



# **Salamander Shores**

**Geotechnical Investigation - Stage 2** 

Salamander Properties Pty Ltd ATF



#### Reference: 754-NTLGE202648-1-AB

22 February 2022

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# ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
AEC	Area of Environmental Concern
AHD	Australian Height Datum
ASS	Acid Sulfate Soils
BGL	Below Ground Level
CBR	California Bearing Ratio
CPT	Cone Penetration Test
DBYD	Dial Before You Dig
DCP	Dynamic Cone Penetrometer
GPR	Ground Penetrating Radar
GPS	Global Positioning System
HSSE	Health, Safety, Security & Environment
m AHD	Elevation in metres relative to Australian Height Datum
NATA	National Association of Testing Authorities
PSD	Particle Size Distribution
QA / QC	Quality Assurance/ Quality Control
RL	Reduced Level
SPT	Standard Penetration Test
SWMS	Safe Work Method Statement
Tetra Tech	Tetra Tech Coffey Pty Ltd

# 1. INTRODUCTION

This report presents the results of our geotechnical investigation carried out by Tetra Tech Coffey Pty Ltd (Tetra Tech) for geotechnical input for the proposed development at 147 Soldiers Point Road, Soldiers Point.

It is understood that the proposed development will be two structures, one being a six-storey structure with three basement levels to approximately RL 5m and one being a five-storey structure with one basement level to approximately RL 16 m. The proposed development is shown in the drawings provided by the client titled 'SALAMANDER SHORES, 147 Soldiers Point Road Soldiers Point", ref 20421, Rev D, dated 24/09/2021.

This report addresses the objectives and scope of work set out in our proposal (754-NTLGE202648-1-AA Stage 2) dated 25 October 2021.

Tetra Tech (formerly Coffey Geotechnics Pty Ltd) undertook a previous geotechnical investigation at the site in 2009. The previous report was titled 'PROPOSED SALAMANDER SHORES HOTEL REDEVELOPMENT', (ref GEOTWARA20848AA-AB, dated 24 March 2009). Tetra Tech also provided previous reports assessing environmental conditions:

- Phase 1 Environmental Site Assessment for Salamander Shores Hotel dated 2 March 2009
- Phase 2 Environmental Site Assessment for Salamander Shores Hotel dated 13 April 2010

#### 1.1 OBJECTIVES

The objectives of the consultancy were to:

- Assess the subsurface conditions within the proposed footprint of the development, particularly to the north, west and north-west of the site.
- Confirm the depth of bedrock across the site through a targeted geotechnical investigation
- Provide up to four (4) geotechnical sections across the site to inform the design of underground basement geometry, using a combination of proposed new boreholes and borehole data from previous investigations.
- Provide recommendations for deep footing design, retaining wall design parameters, excavatability and earthworks.
- Provide commentary on previous environmental assessments undertaken at the site location.

#### 1.2 SCOPE OF WORK

The scope of works undertaken to achieve the objectives described above comprised:

- Desktop review of previous geotechnical reports for the site and surrounding areas from our files and of published geological maps.
- Liaison with DBYD and arrangement of a service locator to clear the locations of underground utilities
- Engagement of a suitably qualified surveyor to survey all borehole locations in order to obtain spatial coordinates and elevation levels
- Detailed mapping by an experienced engineer / engineering geologist to map salient features of the site and the surrounding area, including mapping of rock outcrops in the site area
- Drilling of four (4) boreholes to a target depth of up to 15m.
- Point loads were conducted on rock core at a rate of approximately one test per 1m of core.
- Analysis and preparation of a report addressing the objectives outlined above.
- Laboratory testing consisting of:

- No. 9 Particle Size Distribution
- No. 1 Atterberg Limits tests
- No. 3 Unconfined Compressive Strength (UCS) Tests
- No. 18 Point Load Tests
- No. 5 Aggressivity Tests

All laboratory testing was conducted at NATA accredited testing laboratories

# 2. FIELDWORK

Fieldwork was carried out in one field event between 6 and 10 December 2021. Fieldwork comprised the drilling of four (4) boreholes to depths between 6.42m and 15.0m BGL. Drilling was undertaken with a geoprobe drilling rig. Drilling was undertaken using hollow flight augers, washboring techniques and NMLC rock coring. Standard penetration tests were undertaken at regular intervals to assess soil strength / consistency.

