, 3, 3, 4 N=13				ox 5, 12.5-
- - - - - - -	Sandy SILT; grey. Stiff; low plasticity; moist; sand, fine.								натт	95		v				
	Silty SAND; grey. Medium dense; low plasticity; moist; sa medium.	and, fine to	× ×						SPT	100		0, 0 / 2, 3, 4, 5 N=14				
3F (Residually Weathered			× × × × × ×						натт	36		Y				20.6m
ECB			* * *						SPT	100		2, 3 / 3, 3, 6, 7 N=19				-0.17.0-

				DRILLHOLE LOG											HOLE NO.: BH103				
			CLIENT:	Fletch	er Livin Hills	g =Ilerslie		SIT	SITE LOCATION: Ellerslie Racecourse Hill								Ref.:		_
GEOTECHNICAL SPECIALISTS					: 1761247 em: NZ I: GPSH °): Vertio	5mE, 591570 ΓΜ cal	,5915700.4mN ELEVATION: 41.9m CONTRACTOR: Geotech Driiling Datum: AUCKHT1946 RIG: Track mounted rig Level method: CONTOUR DRILLER: Ben INCLINATION (°): 90						Geotech Driiling ed rig	START DATE: 22/02/2022 END DATE: 22/02/2022 LOGGED BY: BSS CHECKED BY: MDH					
				c	RING	GTH			s	0	5	0.0	INSITU	DISCONTINUITI	ES	t	NOI	KES	
UNIT		MATERIAL DESCRIPT (See Classification & Symbology shee	TON at for details)	GRAPHI	UW SW MW WEATHE	EW VW MS S S S S S S S S S S S S S S S S S S	DEPTH	ВL	SAMPLE	МЕТНО	- <sup>25</sup> TCI - <sup>50</sup> (%	- 25 50 - 75 (%	TESTING SPT 'N' Vane shear strength	DESCRIPTION	N	WATEF	INSTALLA	CORE BO)	
		Clayey SILT, with trace sand; grey. Hard; moist, sand, fine.		× × × × × × × × × × × × × × × × × × ×			      											Box 6, 17.0- 20.6	
				$\frac{\times \times \times}{\times \times \times}$						SPT	100		2, 2 / 5, 6, 6, 8 N=25						
	red)	Sandy SILT; grey. Hard; low plasticity; moist; sand, fine.		× × × × × × × × × × × × ×				-20.0-		НОТТ	-96								
- Meathe	y Weathe			× * * * × * * × *				  		SPT	400		3, 4 / 6, 8, 8, 8 N=30						
	ECBF (Residual						23	   		НОТТ	400						Bentonite	Box 7, 20.6-24.0m	
				* `x * .x * * .x *						SPT	100		3, 6 / 7, 7, 9, 9 N=32						
	-	Clayey SILT, with trace sand; grey. Hard; high plasticity; moist; sand, fine; soils	; residual							натт	100		v						
Ē				× × × × × × × × × × ×									<b>1</b> 2, 4 / 5, 6, 5,						-
		Slightly weathered; grey; SILTSTONE	E; very				26	 16.0 		т врт	9		8 N=24					. 24.0-26.5m	
Coast Bay	rmation	weak.			s₩	ývý				ГØН	100		<b>1</b> 10 10/11					Box 8	-
East (	Ĕ	EOH: 26.95m						-15.0-		SPT	100	66	13, 15, 11 for 50mm N=50+ for				26.95m		
RE	MA	\RKS:											275mm						





Generated with CORE-GS by Geroc - Drillhole\_Initia - 4/03/2022 12:35:38 PM



	N	CLIENT: Fletcher Living         SITE LOCATION: Ellerslie Racecourse Hill           PROJECT: The Hills, Ellerslie         Fletcher Living											HOLE NO.: BH104 Project Ref.: P-001218			
 Geo	N I T I A	CO-ORDINATES: 1761268.2mE, 5915681.2mN Co-ordinate system: NZTM Location method: GPSH				ELEVATION: 42.1m CONTRACTOR: Geof Datum: AUCKHT1946 RIG: Track mounted r Level method: CONTOUR DRILLER: Ben					Geotech Driiling ed rig	START D END DAT LOGGED CHECKE	ATE: 22/02 E: 22/02/20 BY: BSS D BY: MDF	20 20		
UNIT	MATERIAL DESCRIPT (See Classification & Symbology shee	TON et for details)	GRAPHIC	W WEATHERING	w w s s s s	DEPTH	RL	SAMPLES	METHOD	50 TCR (%)	55 RQD 56 (%)	INSITU TESTING SPT 'N' Vane shear strength	DISCONTINUIT	NATER N	INSTALLATION	
Auckand Volcanic Field         Auckand Volcanic Field         Auckand Volcanic Field         Topsoil	SILT, with minor rootlets and gravel;         Firm; low plasticity; moist; gravel, mecoarse, basalt.         0.35m - 1.5m: Core loss         Clayey SILT, with trace gravel; light o brown.         Hard; high plasticity; moist; gravel, fin         2.8m - 3.0m: Core loss         Moderately weathered; dark grey; B/moderately strong; highly fractured, n vesicular.         3.9m - 4.5m: Core loss         Slightly weathered; dark grey; BASA moderately vesicular.         6.50m - 6.80m: with greenish grey, c infill, moderately we i	AsALT; Index and the set of the		IVV	SS S				ΗαΤΤ         ΗαΤΤ         ΗαΤΤ         ΑΠ         ΗαΤΤ         ΑΠ	46         46         400		UTP 192+ kPa 1,3/3,3,3, N=12 UTP 17, 14/15, 35 N=50+ for 150mm	3.50m, 1No. 45°, . 3.50m, 1No. 45°, . CRV, RG 4.80m, 2No. 30°, . PL, RG 5.20m, 1No. 45°, . ST, RG 6.30m, 1No. 45°, . PL, RG 7.20m, 1No. 30°, . PL, RG 7.60m, 1No. 30°, . PL, RG 7.80m, 1No. 30°, . PL, RG	л., л., л., л., л., л., л.,	Bentonite	
REM	LEOH: 9.00m	/														





Lander Geotechnical Consultants Limited Level 3, 3 Osterley Way, P O Box 97 385, Manukau, Auckland 2241 Phone: (09) 262 1528 www.landergeotechnical.co.nz

#### Memorandum

То	Don Greenaway	From	Chris Edwards
Email	Don.G@ellerslie.co.nz	Date	13 July 2021
Company	Auckland Racing Club	Reference	J01706-Rev1
сс	Vijay.Lala@tattico.co.nz	Pages	1 of 7, plus attachments
Subject	Preliminary Geotechnical Data	– Ellerslie Ra	acecourse ('The Hills Area')

## 1 INTRODUCTION

The purpose of this memo is to provide the geotechnical data to date for the site referenced above and provide some preliminary geotechnical comments regarding the key perceived geotechnical considerations for the future development of the site for residential purposes.

As shown on the below plan (Insert A), considerable field testing has been undertaken between March and May 2021 for Auckland Racing Club of 'The Hills' area. Our field logs, cross-section profiles with interpreted geological units and site plan are attached for reference for the machine borehole, hand auger borehole and trial pit testing.



This memorandum contains CONFIDENTIAL INFORMATION which may also be LEGALLY PRIVILEGED and which is intended only for the use of the Addressee(s) named. If you are not the intended recipient of this memorandum, or the employee or agent responsible for delivering it to the intended recipient, you are hereby notified that any dissemination or copying of this memorandum is strictly prohibited. If you received this memorandum in error, please notify us immediately by telephone and destroy the original memorandum.

## 2 DESKTOP REVIEW

#### 2.1 Geology Maps

A review of GNS digital QMAPs indicates that the site is located at a geologic boundary between the East Coast Bays Formation, Tauranga Group Holocene alluvial and colluvial deposits and Auckland Volcanic Field tuff, shown on Insert B (right). Our borehole logs also identified the presence of Auckland Volcanic Field basalt (lava flows) within the southern portion of the site.



Insert B: Geological boundaries between East Coast Bays Formation (orange), Tauranga Group (White) and tuff (red).

## 2.2 Retrolens and Auckland Council Historic Image Database

A review of Retrolens' historic image database (since 1940-1980) and Auckland Council database (1940-1996) indicates that two channels (depressions/gullies) had previously existed towards the northern end of the site. By 1975 the western most channel appears to have been filled in, and a retaining wall constructed within its flow path. Some small structures are also visible on the site in the

1975 image.

Historic imagery from 1988 indicates that the small structures have been removed, and infilling had begun on the second (eastern) channel. By 1996 the Auckland council imagery shows that the pond had been formed and the filling of the second channel mostly completed.

**Insert C:** Retrolens images showing the change in land use of the site over the last 80 years.



# 3 FIELDWORK AND FINDINGS

## 3.1 Fieldwork Programme

Our fieldwork was commenced on 29 March 2021 and involved the drilling of eight hand auger boreholes and six machine boreholes to depths of up to 24 metres and the supervision of the excavation of twelve trial pits to depths of up to 4.4 metres in the positions indicated on the appended site plan. Soil samples were recovered from between 0.5 and 1.0m depth within HA02 and HA05 for subsequent laboratory examination and expansive soil testing.

To help assess the strength and consistency of the strata beyond the reach of the boreholes, we also carried out base penetration resistance tests (scalas) in HA01 and HA08.

Results of all insitu soil tests and groundwater monitoring, together with detailed descriptions and depths of strata encountered during the drilling of the boreholes, and during the excavation of the trial pits are appended.

Our findings are summarised as follows:

## 3.2 Findings

## 3.2.1 Topsoil

Topsoil was encountered within each borehole and trial pit location between 0.1 and 0.4m depth.

#### 3.2.2 Fill

**Non-engineered** fill was identified within HA02, HA06 and HA08, MH01, MH02, MH03, MH05 and MH06, and TP01 TP02, TP03 TP04, TP06, TP07, TP08, TP09, TP10 and TP11, between depths of 0.4m and approximately 8.0m depth. This material was described as orange, brown, grey, blue, white and black clays, silts, sands and gravels and included blocks of non-insitu basalt, concrete, wood, asbestos, brick, asphalt, piping and metal wiring along and other various building debris. Undrained shear strengths ranged between 54kPa (stiff) and 171kPa (very stiff).

## 3.2.3 Recent Alluvium

Recent Alluvium was identified within TP06 underlying the fill to a depth of 1.8m. This deposit comprised of orange and dark grey organic stained clays and silts. The shear vane blade was unable to penetrate this soil.

## 3.2.4 Ash

Ash was described within HA01, HA03, HA04, HA07, MH01, MH02, MH06, TP01, TP05 and TP12 underlying the surficial topsoil and/or fill to between 0.15m and 3.5m depth. These soils comprised orange, grey, brown and red clays, silts and scoriacous and basaltic gravels. Undrained shear strengths ranged between 108kPa (stiff) and greater than 215kPa (hard), with the shear vane blade unable to penetrate the soil in some instances.

## 3.2.5 Basalt

Basalt was identified within MH01 (3.5m to 5.9m) and MH06 (1.2m to >9.5m). HA01 terminated at 0.15m depth and base penetration (scala) testing found hammer bouncing on inferred basalt at 0.4m depth.

## 3.2.6 Tauranga Group Alluvium

Alluvium was described within HA05 (0.4m to >5m), MH01 (5.9m to 21m) and MH04 (0.2m to >22m) at 5.9m and 0.4m depth, respectively. These soils were described as grey, green, black, brown and

orange, clays silts and sands with some organic inclusions and organic stained layers. SPT 'N' values were between 2 (very loose) and greater than 50 (very dense).

## 3.2.7 Residual East Coast Bays Formation

Residual East Coast Bays Formation soils were noted within HA02, HA03, HA04, HA06, HA07, MH02, MH03, TP02, TP03, TP04, TP06, TP07, TP08, TP09, TP10 and TP11 at between 0.4m and 8.0m depth. These deposits comprised orange and grey silts, clays and sands and undrained shear strength values were between 89kPa and greater than 215kPa (hard), with the shear vane blade unable to penetrate the soil in come instances.

## 3.2.8 Transitional East Coast Bays Formation

Transitional East Coast Bays Formation soils were described within HA06, MH02, MH03 and MH05 at between 4.9m and 10.6m depth. These deposits consisted of dark grey clays, silts and sands. SPT 'N' values ranged between 23 (medium dense) and greater than 50 (very dense).

## 3.2.9 East Coast Bays Formation Bedrock

East Coast Bays Formation bedrock was identified within MH01, MH03 and MH05 at 21.0m, 11.8m and 10.5m depth, respectively. SPT 'N' values within this material were all greater than 50. (very dense).

## 3.2.10 Groundwater Monitoring

During our time onsite, no groundwater was encountered within the hand auger boreholes or trial pit excavations. Piezometers were installed within HA05, HA06, MH01, MH02, MH03 and MH04 for subsequent groundwater monitoring. Table 1 below shows the depths of groundwater encountered within each borehole:

Date Measured	HA03	HA06	MH01	MH02	MH03	MH04
06.04.21	No groundwater encountered	No groundwater encountered	3.05m	4.70m	Not yet drilled	3.66m
13.04.21	No groundwater encountered	No groundwater encountered	2.86m	4.77m	6.02m	3.70m
16.04.21	No groundwater encountered	No groundwater encountered	2.80m	4.83m	6.19m	3.74m

#### Table 1: Groundwater levels measured within piezometers in m below existing ground level.

## 3.2.11 Laboratory Results

The Atterberg Limits laboratory testing undertaken from samples from HA02 and HA05 (0.5m to 1m depth) returned liquid limits of 109 and 75 respectively and linear shrinkages of 22% and 19% respectively. In terms of NZS3604, this classifies the soils outside the definition of 'Good Ground' on account of their expansive nature (as is common of most clayey soils in the Auckland Region).

## 4 OTHER GEOTECHNICAL DATA FOR THE SITE

A previous geotechnical investigation and assessment report encompassing 'The Hills' area was prepared by Harrison Grierson Consultants Limited (reference 1015-126669-01, dated May 2008). This

report included the drilling of 2 machine boreholes (MB01 and MB02) and 3 hand auger boreholes (HA1 to HA3) within the subject site. A copy of this report is appended for reference and as supplementary information. The boreholes found natural soils similar to those encountered within our boreholes (mostly East Coast Bays Formation soils and rock and/or Puketoka Formation alluvium) with HA2 encountering existing fill deposits to greater than 0.8m depth (which was drilled in a similar location to our HA08 which found similar filled ground).

# 5 KEY GEOTECHNICAL CONSIDERATIONS

## 5.1 Existing (Non-Engineered) Fill

The attached site investigation plan (Figure 01) shows the depth that existing (non-engineered) fill was found at each borehole and trial pit location. These deposits were up to 8m depth (inferred as core recovery within MH03 and MH05 were poor from 6m to 8m depth) and comprised of variable materials.

These deposits will not be suitable to construct buildings on (unless a fully piled and suspended foundation system can be designed for) or associated infrastructure and roading. Depending on final development proposals for the site, it is most likely that these deposits will need to be removed (where within development areas) to stiff inorganic natural ground, underfill drainage installed (where deemed necessary) and the areas backfilled with engineer certified materials to design levels.

Given the variable materials within the fill deposits (including refuse materials and organic deposits), from a geotechnical perspective there will be a portion of these deposits that will not be suitable for reuse as engineered fill on site. If re-use of the fill deposits as engineered fill on site is proposed, then that would be subject to further geotechnical assessment (and subject to environmental engineering assessment by the environmental consultant for the development) and would likely require sorting 'suitable' inorganic clay materials from 'unsuitable' refuse and organic deposits onsite (subject to the practicalities of this) and mixing the 'suitable' existing fill deposits on site with imported fill products.

## 5.2 Foundations

From review of the borehole records, most of the site is underlain by inorganic stiff to very stiff East Coast Bays Residual Soils or stiff to very stiff Alluvium (excluding the existing fill deposits discussed above). A Geotechnical Ultimate Bearing Capacity of 300kPa should be available for foundation design purposes for light weight (i.e. NZS3604 style, timber framed, one to two story) dwellings constructed on the natural ground or engineered fill. However, some softer areas were identified at depth within some of the machine boreholes at depth and confirmation of a preliminary bearing capacity for the site will need to be determined once earthworks proposals are known.

The design of heavy/ large buildings foundation (i.e. if multi story apartment blocks are proposed) will require further assessment and will be subject to final building loads/ foundation requirements. Bridging pile requirements for any foundations within the 45-deg zone of influence of any public service lines will also be required.

From the preliminary laboratory testing undertaken and review of the borehole logs, the preliminary expansive site class classification of the site in accordance with MBIE Acceptable Solutions and Verifications Methods (for NZ Building Code Clause B1 Structure, effective 28 November 2019) is H (High) with a characteristic soil movement (ys) of up to 78mm. This preliminary assessment can be reassessed on site after earthworks are undertaken by shrink-swell laboratory testing as recommended in the above-mentioned document.

## 5.3 Slope Stability

Most of the site is gently sloping, however steeper slopes (i.e. greater than 1(v) in 4(h)) exist within the northern corner of the site. If/where slopes steeper than 1(v) in 4(h) exist within the proximity of proposed development areas, these will need assessment for slope stability and/or the effects of any shallow soil creep that can occur on such slopes and their potential effects on any nearby building platforms. This will also be the case for any proposed cuts/retaining walls proposed near site boundaries.

Re-assessment of this can be made once development and earthworks proposals are finalised.

## 5.4 Groundwater

Table 1 above shows that the highest groundwater level measured was 2.8m deep below existing ground level (MH01 – situated near the pond in the lower lying area of site). The other boreholes measured groundwater at greater than 3.5m below existing ground level (or did not encounter the groundwater table).

Once final earthworks and building development proposals are known, assessment of the proposals to AUP E7 guidelines will need to be made (especially if cuts greater than 2.5m are proposed, dependant on location on site).

## 5.5 Earthworks

## 5.5.1 Existing Pond

We understand that the existing pond on site will likely be decommissioned and backfilled. Prior to backfilling the pond, any sediments/organic materials within the base of the pond will need to be removed to expose stiff natural ground (we currently do not have any data as to the depth of such deposits on site). Installation of sumps and pumping of ground water and/or underfill drainage may be necessary while the pond is being backfilled.

## 5.5.2 Undercut of Existing Fills

Following topsoil stripping from site, assessment of areas requiring undercutting of existing fills will be made by the certifying engineer (subject to the final development proposals for the site). During undercutting of the existing fills, assessment can be made regarding their suitability for re-use on site/ what materials could be suitable to be re-used as engineered fill on site with sorting or mixing with imported fill products and what materials are unsuitable for re-use on site and will need removal.

## 5.5.3 Filling

The use of natural inorganic cut ground (typically being cohesive silty clays and clayey silts) on site as fill should be relatively straight forward using conventional earthmoving equipment. However, some degree of conditioning, mixing and drying is expected would be required subject to time of year that earthworks are undertaken.

Assessment of materials to be imported to site for use as fill will be required to determine their suitability for use as engineered fill.

## 5.5.4 Underfill Drainage

Underfill drainage is likely will be necessary within the areas on site where deep undercut of existing fill is required and within the existing pond area. But this will need to be further assessed once earthworks plans are finalised.

## 5.5.5 Basalt

Basalt was encountered within the southern corner of the site (MH01 and MH06). If cuts are proposed within this area of site, then these deposits may be encountered (likewise for any underground services or foundations within this portion of site). Rock breaking to excavate these deposits where encountered will likely be required.

## 5.5.6 Settlement

Subject to final earthworks proposals (i.e. fill heights) and final building loads proposed, assessment of the settlement characteristics (consolidation settlement) of placement of fills upon the natural ground on site may be required. This will need to be assessed once development proposals are known.

# 6 CLOSURE

It is reiterated that this preliminary geotechnical data memo is intended to inform you on the general ground conditions and key geotechnical considerations for the site. Once detailed development proposals and earthworks plans are known these considerations will need to be re-assessed and there may by other considerations to be made that have not been outlined above. A full and detailed Geotechnical Investigation Report will need to be prepared to accommodate any Resource Consent application for the site.

This memorandum has been prepared solely for the use of our client, Auckland Racing Club and their professional advisers. 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.

The opinions, recommendations and comments given in this report result from the application of normal methods of site investigation. As factual evidence has been obtained solely from boreholes and trial pits which by their nature only provide information about a relatively small volume of subsoils, there may be special conditions pertaining to this site which have not been disclosed by the investigation and which have not been taken into account in the report.

For and on behalf of Lander Geotechnical Consultants Limited

Chris Edwards Senior Engineering Geologist

Attachments: Harrison Grierson Cross-Sections and Plan Lander Geotechnical Site Plan and Geological Cross-Sections 2 and 5 Lander Geotechnical Borehole Records and Trial Pit Records Geotechnics Laboratory Testing Supplementary Data: Harrison Grierson 2008 Geotechnical Investigation and Assessment Report



	ACENZ	ASSOCI ENGINE	ATION O ERS NEW	F CONSULT / ZEALAND	ING		ISO QU/ ASS	9001 ALITY SURED			
	THIS DRAWIN OR ALTERED, LIMITED. NO	IG AND DESI WITHOUT TH LIABILITY SH	GN REMAIN IE WRITTEN IALL BE ACC	IS THE PROPER PERMISSION ( CEPTED FOR UI	TY OF, AND M OF HARRISON NAUTHORISED	IAY NOT BE GRIERSON ) USE OF T	E REPRO CONSU HIS DR	ODUCED JLTANTS AWING.			
	NOTES	5									
XX	1. COORDI EDEN C	INATES AI IRCUIT.	RE IN TEF	RMS OF NZ	GEODETIC	DATUM	2000	МТ			
	2. REFER I CROSS	DRAWINGS	5 201046 5.	4-SK1-120	TO SK1-12	2 FOR E	XIST	ING			
111.											
A I											
	<u>LEGE</u>	END:									
				PROJECT	BOUNDA	ARY					
	0 )	20-	74 <b>+</b>	EXISTIN	G SECTIC	) N LINE					
1 1 1											
EE DRIPLAT											
SECTION											
LETION 5											
				AUCKL	AND AIRPORT	OFFICE					
				LEVEL 4 MANUK T +64	I, QUAD 5 4 L AU AUCKLAN 9 966 3380	EONARD IS ID 2022	SITT DF	RIVE			
				W www	w.harrisongrie	rson.com					
CROWN CROWN											
CROWN DAY SHARE	A CLIENT	ISSUE					NJS	10.05.21			
	REF REVISI PROJECT:	ONS					BY	DATE			
		AUC	KLAN ERSU		ING C						
			El	LERS	IE						
	TITLE:										
AZ.00 REE E. SM	EXIS	IING	SECI	IONS	LOCA	ION	ΡL	AN			
CC											
	ORIGINATOR: D DVS 0	ATE: 5.2021	SIGNED:			PLOT BY:		DVS			
	JXA D CHECKED: D	ATE: 5.2021 ATE:	SIGNED:			SURVEY	ı⊑: 1 BY:	10.05.21			
	DVS 0 APPROVED: D NJS 0	5.2021 ATE: 5.2021	SIGNED:			SURVEY	DATE:				
	ISSUE STATUS:	2.2021			CLI	ENT	IS	SUE			
	PROJECT No: A2010464.0	0	SCALES:	1:750 - A1 1:1500 - A	.3			A1			
TONLY		י: <u>ר</u> אר			110			REV			
	201	U4C	94-2	DK1-	TTO			A			
EXISTING LEVEL	42.34	41.96	41.63	41.13	41.42	41.64	40.56	38.71	38.51	38.55	
----------------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	---
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	00.06	1

SECTION 1 SECTION BETWEEN CH: 0.00 AND 293.94 x1 VERTICAL EXAGGERATION

EXISTING LEVEL	44.69	44.77	44.79	46.67	48.20	49.54	50.67	51.64	52.19	52.61	52.94	54.69	54.05	53.90	54.51	54.50	54.85	55.55	55.76	55.58 55.46
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	00 <sup>.</sup> 06	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00 193.49

\_\_\_\_\_

SECTION 2

SECTION BETWEEN CH: 0.00 AND 193.49 x1 VERTICAL EXAGGERATION







RACECOURSE PROJECT EXTENT

ACEN7	ENGIN	EERS NEW Z	CONSULTING EALAND		QU ASS	) 90 IALI SUR
THIS DRAWI OR ALTERED, LIMITED. NO	NG AND DES , WITHOUT T LIABILITY S	SIGN REMAINS 1 THE WRITTEN PE SHALL BE ACCEP	THE PROPERTY OF, RMISSION OF HAR PTED FOR UNAUTH	, AND MAY NOT RISON GRIERSC ORISED USE OF	BE REPR ON CONS	RODU SULTA RAWI
NOTE	S					
1. REFER	DRAWING	G 2010464-S	K1-110 FOR L	OCATION DE	TAILS	
_			AUCKLAND AI	RPORT OFFICE		
			AUCKLAND AI LEVEL 4, QUA MANUKAU AU	RPORT OFFICE D 5 4 LEONARD ICKLAND 2022	) ISITT D	RIVE
			AUCKLAND AI LEVEL 4, QUAI MANUKAU AU T +64 9 966 3 W www.harris	RPORT OFFICE D 5 4 LEONARD ICKLAND 2022 3380 songrierson.con	) ISITT D n	RIVE
			AUCKLAND AI LEVEL 4, QUA MANUKAU AU T +64 9 966 3 W www.harris	RPORT OFFICE D 5 4 LEONARD ICKLAND 2022 3380 songrierson.con	) ISITT D n	RIVE
			AUCKLAND AI LEVEL 4, QUA MANUKAU AU T +64 9 966 3 W www.harris	RPORT OFFICE D 5 4 LEONARD JCKLAND 2022 3380 songrierson.con	) ISITT D n	RIVE
			AUCKLAND AI LEVEL 4, QUAI MANUKAU AU T +64 9 966 3 W www.harris	RPORT OFFICE D 5 4 LEONARD ICKLAND 2022 3380 songrierson.con	) ISITT D	RIVE
B AMENI A CLIEN		PROFILE VERT	AUCKLAND AI LEVEL 4, QUA MANUKAU AU T +64 9 966 3 W www.harris	RPORT OFFICE D 5 4 LEONARD JCKLAND 2022 3380 songrierson.con	) ISITT D n NJS NJS	RIVE
B AMENI A CLIEN REF REVIS	DMENT IN T ISSUE IONS	PROFILE VERT	AUCKLAND AI LEVEL 4, QUAI MANUKAU AU T +64 9 966 3 W www.harris	RPORT OFFICE D 5 4 LEONARD ICKLAND 2022 3380 songrierson.con	o ISITT D n NJS NJS BY	RIVE
B AMENI A CLIEN REF REVIS PROJECT:			AUCKLAND AI LEVEL 4, QUAI MANUKAU AU T +64 9 966 3 W www.harris	RPORT OFFICE D 5 4 LEONARD ICKLAND 2022 3380 songrierson.con	o ISITT D n NJS NJS BY	RIVE
B AMENI A CLIEN REF REVIS PROJECT:	DMENT IN T ISSUE IONS AUC ELL	PROFILE VERT	AUCKLAND AI LEVEL 4, QUAI MANUKAU AU T +64 9 966 3 W www.harris	RPORT OFFICE D 5 4 LEONARD ICKLAND 2022 3380 songrierson.con	ISITT D	RIVE
B AMENI A CLIEN REF REVIS PROJECT:	DMENT IN T ISSUE IONS AUC ELL	PROFILE VERT	AUCKLAND AI LEVEL 4, QUAI MANUKAU AU T +64 9 966 3 W www.harris	RPORT OFFICE D 5 4 LEONARD ICKLAND 2022 3380 songrierson.com	o ISITT D n NJS NJS BY	RIVE
B AMENI A CLIEN REF REVIS PROJECT:	DMENT IN T ISSUE IONS AUC ELL	PROFILE VERT	AUCKLAND AI LEVEL 4, QUAI MANUKAU AU T +64 9 966 ( W www.harris	RPORT OFFICE D 5 4 LEONARD JCKLAND 2022 3380 songrierson.con	o ISITT D n NJS NJS BY	RIVE
B AMENI A CLIEN REF REVIS PROJECT:	DMENT IN T ISSUE IONS AUC ELL EXIS	PROFILE VERT	AUCKLAND AI LEVEL 4, QUAI MANUKAU AU T +64 9 966 3 W www.harris TICAL EXAGGER/ RACEC LERSLIE ROSS SI	RPORT OFFICE D 5 4 LEONARD JCKLAND 2022 3380 songrierson.con	NJS NJS BY	RIVE
B AMENI A CLIEN REF REVIS PROJECT :	DMENT IN T ISSUE IONS AUC ELL EXIS	PROFILE VERT	AUCKLAND AI LEVEL 4, QUAI MANUKAU AU T +64 9 966 : W www.harris	RPORT OFFICE D 5 4 LEONARD ICKLAND 2022 3380 songrierson.con ATION G CLUE OURSE OURSE ECTION 3	o ISITT D n NJS NJS BY	RIVE
B AMENI A CLIEN REF REVIS PROJECT:	DMENT IN T ISSUE IONS AUC ELL EXIS	PROFILE VERT	AUCKLAND AI LEVEL 4, QUAI MANUKAU AU T +64 9 966 3 W www.harris O RACINO E RACEC LERSLIE ROSS SI ET 1 OF	RPORT OFFICE D 5 4 LEONARD JCKLAND 2022 3380 songrierson.con ATION G CLUE OURSE OURSE ECTION 3	ISITT D	RIVE
B AMENI A CLIEN REF REVIS PROJECT:	DMENT IN T ISSUE IONS AUC ELL EXIS	PROFILE VERT	AUCKLAND AI LEVEL 4, QUAI MANUKAU AU T +64 9 966 3 W www.harris O RACINO E RACEC LERSLIE ROSS SI ET 1 OF	RPORT OFFICE D 5 4 LEONARD ICKLAND 2022 3380 songrierson.con G CLUE OURSE OURSE ECTION 3	NISITT D	RIVE
ORIGINATOR: C DVS C C C C C C C C C C C C C C C C C C C	DMENT IN T ISSUE IONS AUC ELL EXIS	PROFILE VERT	AUCKLAND AI LEVEL 4, QUAI MANUKAU AU T +64 9 966 3 W www.harris	RPORT OFFICE D 5 4 LEONARD ICKLAND 2022 3380 songrierson.con G CLUE OURSE OURSE ECTION 3 PLOT E PLOT E	ISITT D NJS NJS BY BY	RIVE
ORIGINATOR: DVS DVS DRAWN: DVS CHECKED: D	DMENT IN T ISSUE IONS AUC ELL EXIS DATE: DATE: DATE: DATE: DATE: DATE:	PROFILE VERT CKLANC ERSLIE ELL TING C SHEE SIGNED: SIGNED:	AUCKLAND AI LEVEL 4, QUAI MANUKAU AU T +64 9 966 3 W www.harris O RACINO E RACEC LERSLIE ROSS SI ET 1 OF	RPORT OFFICE D 5 4 LEONARD ICKLAND 2022 3380 songrierson.com G CLUE OURSE OURSE ECTION 3 PLOT E PLOT E	ISITT D NJS NJS BY BY S S S S S S S S S S S S S S S S	RIVE
ORIGINATOR: DRAWN: DRAWN: DRAWN: DXA CHECKED: DVS CHECKED: DVS CHECKED: C CHECKED: C C	DMENT IN T ISSUE IONS AUC ELL DATE: DATE: DATE: DATE: DATE: DATE: DATE: DATE: DATE: DATE:	PROFILE VERT	AUCKLAND AI LEVEL 4, QUAI MANUKAU AU T +64 9 966 : W www.harris	RPORT OFFICE D 5 4 LEONARD ICKLAND 2022 3380 songrierson.com G CLUE OURSE OURSE ECTION 3 PLOT E PLOT E SURVE	OISITT D N NJS NJS BY S S S S S S S S S S S S S S S S S S	RIVE
ORIGINATOR: DVS DRAWN: DVS DRAWN: DVS CHECKED: DXA CHECKED: DXS CHECKED: C APPROVED: C APPROVED: C C APPROVED: C C C C C C C C C C C C C C C C C C C	DMENT IN T ISSUE IONS AUC ELL DATE:	PROFILE VERT	AUCKLAND AI LEVEL 4, QUAI MANUKAU AU T +64 9 966 3 W www.harris O RACINO E RACEC LERSLIE ROSS SI T 1 OF	RPORT OFFICE D 5 4 LEONARD JCKLAND 2022 3380 songrierson.com G CLUE OURSE ECTION 3 PLOT E PLOT E SURVE	ISITT D NJS NJS BY S S S S S S S S S S S S S	RIVE
ORIGINATOR: DVS DRAWN: JXA CHECKED: DXS ISSUE STATUS	DMENT IN T ISSUE IONS AUC ELL OATE: DATE:	PROFILE VERT CKLANC ERSLIE ELL TING C SHEE SIGNED: SIGNED: SIGNED:	AUCKLAND AI LEVEL 4, QUAI MANUKAU AU T +64 9 966 : W www.harris O RACINO E RACEC LERSLIE ROSS SI ET 1 OF	RPORT OFFICE D 5 4 LEONARD ICKLAND 2022 3380 songrierson.com ATION G CLUE OURSE OURSE OURSE OURSE OURSE SURVE SURVE	OISITT D NJS NJS BY NJS BY S S S S S S S S S S S S S S S S S S	RIVE
A CLIEN REF REVIS PROJECT: TITLE: ORIGINATOR: C DVS C DVS C DVS C DRAWN: C DVS C DRAWN: C DVS C CHECKED: C DVS C CHECKED: C C NJS C CHECKED: C C NJS C C C C C C C C C C C C C C	DMENT IN TISSUE IONS AUC ELL DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021	PROFILE VERT	AUCKLAND AI LEVEL 4, QUAI MANUKAU AU T +64 9 966 3 W www.harris O RACINO E RACEC LERSLIE ROSS SI ET 1 OF	RPORT OFFICE D 5 4 LEONARD JCKLAND 2022 3380 songrierson.com ATION G CLUE OURSE OURSE ECTION 3 PLOT E PLOT E PLOT E SURVE SURVE	ISITT D NJS NJS BY S IS IS IS IS IS IS IS IS IS	RIVE
DRIGINATOR: DRIGINATOR: DVS PROJECT: TITLE: TITLE: DVS DRAWN: DXA CHECKED: DVS DRAWN: DXA CHECKED: DVS C APPROVED: C APPROVED: C C APPROVED: C C APPROVED: C C APPROVED: C C C APPROVED: C C C C C C C C C C C C C C C C C C C	DMENT IN T ISSUE IONS AUC ELL DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021	PROFILE VERT CKLANC ERSLIE ELL TING C SHEE SIGNED: SIGNED: SIGNED: SIGNED: 1	AUCKLAND AI LEVEL 4, QUAI MANUKAU AU T +64 9 966 ; W www.harris ICAL EXAGGER/ RACING RACING RACING RACEC LERSLIE ROSS SI T 1 OF	RPORT OFFICE D 5 4 LEONARD ICKLAND 2022 3380 songrierson.com ATION G CLUE OURSE OURSE OURSE OURSE SURVE SURVE CLIENT V - A1 00 V - A3	NISITT D NISITT D NIS NJS BY NJS BY NJS BY NJS BY NJS TIS	RIVE

REFER TO APPROVED MASTER DRAWINGS FOR ORIGINAL SIGNATURES FILE: MANUKAU \\HARRISONGRIERSON.COM\HGDATA\NEWMARKET\SHARES\JOBS\1030\2010464\_A ELLERSLIE RACECOURSE\CAD\CIVIL\SHEETS\2010464-SKETCHES.DWG

EXISTING LEVEL	45.90	46.01	46.17	46.37
CHAINAGE	0.00	10.00	20.00	30.00

SECTION 3 SECTION BETWEEN CH: 0.00 AND 85.21 x1 VERTICAL EXAGGERATION

EXISTING LEVEL	46.75	46.91	51.49
CHAINAGE	0.00	10.00	20.00

SECTION 4 SECTION BETWEEN CH: 0.00 AND 67.96 x1 VERTICAL EXAGGERATION





54.51				
30.00	40.00	50.00	60.00	67 06



	ENGINE	IATION OF C EERS NEW Z	CONSULTING EALAND		ISC QU ASS	) 9001 IALITY SURED
THIS DRAWI OR ALTERED, LIMITED. NO	NG AND DES WITHOUT T LIABILITY S	GIGN REMAINS T THE WRITTEN PE GHALL BE ACCEP	HE PROPERTY OF, A RMISSION OF HARRI TED FOR UNAUTHOR	ND MAY NOT SON GRIERSC RISED USE OF	BE REPR ON CONS	RODUCEI SULTANT: RAWING
		2010464-5				
I. REFER	DRAWING	3 2010404-3	KI-IIU FOR LOO	LATION DE	TAILS	•
			AUCKLAND AIRF LEVEL 4, QUAD 5	PORT OFFICE	) ISITT D	RIVE
			AUCKLAND AIRF LEVEL 4, QUAD 5 MANUKAU AUCI T +64 9 966 338 W www.harriso	PORT OFFICE 5 4 LEONARD KLAND 2022 30 ngrierson.con	) ISITT D	RIVE
			AUCKLAND AIRF LEVEL 4, QUAD 5 MANUKAU AUCI T +64 9 966 338 W www.harrison	PORT OFFICE 5 4 LEONARD KLAND 2022 30 ngrierson.con	) ISITT D	RIVE
			AUCKLAND AIRF LEVEL 4, QUAD 5 MANUKAU AUCI T +64 9 966 338 W www.harrison	PORT OFFICE 5 4 LEONARD KLAND 2022 30 ngrierson.con	) ISITT D	RIVE
			AUCKLAND AIRF LEVEL 4, QUAD 5 MANUKAU AUCI T +64 9 966 338 W www.harrison	PORT OFFICE 5 4 LEONARD KLAND 2022 30 ngrierson.com	D ISITT D	RIVE
B AMENI A CLIEN	DMENT IN T ISSUE	PROFILE VERT	AUCKLAND AIRF LEVEL 4, QUAD 5 MANUKAU AUCI T +64 9 966 338 W www.harrison	PORT OFFICE 5 4 LEONARD (LAND 2022 30 ngrierson.com	ISITT D	RIVE
B AMENI A CLIEN REF REVIS	DMENT IN T ISSUE IONS	PROFILE VERT	AUCKLAND AIRF LEVEL 4, QUAD 5 MANUKAU AUCI T +64 9 966 338 W www.harrison	PORT OFFICE 5 4 LEONARD KLAND 2022 30 ngrierson.com	ISITT D	RIVE 20.05 10.05 DAT
B AMENI A CLIEN REF REVIS	DMENT IN T ISSUE IONS		AUCKLAND AIRF LEVEL 4, QUAD 5 MANUKAU AUCI T +64 9 966 338 W www.harrison	PORT OFFICE 5 4 LEONARD (LAND 2022 30 ngrierson.com ION	ISITT D	RIVE 20.05 10.05 DAT
B AMENI A CLIEN' REF REVIS PROJECT:	DMENT IN T ISSUE IONS AUC ELL	PROFILE VERT	AUCKLAND AIRF LEVEL 4, QUAD 5 MANUKAU AUCI T +64 9 966 338 W www.harrison	PORT OFFICE 5 4 LEONARD (LAND 2022 30 ngrierson.com ION	ISITT D	RIVE
B AMENI A CLIEN' REF REVIS PROJECT:	DMENT IN T ISSUE IONS AUC ELL	PROFILE VERT	AUCKLAND AIRF LEVEL 4, QUAD 5 MANUKAU AUCI T +64 9 966 338 W www.harrison	PORT OFFICE 5 4 LEONARD (LAND 2022 30 ngrierson.com ION	ISITT D	RIVE
B AMENI A CLIEN' REF REVIS PROJECT:		PROFILE VERT	AUCKLAND AIRF LEVEL 4, QUAD S MANUKAU AUCI T +64 9 966 338 W www.harrison	PORT OFFICE 5 4 LEONARD (LAND 2022 30 ngrierson.com ION ION	ISITT D NJS NJS BY	RIVE
B AMENI A CLIEN' REF REVIS PROJECT:	DMENT IN T ISSUE IONS AUC ELL EXIS	PROFILE VERT	AUCKLAND AIRF LEVEL 4, QUAD S MANUKAU AUCI T +64 9 966 338 W www.harrison ICAL EXAGGERAT	PORT OFFICE 5 4 LEONARD (LAND 2022 30 ngrierson.com ION ION	ISITT D NJS NJS BY	RIVE
B AMENI A CLIEN REF REVIS PROJECT:	DMENT IN T ISSUE IONS AUC ELL EXIS	PROFILE VERT	AUCKLAND AIRF LEVEL 4, QUAD 5 MANUKAU AUCI T +64 9 966 338 W www.harrison ICAL EXAGGERAT	PORT OFFICE 5 4 LEONARD (LAND 2022 30 ngrierson.com ION ION G CLUE OURSE OURSE	ISITT D	RIVE 20.05 10.05 DAT
DRIGINATOR: C	DMENT IN T ISSUE IONS AUC ELL EXIS	PROFILE VERT	AUCKLAND AIRF LEVEL 4, QUAD 5 MANUKAU AUCI T +64 9 966 338 W www.harrison ICAL EXAGGERAT RACECC ERSLIE RACECC ERSLIE	PORT OFFICE 5 4 LEONARD (LAND 2022 30 ngrierson.com ION GCLUE OURSE OURSE OURSE	ISITT D	RIVE 20.05 10.05 DAT
ORIGINATOR: C DVS DXA	DMENT IN TISSUE IONS AUC ELL EXIS EXIS	PROFILE VERT CKLAND ERSLIE ELL TING C SHEE SIGNED:	AUCKLAND AIRF LEVEL 4, QUAD 5 MANUKAU AUCI T +64 9 966 338 W www.harrison ICAL EXAGGERAT RACING ERSLIE RACECC ERSLIE ROSS SE T 2 OF 3	PORT OFFICE 5 4 LEONARD (LAND 2022 30 ION ION CLUE OURSE OURSE OURSE OURSE	ISITT D NJS NJS BY S S	RIVE 20.05 10.05 DAT
ORIGINATOR: DVS DRAWN: JXA CHECKED: CHECKED: C	DMENT IN TISSUE IONS AUC ELL EXIS EXIS	PROFILE VERT CKLAND ERSLIE ELL TING C SHEE SIGNED: SIGNED: SIGNED:	AUCKLAND AIRF LEVEL 4, QUAD 5 MANUKAU AUCI T +64 9 966 338 W www.harrison ICAL EXAGGERAT RACING E RACING E RACECC ERSLIE ROSS SE T 2 OF 3	PORT OFFICE 5 4 LEONARD 30 ngrierson.com 10N 6 CLUE 0URSE 0URSE 0URSE 0URSE 0URSE	ISITT D NJS NJS BY S S S S S S S S S S S S S S S S S S	RIVE 20.05 10.05 DAT
B AMENI   A CLIEN   B AMENI   A CLIEN   PROJECT: I   DYS I   DYS I   DAWN: I   DVS I   DXA I   CHECKED: I   DYS I   APPROVED: I   CAPPROVED: I	DMENT IN TISSUE IONS AUC ELL EXIS EXIS EXIS	PROFILE VERT CKLAND ERSLIE ELL FING C SHEE SIGNED: SIGNED: SIGNED:	AUCKLAND AIRF LEVEL 4, QUAD S MANUKAU AUCI T +64 9 966 338 W www.harrison ICAL EXAGGERAT RACING E RACING E RACING	PORT OFFICE 5 4 LEONARD (LAND 2022 30 ngrierson.com ION CLUE OURSE OURSE OURSE OURSE OURSE OURSE	ISITT D NJS NJS BY S S S S S S S S S S S S S S S S S S	RIVE 20.05 10.05 DAT 20.05
B AMENI   A CLIEN   REF REVIS   PROJECT: I   ORIGINATOR: I   DVS I   DVS I   DXA I   CHECKED: I   DXA I   DVS I   APPROVED: I   ISSUE STATUS	DMENT IN TISSUE IONS AUC ELL EXIS EXIS EXIS DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021	PROFILE VERT CKLAND ERSLIE ELL FING C SHEE SIGNED: SIGNED: SIGNED:	AUCKLAND AIRF LEVEL 4, QUAD S MANUKAU AUCI T +64 9 966 338 W www.harrison ICAL EXAGGERAT RACING E RACING E RACING E RACING E RACING E RACING E RACING T 2 OF 3	ORT OFFICE 5 4 LEONARD 30 ngrierson.com 10N 6 CLUE 0URSE 0URSE 0URSE 0URSE 0URSE 0URSE	ISITT D NJS NJS BY S IS NJS BY S IS NJS BY S IS IS IS IS IS IS IS IS IS IS IS IS I	RIVE 20.05 10.05 DAT 20.05
ORIGINATOR:   A   CLIEN   A   CLIEN   REF   REVIS   PROJECT:   DRAWN:   JXA   CHECKED:   DXS   CHECKED:   CAPPROVED:	DMENT IN TISSUE IONS AUC ELL EXIS EXIS AUC ELL DATE: 05.2021 DATE: 05.2021 DATE: 05.2021 DATE: 05.2021 DATE: 05.2021 DATE: 05.2021 DATE: 05.2021	PROFILE VERT	AUCKLAND AIRF LEVEL 4, QUAD S MANUKAU AUCI T +64 9 966 338 W www.harrison ICAL EXAGGERAT RACING E RACING E RACING E RACING E RACECC ERSLIE ROSS SE T 2 OF 3	ORT OFFICE 5 4 LEONARD (LAND 2022 30 angrierson.com 10N 5 CLUE 0URSE 0URSE 0URSE 0URSE 0URSE 0URSE 0URSE 0URSE 0URSE 0URSE	ISITT D NJS NJS BY S S S S S S S S S S S S S S S S S S	RIVE 20.05 10.05 DAT 20.05
DRIGINATOR: DITILE: DI	DMENT IN T ISSUE IONS AUC ELL DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021 DATE: D5.2021	PROFILE VERT	AUCKLAND AIRF LEVEL 4, QUAD 5 MANUKAU AUCI T +64 9 966 338 W www.harrison ICAL EXAGGERAT RACING ERSLIE RACECC ERSLIE ROSS SE T 2 OF 3	CTION	ISITT D NJS NJS BY S BY S S S S S S S S S S S S S S S	RIVE 20.05 10.05 DAT 20.05

REFER TO APPROVED MASTER DRAWINGS FOR ORIGINAL SIGNATURES FILE: MANUKAU \\HARRISONGRIERSON.COM\HGDATA\NEWMARKET\SHARES\JOBS\1030\2010464\_A ELLERSLIE RACECOURSE\CAD\CIVIL\SHEETS\2010464-SKETCHES.DWG



SECTION 5 SECTION BETWEEN CH: 0.00 AND 399.86 x1 VERTICAL EXAGGERATION

52.97	53.14	53.71	54.37	54.39	53.21	53,13	53.00	52.58	52.31	51,99	52.25	53.04	52.04	50.12	48,43	47.94	48.75	51.62	55.04	56.37	56.89	57.53	57.92
150.00	160.00	170.00	180.00	190.00	200.00	210.00	220.00	230.00	240.00	250.00	260.00	270.00	280.00	290.00	300.00	310.00	320.00	330.00	340.00	350.00	360.00	370.00	380.00

\_\_\_\_\_







-----



BASEPLAN FROM AUCKLAND COUNCIL GIS. RETIREVED 09.04.21

	description	drawn	approved	date		drawn	RG	client:
						approved	CE	project:
vision					Horizontal Scale (metres) 0 30.0 60.0 90.0 120.0	date	13.05.21	
ē					Vertical Scale (metres)	scale	1:2000	title:
					- (	original size	A3	project



## Legend and/or Notes:

Hand Auger Borehole

Machine Borehole

Trial Pit

 $\bigcirc$ 

[X.Xm]

[X.Xm]

Hand Auger Probe

Depth of fill

Depth of basalt

Inferred stockpile

Inferred area of deep (>1.0m) fill

**Cross Section** lines

# AUCKLAND RACING CLUB

### ELLERSLIE RACECOURSE, ELLERSLIE

### SITE INVESTIGATION PLAN

<sup>t no:</sup> **J01706** 

figure no:

01





### Legend and/or Notes:



Sandstone

	description	drawn	approved	date	0	25.0	50.0	75.0	100.0	drawn	RG		client:	AUCKLAND RACING CLUB
uo						Horizor	ntal Scale	(metres)		approved	CE		project	ELLERSLIE RACECOURSE. ELLERSLIE
S/ISI					ļ	25.0	50.0	75.0	100.0	date	26.05.21			,,
Ψ						Vertic	al Scale (i	metres)		scale	1:1500	LANDER	title:	CROSS SECTION 5
							(	,		original size	A3		project	<sup>no:</sup> J01706 figure no: 03

Client :	client :       AUCKLAND RACING CLUB         Project Location :       ELLERSLIE RACECOURSE, ELLERSLIE							Aug	er Bo	oreho	le No.	F	IA1
Project	Locatio	.IE					:	Sheet 1	of 8				
Job Nu	mber.	.10	01706		Vane	Head:	Logge	d By:	Process	or: Dat	e:		
			mE	Cre			3			κ <u>∠</u>	RZ	2	9.03.21
Borehole Location:	MN Description		Refer to site plan	Gro	ouna R.L.		- pu	h (m)	ding Leve	ne (kPa esidua	il tivity	Samp	le and
	Description						Lege	Dept	Stan /ater	Va Shear <sub>eak / r</sub>	So Sensit	T	est est
TOPSON		50		ION			$\left  \right $		5	0, 4	0)	De	
clayey SIL1	Γ, brown. Har	d, dry, no	plasticity [ASH]				<u>}}</u>	È				5	
- EOB at 0.15	im. Too hard	to auger	further. Scala per	ntromete	r test commence	ed and found		-				- 9	
	usar (Ert) at t	.4111.						- 0.5				- 10 (ER,	HB)
-								E				Scala Pentrom	eter
-								+				Test (blows/1	00mm)
-												HB = Ha	ammer
-												Bouncin	g
-								F					
-								-					
-													
-								F					
-													
-								- 2.0					
-								F					
-								- 25					
-								- 2.5					
-								F					
-								E.					
-								- 3.0					
-								F					
-													
-								- 3.5					
-								F					
_								E.					
-								- 4.0					
-								F					
-								E.					
-								-4.5					
-								F					
_													
-								- 5.0					
-								F					
-								F					
-								-5.5					
-								F					
- -													
_		Comme	ents:		Borehole Diameter:	Topsoil	$\frac{1}{2}$	Sand		Sandston		Plutonic	++++
		Ground	water not encount	ered.	50mm	Fill	$\boxtimes$	Gravel		Siltstone	2 2 2 2	No Core	
LAND	DER	UTP = t EOB =	unable to penetrate end of borehole.	e.	Checked:	Clay		Organic	<u>www</u> www	Limeston			
geoteci	nical				RG	Silt X	$\times \times $	Pumice	> <del>0 0 0</del> > 0 0 0 0	Volcanic		7	

Client :	AUCKLAND RACING C	LUB			Aug	er B	oreho	le No		HA	42
Project Locatio	n: ELLERSLIE RACECOUI	RSE, ELLERSL	.IE						Sheet	2 of	8
Job Number:	J01706			Vane	Head:	Logge	ed By:	Process	sor :	Date:	21
	mF									20.00.	21
Borehole Location: Description	Refer to site plan			- pue	ш ц	ding	ne (kPa esidua	il tivity	Sa	ample an	d )ther
				Leg	Dept	Stan Vater	Va Sheai	Sc Sensi	Labo	Test Details	
TOPSOIL	SOIL DESCRIPTION			+			•• -			Detailo	
silty CLAY, grey and brow	wn mottled orange and light grey. H	lard, moist, medi	um plasticity	$\overline{\mathbb{Z}}$	7						
_ [FILL] L					t						
ailty CLAY with trace fine	and arongo and light grov mottle	d Hard maint m	adium	<u>                                     </u>	- 0.5		201+				
plasticity [RESIDUAL EA:	ST COAST BAYS FORMATION]	a. nara, moist, n	lealum	-x-x-x	ļ.				s	ample 1	
-					it.					isturbed .5-1.0m	
-					-1.0		201+				
-				-x-x-x	F						
-				-x-x-x	i l						
<ul> <li>becoming very stiff, insen</li> </ul>	sitive			-x-x-x	-1.5		150/98	1.5			
-					F						
-					t						
-				-x-x-x	- 2.0		150/89	1.7			
-				-x-x-x	F						
-					Ĺ						
-				-x-x-x	- 2.5		124/100	1.2			
silty CLAY, grey. Stiff, mo	pist, high plasticity, insensitive, with	trace black carbo	onaceous	-x-x-x	+						
inclusions				-x-x-x	÷						
-				-x-x-x	-3.0		89/66	1.3			
-				-x-x->	-						
-					F						
<ul> <li>becoming very stiff</li> </ul>					- 3.5		115/83	1.4			
-					ł						
-					F						
					-4.0		121/86	1.4			
_ clayey SIL1, grey. Very s _	tiff, moist, low plasticity, insensitive										
-				$\left  \begin{array}{c} X \\ X \\ X \\ \end{array} \right\rangle$							
-					<b>-</b> 4.5		130/104	1.3			
-											
-					- -		107/00				
EOB at 5.0m. Target dep	th			1000	- 5.0		135/98	1.4			
-					E						
-					F						
-					- 5.5						
-					F						
-					-						
	Comments:	Borehole Diameter:	Topsoil	$\frac{1}{2}$	Sand	· · · ·	Sandstone		Plut	tonic +	++
	Groundwater not encountered.	50mm	Fill	$\square$	Gravel		Siltstone	222	Z No	Core	* *
LANDER geotechnical	UIP = unable to penetrate. EOB = end of borehole.	Checked:	Clay -		Organic	EEEE EEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEE	Limestone		Ħ		
		RO	Silt	COL F	umice	(YYY)	Volcanic	1000	<b>∪</b>	1	

Client :		AUC	KLAND RAC	ING C	LUB				Aug	er B	oreho	le No		н	A03
Project	Locatio	n: RES	IDENTIAL DE	EVELC	PMENT				_				Sheet	3	of 8
Lab No.		ELLE	ERSLIE RACI	ECOU	RSE		Var	ne He	ead:	Logge	d By:	Process	or :	Date:	
JOD NU	imper:	J017	06				_	190	00		RZ	RG	i	29.	03.21
Borehole	mN	m	E	Gr	ound R.L.			_	(E	ng evel	Pa) dual	ity	s	ample	and
Location:	Description	Ref	er to site plan					gene	pth	andii er Lo	/ane ar(k	Soil Isitiv	Labo	ratory	/ Other
		SOIL	DESCRIPT	ON			.	Le	De	Sta	She Peak	Sen		Detai	ls
							$\overline{\nabla}$	$\overline{\mathbf{A}}$	_	FT F.					
-								N	-	FI F					
clayey SILT,	, orange/brow	/n. Hard, mo	ist, medium pla	asticity	[ASH]		ΞŻ.	ŻŻ	-	FI E					
-								≤×i ≤×i	- 0.5	╞╪╧╪	215+				
-								충축	-						
<ul> <li>becoming lig</li> </ul>	ght brown/ora	nge mottled	orange/brown,	low pla	sticity, with trace	limonite		준축	-						
-								Ś₫	-	li目!	215+				
-								ÌÌ	- 1.0		213+				
slightly claye	ey SILT with t	race fine sar	nd, light grey m	ottled li	ght orange/browr	n. Hard,		इंट्री	-						
_ moist, low p	lasticity, with	trace limonit	e [RESIDUAL	EAST (	COAST BAYS FO	RMATION	$1 \begin{bmatrix} x \\ x \end{bmatrix}$	충화	-						
-								준지	-1.5		215+				
			) (			141		ΞĪ	-						
trace limonit	e e	ea light grey	. very sun, mo	ist, nigr	i plasticity, insens	sitive, with	-x-: -x-:	×-× ×-×	-						
_							-×-: -×-:	×-×- ×-×-	- 2.0		200/117	1.7			
-							-x-3	×-×+ ×-×+	-						
-							-x-3	×-×	-						
-									-						
becoming vertex	ery stiff, mode	erately sensit	live				-8-3		- 2.5 -		160/80	2.0			
-								×-×1	-						
-							-×-: -×-:	×-×1 ×-×1	-						
-							-x-3	×-×-, ×-×-,	-3.0		135/61	2.2			
-							-8-0	<u></u>	-						
							-x-	×-×-	-						
<ul> <li>becoming lig</li> </ul>	ght grey, with	out limonite					-x-3	×-×,	- 35		160/77	21			
-							-x-: -x-:	×-×- ×-×-	-		100/11	2.1			
-							-x-: -x-:	×-×4 ×-×4	-						
-							-x-3	×-×-	-						
<ul> <li>becoming had</li> </ul>	ard						-×-3	<u></u>	<b>-</b> 4.0		215+				
-							-×-		-						
-							-8-3		-						
-								×-×-	-4.5	l¦⊟!	215+				
-							-x-: -x-:	×-×1 ×-×1	-						
-							-x-3	×-×-	-						
at 5.0m, bec	oming very s	tiff, insensitiv	/e				- <u>-</u>	x-x-	- 		154/108	1.4			
<ul> <li>EOB at 5.0m</li> </ul>	n. Target Dep	oth.							-						
_								F	-						
F								ł	-						
-								ŀ							
È								ŀ	-						
F								-	-						
-		1			1			, ŀ	-6.0	<u> </u>	l				
		Groundwat	er not encount	ered	Borehole Diameter:	Topsoil	>>>	Sa	nd		Sandston	•	Plu	tonic	· + + + - <del>+ + +</del>
	DEP	Measured o	on 6.04.21, 13.	04.21	Charles d	Fill	4	Gra	avel		Siltstone	EZZ:	No	Core	
geotech	nical	UTP = unal	∠ i ble to penetrate	э.	Cnecked:	Clay	 < x x x	Org	janic	<u></u>	Limeston		┩		
		I = OB = end	of borehole		RG	Silt	<pre>x x x</pre>	Pur	nice	. á å ż	Volcanic	$-\mu \sim \sim$	~ I		

Client :	AUCKLAND RACING C	LUB			Aug	er Bo	oreho	le No		HA4
Project Locatio	n: ELLERSLIE RACECOU	RSE, ELLERSL	IE						Sheet	4 of 8
loh Number	101706			Vane I	lead:	Logge	d By:	Process	or: Da	te:
Job Number.	JU1706			30	)7	F	RZ	RZ		29.03.21
Borehole mN	mE Gr	ound R.L.		- <sub>v</sub>	E)	ng evel	e (Pa) idual	'ity	Sam	ple and
Location: Description:	: Refer to site plan			gen	epth	andi ter L	Van€ ∋ar(k k / res	Soil	Laborat	ory / Other
	SOIL DESCRIPTION			Ľ	Ĕ	St Wai	She	Ser	D	etails
TOPSOIL					1					
clayey SILT, orange/brow	vn. Hard, moist, low plasticity [ASH	1]			<u>}</u>					
-										
-					- 0.5		201+			
-					Ł				Sam	nle 1
-					F				Dist	urbed
-					<u>+</u>				0.5-	1.0m
-					-1.0		201+			
-					-					
silty CLAY, orange and lie	ght grey mottled. Hard, moist, med	lium plasticity [RE	SIDUAL		t					
EAST COAST BAYS FO	ŘMĂTION]	1 )[		-2-2-2			201+			
-					-		2017			
-				-×-×-×	t					
-					<u> </u>					
-					- 2.0		201+			
-					t.					
F				-×-×-×	<b>}</b>					
-	a o iti ya				f					
<ul> <li>becoming very suit, insert</li> </ul>	Isilive				2.5		150/104	1.4		
-				-×-×-×	1					
-					£					
-					-3.0		124/72	1.7		
-					1					
-				-×-×-×	F					
-					ŀ					
-				-x-x-x	- 3.5		170/112	1.5		
clayey SILT, orange and	light grey mottled. Hard, moist, low	v plasticity			-					
-										
-							201+			
-				ĮŽŽŽ	- ···					
-				- ÉXXX						
-					+					
					-4.5		201+			
-					F					
-					<u>+</u>					
-							201+			
EOB at 5.0m. Target dept	th						2011			
-					L					
-					$\vdash$					
-					-5.5					
F					F					
-					F					
-					-60					
	Comments.	Borehole Diameter:	Topsoil	$\sqrt{N}$ s	and	<u> </u>	Sandston		Plutonio	<u>,   + + +</u>
	Groundwater not encountered.	50mm	Fill	$\rightarrow \uparrow$	Gravel		Siltstone	2 Z Z :	Z No Cor	<mark>╞╪╪╪</mark>
LANDER	UTP = unable to penetrate.	Checked:	Clay		rganic	YYY	Limeston		3	
geotechnical	EOB = end of borehole.	RG	Silt		umice		Volcanic		<del>. </del>	

Client :	AUCKLAND RACING			Aug	er Bo	oreho	le No	. н	<b>\</b> 5	
Project Locatio	n : RESIDENTIAL DEVEL								Sheet 5	of 8
Job Number		UKSE		Vane H	lead:	Logge	d By:	Process	or: Dat	e:
				19	00		₹G 	RZ	4	29.03.21
Borehole MN Location: Description:	Refer to site plan	Fround R.L.		- pu	h (m)	ding Leve	ne (kPa esidua	il tivity	Samp	ble and
Beschption.				Lege	Dept	Stan Vater	Va Shear eak / r	So Sensit	T	est
T0000	SOIL DESCRIPTION					>	0, 1	0,	De	lans
				$\sum$						
-				$\mathbb{N}$	+					
silty CLAY, orange streak	ed light grey. Very stiff, moist, m	edium plasticity, wi	ith trace		- 0.5		193+			
				-x-x-x-	F				Sam	ole 1
clayey SILT, light grey mo	ottled orange/brown. Very stiff, n	noist, low to mediur	n plasticity		╞				Distu	rbed
-					-		193+		0.0-	1.011
<ul> <li>becoming brown, low plas</li> </ul>	sticity				E				_	
-					F					
- — becoming very stiff mode	rately consitivo							0.7		
- becoming very sun, mode	Tately sensitive				- 1.5		110/41	2.7		
-					F					
-					+					
-					- 2.0		113/39	2.9		
-				ĬŶŶ	-  -					
<ul> <li>silty CLAY, orange/grey n moderately sensitive</li> </ul>	nottled grey. Very stiff, moist, me	edium to high plasti	city,		╞					
-					<b>-</b> 2.5		130/61	2.1		
<ul> <li>becoming orange/brown</li> </ul>					E					
-					F					
<ul> <li>becoming insensitive</li> </ul>					-3.0		130/69	1.9		
silty CLAY, black speckled	d dark brown. Verv stiff. moist. n	nedium to high plas	ticity, with	-x-x-x-	+					
trace organic inclusions		io aloni to iligii piao			F					
-				-x-x-x-	- 3.5		193+			
-				-x-x-x-	╞					
-					È.					
-				-x-x-x-	-4.0		193+			
-				-x-x-x-	F					
-				-x-x-x-						
-				-x-x-x-	-4.5		193+			
-				-x-x-x-						
-				-x-x-x-	-					
at 5.0m, becoming insens	itive			<u>-×-×-×</u>	-5.0		180/102	1.8		
	11				E					
-					-					
-					-5.5					
-					F					
-				1	╞					
-					-6.0					
	Comments:	Borehole Diameter:	Topsoil	Si	and		Sandston		Plutonic	+ + +   + + +
	Groundwater not encountered.	50mm	Fill	G	ravel		Siltstone	2 2 2 2	No Core	
<b>LANDER</b> geotechnical	UIP = unable to penetrate. EOB = end of borehole.	Checked:	Clay -		ganic	NAR NARA	Limestone	· <mark>┣ ┛ ┛</mark>	Ħ	
and the second se		RG	Silt	Pi	umice		Volcanic	$ \psi \vee \vee \rangle$	~	

Client :	AUCKLAND RACING CI			Aug	er B	oreho	le No.	H	IA6	
Project Locatio	n : RESIDENTIAL DEVELO	PMENT						5	Sheet 6	of 8
		RSE		Vane	Head:	Logge	d By:	Processo	or: Date	e:
JOD NUMBER:	JU1706			1	900	F	RG	RZ	0	1.04.21
Borehole mN	mE Gro	ound R.L.		- <sub>-</sub>	(E	ng evel	e (Pa) iidual	ìty	Samp	le and
Location: Description	: Refer to site plan			egen	epth	andi ter L	Vane ear(k <sup>k / res</sup>	Soil	Laborato	ry / Other
	SOIL DESCRIPTION			Ľ	Ĕ	Nai St	She J	Ser	Det	ails
TOPSOIL				$\rightarrow$	1	ΈΓΕ				
_ clayey SILT, dark brown. _	. Stiff, moist, medium plasticity, with	n trace fine grave	I [FILL]			E				
silty CLAY_orange streat	ked light grev. Verv stiff moist high	plasticity mode	rately		4	日日				
sensitive [RESIDUAL EA	AST COAST BAYS FORMATION]	,	<b>,</b>		<b>–</b> 0.5		203/61	3.3		
-				-x-x->	ł					
clayey SILT, orange stre	aked light grey. Hard, moist, mediu	m plasticity		Ţ <u>ŻŻ</u>	1	IΞ				
-				<u>tâ</u> ź	-1.0	ΙΞ	215+			
- becomina light arev				$\begin{bmatrix} x \\ x $						
-						日日				
-							045.			
-					- "	日日	210+			
<ul> <li>becoming orange streake</li> </ul>	ed light grey, with trace limonite			ĮŽŽ.	1	IΞ				
-				<u>tâ</u> ź	<u>-</u>	ΙΞ				
<b>-</b>					- 2.0	日目	190/68	2.8		
-				$\left[ \begin{array}{c} X \\ X \\ X \\ \end{array} \right]$	<u>[</u> -					
-										
-					- 2.5	日日	215+			
-				<u>[</u> 223	1					
-				<u>tâ</u> ź	<u>-</u>					
<ul> <li>becoming light grey with</li> </ul>	trace fine sand				<u> </u>	日目	215+			
-				$\left[ \begin{array}{c} X \\ X \\ X \\ \end{array} \right]$	- 3.0		210+			
-					<u>-</u>					
-						日日				
-				ĮŽŽ.	- 3.5	IΞ	215+			
-				<u>t</u> źż	-					
-	-i					日日				
eithe CLAX light group and			h i a h		-4.0	日日	129/55	2.4		
plasticity, moderaely sen	sitive, with trace limonite	ioist, meaium to	nign		Ł					
-				-x-x->	-					
- 					È.,		160/05	17		
					4.5	日日	100/95	1.7		
clayey SILT, orange. Ver	y stiff, moist, medium plasticity, with	h some limonite								
clavey SILT with trace fin	ne sand dark grev Hard moist low	to medium plact	icity							
TRANSITIONAL EAST	COAST BAYS FORMATION]		liony	$+\times\times$	- 5.0		UTP			
EOB at 5.0m. Target Dep	pth.				$\vdash$					
-					E					
-					-5.5					
F F					Ę					
F					$\vdash$	1				
-										
	Comments:	Borehole Diameter:	Topsoil	$\overline{\overline{\mathbf{x}}}$	Sand	<u> </u>	Sandston	e	Plutonic	++++
	Groundwater not encountered.	50mm	Fill	$\rightarrow \uparrow$	Gravel		Siltstone	2222	No Core	<del>╞╪╪╪</del>
LANDER	and 16.04.21	Checked:	Clay		Organic	in the second se	Limeston		3	
geotechnical	OIP = unable to penetrate. EOB = end of borehole.	RG	Silt X	XXX XXX	umice		Volcanic	- <del></del>	<del>/</del>	

Client :	AUCKLAND RACING			Aug	er Bo	oreho	le No		HA7	
Project Locatio	n: ELLERSLIE RACECO	URSE, ELLERSL	.IE		-				Sheet 7	of 8
Job Number:	.101706			Vane I	lead:	Logge	d By:	Process	or: Date	e:
	mE C			30			~	RZ	2	9.03.21
Borehole MN Location: Description		FOUND R.L.		- pu	h (m)	ding Leve	ne (kPa esidua	il tivity	Samp	le and
Beschption				Lege	Dept	Stan Vater	Va Shear <sub>eak / r</sub>	So Sensit	Te	est est
	SOIL DESCRIPTION				ļ	>	0, 1		Dei	.alis
clayey SILT, brown. Hard	l, dry to moist, low plasticity [ASH	ł]			Ì					
-					$\mathbf{F}$					
<ul> <li>becoming brown/orange</li> </ul>					- 0.5		201+			
-				$\begin{bmatrix} \mathbf{x} \ \mathbf{x} \\ \mathbf{x} \end{bmatrix}$					Samp	ole 1
-					Ł				Distu 0.5-1	rbed .0m
-					-1.0		201+			
<ul> <li>becoming moist, medium</li> </ul>	plasticity				Ĺ					
-					+					
-							201+			
-					- "		2017			
silty CLAY, orange and lig	ght grey mottled. Hard, moist, me	edium plasticity [RE	SIDUAL		Ţ					
EAST COAST BAYS FOR	(MATION]			-x-x-x	╞					
<b>-</b>					- 2.0		201+			
<ul> <li>becoming high plasticity</li> </ul>				-x-x-x	ł					
-					F					
<ul> <li>becoming very stiff, insen</li> </ul>	nsitive				- 2.5		184/138	1.3		
-					F					
<ul> <li>becoming wet</li> </ul>					Ł					
-					-3.0		173/118	1.5		
-					£					
-					┟					
-					- 3.5		178/130	14		
-					}					
-				-x-x-x	Ę					
clayey SILT, grey. Hard, ı	moist, low plasticity						201			
-				<u>t</u> âxâ	1 – 4.0  -		201+			
-					£.					
-					-					
-					-4.5		201+			
-					╞					
-				$\begin{bmatrix} \mathbf{X} \\ \mathbf{X} \\ \mathbf{X} \end{bmatrix}$						
EOB at 5.0m. Target dep	th			FXXX	-5.0		201+			
-					F					
-					E					
-					-5.5					
-					F					
-					E					
-					<b>-</b> 6.0					
	Comments:	Borehole Diameter:	Topsoil	S s	and		Sandstone		Plutonic	++++
	Groundwater not encountered.	50mm	Fill		Favel		Siltstone	2 2 2 :	No Core	
LANDER	UTP = unable to penetrate. EOB = end of borehole	Checked:	Clay	0	rganic	<u>ÅÅÅ</u> AAA	Limestone		<u> </u>	
gootoonnoal		RG	Silt	××3 P	umice	·@@@ 	Volcanic	[ ~ ~ ~ ~	J – T	

Client : AUCKLAND RACING CI			Aug	er Bo	oreho	le No		HA8	
Project Location : ELLERSLIE RACECOUF	RSE, ELLERSL	IE						Sheet	8 of 8
Job Number: J01706			Vane H	lead: 7	Logge F	d By: 87	Process R7	or: Da	ite: 29.03.21
Parabala MN ME Gro	ound R.L.			Ē	el .	a) al			
Location: Description: Refer to site plan			jend	oth (n	nding r Lev	ane ar(kP; ′ <sub>residu</sub>	oil sitivity	Sam Laborat	ple and ory / Other
SOIL DESCRIPTION			Leç	Dep	Sta Wate	V Shea <sup>peak</sup>	S Sens	T Di	Γest etails
TOPSOIL			$\sim$					Socia	
_ clayey SILT, orange and grey mottled brown. Hard, moist, m	nedium plasticity [	[FILL]		}				Pentror	neter
FOR at 0.4m. Too hard to auger further. Scale pentremeter	tost commoncod	and found	$\mid \square$	F				(blows/	100mm)
effective refusal (ER) at 0.6m.	test commenced			<del>-</del> 0.5				= 10	
-				E				<del>-</del> 20+ (E	R, HB)
-				+				HB = H Bouncir	ammer ng
-				-1.0					5
				F					
_									
-				-1.5					
-				F					
-				- 20					
_									
-				F					
-				- 2.5					
				F					
-				F					
-				-3.0					
-				F					
-				F					
-				- 3.5					
-				F					
-				F					
-				-4.0					
-				L					
-				F					
-				-4.5					
-				F					
-				-					
-				- 5.0					
-				F					
-				-					
-									
-				╞					
- 				<u>-6.0</u>					
Comments:	Borehole Diameter:	Topsoil	s	and		Sandstone	• • • •	Plutoni	,
Groundwater not encountered. UTP = unable to penetrate.	50mm	Fill	G	ravel	<u>www</u>	Siltstone	2223	No Cor	e
geotechnical EOB = end of borehole.	RG	Silt	0 0 	umice	<u>***</u>	Limestone Volcanic		년	

	Client :	Client : AUCKLAND RACING CLUB								ine	Bor	eho	le l	No.	MF	101
	Project Locatio	n: ELLERSLIE	RACECO	URSI	E, ELL	ERSL	.IE						Sh	neet 1	of	4
	Job Number:	J01706						Vane He 1900	ead: Lo	gged I RG	By: P	roces: RG	sor :	Start Finish	Date: Date:	30.03.21 31.03.21
рhу	Borehole mN	mE				Grou	ind R.L.			ater/ ster	sthod	(%)	(9	and	ails	al / Γ
tigral	Location: Description	Refer to site plan		<del>م</del>	6	Orier	ntation:	vertical		swbni zome	ng Me Casir	very	%) QC	nple borate	t Det	ne Di insitiv k SPT
Stra	CORE	DESCRIPTION		Legen	Depth (m)		DEF	ECTS		Grou	Drillir &	Reco	R	Sar Lal	Tes	Se Se
				$\overline{\langle \cdot \rangle}$	$\left  \right $			Bentonite			rrel					
Ē	<ul> <li>clayey SILT, orange, dark</li> <li>Hard, moist, medium plas</li> <li>inclusions</li> </ul>	< grey and light brown/gr sticity, with occasional fir	ey streaked. ne gravel		- - - -						Open Ba	74			U	TP
Ash	<ul> <li>clayey SILT, light brown r</li> <li>medium plasticity, with m</li> </ul>	nottled dark brown/red. inor fine basaltic gravel	Hard, moist,									60				
	fine to medium scoriaceo brown/red. Loose, moist,	us GRAVEL with some no plasticity	silt, dark		- 1.0 -		Gra	avel backfill				54			U	TP
	silty CLAY, dark brown/re plasticity, with minor base	ed. Very stiff, moist, med altic inclusions up to 70n	ium nm diameter	-x-x-: -x-x-: -x-x-:	- 1.5 - -		sc 1.	creened from 0m to base	m — — •			SPT				SPT at 1.5-1.95m 6/2/4
	<b>–</b> - -			-x-x-: -x-x-: -x-x-:	2.0			Groundwat 2.8m. Mea	er at sured							0-11
	clayey SILT, orange/red a moist, medium plasticity at 2.6m, becoming red/br	and orange mottled red/l own, low plasticity	orown. Hard,		- - -		Grour 2.86m Meas	on 16.04.2 ndwater at n. ured on	1			76				
	slightly clayey SILT, oran stiff, moist, low plasticity	ge/brown streaked dark	green. Very		- - 3.0		13.04 Grou 3.05 Mea	.21 undwater at m. sured on			ube	РТ			U	TP SPT at 3.0-3.45m
	E			$ X \times Z \rangle$ $ X \times Z \rangle$			06.0	4.21		目	ple T	S				0/0/0 N=0
d Basalt	slightly weathered, black,	vesicular BASALT; Stro	ng		- 3.5 - -	at 3.8	-4.0m, Ch	aotically fra	octured		Ţ	36	36			
canic Fiel	<b>-</b> - -				- 4.0 - -	1JN, 8 1JN, 1	ST, R4, 30 UN-PL, R4	)° 4, 30°				100	36			
and Vo	<b>–</b> -				4.5	infill at 4.6	m, 1JN, P	L, R4, 90°,	clay clay			100	36			
Auck					5.0	at 4.8	m-5.2m V	oid				0	0			
	slightly weathered, black,	vesicular BASALT; Stro	ng													
					<b>5</b> .5	Chaot Chaot	tically fract	tured tured				86	36			
Alluvium	fine to medium basaltic G mottled black. Loose, mo clayey SILT, orange strea plasticity, with trace limon	RAVEL with minor clay, ist, no plasticity, aked light grey. Stiff, mo iite	light grey st, medium	XXXXX XXXXX XXXXX	6.0											
				<u>X X X X X </u> X X X X X X X X X X X X X X	7.0							100				
	with trace black organic in	nclusions		<u>IXIXIXIXIXIXI</u> XIXIXIXIXIXIXIXIXIXIXIXIX	- - - -											
⊢		Commente		<u>[x̄x̄</u> ;	<b>— 8.0</b> Drilling	Fluid:	Topsoil	$\overline{}$	Sand	re. T	۱ ا		one	 • • • • •	Plutonic	+++
		comments.			wa	ter	Fill	$\Rightarrow \Rightarrow$	Gravel		s S	Siltston	e	<del>2 2 2 1</del> 2 2 2 1	No Core	• • • • •
	LANDER				Chec	ked:	Clay		Organic			imesto	one			
1	geotechnical	Driller: Pro-Drill	Rig: Tractor		RF	>	Silt	$\times \times \times \times$	Pumice			/olcani	。			

	Client :		N	lach	ine E	Bor	eho	le N	lo.	MF	<b>I</b> 01				
	Project Locatio	on: ELLERS	LIE RACEC	OURS	E, ELI	ERSLIE						She	eet 2	of 4	1
	Job Number:	J01706					Vane H 1900	ead: Lo 0	gged B RG	y: P	rocess RG	sor :	Start Finis	Date: h Date:	30.03.21 31.03.21
hy	Borehole mN		mE			Ground R.L.			tter/ ter	thod	(%)	-	and	ails	al / ty
igrap	Location: Description	n: Refer to site pl	an			Orientation:	vertical		ndwa omet	d Me	very	D (%	iple a	Deta	e Dia Isitivi SPT
Strat	CORE	DESCRIPTION		egenc	Depth (m)	DEF	ECTS		Grou	Drilling & C	Reco	RQ	Sam	Test	Van Ser &
E					_				tet	e E					SPT at
lluviu	<ul> <li>with trace fine sand</li> </ul>				-				目	e Tuł	SPT				1/2/4 N=6
A	- 	gravel sized basaltic	inclusions to	XX	- 8.5				目	<b>Γ</b> ripl€					
									目	'	g				
	-			$\begin{bmatrix} \overline{X} \ \overline{X} \end{bmatrix}$	- - 9.0				昌		Ĕ				
									[目]						SPT at
	-				- 45				目		μ				9.2-9.65m 0/2/3
	-				-				目					-	N=5
	 organic stained silty CLA	Y, dark grey/brown.	Stiff, moist,		-										
	medium to high plasticity	inclusions			- 10.0 -										
	-								昌		100				
					<del>-</del> 10.5				[目]						
	silty CLAY, orange mottle medium to high plasticity	ed light grey/brown. S , with trace limonite	Stiff, moist,	-×-×-					目						
	<b>—</b> -			-x-x-	<b>—</b> 11.0 —				目						SPT at
	-								目		SP				0/2/2 N=4
	- -			-x-x-	11.5										
	-				-						100				
	-				- 12.0										SPT at
	organic stained silty CLA moist, high to medium pl	Y, black mottled brow asticity, with trace bla	wn/grey. Stiff, ack organic								SPT			ľ	12.0-12.45m 0/1/1
	<ul> <li>inclusions</li> </ul>				- 				目		$\vdash$				N=2
	F			-8-8- -8-8- -8-8-	-				目						
	- - <b>-</b>								目						
	-				-										
					-										
	<b>-</b> -				<b>—</b> 13.5 — —				目		Ņ				
	-			-X-X- -X-X- -X-X- -X-X-	-				目						
	<b>-</b> -			-x-x- -x-x- -x-x- -x-x- -x-x-	<del>-</del> 14.0 -										
	<pre>silty CLAY with trace fine</pre>	sand, black mottled	light grey/brow	n.	E										
	Stiff, moist, high plasticit	y, with trace organic i	inclusions		<b>-</b> 14.5										
	<ul> <li>with very thin layer black</li> </ul>	wood			-										
	with some black organic at 15.0m, becoming light	inclusions grey, with minor fine	sand, without		- 15.0										SPT at
	_ organic inclusions			-×-×- -×-×-	-						SPT				15.0-15.45m 0/1/2
	<ul> <li>becoming dark grey</li> </ul>			-x-x-	- - 15.5				≣	lire	$\parallel$				N=3
				-×-×- -×-×-	E				目	n Ba	_				
	-				- 					Ope	ĕ				
		Comments:			Drilling	g Fluid: Topsoil	$\gg$	Sand		s	andsto	ne		Plutonic	;
	LANDER				Chec	Ked: Clay	44	Gravel			Siltston			No Core	)
	geotechnical	Driller: Pro-Drill	Rig: Tracto	or	RI	P Silt	XXXX	Pumice		× -	Volcani	c			