The fieldwork was carried out in fulltime presence of a geotechnical engineer who produced engineering logs of the boreholes. The engineering logs of the borehole are attached together with photos and explanation sheets defining the terms and symbols used in its preparation.

Borehole locations from this and previous investigations are indicated on the attached drawings. Boreholes logs from this investigation and the previous investigation and are included in Appendix A and C respectively.

Test Location	Easting	Northing	RL (mAHD)
BH01-21	413008.2	6380403.5	7.6
BH02-21	412976.6	6380385.7	7.0
BH03-21	413048.6	6380381.7	12.6
BH04-21	412979.4	6380363.5	7.7

#### Table 1: Investigation coordinates from this investigation

Notes on Table 1.

(1) Surveyors from Barker Ryan Stewart were engaged by Tetra Tech to survey locations and elevations of each test location (2) Coordinates are recorded in MGA94

# 3. SITE CONDITIONS

#### 3.1 REGIONAL GEOLOGY

Regional topography in the vicinity of the site is characterized by an elongated peninsular (Soldiers Point) extending into Port Stephens approximately 600m wide and 3km long with a transition of residual slightly undulating terrain situated to the west of the area and near shore low lying aeolian dunes and estuarine tidal flats toward the east.

Reference to the Newcastle Coalfield 1:250 000 Geological Series Sheet S1 56-2, the site appears to be entirely underlain by Quaternary aged alluvial deposits, with neighbouring Carboniferous ages Nerong Volcanics to the west.

Reference to Minview Seamless Geology Maps, the site appears to be predominately underlain by Nerong Volcanics, with a dominant lithology of pyroclastic rock described as rhyodacitic ignimbrite (NSW Geology code: Cumn). To the north, south and west of the site is partially consolidated, marine deposited and aeolian

reworked coastal sand dunes. This sand is quaternary aged at the base to present at the surface and belongs to the Cenozoic Sedimentary Province (NSW Geology code: QP\_bd). To the east of the site, bounded by the Karuah River is the shoreline of estuarine deposited clastic sediment (QH\_ecl).



Figure 1: Published geology (Minview Seamless geology, 2022) and approximate site area boundaries (minview.geoscience.nsw.gov.au, n.d.)

#### 3.2 SURFACE CONDITIONS

The site is located on the eastern side of Soldiers Point Road, Soldiers Point. Site dimensions are approximately 100m wide by 130m long and occupy an approximate area of 12,300m<sup>2</sup>. The site is bounded by Port Stephens Sailing and Aquatic Club to the east, maintained reserve and parklands to the north and undeveloped bushland to the south. The foreshore of Port Stephens is situated approximately 50m to the east of the site boundary.

The site is positioned on the northern side pf a prominent low rounded residual knoll / hill with surface relief ranging from approximately RL20m to RL6m (AHD). The site predominately slopes toward the north west with slope angles in the order of 15° to 10° toward the upper slopes of the hill flatting to 5° toward Soldiers Point Road. The site slopes toward east / north east along the eastern boundary at 5° increasing to 10° to 15° toward the mid and lower slopes of the hill where it flattens at the foreshore of Port Stephens. A near vertical rock cutting is situated to the east of the site, approximately 8m high, with Port Stephens Sailing and Aquatic club clubhouse positioned within this area.

The site is currently occupied by a rendered brick construction multilevel hotel fronting Solider Point Road, with associated car parks and garden beds. No evidence of brickwork distress was noted from external observation.

Numerous small rock outcrops, comprising very high strength rhyodacite (volcanic rock), were observed along the eastern site boundary and in the adjacent council reserve. Slightly weathered rhyodacite was also observed in the rock cutting adjacent to the Sailing and Aquatic Club

Drainage at the site is assessed to occur predominantly by infiltration into the sand subsoil with some minor overland flow over paved surfaces directed to dedicated storm water drainage structures over the site. Vegetation across the site comprises maintained lawns and gardens, with some stands of trees up to 10m height.

#### 3.3 SUBSURFACE CONDITIONS

The rhyodacite is a volcanic extrusive rock (lava) with a crystal structure predominately comprised phenocrysts (large crystals 1mm to 5mm) of quartz, alkali feldspar, plagioclase and biotite within a finegrained pyroxene (iron) matrix. The rock is characterised by a very high to extremely high strength.

Defects throughout the rock mass comprise mainly of moderately dipping joints with clean or slightly iron stained joint faces. Some weathered clay seams occur throughout the rock mass representing weathering zones of secondary hydrothermal mineralisation and alteration. Defect spacing within the rock mass generally increases with depth, with the general defect spacing in Unit 2B in the order of 100m to 300m increasing in Unit 2C to 300mm to 1000mm. Local outcropping and previous experience with rhyodacite materials in the area suggest the defects within the rock mass form a predominately columnar jointing structure. Areas of localised intense random jointing may be apparent along previous cooling margins and hydrothermal intrusion within the rock mass.

The geotechnical units have been summarised in Table 2 and their distribution across the boreholes with depth summarised in Table 3. The distribution of geotechnical units from the previous investigation has been summarised in Table 4. Tables 2, 3 and 4 together comprise a simplified ground model for the site. Cross sections depicting interpreted subsurface conditions are included in the attached drawings.

Unit	Origin	Description
Unit 1A	Fill	ASPHALT Gravelly SAND: fine to medium grained, brown, angular to sub-angular, fine to
		Silty SAND: fine to coarse grained, dark brown, with clay and fine to coarse grained
		gravels
Unit 1B	Aeolian Sand	SAND: fine to medium grained, brown / dark brown and yellow / light brown, medium dense
Unit 2A	Residual Soil / Extremely Weathered Material	Sandy CLAY / Clayey SAND: medium plasticity brown to yellow, fine to coarse sand. Moisture content generally less than plastic limits with a very stiff consistency.
Unit 2B	Highly to Moderately Weathered Rhyodacite	RHYODACITE: Coarse grained crystal structure, light pink and blue grey, highly to moderately weathered, very high to extremely high strength
Unit 2C	Slightly weathered to Fresh Rhyodacite	RHYODACITE: Coarse grained crystal structure, light pink and blue grey, slightly weathered to fresh, extremely high strength.

#### Table 2: Summary of geotechnical units

Location	Approximate depth range of unit (mBGL)				
	1A	1B	2A	2B	2C
BH01-21	0.0 - 0.6	0.6 - 6.9	NE	6.9 – 7.13	7.13 - >10.11
BH02-21	0.0 – 0.5	0.5 – 9.6	9.6 – 10.03	10.03 – 11.18	11.18 - >13.53
BH03-21	0.0 - 1.9	NE	1.9 – 2.32	2.32 - 3.3	3.3 - >6.42
BH04-21	0.0 - 1.0	1.0 – 7.77	7.77 – 8.0	8.0 - 9.7	9.7 – 15.0

#### Table 3: Distribution of geotechnical units - current investigation (2021)

#### Table 4: Distribution of geotechnical units - previous investigation (2009)

Location	Approximate depth range of unit (mBGL)				
	1A	1B	2A	2B	2C
HA1	0.0 - 0.3	NE	0.3 – 0.31	>0.31	-
HA2	0.0 - 0.2	NE	0.2 - 0.45	>0.45	-
HA3	0.0 - 0.2	NE	0.2 – 1.0	>1.00	-
HA4	0.0 – 0.5	NE	0.05 – 0.85	>0.85	-
HA5	NE	0.0 – 0.15	0.15 – 0.25	>0.25	-
HA6	0.0 - 0.1	0.1 – 0.2	0.2 - 0.4	>0.4	-
HA7	0.0 - 0.1	0.1 ->2.0	-	-	-
BH1	NE	NE	0.3 – 1.3	1.3 – 1.6	1.6 - >5.61
BH2	NE	0.2 - 0.6	0.6 – 1.3	1.3 – 1.8	1.8 - >7.00

Notes on Table 3 and Table 4:

'NE' denotes 'Not Encountered'

'-' denotes beyond the limits of the test location

#### 3.4 GROUNDWATER

Groundwater was encountered at approximately 2.5mBGL in the boreholes that were drilled at similar elevations surrounding the lower, north-western areas of the site. Groundwater was not encountered in BH03-21 as it was located at the top of a fill mound overlying shallow rhyodacite. A summary of groundwater depths encountered is provided in Table 5.