	Client :		N	<i>l</i> lach	ine	Bor	eho	le l	No.	MH0 <sup>.</sup>	1					
	<b>Project Location</b>	: ELLERSLIE	RACECO	URSE	E, ELL	ERSLI	E						Sh	eet 3 c	of 4	
	Job Number:	J01706						Vane H 1900	ead: Lc 0	ogged I RG	3y: Pi	rocess RG	sor :	Start Dat Finish Da	te: 30 ate: 31	).03.21 1.03.21
hy	Borehole mN	mE				Grour	nd R.L.			ater/ ter	thod	(%)	()	and ory ails		it a
tigra	Location: Description:	Refer to site plan		9		Orien	tation:	vertical		indw: zome	g Me Casir	very	ND (%	nple a porate t Det	j j	ופ ני SPT נ
Stra	CORE D	ESCRIPTION		-egen	Depth (m)		DEFI	ECTS		Grou	Drillin &	Reco	R	San Lat Tes	Var	2 0 %
Alluvium	CORE D	c stained silty CLAY sand, dark grey. Stiff, n	moist,	섢흾욚ᅝᆙᇶᅝᆙᇶᅝᆙᇶᅝᆙᇶᅝᆙᇾᅝᆙᇶᅝᆙᇃᅝᆙᇾᅝᆙᇃᅝᆙᅝᅝᆙᇾᅝᆙᇶᅝᆙᇶᅝᆙᇶᅝᆙᇶᅝᆙᇔᆙᇔᆙᄣᇔᆙᇏᄣᇔᄣᇔᄣᇔᄣᇔᄡ ᇵᇗᇉᇉᇥᇥᇥᇥᇥᇥᇥᇥᇥᇥᇥᇥᇉᇉᇉᇉᇉᇉᇉᇉᇉᇉᇉᇉᇉᇉᇉᇉᇉᇉᇉᇉᇉᇉᇉ	□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □		DEFI	ECTS		ឲ្យបំណុំបំណុំបំណុំបំណុំបំណុំបំណុំបំណុំបំណុ	Triple Tube Open Barrel Dri	84 SPT 63 SPT 68 Re			0/0 19.	SPT at 5-17.95m 1/3/4 N=7 SPT at 5-19.95m 7/7/8 N=15
East Coast Bays Formation Bedrock	highly weathered, dark grey with very thin black extreme carbonaceous bands becoming medium SANDS carbonaceous inclusions, w green hardened silt clast in at 22.0m, without hardened becoming medium to cours gravel sized hardened dark clast inclusions, with trace l	y, fine SANDSTONE; V ely closely to closely sp TONE, with some blac vith minor fine gravel si clusions I silt clast inclusions I silt clast inclusions e SANDSTONE, with f green, dark red and d black carbonaceous in	Veak paced k ized dark trace fine ark grey silt clusions		21.0 21.5 21.5 22.0 22.5 23.0 23.5 23.5	at 21.3r 80-90°	n-22.0m,	5JN, PL, I	R4,			90 SPT 100 SPT	100 SPT 100 SPT		21. for	0-21.15m 50 130mm N>50 SPT at 5-22.95m 50 110mm N>50
		Comments:			<b>— 24.0</b> Drilling	g Fluid:	Topsoil		Sand		s	andsto	ne	Plu	Itonic	· + + + ·
					wa	ter	Fill		Gravel		5	Siltston	e	ZZNo	Core	
	<b>LANDER</b> geotechnical				Chec RI	ked:	Clay	 ×××××	Organic			imesto	ne		-+	
		Uriller: Pro-Drill	Rig: Tractor				Silt	хххх	Pumice	نَّهُمًا	۱۱۵۵	/olcan	ic	~~~		

	Client :	lient : AUCKLAND RACING CLUB									eho	le	No.	MH01
	Project Locatio	n: ELLERSLIE	RACECO	JRSI	E, ELL	ERSLIE						Sł	neet 4 of	- 4
	Job Number:	J01706					Vane He 1900	ad: Lo	gged l RG	By: Pr	oces RG	sor :	Start Date	e: 30.03.21
γu	Borebole mN	mE				Ground R.L.			er/ er	pou	(%		n sie Bis Za	
igrapl	Location: Description	: Refer to site plan				Orientation:	vertical		ndwat	g Mett	very (	D (%)	ple al oratol Deta	e Dia Isitivit SPT
Strat	CORE I	DESCRIPTION		-egend	Depth (m)	DEF	ECTS		Groui Piez	Drilling & O	Reco	RQ	Sam Lab Test	Van Ser &
Jok	-			••	-						PT-	SPT		SPT at 24.0-24.12m
Bedro	EOB at 24.12m. Target [	Depth.			-									50 for 120mm
ation	-				<b>-</b> 24.5									N>50
Form														
Bays														
oast														
ast C														
ш														
											06	8		
												Ť		
		Comments:			Drilling	Fluid: Topsoil	$\mathbb{R}$	Sand	$\left  \right $	Sa	andsto	one	Plut	onic + + +
	LANDER				Chec	Ked: Clay	<u> </u>	Gravel		S I	iltston			Core
	geotechnical	Driller: Pro-Drill	Rig: Tractor		R	P Silt	XXXX VVVV	Pumice			/olcan	ic		

LANDER PARK Sealer				
				tone transmission of the second secon
	client:	AUCKLAND RACING CLUB	project no:	figure no:
	project:	ELLERSLIE RACECOUSE	J01706	Figure MH01a
LANDER		ELLERSLIE	compiled:	date:
	title:	PHOTO SUMMARY	RG	30.03.21-31.03.21

	70/704 00112 Packook 00112 Packook 00112 Packook				
	client:		AUCKLAND RACING CLUB	 project no:	figure no:
	project:			.101706	Figure MH01b
LANDER				compiled:	date:
geotechnical	title:		ELLEKƏLIE		
- AV	uue.		PHOTO SUMMARY	RG	30.03.21-31.03.21

	Client :	AUCKLAND F	RACING	CLUE	3		Ma	ichi	ne I	Bor	eho	le l	No.	М	H02
	Project Locatio	n: ELLERSLIE R	ACECO	URSE	E, ELL	ERSLIE						Sh	eet 1	of	2
	Job Number:	J01706					Vane Head 1900	d: Log	gged E RG	3y: P	rocess RG	or :	Start Finisł	Date: n Date	31.03.21 : 01.04.21
hy	Borehole mN	mE				Ground R.L.			ater/ ter	thod	(%)	(	and	ails	al /
tigrap	Location: Description:	Refer to site plan		5		Orientation:	vertical		ndwa zome	g Me Casin	very	ND (%	ple a	t Det	ne Dia Insitivi
Stra	CORE D	DESCRIPTION		Legen	Depth (m)	DEF	ECTS		Grou Pie:	Drillin & (	Reco	RC	San	Tes	Sel Sel
	TOPSOIL			$\sum$	-		Bentonite —		=] E	rrel					
Fill	<pre>clayey SILT, orange, grey Hard, moist, medium plas</pre>	and light brown/yellow mo ticity, with trace fine grave	ottled. I						-1 [-1	n Ba	72				
٨sh	_ clayey SILT, black specke	ed dark brown. Very stiff, n	noist,	<u>X</u> X;	<del>-</del> 0.5 -					Ope				U	JTP
⊲											100				
	<b>_</b>				- 1.0	Gra	vel backfill—		Ħ					2	215+
	<ul> <li>becoming dark brown spe</li> <li>gravel sized dark red/brow</li> </ul>	cked orange/brown, with t vn hardened silt clast inclu	race fine sions	$\overline{X}$					昌]		100				
	fine to medium scoriaceou	us gravel, red/brown. Loos	e, moist,	× × )	- 1.5	Pie sci 1 c	ezometer reened from <sup>-</sup>		- <b>[</b> ]					l	SPT at
uvium	<ul> <li>_ no plasticity _</li> <li>_ silty CLAY, light grey streated by the plasticity.</li> </ul>	aked light orange. Stiff, mo	oist, high	-x-x-: -x-x-:	Ē	1.0	in to base	•	1日		ß				8/9/8 N=17
Alli					- 2.0				目						
					-										
	<b>–</b> –				- 2.5				目		48				
	-			-×-×-:				•	目						
	- -				- 3.0						$\vdash$			3	36/61 - 1.4 SPT at
	-										SPT				3.0-3.45m 1/1/2
	clayey SILT with minor fin	e sand, orange streaked li	ght grey.	-×-×-: 	- 3.5				目		$\square$			1	N=3
	<ul> <li>Very stiff, moist, medium t</li> </ul>	to low plasticity			-				目						
	- - - alovey SILT with miner fin	o cond dark grov Stiff m	oiot		- 4.0				]]		100				
	<ul> <li>medium to low plasticity</li> </ul>	e sand, dan grey. Sun, m	uist,		_				目		$\left  \right $				
	- -				- 	Gro	oundwater at		目					7	77/31 - 2.5 SPT at
				$\left  \overline{X} \overline{X} \right\rangle$	E	4.7 on Groui	m. Measured 06.04.21 — odwater at				μ				4.5-4.95m 2/4/6
	-				- 5.0	4.77n Meas	n		Ĩ						N=10
	with moderately thin bed c	organic stained clayey SIL	т			13.04 Gro	.21 oundwater at		11						
	→ →with very closely spaced, I	laminated grey silty CLAY	beds	$\overline{X}\overline{X}$	- 5.5	4.8 Me 16	3m. asured on 04 21		目		100				
						10.	04.21								
	-				- - 6.0				]]					ι	JTP SPT at
					E				<u></u> ]		PT				6.0-6.45m 8/10/18
	_ <b>_</b>			$\overline{X}$	- - 6.5				]]		Ľ,				N=28
									[]						
	_ <b>_</b>			(XX) XXX	- 7.0			•	]]		6				
	-			$\left  \overline{X} \overline{X} \right\rangle$					目						
	→ without silty CLAY bands				- 7.5				目	<u>]</u> e	$\square$			ι	JTP SPT at
									]]	le Tu	SPT				7.5-7.95m 1/1/2
	-				- 8.0			1	且	Trip					N=44
		Comments:			Drilling wa	Fluid: Topsoil	Sa Sa	and .		s	andsto	ne	• • • • • • • • • • • • • • • • • • •	Pluton	ic + + + +
	LANDER				Chec	Fill ked: Clav	Gr Or	ravel ganic			imesto	, ne		NO CO	re
	geotechnical	Driller: Pro-Drill F	ig: Tractor		RF	Silt	X X X X X X X X Pu	imice			olcanic				

	Client :	AUCKLANE	RACING	CLUE	3			/lachi	ne B	Boreh	ole	No.	мно	2
	Project Location :	ELLERSLIE	RACECO	URSE	E, ELLE	RSLIE					S	heet 2	of 2	
	Job Number:	J01706					Vane H 190	ead: Loo 0	gged B RG	y: Proce	essor G	: Start Finisł	Date: 3 Date: 0	1.03.21
hy	Borehole mN	mE			(	Ground R.L.			ater/ ter	g (%)		, pri	ails	ity
tigrap	Location: Description: Refe	er to site plan				Orientation:	vertical		ndwa <u>romet</u>	g Me	(%) Q	iple a	t Det	In Sitivi SPT
Stra	CORE DESCI	RIPTION		egenc	Depth (m)	DEF	ECTS		Grou Piez	Orillin & O	RO R	Sam	Test	Ser Ser &
Alluvium				\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\						Triple Tube	-		S fc	SPT at .5-9.91m 14/50 pr 260mm N>50
Coast Bays Formation	<ul> <li>silty CLAY, dark grey. Hard, mois</li> </ul>	t, medium to hig	gh plasticity		- - - - - - - - - - - - - - - - - - -					SPT 35			1 <sup>1</sup> fc	SPT at 1.0-11.4m 15/50 or 250mm N>50
Transitional East	- clayey SILT with trace fine sand, medium plasticity	dark grey. Very	stiff, moist,	*1*1*1*1*1*1*1*1×1×1×1×1×1×1×1×1×1×1×1×	- - - - - - - - - - - - - - - - - - -					SPT			12	SPT at .5-12.95m 10/11/16 N=27
	- - - - - - silty CLAY, dark grey. Hard, mois	t, high to mediu	m plasticity	<pre>dxlxlxlxlxlxlxlxl, *, *, *, *, *, *, *, *, *, *, *, *, *,</pre>	- 13.0 					0 U	}			SPT at
					_ _ _ _ _ _ _ _ _					ZPT ZPT			14	.0-14.45m 11/19/26 N=45
	EOB at 15.95m. Target Depth.			· · · · · · · · · · · · · · · · · · ·							-		15	SPT at 5-15.95m 14/18/26 N=44
	Comm	nents:			Drilling Fl	luid: Topsoil	$\gg$	Sand		Sand	stone	***	Plutonic	++++
					Chock	Fill	<u> </u>	Gravel	<u>.</u>	Siltst	one	2221	No Core	
	geotechnical Driller:	Pro-Drill	Rig: Tractor		RP	Silt	XXXX	Pumice		Volc	anic			

	lient:	AUCKLAND RACING CLUB	project no:	figure no:
	project:	ELLERSLIE RACECOUSE	J01706	Figure MH02
LANDER		ELLERSLIE	compiled:	date:
geotechnical	title:	PHOTO SUMMARY	RG	31.03.21-01.04.21

	Client :	AUCKLAND	RACING C	LUB			N	lachi	ine I	Bor	eho	le N	lo.	MH0	3
	Project Locatio	n: ELLERSLIE	RACECOU	IRSE, E	LLERSI	_IE						Sh	eet 1	of 2	
	Job Number:	J01706					Vane He 1900	ead: Lo )	gged E RG	By: Pr	ocess RG	sor :	Start D Finish	)ate: 0 Date: 0	6.04.21 7.04.21
hy	Borehole mN	mE			Grou	und R.L.			ater/ ter	thod	(%)		and	ails	ity '
tigrap	Location: Description	: Refer to site plan		7	Orie	ntation:	vertical		ndwa	g Me Casin	very	%) Qi	iple a	Det	Insitivi SPT
Stra	CORE I	DESCRIPTION		Legend Depth	Ê)	DEF	ECTS		Grou Piez	Drilling & 0	Reco	RQ	Sam Lab	Test	van Ser &
Fill Stratig	CORE I clayey SILT, light orange stiff, moist, medium plasti at 0.15m, with 60mm diar with 100mm diameter bas with moderately thin bed l coarse to medium basaltic plasticity silty fine GRAVEL, dark g no plasticity, with minor plasticity, with minor slightly weathered black v silty CLAY, black and gre high plasticity, with minor brick at 3.45m CONCRETE slightly weathered, black, clayey SILT, dark brown. with trace fine to medium with 90mm diameter basa without fine gravel with 45mm diameter woo at 6.35m, with 70mm diar at 6.4m, with 70mm diar	DESCRIPTION and light grey mottled bi city, with minor fine grave ter concrete block neter basaltic gravel altic gravel casalt c GRAVEL, black. Loose rey specked dark brown tedium gravel resicular BASALT; Stron y mottled light brown. St fine gravel, with 40mm of vesicular BASALT; Stron Very stiff, moist, medium gravel altic gravel d block mater can up to 30mm diameter meter basaltic gravel	rown. Very rel		0       0         5       0         5       0         5       0         5       0         5       0         5       0         5       0         5       0         5       0         5       0         5       0         5       0         5       0         5       0         5       0         5       0         5       0	Groundw 6.02m. M on 13.04. Grouna 6.19m. on 16.1	ECTS Bentonite avel backfil ezometer reened fro om to base		intriction of the second se	Triple Tube Open Barrel Drilling & Ca	0 11 148 39 SPT 94 10 17 SPT 60 44 100 Recove	RQD	Samp		S & S S SPT at 1.5-1.58mm (HB) N>50 SPT at .5-3.73m 3.6 or 75mm (HB) N>50
	- - - -				5										
	-	1	k				<u></u>		ļΞl	. 1					<b>.</b>
		Comments:		Dril	ling Fluid: water	Topsoil	$\gg$	Sand		S	andsto	ne	F	lutonic	
					water	Fill		Gravel		s	iltstone	•		lo Core	
	LANDER geotechnical			Cł	necked:	Clay		Organic	KWY & X		mesto	ne			
		Driller: Pro-Drill	Rig: Tractor		RP	Silt	~ ^ ^ ^ A X X X X	Pumice		Iv	olcanio	, [ .	::::		

	Client :	AUCKLANE	RACING	CLU	В			М	ach	ine	Bore	eho	le M	lo.	MH	03
	Project Locatio	on: Ellerslie		URS	E, ELI	ERSL	IE						Sh	eet 2	of 2	
	Job Number:	J01706						Vane He 1900	ad: Lo	ngged   RG	By: Pr	oces: RG	sor :	Start D Finish	)ate: ( Date: (	)6.04.21 07.04.21
۸hd	Borehole mN	mE				Grou	nd R.L.			ater/ ter	ethod	(%)	()	and	ails	al / ⊺ity
tigra	Location: Description	Refer to site plan		0	-	Orier	ntation:	vertical		indw: zome	g Me Casir	very	%) Q	nple a	t Det	ie Di nsitiv SPT
Stra	CORE	DESCRIPTION		Legen	Depth (m)		DEFE	ECTS		Grou	Drillin &	Reco	R	Sar Lat	Tes	Vai Se 8
Alluvium	silty CLAY, orange stread medium to high plasticity	ked light grey/brown. Sti ,	iff, moist,		- - - - - - - - - - - - - - - - - - -						Triple Tube	0 SPT				SPT at 3.0-8.45m 2/3/4 N=7
's Formation	fine sandy SILT with min- Medium dense, moist, lov silty CLAY, dark grey, Ha	or clay, white specked c w to no plasticity rrd, moist, medium to hig	lark grey. gh plasticity		9.5 - - - - 10.0							SPT				SPT at 9.5-9.95m 4/9/14 N=23
al East Coast Bay	with trace fine sand without fine sand without fine sand with minor black carbona	ceous inclusions			- - - - - -							84				
Transition					- 11.0 							SPT			1	SPT at 1.0-11.24m 27, 50 for 90mm N>50
tion Bedrock	☐ highly to moderately wea	thered white specked d /ery weak	ark grey,	-×-×- ••• ••• •••	12.0	Chaot at 12,.	ically fractu .0-12.3m, 3	Ired BJN, PL, R4	4, 90°			57	60			
oast Bays Forma				•••	- 12.5 - - - - 13.0			,,	.,			SPT	SPT		1:	SPT at 2.5-12.75m 30,50 for 95mm N>50
East Co	moderately weathered, d	ark grey, fine SANDST(	DNE; Weak	• • • • • • • •	- - - - -	1JN, F at 13.7	PL, R4, 90° 7-13.8m, 2	JN, PL, R4	↓, 80°			58	66			
	<b>-</b> - -			**	- 14.0 -	at 13.9 80-90°	95m, 1JN, °	PL-UN, R4	1,			SPT	SPT		1	SPT at 4.0-14.28m 37, 50 for 130mm
	EOB at 14.28m. Target I	Jepth.			- - - - - - - - - - - - - - - - - - -											N>50
┢	-	Comments:			<b>— 16.0</b> Drilling	g Fluid:	Topsoil	$\overline{\mathbf{N}}$	Sand	1	l Sa	andsto	ne		Plutonic	+++
					wa	iter	Fill		Gravel		s	iltston	е	ZZN	lo Core	
	LANDER				Chec	ked:	Clay	(	Organio		<u>k w</u> K w Li	mesto	ne			
ĺ	georeennical	Driller: Pro-Drill	Rig: Tractor		R	Р	Silt	×××× ×××××	Pumice		88 V	'olcan	ic	/~~/		

	client:		project no:		figure no:
	project:	AUCKLAND RACING CLUB	project no.		
	project:	 ELLERSLIE RACECOUSE		J01706	Figure MH03
LANDER		ELLERSLIE	compiled:		date:
geotechnical					

	Client :	AUCKLAND RACI	NG CLU	JB		Mac	hine Bo	ehole	No. I	VH04
	Project Loca	ation: ELLERSLIE RACE	COUR	SE, ELI	ERSLIE				Sheet 1 of	3
	Job Number	<b>r:</b> J01706				Vane Head: 1900	Logged By: F RG	Processor RG	: Start Date Finish Date	e: 29.03.21 e: 29.03.21
hy	Borehole mN	mE			Ground R.L.		ter/ er hod	(%)	nd ry	/ I
grap	Location: Descri	ption: Refer to site plan			Orientation:	vertical	ndwa Dmet Met	ery (	ple a brato Deta	e Dia sitivit SPT
Strati	со	RE DESCRIPTION	Legend	Depth (m)	DEF	ECTS	Grour Piezo Drilling		Sami Labo	Vane Sen &
	TOPSOIL			1		Bentonite	L L L			
Alluvium	clayey SILT, light or moist, medium plast at 0.4m, with minor at 0.5m, with thin be at 0.6m, with extrem hardened limonite S	ange mottled light grey/brown. Very si ticity limonite ad dark orange/brown limonite SILT at rely closely spaced laminated beds SILT, to 0.65m	40° × ×	- - - - -				00 100		UTP
	at 0.7m, with trace f grey organic stained at 0.9m, with lamina at 1.0m, becoming g at 1.2m, with moder	it is sity CLAY ted bed orange hardened limonite SIL grey ately thin bed limonite SILT	" [X X X T [X X X] X X X [X X X X [X]	- - - -	Gra	vel backfill		00		UTP
	- - -			- 	Pie scr 1.0	zometer eened from — m to base		- -		UTP SPT at 1 5-1 95m
	_ slightly clayey SILT _ dark grey. Hard, mo	with minor fine sand, orange streaked ist, low plasticity, with minor limonite		- 2.0				Ъ		13/19/17 N=36
	– becoming dark gree	en and orange stained dark grey		- - - - - -				100		
	<ul> <li>becoming medium p</li> <li>becoming dark grey</li> </ul>	olasticity, with without fine sand , without limonite staining		- 3.0	Gro 3.66 on (	undwater at 6m. Measured 06.04.21	►₽			UTP SPT at
	-		(X X X) (X X X)		Groun	dwater at		SPT		3.0-3.45m 9/12/16 N=28
				- 3.5 	Grour 3.74m 3.74m	04.21 ndwater at n. Measured .04.21		100		
	<ul> <li>− with moderately thin</li> <li>− inclusions</li> </ul>	bed with minor black carbonaceous	X X X X X X X X X X							UTP SPT at
	<ul> <li>becoming orange ar</li> <li>becoming orange st</li> </ul>	nd dark green mottled						SPT		4.5-4.95m 15/50 for 180mm N>50
				- 5.5 - 5.5 - 5.5				00		
	- - - - - - -			- 6.0 						SPT at
	- - - - -		איאיאיאיא גיאיאיאיאיא	- - - - - 7.0				SPT		6.5-6.95m 23, 50 for 225mm N>50
	- 	ey, without limonite	<u>(                                    </u>	7.5				94		
		Comments:		Drilling	g Fluid: Topsoil	Sand	d l	Sandstone	Pluto	nic +++
				wa	iter Fill	Grav	/el	Siltstone	Z Z Z No C	ore
	LANDER			Cheo	ked: Clay	Orga	inic	imestone		
	georeennical	Driller: Pro-Drill Rig: Tr	actor		Silt	×××× ×××× <sup>Pumi</sup>		Volcanic		

	Client :	AUCKLA	ND RACING	CLUE	В		N	Mach	ine	Bor	eho	le l	No.	M	104
	Project Locatio	n: ELLERSL		URSI	E, ELL	ERSLIE						Sh	eet 2	of	3
	Job Number:	J01706					Vane H 190	lead: Lo 0	ogged I RG	By: P	rocess RG	sor :	Start Finis	: Date: h Date:	29.03.21 29.03.21
hy	Borehole mN	n	۱E			Ground R.L.			iter/ ter	thod	ع (%)	(	nd	ails	ty /
tigrap	Location: Description	: Refer to site pla	an	1 77		Orientation:	vertica	I	ndwa zomet	g Me	very	%) (%	iple a	t Deta	ie Dia Isitivi SPT
Stra	CORE I	DESCRIPTION		egenc	Depth (m)	DEF	ECTS		Grou Piez	Srilling &	Reco	RQ	San	Test	Van Ser &
E	_				-				B	pe [	F				SPT at 8 0-8 41m
lluviu	-								目	e Tu	S R				19, 50 for 228mm
A					<b>-</b> 8.5					Tripl				Γ	N>50
	_			$\frac{X}{X}$											
	-				9.0				目		94				
	=								目						
	-				- 9.5										SPT at
	-			X X					目		SPT				9.5-9.45m 22/22/28
0	- - bocoming orange mottled	aroop/arov			- - 10.0				E.						N=50
	<ul> <li>with moderately thin bed</li> </ul>	highly weathered ora	nge mottled						目						
	<ul> <li>dark grey, fine SANDSTC</li> </ul>	ONE; Extremely to ve	y weak at 40°		- - 10.5				目		95				
	-			X X					目						
	– at 10.9m, becoming dark <del>–</del>	grey			- <b>-</b> 11.0				E.						SPT at
	-								目		SPT				11.0-11.44m 13, 50
	_ —becoming clayey SILT, m	edium plasticity,with	laminated black		- 				目						N>50
	<ul> <li>organic band, without fine</li> <li>at 11.6m, with minor black</li> </ul>	e sand k organic inclusions		X X					目						
o	<ul> <li>at 11.7m, becoming low p</li> <li>very closely spaced lamin</li> </ul>	ited bed grey silty CL	ne sand, with AY		-				目		100				
	-				-				E.						
	-				-									L	
	-			XIXI XIXI	- 12.5 						РТ				SPT at 12.5-12.95m
	- - 	wn fino limonito grov	ol		-				目		S				N=48
	clayey SILT with trace fin	e sand, dark brown/o	range mottled		- 13.0 -				目						
	with trace limonite at 13.2m, with very thin la	aver dark orange/brow	vn limonite		-				目						
	band at 20° interbedded very thin to th	hin clayey SILT, oran	ge mottled		- 13.5 -				目		6				
	<ul> <li>light brown/grey. Hard, me</li> <li>very thin to thin silty CLA</li> </ul>	oist, medium plasticit Y, grey. Hard, moist,	y beds with medium		-				E.						
	plasticity slightly clayey SILT with to plastic the second sec	race fine sand, dark	orange mottled	XX) XX)	- 14.0 -				目		⊢				SPT at 14.0-14.45m
	at 13.7m, with very thin b	ed hardened dark red mottles	l/brown	XX) XX)					目		Ъ				8/15/25 N=40
	fine sandy SILT with trace light orange/brown. Dense	e clay, light grey and e, moist, no to low pla	black mottled asticity, with	XXX	<b>-</b> 14.5				目					Г	
	trace manganese oxidatio	on		(X, X) (X, X) (X, X)					II.						
	━with orange streaks at 10 ━	٥		XX) XX)	<del>-</del> 15.0				目		67				
	– – becoming orange streake –	ed light orange/brown		XX) XX					目						
	ー with moderately thin bed	with light grey silty Cl	AY mottles up	(X,X) (X,X)	<del>-</del> 15.5 -				目						SPT at
	<ul> <li>to 10mm diameter interm</li> <li>becoming black specked</li> </ul>	ixed and light orange mot	tled light grey						E.		SPT				15.5-15.95n 13/11/15 N=26
	-	Commonte		[x x :	<b>— 16.0</b> Drilling	Fluid: Topooi		Sand				ne		Plutor	<u>++++</u>
		comments:			wa	ter Fill	ightarrow  ightarrow	Gravel	1		Siltston	e	<del>2 2 2 1</del> 2 2 2 2 3	No Cor	- <u></u>
	LANDER				Chec	ked: Clay		Organic		v V V	imesto.	ne			
	Jootoonnioar	Driller: Pro-Drill	Rig: Tractor		R	Silt	~	Pumice			Volcan	c	$\sim$		

	Client :		AUC	KLANE	D RACING	CLU	В			N	<b>/</b> ach	ine	Bor	eho	le I	No.	М	H04	ł
	Project	Locatio	n: ELL	ERSLIE	E RACECO	OURS	E, ELL	ERSL	IE		•		-		Sh	eet 3	of	3	
	Job Nu	mber:	J017	706						Vane H 190	lead: Lo 0	ogged l RG	By: Pr	oces: RG	sor :	Start Finis	Date: h Date	29 : 29	.03.21
hy	Borehole	mN		mE	1			Grou	nd R.L.			tter/ ter	thod a	(%)	)	and	ails	/ le	.t∠
tigrap	Location:	Description	Refer to s	site plan		1 7		Orier	ntation:	vertica		ndwa	g Met Casin	very	%) (%	iple a	t Deta	le Dia	SPT
Stra		CORE I	DESCRIPT	ION		-egend	Depth (m)		DEF	ECTS		Grou Piez	Orillin & (	Reco	RC	San	Test	Var	୍ ଜୁ ଷ
Alluvium Stratigr	becoming of orange/bro orange/bro irrregularly i clay, orang dense, moi CLAY, ligh slightly clay Very stiff, r at 18.6m, t becoming of becoming of becoming of becoming of becoming of becoming of becoming of becoming of becoming of becoming of becoming of becoming of bec	Description CORE I dark orange ar wn, with trace interbedded thi e and light gre ist, low plasticit t orange/brown yey SILT with r noist, low plast becoming light orange streake orange streake light grey, with black mottled a 95m. Target D	<ul> <li>Refer to s</li> <li>DESCRIPTI</li> <li>Id light grey sp limonite</li> <li>in beds of fine y specked light y, with laminat</li> <li>Very stiff, modified</li> <li>Nery stiff, modified</li> <li>in the sance of the second second light grey</li> <li>in the second second second second light grey</li> <li>in the second second</li></ul>	ite plan ION ION IS sandy SI to orange ted bands bist, medi ith trace I ith trace I ith trace I ith orange	ght ILT with mino Medium s of silty ium plasticity ange/brown. black organic		11.5 1	Orier	<u>DEF</u>	vertical		bititititititititititititititititititit	Triple Tube Drilling M & Cas	SPT         88         SPT         100         SPT         90         SPT         86         Recover		Sample	Test De	20.0 17.0 7 21.5 18.5 7	SPT at SPT at
	-						F												
	-		<u> </u>				24.0	I			1							<b></b>	<u> </u>
			Comments:				Drilling wat	g Fluid: ter	Topsoil	>>>>	Sand	+	S:	andsto	one		Pluton	nic	+ + + +
		DER					Chec	ked.	Fill		Gravel	<u>t</u> er	S S	most			No Co	ore	
	geotec	hnical	Driller: Pro-D	rill	Rig: Tracto	or	RF	D	Silt	XXXX	Pumice	′ <mark>∎⊂x</mark> ⊂s ©©	<u> ( ¥</u>	niesto	ine	~~~~		$\dashv$	

ANDER ELSINGLE ALLANAN ANDER A	T 2 2 M			
client:		AUCKLAND RACING CLUB	project no:	figure no:
project:		ELLERSLIE RACECOUSE	J01706	Figure MH04
LANDER		ELLERSLIE	compiled:	date:
title:		PHOTO SUMMARY	RG	29.03.21

	Client :	AUCKLAND RACING	CLUE	3		М	achi	ne l	Bore	eho	le I	No.	MHC	5
	Project Locatio	n: ELLERSLIE RACECO	URSE	E, ELL	ERSLIE						Sh	eet 1	of 2	
	Job Number:	J01706				Vane He 1900	ad: Lo	gged I RG	3y: Pr	ocess RG	sor :	Start D Finish I	ate: 0 Date: 0	7.04.21 7.04.21
hy	Borehole mN	mE			Ground R.L.			iter/ ter	thod g	(%)	)	and iry	alls	ty
tigrap	Location: Description:	Refer to site plan			Orientation:	vertical		ndwa zomet	g Me Casin	very	N) (%	iple a		Insitivi SPT
Stra	CORE I	DESCRIPTION	egenc	Depth (m)	DEF	ECTS		Grou Piez	Srilling & (	Reco	RQ	Sam Lab	: es	Ser Ser
			$\overline{7}$	- 1					lel					
Fill	_ clayey SILT, light grey, bro _ orange/brown. Very stiff, r	own and orange streaked light noist, medium plasticity							en Bar	ọ				
	<b>–</b> -			- 0.5					0 0	ч				
	_ clayey SILT, orange and g	grey mottled dark brown. Very stiff,												
	medium scoriaceous and	basaltic GRAVEL, with brick		- 1.0					Tube					
	<ul> <li>low to medium plasticity</li> </ul>			- 1.5					iple <sup>-</sup>	o				
	F								Ţ	0)				
	orange brick			- 2.0										
	_ clayey SILT, red and oran — moist, medium plasticity	ige mottled dark grey/blue. Very stiff,												
	-			- - 2.5										
										33				
	-			- 3.0										
	silty CLAY, black and orar moist, high plasticity	nge mottled light grey/blue, very stiff,												
	<pre>_ at 3.2m, becoming light gi grey/black</pre>	rey/blue and black mottled dark		- 3.5										
	<ul> <li>clayey SIL1, red and light</li> <li>moist, medium plasticity, v</li> <li>gravel inclusions</li> </ul>	brown mottled dark brown. Stiff, with minor fine to medium basaltic												
				- 4.0										
										13				
	-			- 4.5										
	-													
	clayey SILT, orange mottl	ed light grey/blue. Very stiff, moist,		5.0						00				
	<ul> <li>clayey SILT with tarce fine</li> <li>moist, low to medium plas</li> </ul>	e gravel, dark brown. Very stiff, sticity with trace rootlets		EI						~				
	– –			5.5										
	-									5				
		vesicular BASALT; Strong, infilled Stiff, moist, medium plasticity, with		6.0						7				
	_trace fibrous inclusions													
	- -			6.5										
	=			F										
	- -			7.0										
	=									0				
	- -			7.5										
	F													
	_	<b>0</b>	12	<b>8.0</b>	Eluid:	$\overline{\langle \nabla \nabla \rangle}$			· -		•	• • • d_		
		Comments:		wat	er Fill	$\longrightarrow$	Sand Gravel		Sa Si	andsto	ne e	2 Z Z IN	utonic	
	LANDER			Chec	ked: Clay	<u></u> i	Drganic		Li	mesto	ne			
	geotechnical	Driller: Pro-Drill Rig: Tractor		RF	Silt	XXXX	Pumice			olcanio		~~~		

	Client :	AUCKLAND	RACING	CLUE	3		M	lachi	ne l	Bore	eho	le l	No.	MHO	5
	Project Locatio	n: ELLERSLIE	RACECO	URSE	E, ELL	ERSLIE						Sh	ieet 2 of	2	
	Job Number:	J01706					Vane He 1900	ead: Loo	gged I RG	By: Pr	oces: RG	sor :	Start Date Finish Da	e: 07 te: 07	'.04.21 7.04.21
hy	Borehole mN	mE				Ground R.L.			tter/ ter	thod g	(%)	(	and ory ails	/ 16	t
tigrap	Location: Description	Refer to site plan				Orientation:	vertical		ndwa	g Me Casin	very	%) O	orato Deta		SPT
Strat	CORE	DESCRIPTION		Legenc	Depth (m)	DEF	ECTS		Grou Piez	Drilling & (	Reco	RQ	Sarr Lab Test	Van	ser Ser
t Coast Bays Formation	silty CLAY, light grey stre plasticity with 50mm diameter basa silty fine to medium SANI dark grey. Medium dense minor white course sand	aked orange. Stiff, mois altic inclusion D with minor clay, white a, moist, no to low plastic sized inclusions	t, medium speckled ity, with		- 8.5 - 8.5 - 9.0 					Triple Tube	27				
Transitional Eas					- - - - - - - - - - - - - -						40				
Bedrock	<ul> <li>highly weathered, grey, fi</li> <li>weak</li> <li>with minor black carbona</li> </ul>	ne SANDSTONE; Very	weak to	••	-							0			
East Coast Bays Formation	EOB at 11.0m. Target De	epth. Comments:			- 11.0 - 11.5 - 11.5 - 12.0 - 12.0 - 12.5 - 12.5 - 13.0 - 13.5 - 13.5 - 13.5 - 11.5 - 11.5	Fluid: Topsoil		Sand		· · · 58	andstc	me		onic	* * * *
					wat	er Fill	24	Gravel		s	iltston	e	Z Z Z No (	Core	
	geotechnical	Driller: Pro-Drill	Rig: Tractor		R	P Silt	( X X X X X X X X	Pumice	<mark>krana</mark> ⊗⊗⊗	<u>cic</u> li SSI	mesto	ine 🖵	<del>╍┶╍╤╹</del> ╵╵╵╵		

WOO OCCUPATIONS AND	6 Shi	8.0h	B Car	ANDIA HAOS 2-221 FG					
	client:		AUCKLA	ND RACING CLUB	p	project no:	figure no:		
	project:		ELLERS	SLIE RACECOUSE		J01706	Figure MH05		
LANDER			E	LLERSLIE	co	ompiled:	date:		
georeonnical	title:		PHO	TO SUMMARY		RG	07.04.21		

Client : AUCKLAND RACING CLUB								Mach	Machine Borehole No. MH06							
	Project Location : ELLERSLIE RACECOURSE, ELLERSLIE								Sheet 1 of 6							
	Job Number: J01706						Vane Head: Lo 1900			By: Pr	oces RG	sor :	Start Date: 13.04.21 Finish Date: 13.04.21			
yhc	E Borehole mN mE						Ground R.L.		ater/ ter	thod id	(%)	( )	and ory ails	ity		
tigrap	Location: Description	DESCRIPTION				Orientation: vertical		ndwa	g Me Casin	very	) (%	iple a orato	e Dia Isitivi SPT			
Strat	CORE I				Depth (m)		DEF	ECTS	Grou Piez	Srilling &	Seco	RQ	San San Lab Test	Var Sei 8		
	TOPSOIL			$\overline{\overline{}}$	_					e.						
	clayey SILT, brown. Hard	, moist, medium plasticit	y, with fine	$\rightarrow$						Barr	2					
ш	<ul> <li>gravel inclusions</li> </ul>				- - 0.5					pen				UTP		
	clayey SILT with trace fine	e sand, orange mottled I	ight	ĘĘ.	-					Ō	ę			UTP		
Ash	at 0.65m, with thin bed ba	asaltic GRAVEL		<u>X</u> X	F						67					
	plasticity, with black fine g	proven. Very still, moist, gravel inclusions		<u>XX</u>	E 1.0					ube	8	8		011		
asalt	slightly weathered, black,	vesicular BASALT; Stro	l ng			at 1.4	-1 6m 2.IN	I PI-UN R4 30°		le T	) m	4				
ld Ba	<b>-</b>			$\sim$	<del>-</del> 1.5 -	LM, ro at 1.5	ootlets 5m. 1JN. F	PL-UN. R4. 80°	,	Trip	ž	ě				
c Fie	F				F	at 1.7 A	m, 1JN, Pl	UN, R4, 85°, LM	,		6	100				
lcani	-				- 2.0											
oV b	_															
cklan	-				- - 2.5											
Au	F				-						100	80				
	F				F											
					- 3.0	at 3.2	m 1.IN PI	R4 0-10° dark								
	Ē					brown	n SILT infill	ured								
	becoming less vesicular				- 3.5	Chaot		lied								
				-												
	-				- 4.0											
	E				Ē						100	87				
					- 4 5											
	F				- 4.5 -	1JN, F	PL, R4, 10	-20°, LM								
	E lõõi				- ,	, , -	- ,									
	- -				- 5.0											
	E				ΕI											
	<b>_</b>				5.5	1.IN 1		° I M								
	E V.			E	at 5.6	5m, 8JN, F SILT infill	, PL, R4, 10°, light			95	55					
				- 6.0	at 5.9 light h	-5.95m, 2J prown SILT	N, PL, R4, 90°, infill									
	F				F	J										
				$E_{\perp}$												
	with little to no vesicles			6.5												
	F				E	1JN, F	PL, R4, 40	-50°, LM								
	F				- 7.0											
	F				F						100	80				
=					$\left  \right $											
<u>E</u>						1JN, F	PL, R4, 30-	-40°								
Comments:				Drilling	g Fluid: tor	Topsoil	Sand		s	andsto	one	Pluto	nic + + +			
				water		Fill	Gravel		s	iltston	e		ore			
	geotechnical		Rig: Tractor		R	neu: D	Clay			<u>₩₩</u> ₽			<del>┲┺┲┖╤</del> ╋ ╲╲╲╲╎			
			TNIG. TRACLOF				Siit	$\times \times \times \times \times$	6	<u>@@</u> V	oicani	U I	<u> </u>			