#### Table 5: Summary of groundwater

Test Location	Date	Groundwater BGL (m)
BH01-21	06/12/2021	2.5
BH02-21	07/12/2021	2.5
BH03-21	08/12/2021	Not encountered
BH04-21	09/12/2021	2.4

# 4. LABORATORY TESTING

The laboratory testing results have been summarised in Table 6 to Table 9.

The laboratory testing summarised below consists of:

- No. 9 Particle Size Distribution
- No. 1 Atterberg Limits tests
- No. 3 UCS Tests
- No. 18 Point Load Tests
- No. 5 Aggressivity Tests

The testing reports can be found in Appendix B

#### Table 6: Summary of Particle Size Distribution Results

Hole ID	Depth (m)	Sieve size (mm)	Percent passing (%)
BH01	1.0 – 1.45	1.18	99
		0.6	98
		0.425	87
		0.3	45
		0.15	6
BH01	4.0 - 4.45	1.18	100
		0.6	99
		0.425	86
		0.3	45
		0.15	6
BH02	2.5 – 2.95	1.18	100
		0.6	100
		0.425	91
		0.3	40
		0.15	2
BH02	5.5 – 5.95	1.18	100
		0.6	99
		0.425	91
		0.3	58
		0.15	6
BH02	8.5 – 8.95	1.18	100
		0.6	99
		0.425	91
		0.3	53
		0.15	7
BH04	1.0 – 1.45	1.18	99

		0.6	98
		0.425	89
		0.3	50
		0.15	12
BH04	2.5 – 2.95	1.18	98
		0.6	98
		0.425	88
		0.3	44
		0.15	2
BH04	5.5 – 5.95	1.18	100
		0.6	99
		0.425	89
		0.3	55
		0.15	8
BH04	6.65 – 7.10	26.5	93
		6.7	59
		2.36	51
		0.6	42
		0.15	13

#### Table 7: Atterberg limits test

Sample ID	Depth (m)	Plasticity Index (%)	Plastic Limit (%)	Liquid Limit (%)	Linear shrinkage (%)
BH04-21	7.77 – 7.92	12	20	32	6.5

#### Table 8: Unconfined Compressive Strength (UCS) results

Sample ID	Depth (m)	Unixial compressive strength (MPa)	Failure mechanism
BH01-21	8.72 – 9.00m	76.9	Defect / shear
BH02-21	11.37 – 11.63m	203	Axial
BH04-21	11.26 – 11.52m	189	Axial / defect

#### **Table 9: Point Load Test results**

Investigation	tion Sample Rock Type Depth Diametral			Axial						
Location ID			(m)	P kN	ls (50) MPa	Failure Mode	P kN	ls (Mpa)	ls (50) MPa	Failure Mode
BH01	1	Rhyodacite	7.94	30.03	11.3	Bad break	-	-	-	-
	2	Rhyodacite	8.67	24.27	9.14	Through substance	-	-	-	-
	3	Rhyodacite	9.73	22.25	8.38	Through substance	-	-	-	-
BH02	1	Rhyodacite	10.60	0.13	0.05	Through substance	0.14	0.05	0.05	Through substance
	2	Rhyodacite	11.68	29.74	11.19	Through substance	32.2	11.05	11.44	Through substance
	3	Rhyodacite	12.82	29.83	11.23	Through substance	-	-	-	-
	4	Rhyodacite	13.06	28.05	10.56	Through substance	-	-	-	-
BH03	1	Rhyodacite	2.84	1.91	0.72	Bad break	-	-	-	-
	2	Rhyodacite	3.69	7.18	2.7	Along defect	-	-	-	-
	3	Rhyodacite	4.94	24.19	9.11	Through substance	-	-	-	-
	4	Rhyodacite	5.49	6.21	2.34	Along defect	-	-	-	-
	5	Rhyodacite	6.30	19.64	7.39	Through substance	-	-	-	-
BH04	1	Rhyodacite	9.48	8.06	3.03	Bad break	-	-	-	-
	2	Rhyodacite	10.35	8.02	3.02	Bad break	-	-	-	-
	3	Rhyodacite	11.57	28.36	10.67	Through substance	-	-	-	-
	4	Rhyodacite	12.26	18.42	6.93	Through substance	5	1.76	1.81	Bad break
	5	Rhyodacite	13.47	15.96	6.01	Through substance	-	-	-	-
	6	Rhyodacite	14.25	0.49	0.18	Along defect	0.47	0.23	0.22	Bad break