	Client :	Machine Borehole No. MH06											
	Project Locatio	Sheet 2 of 2											
	Job Number:	J01706					Vane Head 1900	Logged	By: Pi	roces RG	sor :	Start Date Finish Da	e: 13.04.21 te: 13.04.21
hy	Borehole mN	mE				Ground R.L.		ter/	thod	(%)	(	und rry ails	ty /
tigrap	Location: Description	: Refer to site plan		73		Orientation:	vertical	ndwa	g Mer	very	N) (%	iple a orato t Deta	le Dia Isitivi SPT
Stra	CORE I	DESCRIPTION		Legend	Depth (m)	DEFI	ECTS	Grou	Drillin & 0	Reco	RC	Sam Lab Test	Var Sei
Auckland Volcanic Field	with white quartz inclusion	n up to 60mm diameter			- - - - - - - - - - - - - - - - - - -	1JN, PL, R4, 80- 1JN, PL-UN, R4,	85° 90°		Triple Tube	100	92		
	EOB at 9.5m. Target Dep	Comments:			- 9.3 - 10.0 - 10.0 - 11.0 - 11.0	Fluid: Topsoil	Sa	nd		andsto	ne	Plut	onic + + +
		Comments:			wa	ter Fill	Sai Gra	nd avel	s s	andsto Siltstor	one ne	Z Z Z No (	onic Core
	LANDER geotechnical				Chec	ked: Clay	Org	janic	<u>**</u> **	imesto	one		
Í		Driller: Pro-Drill	Rig: Tractor		<u>۲</u>	Silt	CCCČĺPur	nice 🕅	`%% \	/olcar	nic	~~~1	

	2 Con 1 Len 1 Con															
	client:	AUCKLAND RACING CLUB	project no:	figure no:												
	project:	ELLERSLIE RACECOUSE	J01706	Figure MH06												
LANDER geotechnical		ELLERSLIE	compiled:	date:												
	title:	PHOTO SUMMARY	RG	13.04.21												
	Client :		A	UCKLAND R/	ACING C	LUB					Trial	Pit I	No.	т	P 01	
--------	---	---	--	---	------------------------------	----------------------	--------	---------------------	--------------------------	-----------------	--	---------	---------------	----------------	-------	--------------
	Project	Locatio	n: F		DEVELO	OPMENT							Sheet	1 of	12	
	lah Nu	mhor	E	LLERSLIE RA	ACECOU	RSE			Vane	e Head:	Logge	d By:	Process	or :	Date:	
			J	1	<u> </u>			$\rightarrow$		1900	RG		PL		06.	05.21 ភ្ល
aphy	Pit	mN		mE	Gr	ound R.L.				pu	(m)	vateı	Dial	vity	and	y Te ils
atigra	Location:	Description:		Refer to site pla	an			_		egei	pth	vpun	ine [ eadi	Soil nsitiv	nple	Detai
Stra			S		IPTION						De	Gro	R Va	Sel	Sar	Labo
	TOPSOIL	-							$\overline{\mathcal{N}}$	$\overline{()}$	<u> </u>					
FILL	clayey SII plasticity, at 0.3m, v with trace	LT, orange ar moderately s with minor fine medium to c	nd light g sensitive, e gravel oarse ba	rey mottled dark with trace rootle inculsions asaltic gravel inc	k brown. \ ets ulsions	/ery stiff, moist, m	edium				, , , , , , , , , , , , , , , , , , ,		111/49	2.3		
ASH	BURIED 1 clayey SIL plasticity	TOPSOIL	fine sand	J, orange/brown	. Very stif	f, moist, medium t	to low						UTP			
	EOTP at	1.6m. Target	Depth.			Excavator Used			××		- 2.0 - 2.5 - 2.5 - 3.0 - 3.5 - 3.5 - 3.5 - 4.0 		UTP			+++
			Comn	nents:		Excavator Used:	Topsoi	$\overline{\Delta}$	N	Sand		Sands	stor	Plu	tonic	+++
			groun	idwater inflow	not		Fill	$\mathbb{Z}$	$\square$	Gravel		Siltsto	ne ZZ	Z No	Core	
	LAND	DER	encol			Checked:	Clay			Organic		Limes	stor	<u>-</u>		
	geotech	nical				RG	Silt	<u> </u>	्र	Pumice		Volca		1		

	Client : AUCKLAND RACING CLUB				Trial	Pit I	No.	Т	P 02
	Project Location : RESIDENTIAL DEVELOPMENT						Sheet	2 of	12
	Leb Number: 101706		Vane	e Head:	Logge	d By:	Process	or :	Date:
/				1900	RG	Ļ	RG		06.05.21
raphy	Pit MN ME Ground R.L.		-	pue	(m)	lwate	Dial ling	il ivity	e and ory To ails
tratig			1	Lege	Jepth	Juno	/ane Reac	Sol	ampl oorato Deti
S	SOIL DESCRIPTION		$\mathbb{R}$			Ū	_	0	Lat
			$\bowtie$	$\longrightarrow$					
FILL	clayey SILT with trace fine sand, orange and light grey mottled brown. Very stiff, r low to medium plasticity, with wood, basaltic, gravel, pipe, asphalt and brick fragm	noist, ients							
	up to 30mm diameter		$\mathbb{Z}$		- 0.5				
				[[[			LITP		
CBF	clayey SILT, orange mottled light grey. Hard, moist, medium plasticity, with trace		XX		-1.0		UTP 200/65	3.1	
AL E	at 1.1m, becoming moderately sensitive				-		200/03	5.1	
SIDU					F				
RE					<b>-</b> 1.5				
					E				
					-				
					- 2.0 -				
					-				
					- 25				
					-				
					- 3.0				
					F				
					<b>-</b> 3.5				
					E				
					-				
					<b>-</b> 4.0				
					-				
					-				
					E				
					-5.0				
					F				
					<b>-</b> 5.5				
					-				
	Excavator Used:		$\frac{1}{\sqrt{1}}$	Sand	-6.0	0		* 1	 tonia +++
	groundwater inflow not	$\mathbb{P}$	뉬	Gravel		Sands			
	LANDER encountered Checked: Clay	<b>[</b>		Organic	<u>rrr</u> <u>rrr</u>	Limes	stor		
	PL Silt		( X X ( X X	Pumice	· • • • • •	Volca	nic	-	

	Client :		1	AUCKLAND RACIN	IG CLUB						Trial	Pit I	No.	Т	P 03	
	Project	Locatio	on:	RESIDENTIAL DEV									Sheet	3 of	12	
	Job Nu	mbor.	t	IN1706	COURSE				Van	e Head:	Logge	d By:	Process	or :	Date	05.01
										1900	RG	<u> </u>	KG		00.	est est
aphy	Pit Location <sup>.</sup>	<u>mN</u>			Ground R.L					pu	(E)	wate	Dial ing	l vity	e and	ails Te
ratigi		Description	n:	Refer to site plan						Lege	epth	punc	ane ≷ead	Soi ensiti		Deta
St			5	SOIL DESCRIPTI	ON							ð	> "	ů.	ပိ	Lab
	TOPSOIL	T							$\supset$	$\gg$	$\mathbf{k}$					
FILI	moderatel	y sensitive, v	with asph	nalt, brick and basaltic	fragments up	to 150n	nm diam	eter			7		132/52	2.5		
									$\langle \rangle$		7					
									$\langle \rangle$		- 0.5					
	becoming	light grey, o	range an	d black mottled dark I	brown						Æ					
											7					
BF	clayey SIL	T, orange m	nottled lig	ht grey. Hard, moist,	medium plasti	city			iz z	<u> </u>	<b></b> 1.0		UTP			
ĒC										$\overline{X}\overline{X}\overline{X}$			UTP			
IN	EOB at 1.	3m. Target o	depth.								F		011			
RESI											-1.5					
Ľ											+					
			The second se		A 18/	X	16 H	17			F					
								8			- 2.0					
		Mar Al	24 80					342			-					
											F					
	REA		N 10				12				- 2.5					
	No.	14	and it		and the second	1	1.39	A h			F					
	2 2	1 1234	the cont	and the second	Dearty 1	ala a	1	1 13			F					
	1 miles	de la compañía de la comp		and the second	it in the	Pin	1 they	1			- 3.0					
		And - pl	the second	1 2 4 9 V	- TAN						-					
		5 13 2	the state				An Jan M				F					
	a second	121		a start	·	- 1	and the second	-			- 3.5					
		A Print		Ser Martin		Real	法者				-					
	577	A Property	ales!	al al	T H	The	1	The state			-					
	HSI VI			1 the loss the loss		(PSBHR)	22 19.85	1.26			-4.0					
											+					
											F					
											-4.5					
											F					
											F					
											- 5.0					
											-					
											_					
											-5.5					
											F					
											Ē					
					I_		1		Ļ		-6.0	ļ	 	Ļ,		
			Com	ments: ndwater inflow pot	Excavat	or Used	Topsoi	$ \rangle$	뇠	Sand		Sands	stor	Plu	tonic	+++
		DEP	encou	untered			Fill	4	4	Gravel	****	Siltsto		<u>No</u>	Core	
	geotech	nnical			PL	ı: -	Clay Silt		 	Organic	<u>ŠŠŠŠČ</u> Ratara	Limes		<del>]</del>		

C	Client :			AUCKLAND R	ACING C	LUB				Trial	Pit N	No.	Т	P 04	
F	Project	Locatio	on :			OPMENT						Sheet	4 of	12	
	Job Nu	mber:		J01706	ACECUU	RSE		V	ane Head: 1900	Logged	d By:	Process PL	or :	Date:	5 21
ک	Dit	mN		mE	G	ound R.L.		+	1000		er	_		pr.	est est
grapł	Location:	Description	1:	Refer to site p	lan				gend	th (m	Idwat	e Dia ading	oil sitivity	ple ai	etails
Strati				SOIL DESCR					<u> </u>	Dep	Grour	Van Rea	Sens	Sam	De
	TOPSOIL							╈						-	
FILL	clayey SIL insensitive becoming	T, orange, b e, with trace a dark grey/br	orown ar asphalt, rown, wi	nd light grey moti concrete, grave th minor scoria in	iled. Very s l, scoria, b nculsions	stiff, moist, mediu rick, turf, plastic a	m plasticity and wood					171/92	1.9		
UAL ECBF	clayey SII medium p EOTP at f	LT with mino plasticity, with 1.4m. Target	r fine sa <u>h trace l</u> : Depth.	and, orange mott imonite	led light gi	ey. Hard, moist,	low to		///// 	-1.5		215+ 215+			
RESIDUAL E	EOTP at 1	1.4m. Target	: Depth.							- 1.5 - 2.0 - 2.5 - 2.5 - 3.0 - 3.5 - 3.5 					
			_						<u></u>	_ _ _ 6.0					
			Com	iments: Indwater inflow	not	Excavator Used	l: Topsoi	$\Rightarrow$	Sand		Sands	tor	Plu	tonic	+ + + + + +
	LAND	DER	enco	ountered	not	Checked	Fill	4	Gravel	<u>ter</u>	Siltsto		<u>No</u>	Core	
	geotech	nical				RG	Silt X	× × × ×	Pumice		Volca	nic			

	Client :		A	UCKLAND R	ACING C	LUB				Trial	Pit I	No.	т	P 05	
	Project	Locatio	n: F		DEVELO							Sheet	5 of	12	
	Job Nu	mber:	E L	101706	ACECOU	KƏE		Van	e Head: 1900	Loggeo RG	d By:	Process RG	or :	Date: 06.0	5.21
aphy	Pit	mN		mE	Gr	ound R.L.		_	pu	(m)	vater	Dial ng	vity	e and	lis Ils
ratigr	Looution.	Description	:	Refer to site pl	an			-	Lege	epth	puno	ane l Readi	Soil ensiti	ample	Deta
St			5	SOIL DESCR					<u></u>		G	>-	S	ů č	Lav
HSH	Clayey SIL rootlets	T with trace <sup>-</sup>	fine sand	d, orange/brown	. Hard, mo	bist, low plasticity,	with trace			- - - - - - - - - - - - - - - - - - -		UTP 215+			
	EOTP at 1	.2m. Target	Depth.							- - - - - - - - - - - - -					
										- - - - - - - - - - - - - - - - - - -					
										- - - - - - - - - - - - - - - - - - -					
			Comr	nents:		Excavator Used:	Topsoi	77	Sand		Sands	stor	Plu	tonic	} <b>+ +</b> +
			groun encou	dwater inflow Intered	not		Fill	<u> </u>	Gravel	***	Siltsto	ne ZZ	Z No	Core	
	geotech	inical				Checked: PL	Clay -	 	Organice Pumice	<u>***</u>	Limes		<mark>귀</mark>		

	Client :		/	AUCKLAND	RACING C	LUB				Trial	Pit I	No.	Т	P 06	
	Project	Locatio	on:	RESIDENTI		OPMENT						Sheet	6 of	12	
	Job Nu	mber:	ł	LLERSLIE	RACECOU	RSE		V	ane Head:	Logge	d By:	Process	or :	Date:	
y		mN						+	1900		L.			est of	_
graph	Pit Location:	Description	1:	Refer to site	e plan				end	h (m)	dwate	: Dial ding	ii tivity	le an ory T tails	
Stratiç		<u> </u>							Leg	Dept	iroun	Vane Rea	Scensi	Samp borat Dei	
0,	TOPSOIL				GRIPTION			+	,,,,,,		0			La	_
	TOPSOIL clayey SII sensitive, hydrant becoming organic cl minor roo clayey SIL sensitive,	T with trace fir sensitive, w ayey SILT, o tlets, with trace T, orange m with trace lim 2.4m. Target	ith plasti orange m ce limor oottled lig nonite	d, brown. Ve l, with trace b c pipe, metal nottled dark g ifte int grey. Very	rod and reba	, low to medium p a, scoria and wood ar Dist, medium plast nedium plasticity,	asticity, d, with old					132/28 UTP 141/55	4.7		
										-					
			Com	ments:		Excavator Used:	Topsoil	╲	Sand	<u>1—0.0</u>	Sande	ton	Di i	tonic +++	-
			grou	ndwater infle	ow not		Fill		Gravel		Siltsto			Core	
	LAND	DER	enco	untered		Checked:	Clay -	<u></u>	Organic	<u></u> 	limer				_
	geotech	nnical				RG	Silt ×	íx) (X)	Pumice		Volca	nic			_

	Client :		AUCKLAND RACI	NG CLUB			Trial	Pit	No.	т	P 07
	Project	Locatio	n: RESIDENTIAL DE	VELOPMENT					Sheet	7 of	12
	lob Nu	mbor <sup>.</sup>		ECOURSE		Vane Head:	Logge	d By:	Process	or :	Date:
У		mNI	mE			1900	RG	5	FL.		est est
raph	Pit Location:	Description:	Refer to site plan	Ground R.L.		end	(m)	dwate	Dial ding	il tivity	le an ory T ails
itratig		Beconption				Leg	Depth	Lound	Vane Read	So Sensi	àamp porate Det
0	TOPSOIL		SUIL DESCRIP	ION				0			La
FILL	clayey SII moist, low concrete becoming	T with trace to medium polocks, scoria	fine sand, orange, brown ar lasticity, with minor fine to o , brick, metal wire dark brown, with basaltic b	nd light grey mottled. Vo coarse gravel, with woo locks, asbestos, glass	ery stiff, d, asphalt,		-0.5				
							-1.0		UTP		
	becoming with concr	very stiff, mo	derately sensitive metal wires				-1.5		123/34	3.6	
							-2.0				
RESIDUAL ECBF	clayey SII plasticity,	T with trace with trace im	fine sand, orange mottled li onite	ght grey. Very stiff, moi	ist, medium						
	EOTP at	4.0m. Target	Depth.				-4.0 - - - - - - - - - - - - - - - - - - -				
			Comments:	Excavator Used	l: Topsoi	Sand		Sands	stor	Plu	tonic $+ + +$
		FP	encountered		Fill	Grave		Siltsto		<u>No</u>	Core
	geotech	nical		RG	Clay Silt	C Organi	<u>uuuu</u> 88888 8888	Volca	storit 1	귀	

	Client :			AUCKLAND	RACING	CLUB					Trial	Pit N	No.	т	P 08	
	Project	Locatio	on :	RESIDENTIA	L DEVEL	OPMENT							Sheet	8 of	12	
	lob Nu	mbor:		I01706	RACECO	URSE			Vane	e Head:	Logged	d By:	Process	or :	Date:	00.04
/								_		1750	PL	L	FL		- 00. T	est est
raphy	Pit Location:	<u>MN</u>				Fround R.L.				pue	(m)	wate	Dial	l ivity	e and	ory To ails
ratig		Description	1.		pian					Lege	epth	ound	'ane Read	Soi ensit	amp	orato Deti
St				SOIL DESC	RIPTION	1						Gr	> "	ŭ	တိ	Lab
FILL	TOPSOIL silty CLAY sensitive, clayey SII	, with trace , orange str with fabric in _T, dark gre	boulders eaked lin nculsions y. Very s	ght grey. Very s	stiff, moist, plasticity	high plasticity, mo	derately	, , , , , , , , , , , , , , , , , , ,			<del>╱╎┥┥┥</del>		162/54	3.0		
	clayey SIL trace fine	.T, black mo to medium ູ	ttled ora gravel	ange/brown. Ve	ery stiff, mo	ist, low plasticity, s	ensitive,	with			-1.0		131/31	4.2		
RESIDUAL ECBF	silty CLAY	′, orange str 2.0m. Targe	eaked li	ght grey/white.	Very stiff,	moist, medium to h	igh plast	icity	-×-×; -×-×;		- - - - - - - - - -					
RE				ments:		Excavator Used	Topsoil			Sand	- 2.5 - 2.5 - 3.0 - 3.5 	Sands			tonic	+++
			grou	iments: indwater inflo	w at :		Topsoi Fill	$\geq$	Ż	Sand Gravel		Sands Siltsto	tor ne ZZ	Plu No	tonic Core	+++
	geotech	DER				Checked: RG	Clay Silt			Organic		Limes		<u>–</u>		

(	Client :		AUCKLAND RACING	CLUB				Trial	Pit N	No.	т	P 09	
	Project	Locatio	n: RESIDENTIAL DEVE	LOPMENT						Sheet	9 of	12	
	lah Nu	mhor		OURSE		Van	e Head:	Logge	d By:	Process	or :	Date:	
		inder.				_	1750	PL	<u> </u>	PL		07.0	)5.21 tr
aphy	Pit	mN	mE	Ground R.L.		_	pu	(u)	watei	Dial	vity	e and	ry Te iils
atigr	Location.	Description:	Refer to site plan			_	Lege	epth	pund	ane I keadi	Soil	mple	orato Deta
Str			SOIL DESCRIPTIO	N				Ō	Gro	2° IL	Še	Sa	Labo
	clayey SII fine to me silty CLA	.T, dark brow edium gravel, ⟨, light grey s	/n. Stiff, moist, low plasticity, mo with trace concrete, boulders, o treaked orange	oderately sensitive, wi golf balls, with trace in	th trace clusions o	of		- - - - - - - - - - - - - - - - - - -		89/35	2.5		
	becoming	grey/blue, wi	ith trace coarse sand to fine gra	vel sized scoria inculs	sions			- - - - - - - - - - - - - - - - - - -		54/23	2.3		
	silty CLAY	′, orange stre T, dark browi	eaked light grey/blue. Very stiff, n/blue. Very stiff, moist, low pla	moist, medium to high	gravel	, , , , , , , , , , , , , , , , , , , ,		<b>2</b> .5					
DUAL ECBF	silty CLAY	′, orange stre	aked grey. Very stiff, moist, me	dium to high plasticity		×1×1×1×1×1×1×1×1×1×1×1×1×1×1×1×1×1×1×1		- 3.5 - - - - - - - - - - - - - - - - - - -					
RESI		י.דיוו. דמועצו	copiri.					- 4.5 					
			Comments:	Excavator Used:	Topsoil	$\overline{\mathbf{N}}$	Sand	0.0	Sande	tor	Plu	tonic	+++
			groundwater inflow not		Fill	77	Gravel		Siltsto	ne ZZ		Core	<u>+ + +</u>
	LAND	DER	encountered	Checked:	Clay	<u></u>	Organic		Limes	stor			
	geotech	nical		RG	Silt	XXX	Burnicco	<u>, é é é </u>			치		

	Client :	AUCKLAND RACING	G CLUB				Trial	Pit N	No.	т	P 10
	Project Locatio	n: RESIDENTIAL DEVI	ELOPMENT						Sheet	10 of	12
	lob Number		OURSE		Vane	Head:	Logged	d By:	Process	or :	Date:
/			0			1750	PL	L	KG		07.05.21
raphy	Pit MN Location: Description:		Ground R.L.			pue	(m)	lwate	Dial ling	il ivity	e an ory Tr ails
ratig	Description.					Lege	Jepth	ound	∕ane ⋜ead	Soi ensit	ampl oratc Deta
St		SOIL DESCRIPTIO	DN					Gr	> "	Ň	S; Lab
FILL	slightly clayey SILT, da coarse gravel inclusion	rk brown. Very stiff, moist, low s	to no plasticity, with some				}				
							-				
	with trace red coarse sa	and			$\square$		-				
							- 0.5				
					$\square$		Ļ ,				
	silty CLAY, orange stre	aked light grey. Very stiff, mois	st, medium plasticity, moder	ately	$\square$				116/54	21	
	sensitive, with trace bo	ulders, with trace rubbish			$\square$				110/34	2.1	
							-				
	slightly clayey SILT, da	rk brown. Hard, dry, no plastic	ity		$\square$		-		UTP		
							5				
	silty CLAY, orange stre	aked white. Very stiff, moist, m	nedium plasticity		$\square$	$\square$	-				
					$\square$	44	- 2.0				
	Clayey SIL I, dark brow	n. very sun, moist, low plastici	ıy		$\square$						
ΒF	clayey SILT, orange/bro	own. Very stiff, moist, low plas	licity		XX XX	<del>XXXX</del>	4  -				
ĒC	becoming light grey stre	eaked orange				XXXX XXXX	- 2.5				
DUA					XX XX	$\frac{\times \times \times \times}{\times \times \times}$	F				
RESI					$\frac{\times \times}{\times \times}$	<u>××××</u> ××××	. <del> -</del>				
	EOTP at 2.9m. Target	depth.	THE R. S. LEWIS				<del>-</del> 3.0				
			A LAND CALL				-				
		C. M. C. C. C.					F				
		and the second second		1999			<b>-</b> 3.5 -				
	1. Start	A MULTER A					E				
	the second	Charles and the second					-				
			all the start of				-4.0				
		THE NEW AND		A COLON			-				
	A. Com			4			-				
		State 1					-4.5				
	. No.						F				
	a la						-				
	A.	A MAN	- Alexandre	All the second se			_				
	1.11			10 m 10			-				
							- 5.5				
	A.	A La Sel Las					<b> </b>				
		Sale Start					E				
	10 Z 2 R						-6.0		<b>.</b> -	<u> </u>	ļ,
		Comments:	Excavator Used: Tops		Щ	Sand		Sands	tor	Plu	tonic + + +
		encountered	Fill		4	Gravel	***	Siltsto	ne ZZ	<u>No</u>	Core
	geotechnical		PL Silt			Pumice		Limes	nic	귀	

	Client :			AUCKLAND RAC	ING C	LUB					Trial	Pit I	No.	т	P 11	
	Project	Locatio	on :	RESIDENTIAL DE	EVELO	OPMENT							Sheet	11 of	12	
	lob Nu	mbor			ECOU	RSE			Van	e Head:	Logge	d By:	Process	or :	Date:	
	<b>JOD NU</b>	mber.								1900	RG	<u> </u>	PL		06.	05.21
aphy	Pit	mN		mE	Gr	ound R.L.				pu	(E)	vate	Dial	vity	e anc	ry Te ils
atigr	Location.	Descriptio	n:	Refer to site plan						-ege	epth	hund	ane [ teadi	Soil	mple	Deta
Str				SOIL DESCRIP	ΓΙΟΝ					_	ă	Gro	З°Р	Š	Sa	Labo
	TOPSOIL	-							$\sum$		1					
FILL	clayey SIL moist, me concrete,	T with trace dium plastic brick and gl	e fine sar sity, mode ass fragi	nd, orange and light erately sensitive, wit ments	grey m h mino	nottled dark brown r fine gravel inculs	. Very st sions, wi	iff, th					400/40	0.7		
AL ECBF	silty CLAY sensitive,	′, orange m with trace li	ottled lig monite	ht grey. Very stiff, m	oist, m	edium plasticity, n	noderate	ly		-x-x-x-x -x-x-x-x -x-x-x-x-x	- - - - - - - - - - - - - - - - - - -		151/43	3.5		
<b>RESIDU</b>	EOTP at	1.1m. Targe	et Depth.													
											- 1.5 - - - - 2.0					
		A ALL			P	Con the										
											- 2.5 - -					
											<b>-</b> 3.0 -					
		1 A		1 AM			なる				- - - 3.5					
	and the	ALL STREET		the fill fait			1.2				F					
											E					
											-4.0					
											F					
											-					
											-4.5					
											È I					
											-					
											<del>-</del> 5.0					
											E					
											-					
											<b>-</b> 5.5					ľ
											E					
											-					
						Excavator Used	_	[ ]	 		-6.0		 _   • • •	• •		+++
			grou	i <b>ments:</b> indwater inflow no	t		Topsoi	$\triangleright$		Sand		Sands	stor	Plu	tonic	+++
	LAND	DER	enco	ountered		Checked <sup>.</sup>		É	4	Gravel	****	Siltsto			Core	
	geotech	inical				RG	Silt			Pumice	· * * * *	Limes		귀—		

	Client :		/	AUCKLAND RA	ACING C	CLUB				Trial	Pit M	No.	т	P 12	
	Project	Locatio	n: !		DEVELO							Sheet	12 of	12	
	Job Nu	mber:		LLERSLIE RA J01706	ICECOU	IKSE		Van	e Head: 1900	Loggeo RG	d By:	Process RG	or :	Date: 06.	05.21
hy	Pit	mN		mE	Gr	round R.L.			7	( <i>د</i>	iter	al -	~	pu	Test
igrap	Location:	Description:		Refer to site pla	an				genc	th (r	ndwa	le Diá ading	sitivit.	ple a	atory etails
Strat			9		PTION				Le	Dep	Groui	Van Reć	Sens	Sam	abor: D(
	TOPSOIL							$\overline{\nabla}$	1111						<u> </u>
ASH	clayey SIL plasticity, r	T with trace f noderately se	fine san ensitive sitive	d, orange/brown. , with trace rootle	Very stiff	f, moist, low to me	dium			- - - - - - -		108/46	2.4		
	EOTP at 1	.0m. Target I	Depth.						XXXX	<b>—</b> 1.0		141/31	4.6		
				ments		Excavator Used:	Topsoil		Sand	- - - - - - - -	Sands	stor		tonic	
1			groun	ments: Idwater inflow r	not		Topsoi	ightarrow	Sand Gravel		Silteto	stor = =		tonic	+++
	LAND	DER	encou	untered		Checked:	Clav		Organic		Limes	stor		COLE	
	geotech	nical				PL	Silt	x x x x x x	Pumice		Volca	nic	*		



Our Ref: 1009521.1145.0.0/Rep1 Customer Ref: J01706 23 April 2021

Lander Geotechnical Consultants Limited Level 3, 3 Osterley way Manukau Auckland 2104

Attention: Rosie Garrill

Dear Rosie

#### **Ellerslie Racecourse**

#### **Laboratory Test Report**

The samples we collected from the above mentioned site have been tested according to your instructions and the results are included in this report. Results apply only to the sample(s) tested.

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

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

This report may be reproduced only in full.

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

GEOTECHNICS LTD

Report prepared by:

Tylah Wardrope Laboratory Technician

Report checked by:

Ryan Milligan

. . . . . . . . . . . . . . . . . . .

Authorised for Geotechnics by:

Corey Papu-Gread Project Director



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

Project Manager Approved Signatory 22-Apr-21 t:\geotechnicsgroup\projects\1009521\1009521.1145\workingmaterial\20210422.ellerslie racecourse .tywa.docx

> 15c Amber Crescent, Judea, Tauranga | PO Box 317, Tauranga 3140 p +64 7 571 0280 | tauranga@geotechnics.co.nz | www.geotechnics.co.nz



	15C Amber Crescent			3 of 7
	Judea		Geotechnics Project Number	1009521.1145.0.0
	Tauranga 3110		QESTLab Work Order ID	W21TG-0052
	New Zealand		Customer Proiect ID	J01706
GEOTECHN	p +64 7 571 0280			
	Determination	ı of the Linear Shrinkage - N	NZS 4402:1986 Test 2.6	
		TEST DETAILS		
LOCATION	Description	Ellerslie Racecourse		
	Data	N/A		
SAMPLE	Geotechnics ID	S21TG000098		
	Reference	HA05	Top Depth	0.5m
	Sampled By	Others, Tested As Received	Bottom Depth	1.0m
	Description	Clayey SILT with some sand, tra	ace rootlets; brown. Moist, very high plas	sticity.
SPECIMEN	Reference		Depth	
	Description			
Linear Shrinkage	e 19%			
		TEST REMARKS		
This test result is IAN	Z accredited. • Date tested 21/04/2021			
Approved Signatory	Duan Milligan			
Date	kyan Willigan			
2410	23/04/2021			



Tauranga 15C Amber Crescent Judea Tauranga 3110 New Zealand

p +64 7 571 0280

	Report No: MAT:S21TG000098
Material Test Report	
Customer: Lander Geotechnical	
Address: Level 3, 3 Osterley Way Manukau, 2104	
Project: Ellerslie Racecourse	
Project No.: 1009521.1145.0.0	
Customer Reference No.: J01706	
Report Authorised By : RWM 23/04/2021	Please reproduce this report in full when transmitting to others or including in internal reports.
Sample Details	
Location Ellerslie Racecourse	

Location	
Geotechnics ID	S21TG000098
Sample Reference	HA05
Sample Description	Clayey SILT with some sand, trace rootlets;
	brown. Moist, very high plasticity.
Sample Depth	0.5m
Bottom Depth	1.0m

### **Test Results**

Description	Method	Result	Limits
Moisture Content [NZS 4402:1986 Test 2.1]			
Moisture Content (%)		32.5	
Date Tested		19/04/2021	

#### Comments

This test result is IANZ accredited.

If samples have been taken, and were not destroyed during testing, they will be retained for one month from the date of this report before being discarded. Form No: 18909, Report No: MAT:S21TG000098 © 2000-2018 QESTLab by SpectraQEST.com Page



• The material used for testing was natural, fraction passing a 425um sieve. • This test result is IANZ accredited. • Date tested 20/04/2021

Approved Signatory Ryan Milligan

23/04/2021

Date

	15C Amber Crescent			6 of 7
	Judea		Geotechnics Project Number	1009521.1145.0.0
	Tauranga 3110		QESTLab Work Order ID	W21TG-0052
	New Zealand		Customer Project ID	J01706
GEOTECHNIC	p +64 7 571 0280			
	Determination	of the Linear Shrinkage - I	NZS 4402:1986 Test 2.6	
		TEST DETAILS		
LOCATION	Description	Ellerslie Racecourse		
	Data	N/A		
SAMPLE	Geotechnics ID	S21TG000099		
	Reference	HA02	Top Depth	0.5m
	Sampled By	Others, Tested As Received	Bottom Depth	1.0m
	Description	silty CLAY, trace rootlets and the plasticity.	race gravel; orange brown mixed light bro	own. Moist, extremely high
SPECIMEN	Reference		Depth	
	Description			
Linear Shrinkage	22%			
		TEST REMARKS		
This test result is IANZ a	ccredited.•Date tested 21/04/2021			
Approved Signatory R	yan Milligan			
Date	2/04/2021			
2	3/04/2021			



Tauranga 15C Amber Crescent Judea Tauranga 3110 New Zealand

p +64 7 571 0280

	Report No: MAT:S21TG000099
st Report	
eotechnical 8 Osterley Way , 2104	
Racecourse 1.1145.0.0	
No.: J01706 y: RWM 23/04/2021	Please reproduce this report in full when transmitting to others or including in internal reports.
Ellerslie Racecourse S21TG000099 HA02 silty CLAY, trace rootlets and trace gravel; orange brown mixed light brown. Moist, extremely high plasticity.	
0.5m 1.0m	
	eotechnical 3 Osterley Way 2 104 Racecourse 1.1145.0.0 No.: J01706 by : RWM 23/04/2021 Ellerslie Racecourse S21TG000099 HA02 silty CLAY, trace rootlets and trace gravel; orange brown mixed light brown. Moist, extremely high plasticity. 0.5m 1.0m

## **Test Results**

Description	Method Result	Limits
Moisture Content [NZS 4402:1986 Test 2.1]		
Moisture Content (%)	31.4	
Date Tested	19/04/2021	

#### Comments

This test result is IANZ accredited.

If samples have been taken, and were not destroyed during testing, they will be retained for one month from the date of this report before being discarded. Form No: 18909, Report No: MAT:S21TG000099 © 2000-2018 QESTLab by SpectraQEST.com Page



# OPTIMAX PROPERTY ADVISORY LTD

# Ellerslie Racecourse

# Geotechnical Investigation and Assessment



May 2008 HG Ref 1015-126669-01 Doc Ref rep-opal-126669-GE01-rcs-mmk

# HARRISON GRIERSON CONSULTANTS LIMITED

## Document Control Record

Client	Optimax Property Advisory Limited
Project	Ellerslie Racecourse
Project No.	1015-126669-01
Doc. Ref.	rep-opal-126669-GE01-rcs-mmk
Document	Geotechnical Investigation and Assessment

ISSUE AND REVISION REC	ORD
Status/Revision No.	
Set No.	of
Date of Issue	May 2008
Originator Co-Author Approved	M. Kiryakos - Geotechnical Engineering Manager <i>R</i> - <i>B</i> - <i>M</i> R. Smith - Geotechnical Engineering Technician <i>MMMM</i> P. Williams - Director
Office of Origin	Auckland
Telephone	09 917 5000
Facsimile	09 917 5001
Email	auckland@harrisongrierson.com

HARRISON GRIERSON CONSULTANTS LIMITED

5

- 1 - 1 -

## **OPTIMAX PROPERTY ADVISORY LTD**

## **Ellerslie Racecourse**

## Geotechnical Investigation

May 2008 HG Ref 1015-126669-01 Doc Ref rep-opal-126669-GE01-rcs-mmk

#### **CONTENTS**

Page
------

1.0	INTRODUCTION	1
2.0	SITE DESCRIPTION	1
2.1	AREA 2	2
2.2	AREA 5	2
3.0	PROPOSED DEVELOPMENT	2
4.0	GEOLOGY	2
5.0	FIELDWORK	3
<b>6.0</b> 6.1.1 6.1.2 6.1.3	<b>SUBSURFACE CONDITIONS</b> Area 2 Area 5 Groundwater	<b>4</b> 4 4 6
7.0	GEOTECHNICAL ASSESSMENT	6
7.1	AREA 2	7
7.2	AREA 5	8
8.0	CONCLUSIONS	9
9.0	LIMITATIONS	. 9

## APPENDICES

Appendix 1 – Exploratory Borehole Logs and Scala Penetrometer Test Results

#### DRAWINGS

126669-GE001 – Site Plan Showing Location of Boreholes 126669-GE002 – Geotechnical Cross Section A-A' 126669-GE003 – Geotechnical Cross Section B-B' 126669-GE004 – Geotechnical Cross Section C-C'

## 1.0 INTRODUCTION

Harrison Grierson Consultants Limited (HGCL) has undertaken a geotechnical investigation in April 2008 at the Ellerslie Racecourse, in Ellerslie, for the purpose of proposed upgrades.

The geotechnical investigation was requested by Optimax Advisory Ltd, on behalf of Auckland Racing Club.

The investigation was undertaken in order to assess the subsurface conditions and to identify potential geotechnical issues for the two areas of interest within the racecourse compound. These areas are shown on an overall concept plan prepared by Boffa Miskell Limited, referenced 02296A-029 and dated November 2004.

The investigation by HGCL comprised drilling of machine and hand augered boreholes. This was followed by assessment of the results from a geotechnical perspective for the purpose of resource consent.

This report presents the results of a geotechnical investigation and assessment undertaken.

## 2.0 SITE DESCRIPTION

The two areas under this investigation are under one title, namely Lot 2, DP 200256. The areas described as Area 2 and Area 5 as shown in Figure 1 below.



Figure 1: Site Location Plan (Map reproduced from Google Earth)

#### 2.1 AREA 2

Area 2 is in the proximity of Ellerslie Convention Centre and is on a relatively flat ground that slopes slightly towards the north-northwest. The ground is generally covered in well-kept grass with a single large tree approximately 20m in height, located at the western end of the area.

For Area 2 the drainage channels are present with cesspits and roading drainage along the carriageway.

Power poles were observed through the middle of the site as well as an electrical junction box. An old aerial photo of the site indicates a building was present in the area nearest to the existing Ellerslie Convention Centre.

#### 2.2 AREA 5

Area 5 is located to the east of the racecourse near Ladies Mile road. The site is on sloping ground. The ground slopes moderately downwards (at approximately 12°) to the southwest towards an existing stormwater retention pond and to the west towards the racecourse.

Area 5 is also covered in well-kept grass with medium to large sized shrubs surrounding most of the boundary. A strand of medium sized trees up to 15m tall is located near the stormwater retention pond.

There were no visible drainage channels present onsite within Area 5. However, due to the relatively steep topography of the site, it is logical to assume that most of the surface water will flow towards the stormwater retention pond at the bottom of the slope. At least two inlet pipes were observed within the pond.

## 3.0 PROPOSED DEVELOPMENT

No detailed information of the proposed development was available at the time of writing. However, we understand that the future development, in concept, would comprise the following:

- Area 2: A multi story building with possible underground (basement) level.
- Area 5: Earthworks resulting in a cut to fill platform. The cut will require more than 2.5m high permanent retaining walls.

## 4.0 GEOLOGY

In assessing the geology of the site we have referred to the following geological map:

• Edbrooke, SW (Compiler) 2001: Geology of the Auckland Area, Institute of Geological and Nuclear Sciences (IGNS), 1:250,000 Geological Map 3, Lower Hutt, New Zealand, IGNS Ltd.

According to the geological map:

- Area 2 is located within an area underlain by soils and rocks of the Auckland Volcanic Field.
- Area 5 is located within an area underlain by residual soils and rocks of the East Coast Bays Formation as well as alluvial soils of the Puketoka Formation in the low laying area.

The Auckland Volcanic Field belongs to the Kerikeri Volcanic Group. This in turn has three sub groups that are lava, scoria and pyroclastics, which are all of the late Pleistocene to the Holocene age.

The East Coast Bays Formation belongs to the Waitemata Group of the Early Miocene age. These rocks are an alternating sequence of sandstones and mudstones (flysch deposits) interpreted as a turbidite/inter-turbidite sequence. These rocks are generally very weak to weak, greenish grey or grey when fresh and weathered to light brown or brown soils comprising silts, clays and sand mixtures. The sandstones are often graded, laminated or the bedding is convoluted. These rocks weather to form residual clays and silts up to 10m thick.

The Puketoka Formation belongs to the Tauranga Group of the Pliocene age. These soils are described as undifferentiated, mainly pumiceous deposits, consisting of bedded mud to gravel sized rhyolite pumice clasts and weathered rock fragments. Minor beds comprise pumicite, organic rich clay and peat.

## 5.0 FIELDWORK

ì

The fieldwork phase of the geotechnical investigation was carried out in April 2008. It comprised of a site walkover assessment, slope measurement and drilling of five machine boreholes and three hand augered boreholes together with Scala Penetrometer testing from the base of some of the hand augered boreholes.

An approximate exploratory test location plan can be found on the HGCL drawing No. 126669-GE01 attached. The materials encountered in the boreholes are summarised on the borelogs attached in Appendix 1.

Machine boreholes MB01 and MB02, together with hand auger boreholes HA1 to HA3 inclusive, were drilled within Area 5. Machine boreholes MB03 to MB06 inclusive, were drilled within Area 2.

The fieldwork was carried out under the direction of a Geotechnical Engineering Technician, who nominated sampling and testing depths, and logged the recovered subsurface conditions. The descriptions of the boreholes were logged in accordance with the New Zealand Geotechnical Society (NZGS) Guidelines for Soil and Rock Descriptions.

The machine drilled exploratory boreholes were advanced using rotary auger techniques, with in-situ testing by Standard Penetration Test (SPT) in MB01 and MB02 only. Due to the basalt encountered in MB03 to MB05, no SPT testing was carried out in the boreholes. The drilling in these boreholes was by wash drilling in the soils and HQ triple tube coring in the rock.

The hand augered boreholes were to be drilled to a target depth of 5.0m below ground level (bgl), where practicable, with in-situ shear vane tests made on undisturbed cohesive soils at nominal intervals of 0.5m. The shear vane values obtained from in-situ testing are shown on the attached exploratory borehole logs in Appendix 1.

## 6.0 SUBSURFACE CONDITIONS

The natural soils encountered at the site were consistent with the published geology. The borehole data are depicted on the attached geotechnical cross section A-A', which is established along Area 2, and B-B' and C-C', which are established across Area 5. The following is a summary of the materials encountered at each area:

## 6.1.1 Area 2

- The site is underlain with about 0.2m thickness of topsoil.
- The natural soils underlying the topsoil comprise silts, which are possibly volcanic ash deposits interbeded with alluvial soils.
- Basalt rock was encountered at depths varying from 3.0 to 6.0m bgl. A thin layer of basalt was encountered at approximately 1.5m bgl in MB04, which is located at the south-eastern end of Area 2. This layer could be a boulder. The depth of the basalt appears to be greater near the south-eastern end of Area 2. The Rock Quality Designation (RQD) of the cores recovered in all the three boreholes, ranged from 30 to 60%.

## 6.1.2 Area 5

Topsoil was encountered in all the boreholes drilled within this area. The following is a summary of the subsurface conditions encountered within the area at the top and the toe of the hill.

## Top of the Hill

Boreholes MB01 and HA3 were drilled on top of the hill. Additional hand auger boreholes were drilled at the target location of HA3 (HA3A, B and C).

The subsurface conditions encountered in MB01, which was drilled in this area comprised the following:

- A thin mantle of volcanic silts to approximately 1.0m bgl.
- Residual soils of the East Coast Bays formation were encountered underlying the volcanic deposit to approximately 9.7m bgl. The material consisted of generally firm to stiff silt to approximately 7.3m bgl. The SPT N values ranged from 4blows/300mm penetration at 3.0m bgl to 12 blows/300mm penetration at 6.0m bgl. The silts are underlain by medium dense to dense sand to approximately 9.7m bgl. The SPT N values measured in the sand at 7.5m and 9.0m bgl were 23 and 30blows/300mm respectively.
- The bedrock, comprising siltstone and sandstone, was encountered at 9.7m bgl. The SPT N values measured ranged from 44 to greater than 50 blows/300mm. The RQD was low in the upper siltstone, increasing to approximately 60% in the underlying sandstone at 11.7m bgl.

Several attempts were made to drill deeper than 1.5m bgl in the area near the western boundary of Area 5 (HA3A, B and C). Drilling was difficult at 1.5m bgl in these boreholes and testing by shear vane was not possible due to the hard consistency of the soils at that depth. However, Scala Penetrometer testing was successful in the two boreholes (HA3A and B) where it was possible to probe to up to 3.5m bgl. The Scala Penetrometer test results indicate a weak zone between 2.0 and 2.5m bgl where the soils are inferred to be generally soft to firm (1-2 blows/50mm penetration).

## Toe of the Hill

 $\dot{i}$ 

Machine borehole MB02 was drilled at the toe of the hill near the existing pond. Hand auger borehole HA2 was drilled near the western boundary of Area 5, while HA1 was drilled near the eastern boundary of Area 5. The following is a summary of the materials encountered in these boreholes.

- Fill was encountered in HA1 and HA2 to depths of 0.4m and 0.8m respectively. The fill comprised of clayey silt, with quantities of fine to medium grained sub angular scoriaceous gravels in HA1 and some fine to course grained gravels in HA2. Shear vane testing was not conducted in the fill due to the presence of the gravels.
- The results of Scala Penetrometer testing carried out in HA1 indicate increase in the soils stiffness with depth. The Scala values were 2

blows/50mm penetration at 5.15m bgl increasing to 16 blows/50mm at 5.85m bgl.

- The results of Scala Penetrometer testing carried out in HA2 indicate a weak zone between 1.35 and 2.25m bgl where the soils are inferred to be generally firm (2-3 blows/50mm).
- Alluvial soils of the Puketoka Formation were encountered in MB02 and HA1 overlying residual soils of East Coast Bays Formation soils. The alluvial soils comprised interbeded silts, clays and sands. Trace organic inclusions were encountered in HA1 at 2.4m until 3.2m. The measured undrained shear strength in the alluvial soils ranged from 82kPa to 200kPa (inferred due to the difficulty in soil penetration by the shear vane), indicating a firm to hard consistency.
- East Coast Bays Formation soils were encountered in MB02 and HA1 underlying the above-mentioned alluvial soils. These soils comprised a thin mantle of stiff to very stiff silts and clays (shear strength from 148kPa to 200kPa) overlying sandstone. The SPT N values measured ranged from 36 to greater than 50 blows/300mm. The RQD was 0% in the upper layers of the sandstone, increasing to approximately 67% at 4.5m bgl.

#### 6.1.3 Groundwater

In Area 2, water level was measured at depths varying from 1.1m in borehole MB05 to 3.8m in borehole MB04.

In Area 5, water level was measured at approximately 1.8m bgl in borehole MB01, which is located uphill, and at 0.9m bgl in borehole MB02, which is located near the toe of the hill.

Groundwater was not encountered in any of the hand augered boreholes.

It should be noted that the water levels encountered in the machine boreholes have probably been influenced by the water used during drilling. Although care should be taken in the use of the groundwater levels, it would be reasonable to consider shallow water levels in Area 2 and the toe of hill in Area 5 (near the pond).

It should also be noted, however, that groundwater levels and flows are transient, and are affected by such factors as soil and rock permeability, integrity of buried services and preceding climatic conditions.

## 7.0 GEOTECHNICAL ASSESSMENT

The site geotechnical conditions were assessed based on the results of the investigation and with the reference to the concepts of the proposed developments.

The following is a summary of the main geotechnical issues assessed together with the appropriate design and construction considerations assessed for each area.

## 7.1 AREA 2

This area is suitable for the proposed development in general. The geotechnical issues are mainly related to the basalt encountered at varying depths and the possible presence of groundwater at shallow depth. The following are the geotechnical considerations required for the design and construction of the foundations and the basement.

- For most of the area, basalt rock appears to be at 3 metres depth bgl. It would therefore seem to be convenient to found the building basement on or in the basalt layer. Towards the eastern end, the basalt appears to drop to 6 metres bgl, so in that area, short bored piles may be required, socketed into the basalt for improved lateral resistance. [Alternatively, undercut to the basalt layer and backfill to floor level with compacted hardfill]. Once a firm building footprint is decided, it would be prudent to wash drill at specific points to more precisely locate the top of the basalt layer.
- Permanent ground retention systems, such as concrete block or pre-cast concrete panel walls, will be required for the basement excavation. Drainage measures behind the walls will also be required.
- Temporary retention may also be required if a steep cut angle was selected. Otherwise a battered slope at 1v:1h ratio will likely be acceptable in the short term.
- If the actual groundwater level is higher than the excavation depth, then considerations should be given during the design stage to avoid the potential of groundwater drawdown during construction. Significant groundwater drawdown could cause settlement in the areas surrounding the excavation. However, this risk can be minimised if careful planning and construction was undertaken using measures such as groundwater recharge wells or trenches.
- Detailed geotechnical assessment will be required to establish the design parameters for the basement walls and the foundations in accordance with the current legislations (The New Zealand Building Code and the Australian/ New Zealand Standards 1170). Verification of the groundwater level by simplified methods such as test pitting or hand auger drilling during the detailed design stage is recommended.
- Due to the fractured nature of the basalt encountered ripping the basalt with the standard rock breaking equipment is assessed as feasible.

#### 7.2 AREA 5

Area 5 is suitable for the proposed development in general. The geotechnical issues are mainly related to the thickness of the residual and alluvial soils encountered, as well as the possible presence of groundwater at shallow depth. The following are the geotechnical considerations required for the design and construction of the foundations and retaining walls.

- An embedded pile retaining wall (semi-contiguous) will likely to be the optimum option in terms of stability and cost for the proposed cut. The piles may require strutting by ground anchors if significant wall deflection is predicted. Drainage measures behind the walls will be required.
- The earthworks are envisaged to result in reasonably flat or terraced building platforms. The weak layer encountered in boreholes HA3A and B will be most likely be excavated as part of the earthworks. Therefore, slope stability should not be a critical issue. It is recommended that the slope stability of the proposed earthworks levels be verified by analysis once the earthworks concept is finalised. Specific attention should be made for the western toe of slope if any filling is proposed within that area.
- The subsurface soils are generally suitable for development using a shallow foundation system with a Geotechnical Ultimate Bearing Capacity of 300kPa. However, it should be noted that the residual soils of the East Coast Bays formation are generally described to be 'Moderately Reactive" (Class M) as defined in AS2870: 1996 "Residential slabs and footings" (as referenced in Section 17 of NZS 3604: 1999). These soils have characteristic free surface movement of up to 40mm. The building foundations will therefore be required to be designed to comply with AS2870 for the relevant building design.
- The areas where fill and alluvial soils were encountered may require further assessment. Undercutting and replacement with compacted hardfill may also be required for the building development. Alternatively, a deep foundation system (piles) will be required.
- Detailed geotechnical assessment will be required to establish the design parameters for the retaining walls and the foundations in accordance with the current legislations (The New Zealand Building Code and the Australian/ New Zealand Standards 1170). Verification of the groundwater level by simplified methods such as test pitting or hand auger drilling during the detailed design stage is recommended.

## 8.0 CONCLUSIONS

Areas 2 and 5 are both suitable for the proposed developments in general.

For most of Area 2, basalt appears to be at 3 metres depth bgl. The geotechnical issues are mainly related to the variation of the depth to basalt and the possible presence of groundwater at shallow depth. Concrete block or precast concrete panels can be used for the basement walls and will require adequate drainage measures behind the walls. A convenient construction method for the foundations would be to found on or in the basalt layer. Where the basalt is deep, short bored piles may be required, socketed into the basalt for improved lateral resistance. Alternatively, a cost effective option would be undercutting to the basalt layer and backfilling to floor level with compacted hardfill. The potential for significant groundwater drawdown, as a result of excavation, is envisaged to be low. However, careful design and planning together with verification of the depth the groundwater is recommended. Recharge wells and trenches may be required as precautionary measures against effects of drawdown.

The geotechnical issue within Area 5 are mainly related to the thickness of the residual soils and the depth of groundwater level. A retaining wall such as embedded semi-contiguous pile wall will be required to support the cut resulting from earthworks. As the earthworks will likely result in reasonably flat or terraced building platforms slope instability is not envisaged to be potential. However, verification of stability of the proposed earthworks levels by analysis is recommended once the earthworks concept is finalised. Specific attention should be made for the western toe of slope if any filling is proposed within that area. Shallow foundations of the proposed buildings are assessed to require a specific design in accordance with AS2870: 1996 "Residential slabs and footings" (as referenced in Section 17 of NZS 3604: 1999). The areas near the toe of the slope (underlain by fill and alluvial soils) may require further assessment. Undercutting and replacement with compacted hardfill, or piled foundations, mayo be required for buildings within those areas.

To enable the design of the proposed development in accordance with the current legislations (The New Zealand Building Code and the Australian/ New Zealand Standards 1170), detailed geotechnical assessment will be required to provide design parameters for the foundations and retaining walls including the site seismic classification and seismic design parameters.

## 9.0 LIMITATIONS

This report has been prepared for the particular project described to us and the scope of work agreed between the client and Harrison Grierson Consultants Limited. No responsibility is accepted by Harrison Grierson Consultants Limited or its directors, servants, agents, staff or employees for the accuracy of

information provided by third parties and the use of any part of this report in any other context or for any other purposes.

The recommendations and opinions contained in this report are based on our visual reconnaissance of the site, information from geological maps, and the data from the field investigation. Inferences about the nature and continuity of sub surface conditions away from and beyond the exploratory borehole logs are made, but cannot be guaranteed. The descriptions detailed on the exploratory borehole logs are based on the NZ Geotechnical Society Guidelines for the Field Description of Soils and Rocks for Engineering Purposes.

During construction, an engineer competent to judge whether the conditions are compatible with the assumptions made in this report should examine the site. In all circumstances, if variations in the sub surface condition occur which differ from those described or assumed to exist, and then the matter should be referred back to Harrison Grierson Consultants Limited.

This report has been prepared for the particular project described to us, and no responsibility is accepted by Harrison Grierson Consultants Limited or its directors, servants, agents, staff, or employees for the use of any part of this report in any other context or for any other purposes.

This report is for the use by Optimax Property Advisory Ltd only, and should not be used or relied upon by any other person or entity or for any other project.

## **Harrison Grierson Consultants Limited**

N:\1015\126669\_01\500 Del\510 Rpts\Rpt-opal-126669-GE01-rcs-mmk.doc

## **APPENDIX 1**

Exploratory Borehole and Scala Penetrometer Test Results

g	<b>Geolab</b> CLIENT: Optimax Property Advisory Ltd BOREHOLE No: MB01   air, soil & water PROJECT: Geotechnical Investigation, Ellerslie Racecourse, Sheet 1 of 2					01						
Drill Type Drilled By Date Star Date Enis	KUBOTA STV 40     r:   PRO DRILL (AUCK) LTD     ted:   08:00am 14/4/08     shed:   12:00om 14/4/08	Eliērslie Project No: 1015 Coordinates: Ground Elevation: Water Level: 1.8m	126669-( 04:30pm	)1	008		Logg Shea Cheo	ied By: ar Vane sked By:	ROBERT SMITH No: DR4531			
STRATIGRAPHY	MAINER MAINER R R C R C K N	OIL DESCRIPTION inor components, strength, colour structure, weathering OCK DESCRIPTION AME, weathering, strength, colour discontinuities	WATER LEVEL (m)	° DEPTH (m)	SAMPLE TYPE	C <sub>U</sub> / SPT (KPa) (KPa)	DRILLING METHOD	RECOVERY (%)	TCR SCR RQD	Ŧ	WATER CONTENT	OTHER
EAST COAST BAYS FORMATION     xxx   x x x x x x x x x x x x x x x x x x x	SILT, trace clay, or plasticity, trace ro SILT, trace to mir plasticity becomes light bro becomes minor cl becomes minor to becomes brown a becomes firm to s becomes firm to s becomes firm to s becomes grey, mo becomes grey, mo becomes grey, mo becomes strace mo Stiff becomes grey, mo becomes firm to s becomes firm to s becomes strace cla becomes dark gre becomes dark gre becomes hard fine to medium gra dark grey. Loosely becomes fine to co becomes fine to co	ark brown. "Hard", moist, low bilets present (TOPSOIL) for clay; brown. "Hard", moist, low win ay. Low to moderately plastic light grey and light grey some clay. Stiff tiff adium grained sand and minor clay ottled orange brown tiff some clay; stained and mottled y; orange brown, mottled grey y uned SAND, minor to some silt; packed; moist; uniformly graded dark grey, fine fabric, mely weak	1  40:30pm 14/04/2008			229+ U 229+ U P,135 5 7 N=12 P,37 P,25 V,35 V,35 V,35 V,35 V,35 P,25 2 2 N=4 P,25 P,25 2 3 4 N=7 P,25 V,35 V,22 2 2 N=4 V,35 V,26 V,25	년 전 đ HQ TRIPPLE TUBE		100			

.

71 Great South Rd, P.O.Box 5760, Wellesley St, Auckland. Phone: 09 917 5000 geolab is a division of Harrison Grierson Consultants Ltd

<b>Geolab</b> CLIENT: Optimax Property Advisory Ltd									BOREHOLE No: MB01					
ai la	ir, so Iborat	il & water ory services	PROJECT: Geotechnical Investigation, Ellerslie Race Ellerslie						COUR	xourse, Sheet 2 of 2				
Drill Type: KUBOTA STV 40 Drilled By: PRO DRILL (AUCK) LTD Date Started: 08:00am 14/4/08 Date Finished: 12:00pm 14/4/08		KUBOTA STV 40 PRO DRILL (AUCK) LTD 08:00am 14/4/08 12:00pm 14/4/08	Project No: 1015-126669-01 Coordinates: Ground Elevation: Water Level: 1.8m 04:30pm 14/04/2008			008	Logged By: ROBERT SMITH Shear Vane No: DR4531 Checked By: PB 7=							
STRATIGRAPHY	GRAPHIC LOG	S MAIN/mi ROCK N	OIL DESCRIPTION inor components, strength, colour structure, weathering OCK DESCRIPTION AME, weathering, strength, colour discontinuities		WATER LEVEL (m)	ō DEPTH (m)	SAMPLE TYPE	C <sub>u</sub> / SPT (kPa) (btows/seoferm)	DRILLING METHOD	RECOVERY (%)	TCR SCR RQD	H I	WATER CONTENT	OTHER
EAST COAST BAYS FORMATION S 		highly weathered, SILTSTONE; extre	dark grey, fine fabric, mely weak					18 40 for 30m N = 50+ 10 19 25 N=44 19 30 for 80m V = 50+ 1=50+			100 0 100 2 100 100 60 80 100 55			

71 Great South Rd, P.O.Box 5760, Wellesley St, Auckland. Phone: 09 917 5000 geolab is a division of Harrison Grierson Consultants Ltd


	ge	olab	CLIENT:	Optimax Pro	operty A	dvisc	iry Ltd		Deer			BORE	HOLEN	No: MB	03
	air, so labora	tory services KUBOTA STV 40 PBO DBILL (AUCK) LTD	PROJECT: Geoleconnican investigation, Litershe nacecourse, Ellershe Project No: 1015-126669-01 Logged By: ROBERT SMITH TD Coordinates: Shear Vane No: DR4531 Ground Elevation: Checked By: PSE Water Level: 1.8m 15/04/2008												
	Date Started: Date Finished:	15/4/08 15/4/08	Gi	round Elevation: ater Level:	1.8m 15/	04/200	8			Che	cked By		°₿⊭		
STRATIGRAPHY	GRAPHIC LOG	S MAIN/mi R( ROCK N	OIL DESCRIPT inor components, stra structure, weather OCK DESCRIP AME, weathering, str discontinuities	FION ength, colour ng TION rength, colour		WATER LEVEL (m)	DEPTH (m)	SAMPLE TYPE	C <sub>u</sub> / SPT (MPa) (Ibioua/Seconnit)	DRILLING METHOD	RECOVERY (%)	TCR SCR RQD	ļţ	WATER CONTENT	OTHER
		TOPSOIL "SILT" 	, dark grey, mai to strong, tabu	ssive, <b>BASAL</b>	Τ,	1 1 15/04/2008	$ \begin{array}{c} 0 \\ 1 \\ 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 7 \\ 7 \\ 7 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1$					90 83 17 100 100 43			
2				() Day 5700				dand	Bho		0.017	5000			

.

	1				., ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	uvisu	иу са	1				BORF	HOLE	No: MB	04
	aır, soil laborato	& water ry services	PROJECT:	Geotechnica Ellerslie	al Invest	igati	on, El	lerslie	Race	COURS	se,	Sheet	1 01	1	
	rill Type: rilled By: ate Started: ate Finished:	KUBOTA STV 40 PRO DRILL (AUCK) LTD 15/4/08 15/4/08	Pr Cc Gr W	oject No: bordinates: round Elevation: ater Level:	1015-12 3.8m 15/	6669-0	)1 )8			Logg She Che	ged By: ar Vane cked By:	<sup>No:</sup>	ROBERT DR4531	SMITH	
STRATIGRAPHY	GRAPHIC LOG	S MAINIM ROCK N	OIL DESCRIPT inor components, stre structure, weatherin OCK DESCRIP AME, weathering, str discontinuities	FION angth, colour ng TION ength, colour		WATER LEVEL (m)	o DEPTH (m)	SAMPLE TYPE	C <sub>u</sub> / SPT (KPa) / (biovarsconam)	DRILLING METHOD	<b>РЕСОVERY (%)</b>	TCR SCR RQD	ł	WATER CONTENT	OTHER
	1944 ×	TOPSOIL "SILT"			— — <del>-</del>					WASH DRILL					
ASH/TUFF KVG		slightly weathered, moderately strong SILT, trace to min sand, trace clay ar gravel; dark brown	, dark grey, mas to strong, tabul or medium to c nd minor fine gr i. "Firm", moist,	ssive, <b>BASAL</b> ar oarse grained ained sub rou low plasticity	T; nded	8	» «			HQ TRIPPLE TUBE		73 17 13			
	× × × × × × × × × × × × × × × × × × ×					11 15/04/200	4 1111111111111111111111111111111111111			WASH DRILL					
KVG		slightly weathered, moderately strong	dark grey, mas to strong, tabul	ssive, <b>BASAL</b> ar	Γ;		6   1   1   1   1   1   1   1   1   1			HQ TRIPPLE TUBE		100 100 60			
		END OF BORE. 7.	50 METRES. ACHIEVED)	<u> </u>			9 10 10				~~×				

71 Great South Rd, P.O.Box 5760, Wellesley St, Auckland. Phone: 09 917 5000 geolab is a division of Harrison Grierson Consultants Ltd

	ge air, so aborai	olab il & water tory services	CLIEN I: Optimax Property Advisory Ltd PROJECT: Geotechnical Investigation, Ellerslie Racecourse, Ellerslie Project No: 1015-126669-01 Logged B							se,	BORI Shee	EHOLE I	No: MB	05	
Drill 1 Drille Date Date	Type: d By: Started: Finished:	KUBOTA STV 40 PRO DRILL (AUCK) LTD 15/4/08 15/4/08	Pro Cor Gro Wa	ject No: ordinates: ound Elevation: ter Level;	1015-12 1.1m 15	26669-0	01			Logg Shei Che	ged By: ar Vane cked By	No: :	ROBERT DR4531 PBK	SMITH	
STRATIGRAPHY	GRAPHIC LOG	S MAIN/mi RC ROCK N	OIL DESCRIPT nor components, stre structure, weatherin DCK DESCRIPT AME, weathering, stre discontinuities	ION ngth, colour g TON ingth, colour		WATER LEVEL (m)	° DEPTH (m)	SAMPLE TYPE	C <sub>u</sub> / SPT (kPu) (blows/300mm)	DRILLING METHOD	RECOVERY (%)	TCR SCR RQD	Ť	WATER CONTENT	OTHER
		slightly weathered, moderately strong	dark grey, mas to strong, tabula	sive, <b>BASAL</b> ar	<u>.</u>	1  < 15/04/2008	2 2 3 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			HQ TRIPPLE TUBE WASH DRILL		80 67 30			
		(TARGET DEPTH A	ACHIEVED)				5 								

	g	eo	lab	CLIENT:	Optimax Pro	perty Advisory L	td		<u> </u>		BC	REHOL	E No: H	A1
	air, labo	soil ratory	& water services	PROJECT:	Geotechnica Ellerslie	al Investigation, E	llersl	ie F	lace	course,	Sh	eet 1	of 1	
Dril Dril Dat Dat	ll Type: lled By: te Started te Finishd	50 PE d: 15, ed: 15,	mm HAND AUGER 3K /4/08 /4/08	Pri Co Gr Wa	oject No: rordinates: cund Elevation: ater Level:	1015-126669-01 Groundwater not end	ountere	ed		Logged Shear V Checked	By: 'ane No: d By:	РВК DR28 JCC5	71	
STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG		SOIL DE MAIN/minor.comp structur	ESCRIPTION ponents, strength, s, weathering	olour		WAIENLEVEL (M)	DEPTH (m)	NATUR LIQUID PLASTI SHEAR REMOU POCKE	AL WATER LIMIT C LIMIT 50 1 STRENG JLDED SH T PENETP 50 1	CONTEN	150 (%) 0 v 0 r 0 p 150 (kPa)	LABORATORY TESTS
			TOPSOIL									·····		<u></u>
			TOPSOIL/FI dark brown. common fine	LL.: clayey SILT "firm", moist, lov a to medium sub	, abundant to w to moderate -angular sco	psoil content; plasticity, with ia				·····		•	· · · · · · · · · · · · · · · · · · ·	
	0.5	× × × ×	clayey SILT moderately	; white and light plastic	orange. "stiff	", moist,			<u>0.5</u>		 			
		× × × × × × × × × ×	becomes wi	th trace clay					  <u>1.0</u>	·····				200+ v
		× × × × × × × × × × × × × × × × × × ×	becomes wi streaks, har	th some clay, lig d	ht orange wit	n common white				· · · · · · · · · · · · · · · · · · ·				
	<u>1.5</u> 	× × × × × × × ×	becomes ve	ry stiff					<u>1.5</u>		69 <u>r</u>	120	ŝv 	
MATION	 2.0_	× × × × × × × ×	becomes wi	h trace clay, ora	ange with com	mon white mottle	es		<u>2.0</u>	41 r		/104 v		
DKA FOR	_	× × × × × × ×	sandy SILT moist, none	, sand is fine gra to low plasticity	ained; brownia	sh light grey. stiff,			-					
PUKETO	<u>2.5</u>	× × . × .	silty SAND , occasional c mottles of ar	sand is fine gra range streaks. I norphous organ	ined; brownis oose, moist, v ic înclusions	h light grey with vith common			25					
	3.0	×							3.0	· · · · · · · · · · · · · · · · · · ·				
		× × ×	clayey SILT; moderately ;	light orange an plastic	d grey. "stiff",	moist,	_			·····				
	3.5	× × × × *	becomes sti	f					3.5	50 <u>r</u>		3 v		
	4.0	× × × × × × × × × × × × × × × × × × ×	becomes fin organic inclu	e sandy, with oc Isions	casional mot	les of amorphous	5		4.0	44 <u>r</u>	82	v		
		× × ×	silty CLAY ;	dark grey. very	stiff, moist mo	derately plastic					7			
ECBF			clayey SILT	; dark grey. very	r stiff, moist, n	noderately plastic	;		4 <u>.5</u>  	57	6		148 v	
	5.0	× × _× `	END OF BOF (Target Depti	RE. 5.00 METR	ES.				5.0				+	200+UTP v

,

g	eo	lab	CLIENT:	Optimax Pro	operty Advisory Ltd				BOI	REHOLI	E No: H/	
aiı lat	r, soil 8 boratory	k water services	PROJECT:	Geotechnica Ellerslie	al Investigation, Elle	erslie	Race	course,	She	et 1	ot 1	
Drill Type Drilled By Date Sta Date Fini	e: 50n ly: PBł arted: 16/4 ished: 16/4	nm HAND AUGER K M08 M08	Pn Co Gr Wi	oject No: pordinates; ound Elevation; ater Level;	1015-126669-01 Groundwater not encour	ntered		Logged E Shear Va Checked	By: ane No: By:	РВК DR287 Д.С. 5	71 •	
STRATIGRAPHY	GRAPHIC LOG		SOIL DE MAIN\minor.comp structu	ESCRIPTION ponentis, strength, r re, weathering	colaur	WATER LEVEL (m)	BEPTH (m)	NATURA LIQUID I PLASTIC SHEAR REMOU POCKET 5	AL WATER LIMIT C LIMIT 0 10 STRENGT LDED SHE F PENETRI 0 10	00 1 H EAR OMETER	r ∆ X ⊡ 50 (%) ⊙ r ⊙ p 50 (kPa)	LABORATORY TESTS
		TOPSOIL FILL : SILT, "stiff", moist, coarse sized FILL : SANE moist gravelly SIL brown and li	some clay; light moderately pla I sub-angular gr I, sand is coarso T, gravel is fine ght grey. "stiff",	orange, light stic, with abu avel (volcanic e; dark brown to coarse, ar moist, moder	grey and brown. ndant fine to ) and grey. loose, ngular, volcanic; ately plastic		0.5					
		END OF BOF (Possible bas attempts end	RE. 0.80 METR	ES. der. Too hard le result)	to auger. Other							

	g	eo	lab	CLIENT:	Optimax Pro	operty Advisory Ltd				BO	REHOLI	E No: H	A3 (A)
	air, Iabo	soil & ratory	& water services	PROJECT:	Geotechnic Ellerslie	al Investigation, Elle	rslie	Race	course,	She	et 1	of 1	
Dri Dri Da Da	II Type: Iled By: te Started te Finishe	50r RO 1: 16/ ed: 16/	nm HAND AUGER IBERT SMITH 4/08 4/08	Pr Co Gr Wi	oject No: bordinates: round Elevation: ater Level:	Dry At End Of Drilling	· · · ·		Logged I Shear Va Checked	by: ane No: I By:	DR176	HISMITH	
STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG		SOIL DI MAINminor com structu	ESCRIPTION conents, strength, re, weathering	colour	WATER LEVEL (m)	DEPTH (m)	NATUR/ LIQUID PLASTIC SHEAR REMOU POCKE	AL WATER LIMIT C LIMIT STRENGT STRENGT LDED SHE T PENETR 0 11	00 1: H EAR OMETER 00 1:	50 (%) Ο ν Θ r Ο p 50 (kPa)	LABORATORY TESTS
9-GINT-MB-HA-RCS.GPJ GEOLAB_JANO6.GDT 2/5/08 EAST COAST BAYS FORMATION S			SILT , trace plasticity, "rr (TOPSOIL) SILT , trace moderately becomes re becomes re END OF BOI (DIFFICULT	clay; dark brown noderately sensi to minor clay; bi plastic, "modera ddish brown ddish brown and RE. 1.50 METR TO PENETRAT	n. "Very stiff", tive", trace ro rown. "Very st tely sensitive d brown ES. E, HARD)	moist, low otlets present						50 (kPa)	194+ v 194+ UTP v
SOIL 12666	<u>5.0</u>							<u>5.0</u>					

.

	a	eol	ab	CLIENT: Optimax Pro	perty Advisory Ltd				BOR	EHOLE No:	HA3 (B)
	air, labo	soil &	water services	PROJECT: Geotechnica Ellerslie	I Investigation, Elle	rslie	Race	course,	Shee	et 1 of	1
Dril Dril Dat Dat	l Type: led By: le Started le Finishe	50mr ROB d: 16/4/ ed: 16/4/	n HAND AUGER ERT SMITH 08 08	Project No: Coordinates: Ground Elevation: Water Level:	1015-126669-01 Dry At End Of Drilling			Logged By Shear Van Checked B	r: ne No: By:	ROBERT SM DR1768	ITH .
STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG		SOIL DESCRIPTION MAIN/minor components, strength, o structure, weathering	olour	WATER LEVEL (m)	DEPTH (m)	NATURAL LIQUID LI FLASTIC 50 SHEAR S REMOULI POCKET 50	WATER ( MIT LIMIT 100 TRENGTH DED SHEA PENETRO 100	0 150 (% H C METER C ) 150 (k	LABORATORY TESTS
-ORMATION		× × × × × × × × ×	SILT , trace plasticity, "rr (TOPSOIL) SILT , trace moderately	clay; dark brown. "Very stiff", r oderately sensitive", trace roc to minor clay; brown. "Very sti blastic, "moderately sensitive"	noist, low tlets present ff", moist, low to			ا 			  180 v
COAST BAYS I		× × × × × × × × × × × × × × × × × × ×	 becomes re	dish brown and brown			- - - 10				
EAST		^ × ^ × × × × × × × × × × × × × × × × ×	END OF BOI (DIFFICULT	RE. 1.30 METRES. TO PENETRATE, HARD)			- - 1.5				
							  <u>2.0</u>		· · · · · · · · · · · · · · · · · · ·		
	_ _ _ 2.5						2.5				····
	     3.0										
								· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		
AN06.GDT 2/5/08	-						<u></u>		· · · · · · · · · · · · · · · · · · ·		····
S.GPJ GEOLAB JI	<u>4.0</u>   						<u>4.0</u> 				
69-GINT-MB-HA-RC	4 <u>.5</u>  						4 <u>.5</u>   				
SOIL 1266	<u>5.0</u>				·		<u>5.0</u>				

.

-----

att, soli & worter Ibbortowy sorvices     PHCLELT: Gool@mices investigation, similar Responders, Sim		g	eo	lab	CLIENT: Optimax Property Advisory L	td	 P-		BOF	REHOLI	E No: H	A3 (C)
Det line index Som HAA AGER Prese No. 1075-1888-01 Lange 36 Read Table 1 Data 26 Part 1 Data 26		air, Iabo	soil 8 ratory	k water services	PROJECT: Geotechnical Investigation, E Ellerslie	:ilerslie	Hac	ecourse,	She	et 1	ot 1	
Provide     SOL DESCRIPTION     Sol Additional and a statistic strength of the strengt of the strength of the strengt of th	Dri Dri Da	II Type: lied By: te Starter te Finish	50n ROI d: 16/4 ad: 16/4	111 MAND AUGER BERT SMITH 1/08 1/08	Project No: 1015-126669-01 Coordinates: Ground Elevation: Water Levei: Dry At End Of Drilling	3		Logged B Shear Va Checked I	y: ne No: By:		AT SMITH 38 C	
St. 1         Trace clar, dark from.         Very stiff, molst, low to moderately plastic, 'moderately senative'           0         St. 1         Trace to minor day, brown. "Very stiff, molst, low to moderately plastic, 'moderately senative'           0         St. 1         Trace to minor day, brown. "Very stiff, molst, low to moderately plastic, 'moderately senative'           10         St. 1         Trace to minor day, brown. "Very stiff, molst, low to moderately plastic, 'moderately senative'           11         St. 1         Trace to minor day. brown. "Very stiff, molst, low to moderately plastic, 'moderately senative'           12         St. 1         Trace to minor day. brown. "Very stiff, molst, low to moderately plastic, 'moderately senative'           13         St. 1         Trace to minor day. brown. "Very stiff, molst, low to moderately plastic, 'moderately plastic, 'mode	STRATIGRAPHY	G DEPTH (m)	GRAPHIC LOG		SOIL DESCRIPTION MAINminor components, strength, colour structure, weathering	WATER LEVEL (m)	DEPTH (m)	NATURA LIQUID L PLASTIC 50 SHEAR S REMOUL POCKET 50	L WATER JMIT LIMIT STRENGTI DED SHE PENETRO	CONTENT 10 11 H AR DMETER 10 11	Г <u>А</u> Х БО (%) О V © г О р 50 (кРа)	LABORATORY TESTS
	26669-GINT-ME-HA-RCS.GPU GEOLAB_JAN06.GDT 2/5/08 EAST COAST BAYS FORMATION			SILT , trace plasticity, *n (TOPSOIL) SILT , trace moderately END OF BO (DIFFICULT	clay; dark brown. "Very stiff", moist, low hoderately sensitive", trace rootlets present to minor clay; brown. "Very stiff", moist, low to plastic, "moderately sensitive" RE. 1.30 METRES. TO PENETRATE, HARD)							194+ V 194+ UTP v

. . . . . . . . .





## DRAWINGS

р e

Ţ

---- ----

1...

## **Borehole Location Plan**





	 DESIGN	D: DATE:	SIGNATURE:	PLOT DATE:			PROJECT:	TTTLE:
<u> </u>	 DRAWN:	DATE:	SIGNATURE:	CAD REF: 14443-RC07	CONSULTING ENGINEERS QUALITY	HARRISON	ODTIMAY PROPERTY ADVISORY I TO	CEOTECI
	WSL	20/05/0	8	CAD XREF: 14443-XREF	ACENZ NEW ZEALAND ASSURED	GRIERSON	OF THAN PROPERTY ADVISORTED	GEUTEUP
	 CHECKE	DATE:	SIGNATURE:	SURVEY BY:	THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF,	GRIERSON	ELLERSLIE RACECOURSE	SE
	 			SURVEY DATE:	AND MAY NOT BE REPRODUCED OR ALTERED, WITHOUT	CONSULTING ENGINEERS SURVEYORS PLANNERS		
	 APPROV	D: DATE:	SIGNATURE:	SDR REF:	CONSULTANTS LIMITED. NO LIABILITY SHALL BE	71 Great South Road Auckland Ph 09 917 5000 Fax 09 917 5001		

Ine

1

1

0ir

	TOPSOIL	
	SILT	
-	INFERRED WATER TABLE	
	SANDY	N=

SANDSTONE

FILL

SILTSTONE

SPT VALUE

## SAND

#### LEGEND

### LONGITUDINAL SECTION A-A'

BASALT



CHNICAL BOREHOLE	PLOT STATUS:	
SECTION A-A'	1015.126669.01 1:2000 (A3) DRAWING No: 126669-GE002	A1 REV







			DESIGNED:	DATE:	SIGNATURE:	PLOT DATE:				PROJECT:	TITLE:
· -				-		CAD REF: 14443-RC07	CONSULTING ENGINEERS QUALITY	i i i i i i i i i i i i i i i i i i i	ARRISON	ODTIMAY DEODEDTY ADVICODY LTD	CEOTE
I			WSL	20/05/08	SIGNATURE:	CAD XREF: 14443-XREF	ACENZ NEW ZEALAND ASSURED		GRIERSON		GLUTE
			CHECKED:	DATE:	SIGNATURE:	SURVEY BY:	THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF,			ELLERSLIE RACECOURSE	
1						SURVEY DATE:	AND MAY NOT BE REPRODUCED OR ALTERED, WITHOUT	CONSULTING ENGINEERS SU	JRVEYORS PLANNERS		
-			APPROVED:	DATE:	SIGNATURE:		CONSULTANTS LIMITED. NO LIABILITY SHALL BE	71 Creat South Band Auduland Dh 00	017 5000 5 09 017 5001		
REV	AMENDMENT	BY	ATE			SDR REF:	ACCEPTED FOR UNAUTHORISED USE OF THIS DRAWING.	71 Great South Road Auckland Ph 09	917 5000 Fax 09 917 5001		

.