# 5. DISCUSSION

### 5.1 FOOTING DESIGN

#### 5.1.1 Footing Options

At this stage, it is unknown what the design loads will be, however it is known that the foundation level of structures is to be situated within Unit 2B and 2C rhyodacite.

High level strip or pad footings are considered appropriate where shallow rock is present. High level footings may also be appropriate for smaller structures (if any) founded entirely in dense SAND (Unit 1B) or Residual Soil (Unit 2A).

Excavations for footings founded into rock are expected to be very difficult as outlined in Section 5.3. Provision may be required in design for incorporating predrilled grouted dowels inserted into the rock and structurally incorporated (tied) into reinforcement to provide lateral shear resistance.

The larger buildings will transition the contact between shallow rock and rock underlying substantial deposits of Aeolian Sand (Unit 1B). To reduce the potential for differential settlement all footings must bear on rock. Footings may be deepened where sand is not thick, however this is unlikely to be achievable where surficial soils are deeper than approximately 1.5m. Piles will be required for the portions of buildings positioned where deep surficial deposits are present, namely the northwest portion of the site (see figure 1 in the attached drawings).

Due to the very high to extremely high rock strength and loose nature of the overlying sands, bored pier footings are not considered a viable option at the site due to possible excavation collapse and difficulty drilling a suitable socket depth.

For footings to carry design loads it is assumed that the footing excavations are cleaned of debris. Footing excavations should be inspected by a suitably experienced geotechnical engineer to confirm that conditions encountered during construction are consistent with the design assumptions.

All the footings for a single structure should bear on similar substrate unless the structure is designed with articulation to accommodate variable ground response under loading.

#### 5.1.2 Strip and Pad Footings

Shallow footings comprising strip and pad footings may be proportioned for an allowable bearing pressure of;

- 100kPa in dense or better Sand (Unit 1B)
- 200kPa in Unit 2A residual soil and extremely weathered rhyodacite
- 5MPa in Unit 2B and 2C high to extremely high strength rhyodacite rock.

### 5.1.3 Piled Footings

Geotechnical design parameters for natural soil and rock units are provided in Table 10.

Table 10: Geotechnical Design Parameters

Unit	Material Description	Bulk Density γ (kN/m³)	Inferred SPT (N <sub>60</sub> )	Effective Friction Angle, φ' (°)	Vertical Young's Modulus, E' <sub>∨</sub> (MPa)	Horizontal Young's Modulus, E'н (MPa)	Poisson's Ratio
1B	Aeolian Sand (ground surface to 3.0mRL)	18	8	29	8	6	0.3
1B	Aeolian Sand (from 3.0mRL to Unit 2A or deeper)	19	30	33	50	35	0.3
2A	Residual Soil / XWM	20	10	30	10	7	0.3
2B	Rhyodacite (HW to MW)	25	-	33	14000	10000	0.25
2C	Rhyodacite (SW to FR)	25	-	33	50000	37000	0.25

Geotechnical design parameters for piled footings are provided in Table 11.

#### Table 11: Summary of Pile Design Parameters

Unit	Material Description	Ultimate End Bearing (MPa) (b)(f)	Serviceability End Bearing (MPa)	Ultimate End Bearing (MPa) (b)(f)	Serviceability End Bearing (MPa)		Adhesion (kPa) <sup>I)(e)</sup>	Ultimate Lateral Yield Pressure
		Displace	ment Piles	Non-displacement Piles		Displacement	Non- displacement	(MPa) <sup>(g)(h)</sup>
1B	Aeolian Sand (ground surface to 3.0mRL)	2.5	0.9	1.3	0.4	30	15	0.1*Depth
1B	Aeolian Sand (from 3.0mRL to Unit 2A or deeper)	10	3.3	5.0	1.7	85	45	0.6
2A	RS / XWM	(k)	(k)	(k)	(K)	35	35	(k)
2B	HW – MW Rhyodacite	30 <sup>(I)</sup>	10 <sup>(I)</sup>	30	10	-	40	8
2C	SW - FR Rhyodacite	-	-	60	20	-	75	30

Notes on Table 10 and Table 11.