1	
0.2m	
6.7m 7.4m	
9.7m	
11.6m	
15.19m	
	55.50
	113.00

HNICAL BOREHOLE SECTION B-B'	PLOT STATUS:		
	HG REF: 1015.126669.01	SCALES: 1:400 (A3)	A1
	DRAWING No:	REV	



# LONGITUDINAL SECTION C-C'

SAND

SANDSTONE

SILTSTONE

SPT VALUE

FILL

N =

LEGEND

1

=



SANDY

				DESIGNED:	DATE:	SIGNATURE:	PLOT DATE:			PROJECT:	TITLE
				DD ANNIN.	DATE	CICHIT: DT	CAD REF: 14443-RC07	CONSULTING ENGINEERS OUALITY	HARRISON		HILE.
				WSL	20/05/08	SIGNATURE:	CAD XREF: 14443-XREF	ACENZ NEW ZEALAND ASSURED	C D LE P S O N	OPTIMAX PROPERTY ADVISORY LTD	
				CHECKED:	DATE:	SIGNATURE:	SURVEY BY:	THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF,	GRIENSON	ELLERSLIE RACECOURSE	
rt				APOROVED:	DATE:	SIGNATIOS-	SURVEY DATE:	THE WRITTEN PERMISSION OF HARRISON GRIERSON	CONSULTING ENGINEERS SURVEYORS PLANNERS		
REV AME	NDMENT	BY	DATE			C.C. C.C.	SDR REF:	ACCEPTED FOR UNAUTHORISED USE OF THIS DRAWING.	71 Great South Road Auckland Ph 09 917 5000 Fax 09 917 5001		

CENTROLINGAL DODELLOLE	PLOT STATUS:		
SECTION C-C'	HG REF: 1015.126669.01	SCALES: 1:400 (A3)	A1
	DRAWING No:	9-GE004	REV

_	S	K												Log of In	vestig	ati	on
Proj	ject	Abl	oott	s W	lay	Sto	rmwate	r Upg	rade	•				Drillhole			
Loca	ation	Elle	rslie	Rac	ecc	ourse	)		Pr	oject N	lo: Ae	E02	2819.12	Hole ID: DH	2		
Clier	nt:	Auc	klan	d Cit	ty C	ound	cil							Date: 29/09/2	2006		
		Ð														±.	
R.L. (m)	Depth (m)	Drilling Methoo	Return (%)	(%) 25 50 75	RQD	<sup>100</sup> Spacing of <sup>100</sup> Natural	In-Situ Testing	w Relative ss Strength	Sampling	ww Weathering Arade	Geology Legend	GroundWater	Descri	ption of Strata	a	Geological Un	Backfill / Installation
_	0,												Sandy SILT, abunda	nt grass at the top 50n	nm. (FILL)	$\overline{\square}$	Π
   	<u>1</u> .0	НΩЗ											Gravelly CLAY, mino brownish grey, mottle medium plasticity. Gr poorly graded, Includ vesicular, moderately	r fine to coarse sand a ed yellow brown. Stiff, avel; fine to coarse, ar ed is a basalt cobble ( weathered and strong	and silt; dark moist, ngular, 75mm) g (FI		
   	<u>2</u> .0	SPT		         22 			   S   0,4,4   N=8   						Sandy CLAY, dark br Soft, medium plastici Silty CLAY, minor fine greyish dark brown. V	own, orange brown st ty. (FILL) e to coarse sand and o Very stiff, moist, mediu	reaked. gravel, <sup>-</sup> im		
		HQ3		100			     150.0pp   				×   ×   ×   ×   ×   ×   ×   ×   ×   ×		Clayey SILT, brown, very stiff, moist, low p	mottled brownish grey plasticity. (East Coast	. Stiff to Bays	   	
<u>5</u> 0.0   	<u>3</u> .0	SPT		4			   S   1,3,3   N=6     60.0 <i>pp</i>   					1	Silty CLAY, grey, mo plasticity. (East Coas	ttled brown. Stiff, mois st Bays Formation)	st, high	- - - - - -	
 	<u>4</u> .0	HQ3		67			       I <sub>VP</sub> 75+         								-		
48.0	5.0	SPT		89			   S   3,4,5   N=9 		C1				Clayey SILT, brownis plasticity. <b>(East Coas</b>	sh grey. Stiff, moist, loo <b>st Bays Formation)</b>	N	- - Mwe	
Starte Finisl Drille	ed: hed: er:	27/09/2006 Depth Related Remarks 28/09/2006 Drillwell					l Remarks arks	Groundwater Observations No. Struck (m) Date Observa 1. 3.6m 28/09/2006					ons Observations //2006	Standing (m	Co-ordinat 5915 1761 Elevation:	es: 912.4 335.8 53.00	6mN 8mE ImRL
Loaa	 ed:	TPA				-									Inclination	: -90°	
Chao	ked.	CG														-4	_

NZGD ID: BH\_67982

See key sheet for an explanation of symbols and abbreviations. Material descriptions as per NZGS Guidelines - December 2005.

	S	K	M									Log of Inv	vestig	ati	on
Pro	oject	: Al	obot	ts W	lay Stor	mwate	er Upg	grade	•			Drillhole			
Loc	ation	: Ell	erslie	e Rac	cecourse			Pr	oject N	lo: AE	02819.12	Hole ID: DH2	2		
Clie	nt:	Au	icklar	nd Ci	ty Counc	il						Date: 29/09/2	2006		
R.L. (m)	Depth (m)	Drilling Method	Drilling Flush Return (%)	TCR (%)	RQD Spacing of Natural Defects (mm)	In-Situ Testing	<ul> <li>Relative</li> <li>Strength</li> </ul>	Sampling	Weathering Grade	Geology Legend GroundWater	Descr	iption of Strata	l	Geological Unit	Backfill /
	- - - - - -	HQ3	2 55 50 75                   	25 50 75 76		¢		2			Silty SAND, orange I dense, very fine to fin Formation)	brown, mottled grey. Me ne grained. <b>(East Coas</b>	edium s <b>t Bays</b>	- -Mwe - -	
<u>4</u> 7.0	  	SPT		89		S 2,4,6 N=10		C2			6m to 6.45m: Becon lamination. Sandy SILT, brownis Sand is fine (Fast C	nes grey and orange br sh grey. Stiff, wet, non p	own plastic.	- Mwe 	
<u>1</u> 6.0	- - - - - -	HQ3		55							7.2m to 7.3m: With a	a 100mm layer of brow	, wnish grey	_ _ _ _ _ _ _ _ _ _	
		SPT		89		S 3,6,8 N=14				× × × × × × × × × × × ×	SILT, orange brown. Coast Bays Format	. Stiff, moist, low plastic tion)	ity. <b>(East</b>	- - - - - -	
<u>4</u> 5.0 _ _ _ _ _ _ _	<u>8</u> .0 - - - - - - -	HQ3		100				C3			Silty CLAY, orange to plasticity. (East Coa Sandy SILT, orange plastic. Sand; fine gr Formation)	brown. Stiff to very stiff, st Bays Formation) brown. Very stiff, moist ained. (East Coast Bay	, non <b>ys</b>	Mwe	
<u>4</u> 4.0 - - - - - -	<u>9</u> .0 _ - - - - -	SPT		100		S 5,8,12 N=20					Silty SAND, orangey stained. Medium der <b>Coast Bays Format</b> 9.1m to 9.45m: Beco 9.45m: Becomes lig	brownish grey, reddish nse, moist, fine grained. tion) omes greenish grey. ht greenish grey.	brown (East	- - - - Mwe -	
43.0 Star Finis Drill Plar Log	ted: shed: er: nt: ged:	HQ3 27/09/ 28/09/ Drillwe TD 15 TPA	2006 2006 2006 2006	De Fro	th Related m Remain	Remarks ks		Grou No. 1.	IIIIII Indwater Struck (n 3.6m	Dbserv n) Da n 28	rations te Observation: /09/2006	s Standing (m)	Co-ordinat 5915 1761 Elevation: Inclination	912.4 335.4 53.0 : -90	46mN 88mE 0mRI °

NZGD ID: BH\_67982

See key sheet for an explanation of symbols and abbreviations. Material descriptions as per NZGS Guidelines - December 2005.

sion 1.6 28/08/2006 - S.Humphreys

SKM				Log of Inves	stigation
Project: Abbot	tts Way Stormwat	er Upgrade		Drillhole	
Location: Ellersli	e Racecourse	Project No:	AE02819.12	Hole ID: DH2	
Client: Auckla	nd City Council			Date: 29/09/2006	
R.L. (m) Depth (m) Drilling Method Drilling Method Drilling Flush Return (%)	Performance Perform	Sampling Sampling Garde	CoundWater GroundWater	ription of Strata	Geological Unit Backfill / Installation
			Sandy SILT, mediu	im grey. Stiff to very stiff, mois Coast Bays Formation)	- Mwe t, - 
2.0 11.0 SPT         	100	5         11111         11111           11111         11111         11111           11111         11111         11111           11111         11111         11111           11111         11111         11111           11111         11111         11111           11111         11111         11111           11111         11111         11111           11111         11111         11111           11111         11111         11111	Moderately weather SILTSTONE, extreme Formation)	red, medium grey, homogenou mely weak. <b>(East Coast Bays</b> Becomes very weak.	IS
– HQ3      – HQ3      –        –	<b>100</b> 100   100		Moderately weather extremely weak, fin Formation)	red, medium grey SANDSTON e grained. <b>(East Coast Bays</b>	IE, -Mwe
41.0 12.0 1111 - SPT 111 - III	<b>44</b> 1 1 1 1 S 8,12,1 N=29	7	11.55m: Joint (Dip) Slightly weathered sandy SILTSTONE Bays Formation)	<i>bing 45°), smooth, planar, tigh</i> to unweathered, medium grey , very weak to weak. <b>(East Co</b>	nt Mwe
40.0 <u>13</u> .0 ноз      -      -      -	<b>100</b> 100		Unweathered, med and SANDSTONE, moderately thin (10 (300mm). (East Co	ium grey interbedded SILTST( very weak. The beds are 0mm) to moderately thick <b>bast Bays Formation)</b>	DNE
39.0 14.0	50 SOLUTION	0	Unweathered, med SILTSTONE, very v Formation)	ium grey sandy (fine) weak. <b>(East Coast Bays</b>	
- HQ3	<b>100</b> 100	C4	Unweathered, med weak to very weak, Coast Bays Forma	ium grey SANDSTONE, extrer fine to medium grained. <b>(Eas</b> <b>ation)</b>	nely -
38.0         15.0         111           Started:         27/09/2006           Finished:         28/09/2006           Driller:         Drillwell           Plant:         TD 150	Depth Related Remarks From Remarks	s Groundwater O No. Struck (m) 1. 3.6m	bservations     Date     0bservation     28/09/2006	ns Standing (m) Co- Ele Incl	ordinates: 5915912.46mN 1761335.88mE vation: 53.00mRL ination: -90°
Logged: TPA Checked: CG				Pa	ae 3 of 5

NZGD ID: BH\_67982

See key sheet for an explanation of symbols and abbreviations. Material descriptions as per NZGS Guidelines - December 2005.

#### NZGD |D: BH\_67982

5	S	K	M										Log of Inves	tiga	tion	1
Pro	oject	: Ak	obot	ts W	lay	Stor	nwate	r Upg	rade	;			Drillhole			_
Loc	cation	: Elle	erslie	e Rac	ceco	ourse			Pr	oject I	No: Ae	02819.12	Hole ID: DH2			$\neg$
Clie	ent:	Au	cklar	nd Ci	ty C	Counci							Date: 29/09/2006			$\dashv$
R.L. (m)	Depth (m)	Drilling Method	-52 Drilling Flush -22 Return (%)	LCR (%)	RQD	-500 Spacing of -100 Natural -10 Defects (mm)	n-Situ Testing	-ew -w -s Strength	Sampling	-uw -sw -ww -ww Grade	ски Geology Legend	Descri	ption of Strata	-	Backfill /	Installation
	-	SPT		100			S 18,31,19 N=50\215					14.9m: Becomes we	ak.	_ _M	we	
<u>3</u> 7.0	  <u>_16</u> .0 	HQ3		100							× × × × ×	15m: Becomes very Unweathered, mediu (East Coast Bays F 15.37m: Joint (Dippin Unweathered, mediu extremely weak to we	weak. m grey SILTSTONE, very wea ormation) ng 35°), smooth, planar, tight m grey, slabby SANDSTONE, eak, fine grained. (East Coasi	ak.	we	
<u>3</u> 6.0		SPT		100			S 18,38,12 N=50\170		C5		× × × × × × × × × × × × × × × × × × ×	Bays Formation) Becomes very weak slabs. 16m: Joint (Dipping of Unweathered, mediu (fine) SILTSTONE; v Formation)	easily split into thin 10mm-20 60°), smooth, planar, tight m grey, homogenous sandy ery weak. (East Coast Bays		we	
23/11/06 55	- - - - 18.0	HQ3		100	80						× × × × × × × × × × × × × × × × × × ×	16.5m: Becomes gre Unweathered, mediu weak to very weak, fi Formation)	ey, weak. m grey SANDSTONE, extrem ne grained. <b>(East Coast Bay</b> s	ely s	we	
le: ABBOTS_WAY03.GPJ							C 50 N=50\150		C6		× × × × × × × × × × × × × × × × × × ×	Unweathered, mediu weak. (East Coast E Unweathered, mediu very weak to weak. (I	m grey SILTSTONE, very Bays Formation) m grey, massive SILTSTONE East Coast Bays Formation	, - , - , -		
ILLHOLE Project File Nan 5 0	_  <u>19</u> .0 _ _ _	SPI		100	100							18.8m to 19.4m: Wit @18.8m (70mm), 18 18.84m: With a 30m	h very weak silty sandstone b 8.97m (30mm), 19.3m (100m) m thick sheared zone.	neds n) 		
0T Output Form: DR	  						C 50 N=50\150					Unweathered, mediu thick bedded SANDS grained. <b>(East Coast</b>	m grey, cemented, moderatel TONE, weak to very weak, fir t Bays Formation)	/ - ie _ _ _ _	we	
Sta Sta Fin Dril Pla	ished: lier: nt:	27/09/2 28/09/2 Drillwe TD 150	2006 2006 III	De <i>Fro</i> Re	pth F m mark	Related F Reman	Remarks		Grou No. 1.	undwate Struck (i 3.6r	r Obser m) D n 2	vations ate Observations 3/09/2006	S Standing (m)	rdinates 591591 176133 ation: 53	2.46mN 5.88mE .00mRL	    -
Data Template	ged: ecked:	TPA CG											Pag	e 4 0	f 5	

## NZGD |D: BH\_67982

	S	KM											Log	of Inv	vestiga	atio	n
Pr	oject	: Abbott	ts Way	Storm	wate	er Upg	rade	)					Drillh	ole			
Lo	cation	Ellerslie	Racec	ourse			Pro	oject N	o: <b>A</b>	<b>E02</b> 81	19.12		Hole ID	): <b>DH2</b>			
Cli	ent:	Aucklan	d City (	Council									Date:	29/09/2	006		
R.L. (m)	Depth (m)	Santueass Drilling Method Casing Dismeter (mm) 	TCR (%) 722 20 122	<ul> <li>Bacing of Natural</li> <li>Defects (mm)</li> </ul>	In-Situ Testing	-EW -W -W -W -Ms Strength -S	Sampling	-uw sw ₩ ₩ Ew Grade	Geology Legend	GroundWater		Descri	ption of	Strata		Geological Unit Backfill /	Installation
32.0	_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _	HQ3	<b>100</b> 100							Un SII Fo	weathe TSTO ormatio	ered, mediui NE, very w <b>n)</b>	m grey, hom eak. <b>(East C</b>	ogenous coast Bays		Mwe	
02.0	21.0								<u>× × ¥</u>	DH	l2 term	inated at 21	1.00m. Targe	et Depth			
Sta Fir Dr Pla	arted: hished: iller: ant:	27/09/2006 28/09/2006 Drillwell TD 150	Depth F From	Related Re <i>Remarks</i>	marks		Grou <i>No.</i> 1.	Indwater Struck (m 3.6m	Obser n) D 2	vations <sup>ate</sup> 8/09/20	s 006	Observations	: S	tanding (m)	Co-ordinate 59159 17613 Elevation: 5 Inclination:	es: 12.46m 35.88m 53.00ml -90°	nN וE RL
Lo	gged:	TPA CG													Dago F	of F	
	ICUNED:	00	See kev st	neet for an exi	olanation	of symbols	and abb	reviations.	Materia	l descrip	tions as	per NZGS Gui	delines - Decer	1ber 2005.	Page 5	or 5	

Projec	t: Abb	ootts Wa	y Stormwa	ater Upg	rade	•			Drillhole		
Locatior	n: Eller	slie Race	course		Pro	oject N	No: <b>Ae</b>	02819.12	Hole ID: DH3	;	
Client:	Aucl	kland City	Council						Date: 29/09/2	006	
R.L. (m) Depth (m)	nit Details Drilling Method asing Diameter (mm)	TCR (%) (%)	<ul> <li>Bracing of Natural</li> <li>Defects (mm)</li> <li>In-Situ Testing</li> </ul>	* Relative Strength	Sampling	w Weathering Grade	Geology Legend GroundWater	Desci	ription of Strata		Geological Unit
	∞ 0 23             				>			Clayey SILT with mi grey. Soft, moist, mo (FILL)	inor fine to medium sand edium plasticity, lots of g	; dark - rass roots -	-
<u>5</u> 4.0  	HQ3							Sandy GRAVEL wit fine to medium, ang sand; fine to coarse	h minor silt, dark grey. Lo ular to sub angular, poorl , silt is non plastic. (FILL	bose, wet, ly graded, )	
<u>1</u> .0 								Clayey SILT, minor streaked. Firm, mois	fine gravel; brown grey, r st, medium plasticity. (FII	red brown LL) -	
<u>5</u> 3.0 _ _	       		                 <sub>VP</sub> A                 V <sub>V</sub> A 	4        0               4				Silty CLAY, orange to stiff, moist, mediu Formation)	brown, white grey streak Im plasticity. <b>(East Coas</b>	ed. Firm - t Bays -	-Mwe
_ 2.0 _	    			7                      				SILT with trace clay pink. Firm, moist, lo Formation)	y; light greenish grey, mo w plasticity. <b>(East Coast</b>	ttled Bays	
 	          	         <b>100</b> 	                                 	рр                           	C1		×  ×  ×  ×  ×  ×  ×  ×  ×  ×  ×  ×  ×  ×	Clayey SILT, light g brown. Firm to stiff, Formation)	reenish grey, mottled ora moist. <b>(East Coast Bay</b>	nge - <b>s</b> - -	-Mwe
_ 3.0 _	       		                                       2.6	7			× × × × × × × × × × × × × × ×	Silty SAND, orange grained. (East Coas	brown. Loose, moist, fine st Bays Formation)	- - e	- - - Mwe
 51.0	SPT       	100	N='	13			× * . * * . * .× × * . * × * . *	3m: Becomes orang	ge brown, light grey strea	aked	
- - - 4.0	       	             <b>100</b>					× × ×	wet, non plastic. (Ea	ast Coast Bays Formati	ion) - -	Mwe
							×	Silty SAND, light gre dense, wet, fine gra <b>Formation)</b>	ey, mottled brown. Mediu ined. <b>(East Coast Bays</b>	m - - -	Mwe
	SPT	100		15        23        				SAND with minor si Medium dense, wet Formation)	lt, grey, mottled orange b , fine grained. <b>(East Coa</b>	rown st Bays - -	Mwe
Started: Finished:	25/09/20 27/09/20	06 Depth <i>From</i> 06	Related Remai <i>Remarks</i>	ŕks	Grou <i>No.</i> 1.	Indwate Struck (r 4.3n	I <u>× ·×</u> r Obser∖ n) Da n 27	1 ations ate Observation /09/2006	ns Standing (m)	Co-ordinate 59159 17613	<u>Mwe</u> s: 18.81 70.28

NZGD ID: BH\_67983

See key sheet for an explanation of symbols and abbreviations. Material descriptions as per NZGS Guidelines - December 2005.

28/08/2006 - S.Humpt

9	5	K	M.									Log of Inv	vestig	ati	ion
Pr	ojec	t: Ab	bot	ts W	ay Stor	mwate	er Upg	rade	ļ			Drillhole			
Lo	catior	n: Elle	erslie	Rac	ecourse			Pro	oject N	lo: <b>Ae</b>	02819.12	Hole ID: DH3	3		
Clie	ent:	Au	cklar	nd Ci	ty Counc	il						Date: 29/09/2	2006		
R.L. (m)	Depth (m)	<sup>Snit Details</sup> Drilling Method <sup>Casug Diameter (mm)</sup>	Drilling Flush E Return (%)	(%) 25 50 75	RQD Spacing of Natural Defects (mm)	n-Situ Testing	ew ww ss Strength	Sampling	www www Grade	Geology Legend	Descr	iption of Strata	l	Geological Unit	Backfill /
	_ _ _									× · × ·× · × · × × · ×	Sandy SILT, grey, n non plastic. Sand, fil <b>Formation)</b>	nottled orange brown. Si ne grained. <b>(East Coas</b> i	tiff, wet, <b>t Bays</b>	/ -Mwe	-
9.0	-	HQ3		100						 ×	5.05m: Becomes or	ange brown		Mwe	
	-					200.0 <i>pp</i>		C2		× × ×	Silty CLAY, grey. Ve (East Coast Bays F	ery stiff, moist, medium Formation)	plasticity.	4 - -	
8.0	6.0  	SPT		100		S 3,14,21 N=35 I√p60 I√n20					Silty SAND, grey, m grained. <b>(East Coas</b>	ottled orange. Dense, m t Bays Formation)	noist, fine –	- - - - - - - -	-
	_ _ _ <u>7</u> .0 _	HQ3		73						× × × × × × × × × × × × × × × × × × ×	Highly weathered, g SILTSTONE, extrem Formation)	rey orange brown staine hely weak. (East Coast	d Bays	- - Mwe	-
<u>1</u> 7.0	- ·	SPT		100		S 10,15,18 N=33				· · · · × · · · · · × · · · · × · · · ·	(East Coast Bays F 7.3m: Becomes me Very dense, moist to	dium grey, mottled oran	ge brown.	-Mwe	-
	_ <u>8</u> .0									× × × × × × × × × × × × × × × × × × ×	7.5m: Becomes wei	t, fine to medium graine ed. medium arev. homa	d	HMwe	
46.0	- -	102									SILTSTOŇE, very w Formation)	eak. (East Coast Bays			
<u>4</u> 0.0	- - -	ΠQ3		67							7.95m: With a 50mr bed.	m thick extremely weak	sandstone	ļ	
	- 										Moderately weather SANDSTONE, extre Coast Bays Forma	ed, medium grey, homog mely weak, fine grained <b>tion)</b>	genous I. <b>(East</b>		
	-	SPT		100		5 12,32,40 N=72					9m: Becomes weak	ly cemented			-
<u>4</u> 5.0	- - -										9.4m to 9.7m: With inclined organic laye	a few 2mm to 6mm thic ers.	k, 45⁰		
Sta Fin Dri	irted: ished: ller:	25/09/2 27/09/2 Drillwel	2006 2006 II	De  Fro	pth Related m Rema	Remarks rks	L I	Grou No. 1.	ndwater Struck (n 4.3m	r Obser n) D n 27	vations ate Observation /09/2006	s Standing (m)	Co-ordinat 5915 1761	es: 918.8 370.2	81ml 28ml
Pla Loç	int: gged:	TD 150 TPA	)	Re	marks			<u> </u>					Elevation:	54.5 : -90	0mRl °
Ch	ecked:	CG											Page 2	of	6

See key sheet for an explanation of symbols and abbreviations. Material descriptions as per NZGS Guidelines - December 2005.

Version 1.6 28/08/2006 - S.Hump

#### NZGD ID: BH\_67983

	S	K	M											Log of Inv	/estiga	ati	on
Pro	ject:	Ab	bott	s W	/ay	Stor	mwate	r Up	grade	)				Drillhole			
Loca	ation:	Elle	erslie	Rac	ceco	ourse			Pr	oject l	No: Al	E02	2819.12	Hole ID: DH3	5		
Clier	nt:	Au	cklan	d Ci	ty C	Counci	1							Date: 29/09/2	006		
R.L. (m)	Depth (m) <sup>Shitt Details</sup>	Drilling Method	Drilling Flush Return (%)	LCR (%)	RQD	-500 Spacing of -100 Natural -50 Defects (mm)	n-Situ Testing	-ew -w Mis Strength	ده Sampling	-uv -uv -avv -avv Grade	Geology Legend	GroundWater	Descri	ption of Strata		Geological Unit	Backfill / Installation
Couput Form: DRILLHOLE Project File Name: ABBOTS_WAY03.GPJ 23/11/06	11.0 12.0 13.0 14.0	SPT HQ3 SPT HQ3 SPT		86 100 100 101 100 100 100	61		S 17,43,19 N=62\180 S 14,60 N=60\150 S 30,23,37 N=60\180						Slightly weathered, m sandy (fine) SILTSTC Bays Formation) Significant core lost. If SANDSTONE with ca (East Coast Bays For (East Coast Bays For SANDSTONE, extrer 50mm thick sandy sil Bays Formation) Slightly weathered, m SILTSTONE; very we Formation) Slightly weathered, m SANDSTONE; extrer @ 12.75m (20mm), ' and 13.15m (50mm). Unweathered, mediuu SANDSTONE, weak, Formation)	edium grey, thinly bedo DNE, very weak. (East of Poorly cemented, very v arbonised organic lamin ormation) redium grey, poorly cem nely weak, fine grained tstone @12.1m. (East edium grey, homogeno tak. (East Coast Bays redium grey, poorly cem nely weak, with crushed 12.85m (50mm), 13m ( (East Coast Bays Fo m grey, well cemented, fine grained. (East Co	ded, Coast weak hations. 		
Start Start Finis Drille Plan	15.0  ed: 2 hed: 2 er: 1	 25/09/2 27/09/2 Drillwel TD 150	<u>: : :  </u> 2006 2006 11	De <i>Fro</i>	pth F m mark	Related F Reman	I Remarks ks		Grou No. 1.	L: L	er Obsei ( <i>m) E</i> m 2	ı Prvat Date 27/09	tions 9 Observations 9/2006	Standing (m)	Co-ordinate 59159 17613 Elevation: 4 Inclination:	i i es: 918.8 370.2 54.50 -90°	
	led:	TPA													Page 2	of	6
	ren:	60													Page 3	OŤ	o

## NZGD |D: BH\_67983

	5	K	M											Log of Inv	/estiga	ati	on
Pr	ojec	t: Ak	obot	ts W	/ay	Stor	nwate	r Upg	rade	•				Drillhole			
Lo	catior	n: Elle	erslie	e Rac	ceco	ourse			Pro	oject N	lo: Al	E0	2819.12	Hole ID: DH3	5		
Cli	ent:	Au	cklar	nd Ci	ty C	Counci	I							Date: 29/09/2	006		
R.L. (m)	Depth (m)	Shift Details Drilling Method Casing Diameter (mm)	Drilling Flush Return (%)	U(%)	RQD	<ul> <li><sup>500</sup> Spacing of</li> <li><sup>100</sup> Natural</li> <li><sup>50</sup> Defects (mm)</li> </ul>	In-Situ Testing	w Relative s Strength	Sampling	www Www Grade	Geology Legend	GroundWater	Descri	ption of Strata		Geological Unit	Backfill / Installation
	_	SPT		100			S 43,50 N=50\150				× × × × × × × × × × × ×		Unweathered, mediur SILTSTONE, weak. (	n grey, homogenous East Coast Bays Forr	nation)	Mwe	
<u>39</u> .0	  <u>_16</u> .0 	HQ3		95	100				C3		× × × × × × × × × × × × × × × × × × ×		15.45m: With a 100n strong. Unweathered, mediur homogenous SANDS grained. (East Coast 16.15m: Becomes po very weak to weak.	nm sandy siltstone, me m grey, well cemented, TONE, moderately str Bays Formation)	ong, fine		
<u>3</u> 7.0	- - - - - - - - - - - - - - - - - - -	HQ3		77	55		C 50 N=50\150				× × × × × × × × × × × × × × × × × × ×		Unweathered, mediur homogenous sandy S (East Coast Bays For 17.1m: Becomes weat and a thin (40mm) fir 17.22m to 17.23m: C Unweathered, mediur SANDSTONE, very v crushed zones. (East	m grey, well cemented, SILTSTONE, medium s formation) ak, includes organic lance as sandstone bed. Srushed zone. m grey, poorly cemente weak, fine grained with t <b>Coast Bays Formati</b>	trong. minations d 20mm <b>on)</b>	Mwe	
	      	HQ3		100	100		C 35,45,7 N=52\165		C4		x x x x x x x x x x x x x x x x x x x		17.6m: Becomes well Unweathered, mediur SANDSTONE, weak occasional sub horizo 50mm crushed zone Formation) Unweathered, mediur SILTSTONE, weak. (	I cemented, moderated m grey, homogenous to very weak, fine grain ontal organic layers (2m @17.7m. (East Coast m grey, homogenous East Coast Bays Forr	y strong. ed, im). Bays nation)		
I Output Form: L	_ _ _ _ 20.0								1				19.5m: Becomes san Unweathered, mediur SANDSTONE, weak,	ndy. m grey, homogenous s fine grained. <b>(East Co</b>	lty ast Bays	Mwe	
Stata Template: DATA TEMPLATE.G	arted: iished: ller: ant: gged: ecked:	25/09/2 27/09/2 Drillwe TD 150 TPA CG	2006 2006 II )	De Fro	pth F m mark	Related F <i>Remarl</i>	Remarks (s		Grou No. 1.	ndwatei <i>Struck (ri</i> 4.3m	<sup>-</sup> Obser n) <i>L</i> n 2		tions Observations 19/2006	Standing (m)	Co-ordinate 59159 17613 Elevation: & Inclination: Page 4	es: 918.8 970.2 54.50 -90°	1mN 8mE 0mRL

See key sheet for an explanation of symbols and abbreviations. Material descriptions as per NZGS Guidelines - December 2005.

#### Log of Investigation SKM Drillhole Project: Abbotts Way Stormwater Upgrade Project No: AE02819.12 Location: Ellerslie Racecourse Hole ID: DH3 Auckland City Council Date: 29/09/2006 Client: Drilling Method Spacing of Natural Defects (mm) Geological Unit Drilling Flush Return (%) In-Situ Testing Weathering Grade Backfill / Installation Depth (m) Relative Strength R.L. (m) Sampling Geology Legend TCR (%) RQD Diameter (mm) **Description of Strata** 000 SS§ SS 25 ≧≷ ≥ SS Formation) 1111 11111 1111 C5 1111 1111 1111 HQ3 93 93 ||||||||||||111 1111 1111 ||||||111 1111 11111 34.0 11111 1111 1111 11111 11111 11111 11111 111 1111 | | | | | 11111 111 1111 11111 21.0 1111 1111 11111 111 1111 С 1111 11111 |||||50 1111 ||||||| | | N=50\150 1111 11111 1 | | | ||||||111 1111 1111 Unweathered, medium grey sandy SILTSTONE, \*\*\*\* 1111 11111 \*\*\*\* 33.0 weak to very weak. (East Coast Bays Formation) |||||1111 11111 111 ||||||11111 1 | | | 11111 111 1 | | | HQ3 73 73 21.4m: With a 50mm sandstone bed & extremely thin 11111 1111 1111 sandstone layers split into thin slabs. 1111 111 1111 1111 22.0 111 1111 1111 ||||||111 1111 1111 1111 1111 | | | | | 22m: With some 60mm thick organic layers inclined 1111 1111 |||||| $@20^{\circ}-25^{\circ}$ |||||1111 ||||||111 Unweathered, medium grey, homogenous silty SANDSTONE, weak to very weak, fine grained. 1111 |||||||||||32.0 |||||1111 ||||||||||1111 11111 (East Coast Bays Formation) C 50 |||||1111 11111 N=50\150 11111 23/11/06 11111 ||||||1111 1111 11111 22.5m: Becomes slabby, extremely weak to very weak, 11111 111 1 | | | 11111 easily split into 10mm to 20mm slabs. 23.0 11111 111 1 | | | Data Template: DATA TEMPLATE.GDT Output Form: DRILLHOLE Project File Name: ABBOTS\_WAY03.GPJ 111 1 | | | 11111 11111 111 1111 1111 11111 HQ3 47 |||||1111 ||||||| | | 1111 1111 11111 |||||1111 ||||||111 <u>3</u>1.0 11111 1111 11111 111 |||||1111 1111 1111 |||||||||||11111 111 11111 11111 24.0 ||||||1111 11111 11111 11111 C 50 11111 111 1111 1111 24m: Becomes extremely weak to weak, fine to N=50\150 11111 medium grained. 111 1111 1111 11111 1111 1111 ||||||<u>3</u>0.0 24.2m: 20mm crushed zone retrieved as sandy fine to 1111 |||||||||1111 ||||||||||1111 ||||||medium gravel. 11111 60 HQ3 73 111 1111 11111 Unweathered, medium grey sandy SILTSTONE, very 1111 1111 1111 |||||weak to weak. (East Coast Bays Formation) |||||||||25/09/2006 Started: Depth Related Remarks Groundwater Observations Co-ordinates: Standing (m) Remarks No. Struck (m) Date Observations From 5915918.81mN 27/09/2006 Finished: 27/09/2006 4.3m 1. 1761370.28mE Driller: Drillwell Elevation: 54.50mRL Remarks Plant: TD 150 Inclination: -90° Logged: TPA

NZGD ID: BH\_67983

Checked: CG

See key sheet for an explanation of symbols and abbreviations. Material descriptions as per NZGS Guidelines - December 2005

Page 5

of 6

5	KM									Log of Inv	/estiga	tion
Project	: Abbot	ts Way	y Storm	water	Upg	rade	•			Drillhole		
Location	: Ellerslie	Racec	course			Pro	oject N	lo: AE	02819.12	Hole ID: DH3	6	
Client:	Aucklar	nd City	Council							Date: 29/09/2	006	
R.L. (m) Depth (m)	Drilling Method Casing Diemeter (mm) 	TCR (%) 80D 725 50 75	<ul> <li>Spacing of Natural</li> <li>Defects (mm)</li> </ul>	In-Situ Testing	-w Relative -w Strength	Sampling	-ww -sw -sw Grade	Geology Legend GroundWater	Descri	iption of Strata		Geological Unit Backfill /
_ _ _ _								× × × × × × × × × × × × × × × × × ×	25m: With a 70mm s sandy with depth.	sandstone bed. Become	es less _ _ _ _	lwe
  	HQ3	67		C   50 50\150         					Unweathered, mediu weak SANDSTONE a SILTSTONE. Siltston (150mm to 250mm) i sandstone layers. Oc siltstone. <b>(East Coas</b>	m grey, interbedded ext and very weak sandy le beds are moderately and includes few <10n ccasional organic lamina at Bays Formation)	thin - nm thick - ation in _	
<u>28.0</u> - - - 27.0 27.0			           	C   50 50\150   1				XX:1::XX:1::XX: XX:1::XX:1::XX: XX:1::XX:1::XX: XX:1::XX:1::XX:	Unweathered, mediu SANDSTONE (very o weak, fine grained. (I	m grey, very poorly cen dense sand like), extren East Coast Bays Form	- - - - nented - nely - nation) _ -	
_ 	HQ3   	73							28 4m to 28 5m <sup>-</sup> Wit	h a 100mm thick sand	- - - - - - - - - - - - - - - - - - -	we
    25.0	HQ3	50		50 50\150   					bed containing a few	/ dark grey organic lam	inations	
  						1			29.5m to 29.6m: Wit bed.	h a weak cemented sa	ndstone _ _ _ _	
Started: Finished: Driller:	25/09/2006 27/09/2006 Drillwell	Depth From	Related Rer <i>Remarks</i>	marks		Grou No. 1.	ndwate Struck (r. 4.3n	r Observ n) Da n 27	ations terminated at 30 the Observations /09/2006	0.00m. Target Depth s Standing (m)	Co-ordinates 591591 176137	: 8.81ml 0.28ml
Plant:	TD 150	Remar	rks								Lievation: 54	.50mR

Logged: TPA Checked: CG

Data Templa

See key sheet for an explanation of symbols and abbreviations. Material descriptions as per NZGS Guidelines - December 2005.

Version 1.6 28/08/2006 - S.Humpl

Page 6 of 6

25 Tee Auckla	ed Stree	et, Newr w Zeala	narket nd	E	oreno			Bore: B	ΠU	1		C	
Tel: +6 Fax: + Web:	64 9 913 64 9 91 www.sk	3 8900 3 8901 mconsi	ulting.com	Pi 1   Lo	roject Na	<b>me:</b> El Ellerslie	llerslie Racecourse SW Upgrad	e Drilling Da Project Nu	ate: umbe	15/11/2007 er: AE03390.3	-	2	
Drillin	ng Con	npany:	Boart L	ongyea	ar		Drilled Depth: 15m			Logged by: N	DM		
Co-or	dinate	<b>s</b> : 267	1704.00	mE 6	477579.0	0mN	Ground Elevation: 45.10m	RL		Checked by. II	A		
Depth (m BGL)	TCR (%) (SCR (%))	RQD	Fracture Index	Sampling	Geology Legend		Description of Strata	De	fect	Description	Elevation (m)	Backfill / Installation	Comments
						Clayey S plasticity	SILT, dark brown. Firm, moist, moderate y. Minor grass rootlets. (Fill)	2			45.0		
						0.32m: E	Becomes mottled yellow brown. Stiff.						
	100	N/A	N/A	HA		0.60m: A	Absence of mottling.				 44.5 		
						0.75m: E plastic.	Becomes reddish brown. Very stiff, sligi	ntly					
<u>    1.0</u>											 		
	100	N/A	N/A	HQ3		Clayey S yellow b moderat	SILT with minor fine grained sand, light rown mottled yellow brown. Stiff, moist te plasticity. (East Coast Bays Formation	)					
 					× × ×	1.40m: E slightly p Silty CL/ Very stif	Becomes mottled grey white. Very stiff, plastic. AY, light yellow brown mottled grey whi f, moist, moderate plasticity. <b>(East Coa</b> st <b>remation</b> )	ie. it			 		SPT=1,1,2 (Open no:
	100	N/A	N/A	SPT		Bays FO	mauon						
 2.0 											43 0		
					× ×								
2.5	91	N/A	N/A	HQ3									
					$  \times   \times   \times   \times   \times   \times   \times   \times   \times   \times$	Clayey S slight pla	SILT, orange brown. Very stiff, moist, asticity. (East Coast Bays Formation) Becomes mottled brown white flecked of	lark					
					× × * * × ×	fragmen 2.80m: E brown. N	whun nignly weathered, extremely weak its. Becomes brown white mottled orange Moderate plasticity.	IUCK					
	100	NI/A		свт		3.00m: V white mo 3.12m: E slightly p	With a moderately thin layer of stiff, gre ottled orange silty clay. Becomes grey white mottled orange, fir plastic.	/ n,			 42.0 		SPT=1,2,2 (Open nos
	100	IN/A		JT I	× × ×	Sandy S moist, sl occasion Bays Fo	SILT, grey white mottled orange. Firm, light plasticity. Sand is fine grained. Wi nal subhorizontal laminations. <b>(East Co</b> <b>rmation)</b>	h ast					
3.5					· × · × · × · × · × · × · × · × · × · ×	3.45m: \ clayey s 3.55m: E medium	With a moderately thin layer of grey whi ilt. Trace fine to medium grained sand. Becomes orange brown. Sand is fine to grained. Minor clay.	te,			 4 <u>1.5</u> 		
					, ×, ×, ×, ×, ×, ×, ×, ×, ×, ×, ×, ×, ×,	3.68m: E With trac Moderat	Becomes grey white mottled light brown ce fine, angular gravel fragments.	I.					
4.0 Rema	72 rks	17	N/A	HQ3		Formatio	on)						
Groun	dwater	not reco	orded dur	ing the	investigatio	on.							

Tel: - Fax:	-64 9 91 +64 9 91	3 8900 3 8901	ultire	Pr	roject N	lame: E	Ilerslie Racecourse SW	Upgrade	Drilling Date:	15/11/2007		0	
Drill Drill Drill	ing Cor ing Met	npany: hod:	: Boart I	m <b>Lo</b> ngyea	ar 477579		Drilled Depth:	15m 100mm 45 10mRI		Logged by: NE Checked by: TP	DM A		
Depth (m BGL)	TCR (%) SCR (%))	a D D D D D	Fracture	Sampling	Geology Legend		Description of Strat	ta	Defect	Description	Elevation (m)	Backfill / nstallation	Comments
	(36)					3.95m t Unweat (East Co 4.15m: weak.	o 3.99m: Becomes orange. hered, grey, SILTSTONE. Extra oast Bays Formation) Siltstone becomes extremely w	emely weak. weak to very			41.0  	_	
<u>4.5</u>	100	N/A	N/A	SPT		4.50m: fine to r 4.68m:	With a moderately thin layer of nedium grained sandstone. Siltstone becomes very weak.	f very weak,			 40.5  		SPT=12,19,2 (Open no
<u>5.0</u>	- - - - - -					4.95m: medium 4.98m: 5.10m: fine to r dip).	With a thin layer of very weak, o grained sandstone. Bedding dips 60°. With a moderately thin layer of nedium grained sandstone (20	fine to f very weak, o° bedding	5.03m to 5.07m: planar, clean. 5.30m to 5.31m: planar, clean.	Joint (40°) smooth, Joint (10°) smooth,	40.0		
	53 (53)	11	4	HQ3		Unweat SANDS Formati	hered, grey, fine to medium gr. TONE. Very weak. <b>(East Coast</b> on)	ained t Bays	5.32m to 5.34m: planar, clean. 5.39m to 5.41m: planar, clay coat	Joint (20°) smooth, Joint (25°) smooth, ing.			
<u>6.0</u>						6.15m: 6.21m: dip. 6.26m: and sor 6.37m: siltstone (30-40°	Sandstone becomes fine grain With a 4mm thick carbonaceou With minor carbonaceous fleck me carbonaceous flecks at 6,21 With moderately thin layers of e at 6.37m-6.48m and at 6.54m bedding dip).	ned. us band, 45° ks at 6.26m 8m. very weak, n-6.67m	6.24m to 6.26m: 6.31m to 6.32m: planar, clean. 6.56m to 6.58m:	Joint (30°) undulating. Joint (20°) rough, Joint (30°) rough,	39.0		SPT=18,50N (Solid no
	87 (85)	63	3	HQ3	× × × × × × × × × × × × × × × × × × ×	6.67m: 6.79m: Unweat to very 7.05m: weak to	Bedding dips 20°. Sandstone becomes very fine endergy substances of the start sector of the sector o	grained. emely weak <b>tion)</b> f extremely stone.	7.03m to 7.04m: planar, orange su	Joint (10°) rough, urface staining.			
						7.27m t weak. Unweat SANDS (East Co	o 7.28m: Siltstone becomes ex hered, grey, fine to medium gr. TONE. Extremely weak to very <b>bast Bays Formation)</b>	xtremely rained y weak.	7.17m to 7.18m: planar, clean.	Joint (10°) rough,			SPT=43,50N (Solid nc
8.0 Rem Grou	arks	not reco	brded du	ring the	investiga	ation.							

Drilli Drilli	ng Con na Met	npany: hod:	Boart I	Longyea	ır		Drilled D Bore Dia	epth: meter:	15m 100mm		Logged by: N Checked by: T	DM PA		
Co-o	rdinate	<b>s:</b> 267	1704.00	DmE 64	477579	.00mN	Ground I	Elevatior	: 45.10mRL		<b>,</b>			
Depth (m BGL)	TCR (%) (SCR (%))	RQD	Fracture Index	Sampling	Geology Legend		Descript	ion of S	trata	Defect	Description	Elevation (m)	Backfill / Installation	Comments
	88 (87)	81	0	HQ3		8.10m: weak. 8.11m: weak. 8.20m: 8.20m: 8.21m, 8.35m: weak to 8.52m: 8.61m: weak. 8.61m:	Sandstone becc Sandstone becc With a 4mm thi 45° dip. With a moderat b very weak silts Sandstone becc and fine to medi Sandstone becc Sandstone becc	omes fine g omes extrei ck carbonack carbonack carbonack ely thin laye tone. omes extrei um grainec omes extrei	rained, extremely mely weak to very ceous band at yous band at er of extremely mely weak at at 8.57m. nely weak to very o coarse grained.	· · · · · · · · · · · · · · · · · · ·				
 					-	9.00m:	Sandstone bec	omes very v	veak.			36.0		SPT=50N≕ (Solid no
  9.5 						9.33m t weak.	to 9.36m: Sands	stone becor	nes extremely	9.19m to 9.20m planar, clean.	: Joint (5°) rough,	    35.5		
	87 (87)	87	1	HQ3						9.86m to 9.88m planar, clean.	: Joint (15°) rough,	    <u>35.0</u>		
  						10.13m extreme	n: Sandstone be ely weak to very	comes fine weak.	grained,					
					-	10.50m siltstone 10.64m dips 45 10.80m	n: With a modera e. I: Sandstone be <sup>°.</sup> I: Sandstone be	ately thin lay comes very comes extr	ver of very weak weak. Bedding emely weak to			34.5 		SPT=50N=
   	96	93	1	HQ3		very we	<i>τα</i> Κ.			10.92m to 10.96 planar, orange s 10.94m to 10.95 planar, clean.	8m: Joint (50°) rough, surface staining. 5m: Joint (45°) rough,	  <u>_34.0</u> 		
	(93)					11.39m 11.39m bedding 11.41m and fine	n: With a thin lay and a moderat g dip). I: Sandstone be e grained at 11.	rer of very v ely thin laye comes very 52m.	veak siltstone at r at 11.43m (30° weak at 11.41m					
12.0 Borri	arke.													

Web: www. Drilling Drilling Co-ordi	ww.skn g Com	8901	na	1	Boreh Project N	I <b>ole L</b> o Name: E	Dgging Form	Bore: BH( Drilling Date	<b>15</b> /11/2007		S	KM
	g Meth linates	pany: pany: iod: 5: 267	Boart L	n <b>I</b> .ongye	Location ear 6477579	: Ellerslie	e Racecourse Drilled Depth: 15m Bore Diameter: 100mm Ground Elevation: 45.10m	Project Numb	ber: AE03390.3	DM PA		
Depth (m BGL	TCR (%) (SCR (%))	RQD	Fracture Index	Sampling	Geology Legend		Description of Strata	Defec	t Description	Elevation (m)	Backfill / Installation	Comments
						12.00m grained	: Sandstone becomes fine to medium , extremely weak to very weak.			<u>33.0</u>		SPT=36,50N=5 (Solid nose
   <u>12.5</u> 						12.26m 12.30m weak.	: With a thin layer of very weak siltstone : Sandstone becomes fine grained, very					
( ( ( 	52 (52)	45	0	HQ3		12.72m grained	: Sandstone becomes fine to coarse					
										<u>32.0</u>    		
 						13.50m extreme	: Sandstone becomes fine grained, ely weak to very weak.			 		SPT=50N=50
						Unweat (East Co	hered, grey, SILISTONE. Very weak. bast Bays Formation)					
14.0						Unweat Extreme 13.98m grained 14.07m	hered, grey, fine grained SANDSTONE. ly weak. (East Coast Bays Formation) : Sandstone becomes fine to medium ; very weak. With some carbonaceous flecks					
	91 (91)	83	1	HQ3		Unweat (East Co	hered, grey, SILTSTONE. Very weak. <b>aast Bays Formation)</b>					
								14.44m to 14.4 planar, clean.	6m: Joint (20°) rough,	 <u>30.5</u>		
					× × >	Unweat Very we	hered, grey, fine grained SANDSTONE. eak. (East Coast Bays Formation)					
15.0						BH01 te	erminated at 15.00m. Target Depth					SPT=50N=50

25 Te Auckl	ed Stree and, Nev	et, Newi w Zeala	market Ind		Dorent			Boi		0	_		
Tel: + Fax: + Weh <sup>:</sup>	64 9 913 64 9 91 www.sk	3 8900 3 8901 mconsi	ultina.con	n	Project Na Location:	a <b>me:</b> E Ellerslie	llerslie Racecourse SW Upgrade Racecourse	e Drill Proi	ling Date: ect Numbe	19/11/2007 er: AE03390.3	-	2	
Drilli	ng Con	npany	: Boart L	ongy	ear		Drilled Depth: 26m			Logged by: VK	( (		
Drilli Co-o	ng Met rdinate	nod:	1225 00	)mF	6477788	00mN	Ground Elevation: 42 90ml	RI		Checked by: TP	Ά		
pth 3GL) 60	(%)	a. 207	tare the stare	pling	end View Po		Description of Strata		Defect	Description	ation n)	kfill / llation	4
De (J E	TCR (SCF	RC	Frac	Sam	Geo Leg		Description of Strata		Delect	Description	Elev (n	Bac	, and c
						SILT wit Stiff, mo	h minor fine grained sand, dark brown. ist, non plastic. <b>(Topsoil / Fill)</b>						
						Silty CL modera	AY, dark brown, Very stiff, moist, te plasticity. <b>(Fill)</b>						
0.5	100	N/A	N/A	HA							<u>42.5</u>		
						Clayey : orange.	SILT, greyish white intermixed brownish Very stiff, moist, slight plasticity. (Fill)					-	
 						0.70m: modera	Becomes dark orange brown, hard, le plasticity.						
	100	N/A	N/A	HQ		1.00-	Nith minor medium to coorse onculor t				<u>42.0</u> 		
						subangi size 40r	llar, strong basalt gravel, gap graded, m nm and trace fine sand.	ax.					
	88	N/A	N/A	HQ	'								
 1.5					-	Slightly vesicula	weathered, BASALT, grey. Strong, high r (max 50mmØ). <b>(Basalt Lava)</b>	ly					
  								1.6 pla	3m to 1.66m: inar.	Joint (8°) rough,			
								1.7 pla	'6m to 1.77m: inar.	Joint (5°) rough,	41.0		
2.0								2.0	)4m to 2.08m:	Joint (50°) rough,			
	92	92	3	HQ				pla	inar.				
	(92)							2.2 pla	27m to 2.29m: inar.	Joint (5°) rough,	40.5		
2.5													
- 3 U_ 											40.0		
								2.9 infi	8m to 3.00m: illed brown silf	Joint rough, stepped,			
						3.28m:	Becomes less vesicular (max 12mmØ).	3.2	28m to 3.30m:	Joint (15°) rough,			
3.5								pla	mar, clean.		<u>39.5</u>		
 								3.5	55m: Joint (0°)	rough, planar, clean.			
	100 (100)	100	3	HQ				3.7 pla 3 7	75m to 3.78m: inar, clean. 77m: Joint (0°)	Joint (10°) rough, rough, planar. clean			
 4.0	arko												
Grour	dwater	not reco	orded dur	ring th	e investigat	ion.							





25 Te Auckla Tel: +	ed Stree and, Nev 54 9 913	et, Newi w Zeala 3 8900	narket nd	_	Project N	ame: Ellerslie Racecourse SW Upgrade	Drilling Date:	19/11/2007	_	S	KN
Fax: + Web:	64 9 91 www.sk	3 8901 mconsi	ulting.cor	m	Location	: Ellerslie Racecourse	Project Numb	er: AE03390.3	-		
Drilli Drilli	ng Con ng Met	npany: hod:	: Boart I	_ongy	vear	Drilled Depth: 26m Bore Diameter: 100mm		Logged by: VK Checked by: TP	A		
Co-o	rdinate	<b>s:</b> 267	1225.00	DmE	6477788	.00mN Ground Elevation: 42.90mF	RL			1	
Depth (m BGL)	TCR (%) (SCR (%))	RQD	Fracture Index	Sampling	Geology Legend	Description of Strata	Defect	t Description	Elevation (m)	Backfill / Installation	Comments
							12.45m to 12.48	m: loint (15°) rough	<u>30.5</u>		
 							planar, clean.	511. Joint (13 ) Tough,			
	100	100	2	10			10.70m much				
	(100)	100	2	HQ	³ 🏹		12.73m: rougn,	planar, clean.			
 13.0									<u> </u>		
							13.31m to 13.33 stained orange.	3m: Joint rough, planar,			
<u>13.5</u>											
 14.0											
	100	100	0	HQ:	3						
	(100)										
14.5											
						14 90m to 15 00m December high wards in t					
 15 0						17.02111 10 13.02111. Becomes nignly vesicular.			<u>28.0</u>		
 					Ĭ,						
E -									 		
15.5							15.46m: Joint (C	)°) smooth, planar,			
È -											
 	97 (97)	97	3	HQ	3	15.79m: Becomes less vesicular.					
							15.89m to 15.95 planar, infilled y	5m: Joint (50°) smooth, ellowish brown clay.	27.0		
Rema	arks dwater	not reco	orded du	rina tr		ition					

25 Te Auckla	ed Stree and, Nev	et, New w Zeala	market Ind		Boreh	ole Lo	ogging Form		Bore: BH0	6		C	
Tel: + Fax: + Web	64 9 913 64 9 91 www.se	3 8900 3 8901 mcons	ultina co	 m	Project N	lame: E : Ellerslie	llerslie Racecourse SV e Racecourse	/ Upgrade	Drilling Date: Proiect Numb	19/11/2007 er: AE03390 3	-	0	
Drillin Drillin Co-o	ng Con ng Met rdinate	npany hod: s: 267	: Boart I	Longye	ear 6477788	.00mN	Drilled Depth: Bore Diameter: Ground Elevation:	26m 100mm 42.90mRL		Logged by: VK Checked by: TP	A		
Depth (m BGL)	TCR (%) (SCR (%))	RQD	Fracture Index	Sampling	Geology Legend		Description of Str	ata	Defect	Description	Elevation (m)	Backfill / Installation	Comments
									16.05m to 16.23 planar, infilled ye	m: Joint (85°) rough, ellowish brown clay.			
									16.23m to 16.25 planar, infilled ye	m: Joint (20°) smooth, ellowish brown clay.			
 											26.5		
						16.50m	: Absence of vesicles.						
									16.69m to 16.78 planar, coated g	m: Joint (60°) smooth, reyish brown clay.			
 17.0											<u>26.0</u> 		
	100 (90)	80	3	HQ3									
 17.5									17.45m to 17.56 planar, clean.	m: Joint (70°) smooth,			
									17.75m to 17.81	m: Joint.			
									planar, stained c	m: Joint smooth, prange.			
									18.11m to 18.16 planar, clean. 18.16m to 18.19	m: Joint (60°) smooth, m: Joint (60°) smooth,			
									planal, clean.		24.5		
	93	82	1	HQ3									
	(00)										 24.0 		
						2 2							
 											23.5		
20.0													
Rema Grour	arks Idwater	not rec	orded du	iring th	e investiga	ation.							

25 Te Auckl	ed Stree and, Nev	t Merz et, Newr w Zeala	market Ind		Boreh		erslie Racecourse SW Line		re: BH0	19/11/2007		C	
Fax: + Web:	-64 9 91 -64 9 91 www.sk	3 8900 3 8901 mconsi	ulting.cor	n	Location	: Ellerslie	Racecourse	grade Dri	ject Numbe	er: AE03390.3	-	0	
Drilli Drilli Co-0	ng Con ng Met rdinate	npany: hod:	: Boart L	_ongy	ear 6477788	00mN	Drilled Depth: 26n Bore Diameter: 100 Ground Elevation: 42.9	n )mm 90mRl	_	Logged by: Checked by:	VK TPA		
Depth m BGL)	CR (%) CR (%))	RaD	Index	ampling	seology -egend		Description of Strata		Defect	Description	levation (m)	sackfill / stallation	omments
	(§ ⊣			S							ш 	<u> </u>	ŭ
  	100 (100)	100	0	HQ3		20.23m: at 20.58i	Moderate vesicularity at 20.3m-20 n-20.9m.	0.46 and			  22.5		
21.0											 22.0 		
											21.5 		
	100 (100)	100	0	HQ3							210		
 						22.00m: (max 16r	Becomes moderately to highly ve nmØ).	esicular					
  	· ·												
	100	NI/A	NIA	ЦО?		BASALT Loose, n (Transition	GRAVEL in a silty clay matrix, da noist, fine. Trace medium grains. on Zone)	ark grey.			 		
		1974		n Qđ		moderate material.	e plasticity. With trace carbonace (Puketoka Formation)	ous					
23.5											 <u>19.5</u> 		
  	100	N/A	N/A	SPT		23.70m: 23.75m:	With a small piece of organic ma Becomes grey. With occasional reous flecks	iterial.					
 24.0					× ·× ·	Sandy S non plas	ILT, some clay, light grey. Stiff, m tic. (Puketoka Formation, ?)	noist,			<u>19.0</u>		
Rema Grour	arks Idwater	not reco	orded du	ring th	e investiga	ation.							
Tel: +64 9 Fax: +64 Web: ww	9 913 8 9 913 8	000											
-----------------------------------	--------------------	--------------	-----------	----------	--	--------------------------------	---	---	----------------------------------	-------------------------------	-------------------------	---------------------------	----------------------
Drilling	w ekm	8900 8901	lting cor	F I	Project N	<b>lame</b> : E	Ilerslie Racecourse	SW Upgrade	Drilling Date: Project Number	19/11/2007 er: AE03390.3		0	
Drilling	Comp Metho	oany: od:	Boart L	_ongye	ear 6477789		Drilled Depth: Bore Diameter:	26m 100mm 42.90mPl		Logged by: V Checked by: T	K PA		
Depth (m BGL) TCR (%)	(SCR (%))	RaD	Fracture	Sampling	Geology		Description of	Strata	Defect	Description	Elevation (m)	Backfill / nstallation	Somments
						24.00m	: With minor orange brov	vn mottles.					SPT=8,12, (Open n
  	00	N1/A		102		Clayey occasio plasticit	SILT, some fine grained in a grained bonal orange brown mottle by. (Puketoka Formation, 1	sand, grey with s. Stiff, moist, low ?)	-		<u>18.5</u>   		
		N/A	N/A	ΠQ3	* * * * * * * * * * * * * * * *	Silty SA moist, f	AND, minor clay, grey. Me ine grained. <b>(Puketoka F</b> o	edium dense, ormation, ?)					
						Silty CL moist, r ?)	.AY, minor fine grained sa noderate plasticity. <b>(Puke</b>	and, grey. Stiff, toka Formation,			   		
<u></u>  11 11	00	N/A	N/A	HQ3	× · · · · · · · · · · · · · · · · · · ·	Silty SA dense, ?)	ND, minor clay, greyish l moist, fine grained. (Puka	brown. Medium etoka Formation,					
  					× × × × × × × × × × × × × × × × × × ×	moist, r materia	non plastic. With trace ca I. (Puketoka Formation, ?	rbonaceous )					
Remarks	s ater no	ot reco	rded du	ring the	e investig	ation.							

Sincla 25 Te	ir Knigh ed Stree	t Merz et, Newr	narket		Bore	hole L	ogging Form	Bore: BH1	5			
Tel: + Fax: +	64 9 913 64 9 913	8 8900 3 8901	ilting com		Project	Name: E	Ellerslie Racecourse SW Upgrad	le Drilling Date: Project Numb	15/11/2007 er: AE03390.3		5	<u>XW</u>
Drilli	ng Con	npany:	Boart Lo	ongy	/ear		Drilled Depth: 12m		Logged by: N	IDM		
Co-o	ng Met rdinate	<b>noa:</b> s: 267	1561.00	mE	647780	)7.00mN	Ground Elevation: 47.40n	ו IRL	Checked by: 1	PA		
Depth (m BGL)	TCR (%) (SCR (%))	RQD	Fracture Index	Sampling	Geology	5	Description of Strata	Defect	Description	Elevation (m)	Installation	Comments
	100	N/A	N/A	на	×   ×   ×   ×   ×   ×   ×   ×   ×   ×	Clayey plastici Clayey Clayey white n (East C x x 0.89m: plastici	SILT, dark brown. Very stiff, moist, slig ty. With trace grass rootlets. (Fill) SILT with some fine grained sand, grey nottled orange. Stiff, moist, slight plasti oast Bays Formation) Becomes light orange, slight to non ty.	nt		47.0	K K K	
	89	N/A N/A	N/A N/A	HQ:	3 × × × × × × × × × × × × × × × × × × ×	× Silty S/ grey wl (East C 1.64m:	AND with minor clay, light orange mottl hite. Loose, moist, fine to medium grair <b>oast Bays Formation)</b> Becomes grey white. With trace clay.	ed.				SPT=2,2,4N (Open nose
	87	N/A	N/A	HQ	3	Clayey light or grainec	SAND with minor silt, grey white mottle ange. Loose, moist, fine to medium 1. (East Coast Bays Formation) to 2.56m: With thin, subhorizontal tions.	d		<u>40.2</u>  		
	100		N/A			Modera grainec Coast f	ately weathered, grey, fine to medium I SANDSTONE. Extremely weak. (East Bays Formation)					SPT=3,7,9N= (Open nose
				5	- -					44.0   		
4.0 Rema Grour	71 arks adwater	71 not reco	N/A	<u>HQ</u> : ing th	<u>3 iiiiii</u> n	gation.						

Sincla 25 Tee Auckla Tel: +6	ed Stree and, Ne 34 9 91	et, Newi w Zeala 3 8900	market and	_	Boreh Project N	I <b>OIE LO</b> lame: E	Dgging Form	de Drilli	e: BH1	<b>5</b> 15/11/2007		S	KM
Fax: + Web:	64 9 91 www.sk	3 8901 mconsi	ulting.com	1	Location	: Ellerslie	eRacecourse	Proje	ect Numbe	er: AE03390.3	-		
Drillir Drillir	ng Cor ng Met	npany: hod:	: Boart Lo	ongy	/ear		Drilled Depth: 12m Bore Diameter: 100mr	n		Logged by: N Checked by: T	DM PA		
Co-oi	dinate	e <b>s:</b> 267	71561.00r	тE	6477807	'.00mN	Ground Elevation: 47.40n	nRL					
Depth (m BGL)	TCR (%) (SCR (%))	RQD	Fracture Index	Sampling	Geology Legend		Description of Strata		Defect	Description	Elevation (m)	Backfill / Installation	Comments
	(71)												
											43.0		
4.5													SPT=6,9,14
	100	N/A	N/A	SP	T								
 											42.5		
<u>5.0</u>						4.95m: weak to	Sandstone becomes fine grained, extr very weak.	emely					
5.5	30	30	0	HQ	3						<u>42.0</u>		
v 	(30)	_		-									
											41 5		
6.0					_	6.00	a 6 20m With a moderate with the	of					SPT=11.16.1
						extreme	ly weak to very weak siltstone.						(Solid no
						6.21m to	o 6.25m: With a 10 mm thick carbonad	ceous					
 											41.0		
6.5													
 	33 (33)	33	0	HQ	3								
											40.5		
7.5											<u>40.0</u>		
													SPT=12,20,30 (Solid no
											39.5		
8.0													
Rema Groun	irks dwater	not reco	orded duri	ng th	ne investig	ation.							

Sinclair Kni 25 Teed Sti Auckland, N	ght Merz eet, New lew Zeala	market and	В	oreh	ole Lo	ogging Form		Bore: BH1	5		C	
Tel: +64 9 9 Fax: +64 9 9 Web: www	13 8900 913 8901 skmcons	ulting co	Pr m Lo	oject N	lame: El	lerslie Racecourse	SW Upgrade	Drilling Date: Proiect Number	15/11/2007 er: AE03390.3	_	0	
Drilling Co Drilling M	ompany ethod:	: Boart I	Longyea	ar		Drilled Depth: Bore Diameter:	12m 100mm		Logged by: N Checked by: T	NDM IPA		
Co-ordina	tes: 267	/1561.00	0mE 6	477807 	7.00mN	Ground Elevation	on: 47.40mRL					
Depth (m BGL) TCR (%)	RQD	Fracture Index	Sampling	Geology Legend		Description of	Strata	Defect	Description	Elevation (m)	Backfill / Installation	Comments
– – 27 – – (19)	19	0	HQ3									
8.5										39.0		
										38.5		
				-								SPT=13,29,21N (Solid nos
73	73	0	HQ3							38.0		
9.5												
				_								
										37.5		
 					9.99m: S	Sandstone becomes extr	remely weak.					
	) 100	0	HQ3									
				_	10.50m:	Sandstone becomes ex	tremely weak to					SPT=22,35,15N (Solid nos
						an.						
96	96	0	HQ3							 		
(96)												
					Unweath SANDS Formation	nered, fine to medium gr TONE, grey. Very weak. on)	ained, <b>(East Coast Bays</b>			360		
11.5												
100 100	) 100	0	HQ3									
12.0										<u>    35.5</u> _		
Remarks Groundwate	er not rec	orded du	iring the	investiga	ation.							
i j												

Sincla 25 Te Auckla Tel: +	iir Knigh ed Stree and, Nev 64 9 913	t Merz et, Newr w Zeala 3 8900	market Ind	E	Boreh Project N	I <mark>ole L</mark> e Name: E	ogging Form	B Jpgrade	ore: BH1	<b>5</b> 15/11/2007		S	KM
Fax: + Web:	·64 9 91 www.sk	3 8901 mconsi	ulting.com	,   L	.ocation	: Ellersli	e Racecourse	I	Project Numbe	er: AE03390.3	-		
Drilli	ng Con	npany	: Boart Lo	ongye	ear		Drilled Depth:	l2m		Logged by: NE	DM		
Drilli	ng Met	hod:					Bore Diameter:	100mm		Checked by: TF	PA		
Со-о	rdinate	<b>s:</b> 267	1561.00r	mE (	6477807	7.00mN	Ground Elevation: 4	17.40mRL					
Depth (m BGL)	TCR (%) (SCR (%))	RQD	Fracture Index	Sampling	Geology Legend		Description of Strat	a	Defect	Description	Elevation (m)	Backfill / Installation	Comments
						BH15 te	erminated at 12.00m. Target De	epth					SPT=26,44,6N=50 (Solid nose)
L ; ;													
Rema Grour	arks Idwater	not reco	orded duri	ng the	e investig	ation.							

Instruction         Location:         Location:         Location:         Project Number: AE0330.3           Drilling Company:         Dotation:         Elevation Passocause         Project Number: AE0330.3           Drilling Company:         Dotation:         Diriling Method:         Dotation:         Logged by:         NM           Co-ordinates:         267/1644.00mE         More Diameter:         Diriling Method:         Description of Strats         Defect Description         Generation:           State         State <th>Auc Tel:</th> <th>kland, N +64 9 9</th> <th>ew Zeala 13 8900</th> <th>ind</th> <th>Р</th> <th>roject Na</th> <th>me: E</th> <th>llerslie Racecourse SW Upgrade</th> <th>Drilling Date:</th> <th>14/11/2007</th> <th></th> <th>5</th> <th>KM</th>	Auc Tel:	kland, N +64 9 9	ew Zeala 13 8900	ind	Р	roject Na	me: E	llerslie Racecourse SW Upgrade	Drilling Date:	14/11/2007		5	KM
Drilling Company: Boart Languesr Drilling Muthod:         Drilled Daph:         15m         Logged by: NDM           Cocordinate: \$277734.00ml         Bor Diamoter:         100mm         Checked by: TPA           Cocordinate: \$277734.00ml         Bescription of Strata         Defect Description         98 (S)         100 (S)           1         100 N/A         NA         HA         Cocordinate: \$277734.00ml         Description of Strata         Defect Description         99 (S)         100 (S)	Fax: Wel	: +64 9 9 b: www.s	13 8901 kmcons	ulting.cor	n L	ocation:	Ellerslie	e Racecourse	Project Numb	er: AE03390.3			
Drifting Method:         Dore Diameter:         100mm         Checked by: TPA           Co-ordinates::         2671644.00mE         6477734.00ml         Graud Elevation: 48.70mRL         0           1         1         1         1         1         1         0         NA         NA         19         1         1         1         0         NA         1         1         0         1         0         1         0         1         0         1         0         NA         1         1         0         1         0         0         1         0	Dril	lling Co	mpany	: Boart L	ongye	ar		Drilled Depth: 15m		Logged by: N	DM		
Co-ordinates:         2871644.00mE         6477734.00mV         Ground Elevation:         48.70mRL <u>9</u> <u>9</u>	Dril	lling Me	thod:					Bore Diameter: 100mm		Checked by: T	PA		
Image: Section of Strate         Description of Strate         Defect Description         Image: Section of Strate           100         NA         NA </th <th>Co-</th> <th>-ordinat</th> <th><b>es:</b> 267</th> <th>1644.00</th> <th>DmE 6</th> <th>6477734.0</th> <th>0mN</th> <th>Ground Elevation: 46.70mF</th> <th>RL</th> <th></th> <th></th> <th></th> <th></th>	Co-	-ordinat	<b>es:</b> 267	1644.00	DmE 6	6477734.0	0mN	Ground Elevation: 46.70mF	RL				
100         N/A         N/A         HA           0.5         Charge Bill II did bown Stiff cross Ledging         43.2           0.5         CRAVEL_Gat care per hown Loose , field on we how you want to an applic tast, at correctly weak to you you want (Pill)         43.2           1.0         N/A         N/A         HA         CRAVEL_Gat care per hown Loose, field on you how you want (Pill)           1.0         25         N/A         N/A         HA         CRAVEL_Gat care per hown Loose, field on you how you want (Pill)           1.15         No ore recovery.         No ore recovery.         How you want (Pill)         How you want (Pill)           1.0         25         N/A         N/A         Host recovery.         45.3           1.0         26         N/A         N/A         HA         Recovery.         45.3           1.0         1.0         1.0         I.0         I.0         I.0         I.0         I.0           1.0         2.0         I.0	Depth (m RGL)	TCR (%) (SCR (%)	RQD	Fracture Index	Sampling	Geology Legend		Description of Strata	Defect	Description	Elevation (m)	Backfill / Installation	Comments
0.5         0.5         0 <td>-</td> <td></td> <td>N/A</td> <td>N/A</td> <td>НА</td> <td></td> <td>Clayey s plasticity</td> <td>SILT, dark brown. Stiff, moist, slight y. With trace grass rootlets. <b>(Fill)</b></td> <td></td> <td></td> <td> 46.5 </td> <td></td> <td></td>	-		N/A	N/A	НА		Clayey s plasticity	SILT, dark brown. Stiff, moist, slight y. With trace grass rootlets. <b>(Fill)</b>			 46.5 		
10         25         N/A         N/A         HQ3         Highly weathered, basil COBBLE: Weak. Prime vector (max vector bits in trimo) No core recovery.         46.0           1.0         25         N/A         N/A         HQ3         46.0           1.0         25         N/A         N/A         HQ3         46.0           1.0         25         N/A         N/A         HQ3         45.0           1.0         25         N/A         N/A         HQ3         Moderately weathered, grey, fine to medum prime? SANISTONE. Very weak. (Eat Coast Ege reconstant)         45.0           1.0         1.5         Image: Sandstone becomes extremely weak.         1.7 trin to 1.7 trim. Joint (10°) rough, prime? SANISTONE. Very weak. (Eat Coast Ege reconstant)         45.0           1.20         1.8 trim. Sandstone becomes extremely weak to very veak.         1.9 trim. Sint (10°) rough, prime? SANISTONE. Very weak.         1.9 trim. Sint (10°) rough, prime? SANISTONE. Very veak.           2.0 trim. Sandstone becomes extremely weak to very veak.         2.8 trim. Sint to a become settremely weak at 2.0 trim. prime? SANISTONE. Very veak.         44.0           3.30         3.30         2.8 trim. Sint to a become settremely weak at 2.0 trim. 2.7 trim.         44.0           3.40         4.0         4.0         4.0         4.0	_ _ <u>0.</u> {	5 					GRAVE coarse. weather very weather	L, dark orange brown. Loose, fine to Gravel is completely weathered to highly red, subangular basalt; extremely weak to ak. (Fill)	, , , , , , , , , , , , , , , , , , , ,				
1.0         25         N/A         N/A         Hogh weakling COBBLE Weakling (COBBLE Weakling) COBBLE Weakling (COBBLE Weakling) COBBLE Weakling))	Ē						Clayey s plasticity	SILT, orange brown. Firm, moist, low y. <b>(Fill)</b>			 		
1.0         25         N/A         N/A         HO3         Note recovery.           1.0         25         N/A         N/A         HO3         Note recovery.           1.1         -	-						Highly w moderat (Fill)	veathered, basalt COBBLE. Weak, tely vesicular (max. vesicle size 1mmØ)			 		
1.5	<u>1.(</u>	2 25	N/A	N/A	HQ3		NU COľE	тесочету.					
1.5  .											45.5		
2.0       94       0       9       HQ3       1.84m: Sandstone becomes extremely weak.       1.71m to 1.74m: Joint (10°) rough, planar, stained orange.       45.0         2.0       94       0       9       HQ3       2.28m: Sandstone becomes extremely weak.       1.96m to 2.03m: Joint (45°) rough, planar, otain (10°) rough, planar, o	- - <u>1.</u> -	5 					Moderat	tely weathered, grey, fine to medium SANDSTONE. Very weak. (East Coast					
2.0       94       0       9       HQ3       1.84m: Sandstone becomes extremely weak to very weak.       1.99m: Sandstone becomes extremely weak to very weak.       1.99m: Sandstone becomes extremely weak to very weak.       1.99m: Sandstone becomes very weak.       1.99m: Sandstone becomes extremely weak to very weak.       2.26m: Sandstone becomes extremely weak at 2.35m and 2.76m.       44.5         3.0       X       Moderately weak to september d, grey, SILTSTONE. Very weak at 2.88m: Slitstone becomes extremely weak at 2.88m: 2.71m and at 2.74m-2.76m.       44.0       5         3.5       X       Moderately extremely meak to very weak.       3.63m to 3.65m: Joint (20') rough, planar, dean.       43.6         4.0       X       Moderately extremely meak to very weak.       3.63m to 3.65m: Joint (20') rough, planar, dean.       43.0         3.5       X       Unweathered, grey, SILTSTONE. Extremely weak to very weak.       3.63m to 3.65m: Joint (20') rough, planar, dean.       43.0         4.0       X       Unweathered, grey, SILTSTONE. Extremely weak to very weak.       3.63m to 3.65m: Joint (20') rough, planar, dean.       43.0         3.5       X       Unweathered, grey, SILTSTONE. Extremely weak to very weak.       3.63m to 3.65m: Joint (20') rough, plan							Bays Fo	rmation)	1.71m to 1.74m planar, stained 1.77m to 1.79m	: Joint (10°) rough, orange. : Joint (20°) rough,	45.0		
94       0       9       HQ3       2.28m: Sandstone becomes very weak.       44.5         2.5       2.5       44.5       44.5         2.5       1       1       1       1       44.5         2.5       1       1       1       1       1       1         2.5       1       1       1       1       1       1         2.5       1       1       1       1       1       1       1         2.5       1       1       1       1       1       1       1         2.5       1       1       1       1       1       1       1         2.5       1       1       1       1       1       1       1         2.5       1       1       1       1       1       1       1         2.6       1 </td <td>2.(</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>1.84m: \$</td> <td>Sandstone becomes extremely weak. Sandstone becomes extremely weak to v</td> <td>rery 1.98m to 2.03m planar, clean.</td> <td>orange. : Joint (45°) rough,</td> <td></td> <td></td> <td></td>	2.(						1.84m: \$	Sandstone becomes extremely weak. Sandstone becomes extremely weak to v	rery 1.98m to 2.03m planar, clean.	orange. : Joint (45°) rough,			
2.28m: Sandstone becomes very weak. 2.25 2.5 2.5 2.5 2.5 2.5 2.5 2	8/2/08 		0	9	HQ3		wcań.				 44.5 		
30	06S.GPJ 18	- (94) - 5					2.28m: 3 2.35m: 2 2.78m. 1 inclined	Sandstone becomes very weak. Very closely jointed between 2.35m and Three rough, planar, clean, joint sets @ 20°, 45° and 70°.				•	
Image:	IE: BORE LC						Moderat weak. (E 2.68m: 3	tely weathered, grey, SILTSTONE. Very East Coast Bays Formation) Siltstone becomes extremely weak at 2 74m and 41 2 74m 2 76m				-	
3.5	ect File Nan					× × × × × × × × × × × × × × × × × × ×	2.3011/2						
3.5       71       40       5       HQ3       X X X X X X X X X X X X X X X X X X X		-									43.5		SPT=10,20,30N (Solid nose)
1       3.5       1       40       5       HQ3       X X X X (East Coast Bays Formation)       1 <td>DRILLHOL!</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>	DRILLHOL!					× × × × × × × × × × × × × × × × × × ×							
1       40       5       HQ3       X × X × X fine grained sandstone (45° bedding dip).       3.63m to 3.65m: Joint (20°) rough, planar, clean.       43.0         1       (71)       40       5       HQ3       X × X × X × X × X × X × X × X × X × X ×	Eom: VPT	5				× × × × × × × × × × × × × × ×	Unweath (East Co 3.45m: \$	hered, grey, SILTSTONE. Extremely wea bast Bays Formation) Siltstone becomes extremely weak to ve	y 2.62m to 0.05	loint (20%)			
undulating, clean. 3.89m to 3.90m: Joint (10°) rough,	GDT Output	- - 71 - (71)	40	5	HQ3	× × × × × × × × × × × × × × × × × × ×	3.53m: fine grai 3.63m: \$	With a moderately thin layer of very weal ined sandstone (45° bedding dip). Siltstone becomes very weak.	3.76m to 3.65m planar, clean. 3.76m to 3.78m planar, clean. 3.81m to 3.83m	: Joint (20°) rough, : Joint (20°) rough,	 		
	≝4.(					$\begin{array}{c} \times \times \times \\ \times \times \times \\ \times \times \times \end{array}$			undulating, clea 3.89m to 3.90m	n. : Joint (10°) rough,		-	
		narks	r not roc	orded de	ring the	inventiont	00						

25 Te Auckla Tel: + Fax: + Web:	ir Knigh ed Stree and, Nev 64 9 913 64 9 91 www.sk	t Merz et, Newi w Zeala 3 8900 3 8901 mconsi	market ind ulting.co	m	Boreh Project I Locatior	Name: E	ogging Form Ellerslie Racecourse SW Upgrade ie Racecourse	Bore: BH1 Drilling Date: Project Numb	6 14/11/2007 er: AE03390.3	_	S	KM
Drillin Drillin Co-o	ng Con ng Met rdinate	npany: hod: s: 267	: Boart I 1644.00	Longy	/ear 6477734	4.00mN	Drilled Depth:15mBore Diameter:100mmGround Elevation:46.70mR	L	Logged by: ND Checked by: TP	рм А		
Depth (m BGL)	TCR (%) (SCR (%))	RQD	Fracture Index	Sampling	Geology Legend		Description of Strata	Defect	t Description	Elevation (m)	Backfill / Installation	Comments
  					× × × ×	Unwea Very w Very th SILTS weak ( Format	thered, grey, fine grained SANDSTONE. eak. (East Coast Bays Formation) iin interbeds of unweathered, grey, TONE and fine grained SANDSTONE. Very 40° bedding dip). (East Coast Bays ion)	planar, clean. 4.00m to 4.02m planar, clean. 4.21m to 4.22m planar, clean. 4.33m to 4.34m planar, clean. 4.41m to 4.42m planar, clean.	: Joint (20°) rough, : Joint (5°) rough, : Joint (10°) rough, : Joint (10°) rough,	 42.5   		SPT=10,30,20N=50
5.0					× × × × × × × × × × × × × × × × × × ×	4.78m: fracture	thered, grey, SILTSTONE. Extremely weak coast Bays Formation) Siltstone becomes very weak. Very closel ed between 4.78m to 5.85m.	<ul> <li>4.78m to 4.82m planar, clean.</li> <li>4.89m to 5.20m</li> <li>4.90m to 4.95m planar, clean.</li> <li>4.97m to 5.01m planar, clean.</li> <li>5.01m to 5.10m</li> </ul>	: Joint (40°) rough, : Joint. Highly fractured. : Joint (45°) smooth, : Joint (40°) rough, : Joint (30°) smooth, : Joint (60°) smooth,	42.0 42.0   		(Solid nose)
	91 (69)	25	9	HQ	3 <u>* *</u> × × × × × ×	Unwea SANDS Format 5.46m: grained 5.54m: siltstor 5.63m: Unwea (East C	thered, grey, very fine grained STONE. Very weak. <b>(East Coast Bays</b> <b>ion)</b> Sandstone becomes fine to medium d. With a moderately thin layer of very weak le. Sandstone becomes fine grained. thered, grey, SILTSTONE. Very weak. <b>coast Bays Formation</b> )	planar, clean. 5.11m to 5.17m planar, clean. 5.17m to 5.20m planar, clean. 5.26m to 5.30m planar, clean. 5.38m to 5.40m planar, clean. 5.47m to 5.55m planar, clean. 5.50m to 5.53m planar, clean. 5.71m to 5.82m	<ul> <li>: Joint (45°) smooth,</li> <li>: Joint (50°) rough,</li> <li>: Joint (45°) rough,</li> <li>: Joint (30°) rough,</li> <li>: Joint (60°) rough,</li> <li>: Joint (45°) rough,</li> <li>: Joint (45°) rough,</li> <li>: Joint (20°) rough,</li> </ul>	  		
6.0					× × × × × × × × × × × × × × × × × × ×	5.92m: 6.00m: 6.10m: weak, 6.54m	Siltstone becomes extremely weak. Siltstone becomes very weak. With a thin layer of extremely weak to ver fine grained, sandstone at 6.1m, 6.23m an (20-30° bedding dip).	planar, clean. 5.77m to 5.79m planar, clean. 5.81m to 5.85m planar, clean. y	: Joint (30°) rough, : Joint (45°) smooth,			SPT=16,30,20N=56 (Solid nose)
<u> </u>	80 (80)	80	0	HQ	3	Unwea Very w 6.65m band; ( 6.74m siltstor 6.77m graine band; ( 6.96m weak t	thered, grey, fine grained SANDSTONE. eak. (East Coast Bays Formation) to 6.72m: With a 10mm thick carbonaceou 30° dip. With a moderately thin layer of very weak le. to 6.84m: With a very thin layer of fine d sandstone and 3mm thick carbonaceous 30° dip. to 7.10m: Sandstone become extremely o very weak.	JS		40.0		
 7.5  					× × × × × × × × × × × ×	Unwea	thered, grey, SILTSTONE. Extremely weak coast Bays Formation)	ς.				SPT=21,42,8N=50, (Solid nose)

With Wate Wate Status              Control Lists              Project Number Accounts                With Wate Status              Example Status              Example Status              Longed by: NBM Concreted by: NBM Status Status booms wask. Status batus booms wask. Status batus booms w	Sinclair Kn 25 Teed Si Auckland, Tel: +64 9 Fax: +64 9	ight Merz reet, New New Zeala 913 8900 913 8901	market and	_	Borehole	Ellerslie Racecourse SW Upgrade	Bore: BH1 Drilling Date:	6 14/11/2007	_	S	KM
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Drilling C Drilling N Co-ordina	ompany lethod: ates: 267	: Boart L 71644.00	ongy mE	/ear 6477734.00r	nN Ground Elevation: 46.70mR		Logged by: N Checked by: Th	DM PA		
80         1         HG3         Unwethered_pay, SUISTONE_Foremely weak, Sold         5.11m H6.12m. Joint (10°) rough, Sel 1 m H6.12	Depth (m BGL) TCR (%)	RQD	Fracture Index	Sampling	Geology Legend	Description of Strata	Defect	Description	Elevation (m)	Backfill / Installation	Comments
9.0  .	8.5 8.5 8.5	80	1	HQ	3 × S, Fi. 8. gr	nweathered, grey, very fine grained ANDSTONE. Extremely weak. <b>(East Coast Bays ormation)</b> 42m: Sandstone becomes fine grained. 47m: Sandstone becomes fine to medium ained.	8.11m to 8.12m: planar, clean.	Joint (10°) rough,			
10.0       Janar, dean.         10.5       Janar, dean.         10.5       Janar, dean.         10.5       Janar, dean.         10.5       Janar, dean.         11.0       Janar, dean.         11.0       Janar, dean.         11.1       Janar, dean.         Janar, dean.       Janar, dean.	9.0 9.0 9.0 9.5 9.5 9.5 9.5 0 9.5 0 9.7 0 0 9.7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	57	3	HQ	X X X U X X X to X X X X X X X X X X X X X X X X S S F S S F S S S S S S S S S S S S S	nweathered, grey, SILTSTONE. Extremely weak very weak. <b>(East Coast Bays Formation)</b> 23m: Siltstone becomes very weak. nweathered, grey, very fine grained, ANDSTONE. Very weak. <b>(East Coast Bays</b> <b>ormation)</b> 58m: Sandstone becomes fine grained. 66m: Sandstone becomes fine to medium ained.	9.29m to 9.36m planar, clean. 9.35m to 9.39m planar, clean. 9.41m to 9.42m; planar, clean.	: Joint (40°) smooth, - Joint (45°) rough, - Joint (20°) rough,	37.5		SPT=21,37,13N= (Solid nose)
91       57       1       HQ3       X X X X X X X X X X X X X X X X X X X	<u>10.0</u>				× × × × ∪ × × × × × (E × × × × × × × × × × × × × × × × × × × (E	nweathered, grey, SILTSTONE. Very weak. ast Coast Bays Formation) 0.86m: With a moderately thin layer of very weal ary fine grained sandstone.	planar, clean.	John (40 ) rough,			SPT=20,33,17N= (Solid nose)
	<u>11.0</u> 91 (81 <u>11.5</u> <u>11.5</u>	57	1	HQ	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	1.15m: With a thin layer of extremely weak, fine ained sandstone. 1.18m: Siltstone becomes extremely weak. Inweathered, grey, fine to medium grained ANDSTONE. Extremely weak. (East Coast Bays ormation) 1.45m: Sandstone becomes very weak.	11.18m to 11.19 planar, clean. 11.28m to 11.45 11.29m to 11.30 planar, clean.	m: Joint (20°) rough, m. Highly fractured. m: Joint (20°) rough,			

25 Te Auckl Tel: + Fax: - Web:	ed Stree and, Nev 64 9 913 64 9 91	t Merz et, New v Zeala 3 8900 3 8901	market and	- -	Bor Proje	ehole ct Name: ion: Elle	Logging Form Ellerslie Racecourse SW Upgrade	Bore: BH1 Drilling Date: Project Numb	6 14/11/2007 er: AF03390 3	_	S	KM
Drilli Drilli Co-o	ng Con ng Met rdinate	npany hod: s: 267	: Boart I '1644.00	_ongy _ome	year 6477	734.00ml	Drilled Depth:         15m           Bore Diameter:         100mm           Ground Elevation:         46.70mRL		Logged by: Ni Checked by: TF	DM PA		
Depth (m BGL)	TCR (%) (SCR (%))	RQD	Fracture Index	Sampling	Geology	Legend	Description of Strata	Defect	Description	Elevation (m)	Backfill / Installation	Comments
   					****	X X Wea X X Wea X X 12.1 X X San X X 12.2 X X 12.2 X X 12.2 X X X X X X X	veathered, grey, SILTSTONE. Very weak to ik. <b>(East Coast Bays Formation)</b> 16m: With thin layers of very weak, fine grained distone at 12.16m, 12.31m and extremely weak ery weak at 12.42m. 20m: Siltstone becomes very weak.	12.10m to 12.13 planar, clean. 12.35m to 12.38 planar, clean.	3m: Joint (20°) rough, 3m: Joint (45°) rough,	    		SPT=50N=50 (Solid nose
	98 (93)	67	3	HQ	13 × × × × × × × × × × × × × × × × × × ×	$\begin{array}{c} \times \times \times \\ \times \times \times \\ \times \times \times \\ \times \times \times \\ $	70m: With a very thin layer of very weak, fine ned sandstone. 72m: Siltstone becomes very weak. 34m: With a moderately thin layer of very weak, grained sandstone.	13.09m to 13.10	)m: Joint (10°) rough,	<u>34.0</u>		
    	-				××	× × × × SAN Forr	veathered, grey, fine to medium grained JDSTONE. Very weak. <b>(East Coast Bays</b> <b>ration)</b>	planar, clean. 13.24m to 13.28 planar, clean.	8m: Joint (45°) rough,	<u>33.5</u>		SPT=35 50N=5
	- - - - - - -				××	× Unv	veathered, grey, SILTSTONE. Very weak (15°					(Solid nose
	90 (90)	62	3	HQ	x x x x x x x x x x x x x x x x x x x	$\begin{array}{c c} \times & \times & \text{bed} \\ \times & \times & 13.9 \\ \times & \times & \\ \times & \times & \\ \times & \times & 14.1 \\ \times & \times & \\ \times & \times & 14.1 \\ \times & \times & \\ \times & \times & \\ \times & \times & \\ \times & \times &$	ding dip). (East Coast Bays Formation) 33m: Siltstone becomes very weak to weak. 10m: Siltstone becomes weak. 19m: Siltstone becomes very weak to weak. 31m: With thin layers of very weak to weak, fine	13.97m to 14.00 planar, clean. 14.18m to 14.20 undulating, clea	)m: Joint (45°) rough, )m: Joint (20°) rough, n.	   		
					* * * * * * * * * * * * *	<ul> <li>× × grai</li> <li>× very</li> <li>× × 14.5</li> <li>× ×</li>     &lt;</ul>	ned sandstone at 14.31m (40° bedding dip) and / weak at 14.5m (45° bedding dip). 36m: Siltstone becomes very weak to weak. 56m: Siltstone becomes weak. Bedding omes subhorizontal.	14.61m to 14.63 planar, clean. 14.67m to 14.69 planar, clean.	3m: Joint (10°) rough, 9m: Joint (30°) rough,			
<u>15.0</u>					×××	×× ×× BH1	6 terminated at 15.00m. Target Depth					SPT=50N=50 (Solid nose
					×××××	× × × × × × × × BH1	16 terminated at 15.00m. Target Depth					SPT=50N=5 (Solid nos
	arks ndwater	not rect	orded du	ring ti	he inve	stigation.						

Auckla Tel: +	and, Ne 64 9 91	w Zeala 3 8900	nd	Р	roject N	ame: E	Ellerslie Racecourse SW I	Jpgrade D	orilling Date:	12/11/2007		5	KM
Fax: + Web:	·64 9 91 www.sk	3 8901 mconsu	Ilting.cor	n L	ocation:	Ellersli	e Racecourse	Р	roject Numbe	er: AE03390.3	-		
Drilliı	ng Cor	npany:	Boart L	ongye	ar		Drilled Depth:	l5m		Logged by: V	WW		
Drillin	ng Met	hod:					Bore Diameter: 1	100mm		Checked by: T	PA		
Co-o	rdinate	<b>s:</b> 267	1706.00	)mE 6	6477664.	.00mN	Ground Elevation: 4	16.20mRL					
Depth (m BGL)	TCR (%) (SCR (%))	RQD	Fracture Index	Sampling	Geology Legend		Description of Strat	a	Defect	Description	Elevation (m)	Backfill / Installation	Comments
						Silty Cl high pla Silty Cl grey m	AY, trace fine sand, brown. Fir asticity. Trace rootlets. <b>(Topsoil</b> AY, minor fine to medium grav ottled orange brown with dark b	m, moist, / <b>Fill)</b> el, light rownish			46.0		
 0.5  	70	NVA		10		subang 0.32m: scoria g orange 0.53m	II, moist, high plasticity. Graver jular scoria. Trace rootlets. (Fill) Trace carbonaceous material gravel. Becomes light greenish . brown. to 0.55m: With a fine sandy cla	Absence of grey mottled y lense.					
	73	N/A	N/A	ΗQ		0.79m: 0.87m: loose, i layer @ Sandy orange	With some greyish green fleck With a 50mm thick light browni moist, fine to medium grained, s 0 0.87m. SILT, trace fine gravel (scoria), brown mottled light grey. Stiff,	s. ish grey, silty sand trace clay, moist, slight					
						plastici Silty SA Fine to	ty. Sand is fine. ( <b>Fill)</b> AND, orange brown. Very loose medium grained. ( <b>Fill)</b>	, moist.			45.0		
	100	N/A	N/A	SPT		Silty Cl moist, i and roo Modera greyish <b>Tuff</b>	AY, grey with greyish green fle moderate plasticity. Minor orgar titets. (Fill) ately weathered TUFF, weakly the tately weakly welded, dark green brown. Very weak, fine grained	cks. Firm, nic material mixed with d. <b>(Lithic</b>			44.5		SPT=5,10,8N= (Open nose)
2.0 2.0   						1.95m: 2.05m:	Becomes extremely weak. Becomes strongly welded.						
	100	N/A	N/A	HQ		2.50m: Modera weak (I 2.53m:	Becomes greenish grey. ttely weathered SILTSTONE, gr East Coast Bays Formation) Becomes grey.	ey. Very			                  		
						Silty Cl (Compl	.AY, grey. Very stiff, moist, high etely Weathered Siltstone). (Ea ormation)	plasticity. st Coast					SPT=13,17,21N (Solid nose)
					× × × × × × × × × × × × × × × × × × ×	Modera weak. (	itely weathered SILTSTONE, gr East Coast Bays Formation)	ey. Very	3.26m to 3.28m: planar, clean. 3.29m to 3.30m: planar, clean.	Joint (25°) closed, Joint (15°) closed,	43.0		
	81 (81)	79	1	HQ	· · · · · · · · · · · · · · · · · · ·	3.58m: 3.87m:	Trace tiny carbonaceous flecks	кs.			 42.5 		
4.0					XXX								
-													

25 Te Auckla Tel: + Fax: + Web:	ed Stree and, Nev 64 9 913 64 9 91 www.sk	et, Newr w Zeala 3 8900 3 8901 mconsu	narket nd ulting.cor	m	Boreh Project N Location	ole Logging Form ame: Ellerslie Racecourse SW Upgrade : Ellerslie Racecourse	Drilling Date:         12/11/2007           Project Number:         AE03390.3		SKM
Drillin Drillin Co-o	ng Con ng Met rdinate	npany: hod: s: 267	Boart L	_ongy DmE	ear 6477664	Drilled Depth:         15m           Bore Diameter:         100mm           .00mN         Ground Elevation:         46.20mRL	Logged by: \ Checked by: ]	/ww ˈPA	
Depth (m BGL)	TCR (%) (SCR (%))	RQD	Fracture Index	Sampling	Geology Legend	Description of Strata	Defect Description	Elevation (m) Backfill /	Comments
					× × × × × × × × × × × × × × × × × × ×	Unweathered SANDSTONE, grey. Very weak. Fine grained. (East Coast Bays Formation)	4.56m to 4.60m: Joint (90°) rough, planar, clean. 4.73m to 4.79m: Joint (55°) smooth, planar, clean.		SPT=40,50N= (Solid nos
	95 (95)	95	3	HQ		5.41m: Becomes fine to medium grained.	5.28m to 5.33m: Joint (50°) smooth, planar, clean. 5.48m to 5.54m: Joint (60°) smooth, planar, clean.	41.0   	
6.0						Unweathered SILTSTONE, grey. Very weak. (East Coast Bays Formation)			SDT-25 50N-
						<ul> <li>6.00m: Becomes sandy (fine).</li> <li>6.17m: With carbonaceous laminations at 30 to 50mm intervals, with a 30° dip.</li> <li>6.27m: Absence of sand and carbonaceous laminations.</li> </ul>	6.44m to 6.46m: Joint (25°) smooth, planar, clean. 6.47m: Joint (0°) rough, planar, minor	40.0	(Solid nos
	85 (76)	76	4	HQ	1	Unweathered SANUS I UNE, grey. Weak. Fine to medium grained. (East Coast Bays Formation)	carbonaceous materíal; possibly drilli induced. 6.58m to 6.64m: Joint (45°) smooth, planar, clean.	ng	
					× × × × × × × × × × × × × × × × × × ×	Unweathered SILTSTONE, grey. Weak. (East Coast Bays Formation) 6.93m to 6.98m: Highly fractured, recovered as coarse gravel sized pieces. 7.03m to 7.04m: Trace carbonaceous material. 7.15m to 7.24m: Very closely fractured, recovered as medium to coarse gravel sized pieces.	7.15m to 7.24m: Fracture zone.	       	
							7.91m to 7.94m: Joint (30°) smooth, planar, clean.	  - 38.5   	SPT=20,50N= (Solid nos

Sincla 25 Tee Auckla Tel: +6 Fax: + Web:	ir Knigh ed Stree and, Nev 64 9 913 64 9 913 www.sk	t Merz et, Newr w Zeala 3 8900 3 8901 mconsu	market nd ulting.cor	n L	Boreh Project N .ocatior	lame: Ellerslie Racecourse SW Upgrade : Ellerslie Racecourse	Bore: BH17 Drilling Date: Project Number	12/11/2007 : AE03390.3	_	S	KM
Drillir Drillir Co-oi	ng Con ng Met rdinate	npany: hod: s: 267	Boart L	_ongye	ear 6477664	Drilled Depth: 15m Bore Diameter: 100mm Ground Elevation: 46.20mRL	-	Logged by: V Checked by: T	ww PA		
Depth (m BGL)	TCR (%) (SCR (%))	RQD	Fracture Index	Sampling	Geology Legend	Description of Strata	Defect D	Description	Elevation (m)	Backfill / Installation	Comments
	97 (97)	97	3	HQ	*****		8.15m to 8.19m: J planar, clean.	oint (30°) smooth,	 		
							8.74m to 8.76m: J planar, clean. 8.86m to 8.89m: J planar, clean.	oint (25°) rough, oint (30°) rough,			SPT=30,45,5N=50 (Solid nose)
9.5	98 (98)	94	3	HQ	(x)       (x)         (x)       (		9.29m to 9.34m: J planar, clean. 9.34m to 9.38m: J planar, clean. 9.74m to 9.84m: J slickensided, plan. 9.91m to 9.97m: J planar, clean.	oint (40°) smooth, oint (40°) smooth, oint (70°) ar, clean. oint (35°) rough,			
  <u>_10.5</u> 						Unweathered SANDSTONE, grey. Weak. Fine grained. (East Coast Bays Formation) Shear zone containing SAND, minor clay, orange yellow brown. Loose, moist. With a coarse gravel sized piece of extremely weak, orange yellow brown sandstone. (East Coast Bays Formation) 10.34m: With a 70mm thick greenish grey, iron oxide stained moderately weathered weak have					SPT=50N=50/1: (Solid nose)
	93 (93)	93	0	HQ		<ul> <li>of sitistone @ 10.34m.</li> <li>Highly weathered SANDSTONE, yellowish brown and greenish grey. Extremely weak. Fine grained. (East Coast Bays Formation)</li> <li>10.59m to 11.01m: With brownish yellow, high plasticity, subhorizontal, clay layers (3 - 12mm thick) at regular spacings (10 - 50mm).</li> <li>10.65m: With a grey, high plasticity, 20° dip, clay layer (4mm thick) @ 10.65m.</li> <li>11.02m: Becomes light grey.</li> <li>11.04m to 11.29m: With grey, high plasticity, subhorizontal, clay layers (3 - 9mm thick) at regular spacings (30 - 70mm).</li> </ul>	ar		35.5       		
						11.51m to 11.75m: With grey, high plasticity, subhorizontal, clay layers (3 - 9mm thick) at regula spacings (40 - 100mm).	ar				

Write were demonstrating om     Decktor: Ellersie Madecourse     Project Number:     Logged by: WW       Drilling Ochogeny: Boart Longver     Drilling Method:     Sound Elevation: 46 20mRl.     Calged by: WW       Grid Grid     Grid Grid     Grid Grid     Sound Elevation: 46 20mRl.     Calged by: WW       Grid Grid     Grid Grid     Grid Grid     Description of Strata     Defect Description     Grid Grid       Grid Grid     Grid Grid     Grid Grid     Description of Strata     Defect Description     Grid Grid       I I I I I I I I I I I I I I I I I I I	Sincla 25 Te Auckl Tel: + Fax: -	air Knigh ed Stree and, Ne 64 9 91 ⊦64 9 91	t Merz et, New w Zeala 3 8900 3 8901	market Ind		Bore Project	hole L Name: E	ogging Form Ellerslie Racecourse SW Upgrade	Bore: BH'	17 : 12/11/2007	_	S	KW
and bit is a	Web: Drilli Drilli Co-o	www.sk ng Cor ng Met rdinate	mpany hod: es: 267	Boart I	m l _ongy DmE	ear 647766	n: Ellersli 4.00mN	ie Racecourse Drilled Depth: 15m Bore Diameter: 100mm Ground Elevation: 46.20mRI	Project Numl	ber: AE03390.3 Logged by: ∨ Checked by: T	WW PA		
12.5         July CLY (production of motion)         July CLY (production)         Ju	Depth (m BGL)	TCR (%) (SCR (%))	RQD	Fracture Index	Sampling	Geology Lecend		Description of Strata	Defec	t Description	Elevation (m)	Backfill / Installation	Comments
BH17 terminated at 15.00m. Target Depth SPT=24,50N=5 (Solid nose		66 (66) 72 (72)	66	0	HQ		Silty Cl plastici Highly yellow weak. I 12.96n clay lay 12.97n stainin stainin Highly grey. E <b>Bays F</b> 13.71n plastici 13.87n stainin 14.00n 14.06n layer ( 14.11n stainin 14.12n subhor spacin	LAY, greyish green. Stiff, moist, high ty, (East Coast Bays Formation) weathered SANDSTONE, light brownish mottled light greenish grey. Extremely Fine grained. (East Coast Bays Formation) in grained. (East Coast Bays Formation) weathered SANDSTONE, light greenish Extremely weak. Fine grained. (East Coast ormation) n: With a 4mm thick grey, subhorizontal, high ity, clay layer @ 13.71m. n: Laminations of orange brown iron oxide g. Layers dip 20°. n: Absence of iron oxide laminations. n: With a 3mm thick grey, high plasticity, clay 14.06m. n: Laminations of orange brown iron oxide g. 14.06m. n: Laminations of orange brown iron oxide g. 14.06m. n: Laminations of orange brown iron oxide g. 14.44m: With grey, high plasticity, izontal, clay layers (3 - 9mm thick) at regula gs (30 - 60mm).	12.80m to 12.8 undulating, clear h	7m: Joint (50°) rough, an.			SPT=44,50N=50/ (Solid nose) SPT=16,28,22N=5 (Solid nose)
	<u>15.0</u>	1					BH17 t	terminated at 15.00m. Target Depth			<u>-</u> -		SPT=24,50N=50/ (Solid nose)



#### NZGD ID: BH 68073



### NZGD |D: BH\_68073

		5		M	I					Log	of Inv	/estigatio	on
Pr	oject	: E	ller	slie	Southe	ern	Ro	ute	•	Drillh	ole		
Lo	cation	: <b>R</b>	aced	cour	se				Project No: AE03624	Hole II	D: <b>BH1</b>	101	
Clie	ent:	Α	uckl	and	City Cou	unci				Date:	21/10/2	008	
R.L. (m)	Depth (m)	Shift Details Drilling Method Casing Diameter (mm)	TCR (%) (SCR (%))	RQD	In-Situ Testing	Sampling	Geology Legend	GroundWater	Description of Strata	Defect De	scription	Comments	Backfill / Installation
	<u>8</u> .5	HQ3	100	N/A	RPT =13 30 20		×××××× (10100000000000000000000000000000		Slightly weathered, grey SILTSTONE; extremely weak to very weak. (East Coast Bays Formation)			9m: Backfill:	
	<u>-</u> - - - - - - - - - - - - - - - - - -	SPT		N/A	N=50		× × × × × × × × × × × × × × × × × × ×		Slightly weathered, grey, fine grained SANDSTONE; extremely_weak. (East Coast Bays Formation)			Bag-boys gravel	00000000
IE ADD. HOLES.GPJ 24/4/09	  	HQ3	100	N/A					9.95m: Becomes very weak.				000000000
ject File Name: ELLERSL	   	SPT		N/A	SPT_=30,50 N=50/90				SIGNIFICANT CORE LOSS. Recovered: Unweathered, grey SILTSTONE; very weak.				0 0 0 0 0 0
Output Form: COMPILATION BOREHOLE Pro		HQ3	36 (29)	19									
Sta TEMPLATE.GDI Fin Dri	<u>12.0</u> arted: iished: Iler:	21/1 28/1 Boar Long	⊥ 0/2008 0/2008 t lyear	8	ISPT,=3,20,30 Groundwat No. 0	ter Ot Stri	Dserva uck (m 0	i ation າ)	I IS Date Observations Star	nding (m)		Co-ordinates: 6477704.0 2671740.0	0mN 0mE
A Lemplate: L	ant: gged:	TD20	00		Remarks Groundwate	er not	record	ded c	luring the investigation.			Inclination: -90°	
Ch	ecked:	RCR			tee key sheet	for an	avalan	ation	of symbols and abbreviations. Material descriptions as par NZCS C	uidelines Dooo	mbor 2005	Page 3 of	6

NZGD ID: BH\_68073

scriptions as per NZGS Guide December 2005 ey sneet for ar ies

Version 1.6 28/08/2006 - S.Humphrey

#### NZGD ID: BH 68073



NZGD ID: BH\_68073

See key sheet for an explanation of symbols and abbreviations. Material descriptions as per NZGS Guidelines - December 2005.

#### NZGD |D: BH\_68073



## Log of Investigation

	otion	P	2000	<u></u>	<u> </u>						01	
		. R							Project No: AE03624		01	
Cile	nt:	A		ana		Incii				Date: 21/10/2	008	
R.L. (m)	Depth (m)	Shift Details Drilling Method Dasing Diameter (mm)	TCR (%) (SCR (%))	RQD	In-Situ Testing	Sampling	Geology Legend	GroundWater	Description of Strata	Defect Description	Comments	Backfill / Installation
		SPT	95 (95)	N/A	_ SPT_=15,50 N=50/80		××××××××××××××××××××××××××××××××××××××		Unweathered, grey, SILTSTONE; very weak. (East Coast Bays Formation) 16.35m: A carbonaceous lamination (3 mm), dipping 5°. Unweathered, grey, fine to medium grained SANDSTONE; extremely weak to very weak. (East Coast Bays Formation) 17.25m to 17.30m: Extremely closely spaced carbonaceous laminations, dipping 5°. 17.30m: A moderately thin interbed of unweathered, grey, siltstone; very weak. 17.45m: Becomes fine grained grading to fine and medium grained.	<ul> <li>16.00m: Joint (0°) smooth, planar, soil infilling of silt.</li> <li>16.15m: Joint (0°) smooth, planar, soil infilling of silt.</li> <li>16.25m: Joint (0°) smooth, planar, clean.</li> <li>16.40m: Joint (10°) smooth, planar, clean.</li> <li>16.47m: Joint (10°) smooth, planar, clean.</li> <li>17.75m to 17.90m: Joint (45°) smooth, undulating, clean</li> </ul>		
	<u>18</u> .0	SPT	100	N/A	SPT <sub>s</sub> =42,50 N=50/90				18.10m: A moderately thin interbed of unweathered, grey, siltstone; very weak. 18.25m: Becomes fine grained; very weak.	17.95m: Joint (0°) smooth, undulating, clean.		
	<u>19</u> .0	HQ3	100 (100)	84						<ul> <li>18.55m: Joint (0°) rough, undulating, clean.</li> <li>18.65m: Joint (0°) rough, undulating, clean.</li> <li>18.80m: Joint (0°) smooth, undulating, clean.</li> <li>19.15m: Joint (15°) smooth, undulating, clean.</li> <li>19.30m: Joint (15°) smooth, undulating, clean.</li> </ul>		
	    	HQ3	100 (100)	100			× × × × × × × × × × × × × × × × × × ×		Unweathered, grey SILTSTONE; very weak. (East Coast Bays Formation) 19.50m: Becomes weak. 19.60m: A thin interbed of unweathered, grey, fine sandstone; very weak. Unweathered, grey, fine grained SANDSTONE; very weak. (East Coast Bays Formation)	19.40m: Joint (15°) smooth, planar, clean.		000000
Star Finis Drill Plar	ted: shed: er: nt:	21/10 28/10 Board Long TD20	)/2008 D/2008 t year )0		Groundwat No. 0 Remarks	er Ob Stru	serva ick (m) 0	ition	s Date Observations Star	ding (m)	Co-ordinates: 6477704.00 2671740.00 Inclination: -90°	)mN )mE

See key sheet for an explanation of symbols and abbreviations. Material descriptions as per NZGS Guidelines - December 2005.

## NZGD |<mark>D: BH\_ 68073</mark>

		SKN						Log of Inv	vestigatio	n
	Project	: Ellersli	e South	ern Rou	te			Drillhole		
	Location	: Racecou	ırse			Project No: AE03624		Hole ID: BH1	01	
	Client:	Aucklan	d City Co	uncil				Date: 21/10/2	008	
	R.L. (m) Depth (m)	Drilling Method Sang Damate (mm) TCR (%) (SCR (%))	In-Situ Testing	Sampling Geology Legend	GroundWater	Description of Strata	1	Defect Description	Comments	Backfill / Installation
		SPT 100 N/	N=50/120 /A							0 0 0
LATE.GUT OUIDUT FOIM: COMPILATION BOREHOLE Project FIIe Name: ELLERSLIE ADD. HOLES.GPJ 24/4/09	Started:	21/10/2008	Groundwat No.	ter Observat Struck (m)	ions Date	Observations	Standin	g (m)	Co-ordinates: 6477704.00n	nN
emplate: UATA IE	Driller: Plant: Logged:	Boart Longyear TD200 VK	Remarks Groundwate	er not recorde	ed during	the investigation.			2671740.00n Inclination: -90°	ΠE

thecked: RCR

Page 6 of 6

B       DESCRIPTION OF CORE Geological Formation: (weathering, cement, mineralogy, etc)       Image: Comparison of the compar	Test Result SPT'N' Value Shear Strength (kPa) 0 25 7500 0 0.1 0.3 0.5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Graphic Log Graphic Log Graphic Log Graphic Strength / relative density, moisture cont., grading, bedding, plasticity, sensitivity) DEFECT DESCRIPTION (orientation, spacing, persistence, roughness, wall strength, aperture, infill, seepage, sets, block size)	Water Loss (%)
Fill- recent, non-engineered Fill-			0 25 7500
Slightly weathered to investment, extremely strong to strong, light grey, highly vesicular BASALT with closely spaced fractures. Below 3.0 m becomes slightly vesicular. 6 6 7 10 10 10 10 11 2-3 N=5 1-2-3 1-2-3 N=5 1-2-3 1-2-3 N=5 1-2-3 </td <td></td> <td>Silty CLAY, dark brown, stiff, moist, moderately plastic with much fine to coarse sand and coarse gravel (basalt, scoria).</td> <td></td>		Silty CLAY, dark brown, stiff, moist, moderately plastic with much fine to coarse sand and coarse gravel (basalt, scoria).	
		Sub-horizontal and orthogonal fractures, closely spaced, continuous, planar, tight, with trace to some clay in-fill.	PO wire line drilling- Open SPT.

	G	HD	PROJECT: CLIENT: LOCATION: JOB No.: LOGGED B CHECKED D COMMENC COMPLETE	Elle Auc 51/ Y: BY BY: TD ED: 6/1	erslie Ra ckland C erslie Ra 22379/02 0/06	icecour ity Cou acecour 2	se s unci rse	Sto I	rmv	wat	ter Pond I CON EQU INCL X-CC R.L.	Investigation BO Page TRACTOR: Drillwell IPMENT: Newholland INATION (deg): 0 OORDINATE: 304033 SURFACE (m): 42.00	E 2 of 2 TD150 DIAMETER ( Y-COORDIN TOTAL DEP	(mm): 80 n ATE: 6985 TH (m): 14	15 1m (l i55 i.0 m	PQ)	
Depth (m)	Geological Group	DESCRIPTION O Geological Formation: cement, minerald	F CORE (weathering, ggy, etc)	SPT Blow Count	Test Result SPT 'N' Value  Shear Strength (kPa)	Core Los (%)	SS 5	Spac Na Def (I	cing c tural fects m)	of .5	Graphic Log	SOIL DESCRIF (subordinate, minor MAJOR strength / relative density, moi bedding, plasticity, s DEFECT DESCR (orientation, spacing, persis wall strength, aperture, infil block size)	PTION , colour, structure, isture cont., grading, sensitivity) IPTION tence, roughness, I, seepage, sets,	Piezometer Details and Water Levels	V Lo	Vater ss (%	Drilling Method
	Tauranga Group	Alluvial Deposits, Puke	toka Formation	0-3-5 N= 8	53/19							Silty CLAY (organic), black moderately to highly plastic organics (tree roots)	s, stiff, moist, c trace fibrous				
	pre Bo	pxes : 6		Comme	ents : -							End of borehole at 14.0 m.	Target depth.				
Sh Fa Co	ear \ ctor ( ore wi	/ane G357 as per NZGS Guide Il be stored for 3 mo	eline) 1.41 nths only unle	ss alter	native ar	rangeme	ents	are	e ma	ade	е						

				PROJECT:	Elle	erslie Ra	cecourse	Stormw	ater Pond I	nvestigation	Borehole N	lo.:	BI	H7	7	
L				CLIENT:	Auc	kland C	ity Coun	cil			Page: 1 of 2					
Ş		C		LOCATION	: Elle	erslie Ra	cecours	Ð								
		-		JOB No.:	51/2 X DX	22379/02	2		CON	TRACTOR: Drillw						
					Y: <b>BY</b>				EQU	IPMENI: Newn		(				
						0/06							. 6081	1111 525	(PQ)	
				COMPLETE	ED: <b>3/1</b>	10/06			R.L.S	SURFACE (m): <b>42</b>	2.00 TOTAL DEP	TH (	m): 13	3.5	m	
┢												<u> </u>		T		
						Test Result	Core Loss	Spacing of Natural		SOIL D (subordinate, minor l	ESCRIPTION MAJOR, colour, structure,		and		Water	
		dno	DESCRIPTION OF		unt	SPT 'N' Value	(%)	Defects (m)	Graphic Log	bedding, pla	asticity, sensitivity)		letails	L	_oss (%)	g
1		cal G	cement, mineralog	gy, etc)	ow Co	Shear			Chapme Log	DEFECT (orientation, spacing	DESCRIPTION	'	eter L evels			Metho
1 44 44		eologi			PT BIG	(kPa)	0 25 7500	0 0.1 0.3 0.5		wall strength, apert	ure, infill, seepage, sets, ock size)		iezom ater L	0	25 7500	rilling
6	2	U			ō							<u> </u>	<u> </u>	╬		
Ē	)		Fractured basalt mantle	;					20000000000000000000000000000000000000	Silty CLAY, dark bro	own, moist, moderately	1_				
F										plastic with much co (BASALT)	oarse gravel to cobbles	crete -	over			
Ē												Conc	Vell C			
F			Unweathered to slightly ight grey, massive highl	weathered						Closely spaced frac	tures, tight, orthogonal,		steel V			
Ē			BASALT, moderately str	ong with	2-2-50+				(가) - 가이가 - 가 (~ 가는 (~ 가)	some clay in-fill.	המכומו שאווז וומנל וט		U)			
Ē	2		ciosely spaced, tight, orl planar, continuous, fract	inogonal, ures with trac <del>e</del>	N= 50+											
Ę			o some clay in-fill.													
Ē																
F	3		Below 3.0 m becomes	slightly												
Ē			vesicular.						2)-22)-2) (-25-25-							
Ē																
Ē	1								5-55-5 5							
Ē																
Ę												e Seal				
Ē	5								91-201-2 4-25-4-25			ntonite				
Ē												Be				3.5 m
E,																to 10
Ē													ΞII	Ī		6.0 n
Ē		ield							2-51-2-51 2-51-2-5			vel_	Ξ			, PO
E	,	nic F										ed gra				0.9 0.
Ē		olca										washe	of Sci	5010		0 0
E		> pu										m M				drilling
Ē	3	ickla											0.5	2.2		eline
F		٩ſ							ジーンビジーンレ マーントマーン				Ξ			Q wire
Ē													ΞЦ			T T
Ē	1								いこくびにく イーンド イーント					-		
Ē																
E.																
Ē									1-242-24 27-252-2							
Ē																
E	11								2012/2012/ イーンビイーント							
Ē																
Ē									1-25-2							
E	12		Extreamly weathered tu	itt or airfall					8 8 8 8 8							
	Core	e Bo	oxes:4		Comme	ents : -										
	Shea	ar V	ane G357													
F	act	tor (	as per NZGS Guidel	line) 1.41												
(	Core	e wi	I be stored for 3 mor	nths only unle	ess alter	native ar	angemen	ts are ma	de							

	C	HD	PROJECT CLIENT: LOCATION JOB No.: LOGGED CHECKED COMMENT COMPLET	: Elle Auc 51/: BY: BY BY: TD CED: 9/1 ED: 10/	erslie Ra ckland C erslie Ra 22379/02 0/06 10/06	icecol ity Co aceco 2	urse oune urse	e Stormw cil	ater Pond CON EQU INCI X-CC R.L.	Investigation	Borehole N Page: 2 of 2 II Iland TD150 DIAMETER ( 5 Y-COORDIN 00 TOTAL DEP	(mm): 80 m ATE: 6985 TH (m): 13	17 1m (F 535 5.5 m	<b>م</b> ر)	
Depth (m)	Geological Group	DESCRIPTION OI Geological Formation: cement, mineralo	F CORE (weathering, igy, etc)	SPT Blow Count	Test Result SPT 'N' Value Shear Strength (kPa)	Core L (%	-OSS ) 7500	Spacing of Natural Defects (m)	Graphic Log	SOIL DES (subordinate, minor M/ strength / relative density bedding, plast DEFECT DE (orientation, spacing, p wall strength, apertur block	SCRIPTION AJOR, colour, structure, y, moisture cont., grading, iicity, sensitivity) ESCRIPTION persistence, roughness, e, infill, seepage, sets, < size)	Piezometer Details and Water Levels	W Los	′ater ;s (%) 7500	Drilling Method
13 14 14 14 15 16 17 17 18 19 20 21 22 22 24 22 24	Waitemata Group	deposits At 12.5m scoriaceous Slightly weathered, we horizontally bedded, we cemented, alternating S and MUDSTONE (East Formation).	layer. ak, bluish grey akly SANDSTONE Coast Bays	13-35-15+ N= 50+						Silty SAND (coarse), lig normal. Inter-bedded SANDS MUDSTONE. End of borehole at 13	ght brown, loose, moist, TONE and .5 m. Target depth.				
Fa	ore Bo lear \ ctor ( ore wi	oxes : 4 /ane G357 as per NZGS Guide Il be stored for 3 mo	line) 1.41 nths only unl	Comme less alter	ents : - native ar	rangei	men	ts are ma	de						

## Appendix C Slope Stability Analyses





















Material Name	Color	Unit Weight (kN/ m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface
Fill		17.5	Mohr- Coulomb	5	30	Piezometric Line 1
Residual ECBF	Residual ECBF     Image: CBF Rock       New Fill     Image: CBF Rock		Mohr- Coulomb	6	32	Piezometric Line 1
ECBF Rock			Mohr- Coulomb	50	40	Piezometric Line 1
New Fill			Mohr- Coulomb	5	32	Piezometric Line 1






Material Name	Color	Unit Weight (kN/ m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface
Fill		17.5	Mohr- Coulomb	5	30	Piezometric Line 2
Residual ECBF		17.5	Mohr- Coulomb	6	32	Piezometric Line 2
ECBF Rock		22	Mohr- Coulomb	50	40	Piezometric Line 1
New Fill		18.5	Mohr- Coulomb	5	32	Piezometric Line 2







< 0.19</li>

Material Name	Color	Unit Weight (kN/ m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface
Fill		17.5	Mohr- Coulomb	5	30	Piezometric Line 1
Residual ECBF		17.5	Mohr- Coulomb	6	32	Piezometric Line 1
ECBF Rock		22	Mohr- Coulomb	50	40	Piezometric Line 1



Material Name	Color	Unit Weight (kN/ m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface
Fill		17.5	Mohr- Coulomb	5	30	Piezometric Line 2
Residual ECBF		17.5	Mohr- Coulomb	6	32	Piezometric Line 2
ECBF Rock		22	Mohr- Coulomb	50	40	Piezometric Line 1