- (a) The geotechnical parameters are applicable for a single pile of diameter of 0.6 m to 1.5 m.
- (b) The end bearing pressures have been assessed for piles at the top of the relevant unit.
- (c) Adopt shaft adhesion values only where the embedded length into the relevant bearing stratum is at least 2 pile diameters.
- (d) To obtain shaft adhesion values for bored piles, the surface of the pile shaft should be cleared of clay smear and roughened using a suitable tool fitted to the piling rig. Augers and drilling buckets do not clean and roughen sockets adequately unless they are fitted with tools that protrude laterally from the sides of the auger or bucket.
- (e) For limit state design, we recommend a geotechnical strength reduction factor (Φg) of 0.56 unless pile loads tests are carried out to justify a higher value.
- (f) Assuming minimum 2.0 m embedment.
- (g) The ultimate lateral yield pressure at the middle of the layer depth assumes an embedment of at least 2 times the pile diameter.
- (h) Serviceability lateral yield pressure can be derived from the ultimate lateral yield pressure depending on the method adopted by the designer ie AS4678 or AS5100.
- (i) Shaft adhesion is not applicable for steel screw piles.
- (j) Shaft adhesion is not applicable in top 2.0m BGL
- (k) End bearing and Lateral pressures not provided as layer 2A not thick enough to founded in
- (I) The end bearing should be verified by pile driving formula

### 5.2 RETAINING WALLS

Geotechnical design parameters for retaining walls and temporary shoring are provided in Table 12.

Unit	Active earth pressure coefficient (K <sub>a</sub> )	Passive earth pressure coefficient (K <sub>p</sub> )	At rest earth pressure coefficient (K₀)	
Unit 1B (sand)	0.33	3.00	0.5	
Unit 2A (residual/ XWM)	0.33	3.00	0.5	

Table 12: Summary of Retaining Wall Design Parameters

If retaining systems are to be eventually propped by the new building structure, the at-rest earth pressure coefficients indicated above should be used in design.

The above parameters make no allowance for lateral pressures induced by surcharge loading from existing or proposed structures near the crest of the excavation, or for hydrostatic pressure due to groundwater build-up. Based on the results of subsurface investigations, it is recommended that non free draining retaining structures (ie: secant or sheet pile walls) be designed for a full hydrostatic head.

It should be noted that some lateral deformation may still occur with the use of retaining walls. The amount of movement is dependent on the rigidity of the retaining walls, and on the excavation and anchoring procedure. Observed lateral movements of documented walls are typically of the order of 0.5% of wall height.

### 5.3 EARTHWORKS

#### 5.3.1 General Geotechnical Constraints for Development

Excavation conditions within the weathered rock substrata are expected to be very difficult. Excavations in soil materials should be supported by properly designed and constructed retaining walls, rock bolting, shotcrete or else battered at 1V: 2H or flatter and protected against erosion. Excavations in rock should be subject to specific geotechnical assessment in relation to long term stable batter gradients and this will depend on treatment solutions such as rock bolting, shotcrete, meshing etc being adopted.

Permanent / temporary excavations greater than 1.5m deep will require further detailed geotechnical assessment once the location and extent of such excavations are known. This assessment may involve:

- Assessment of slope / retaining wall design parameters
- Assessment of need to provide temporary retention or special precautions during construction
- Viewing of the excavation by a geotechnical engineer during bulk excavation
- Assessment of staged construction requirements

Excavations should be designed for surcharge loading from slopes, retaining walls, structures and other improvements in the vicinity of the excavation.

Drainage measures should be implemented above and behind all temporary and permanent excavations to avoid concentrated water flows on the face of the cut or infiltration into the soil / rock profile behind the cut. Surface water flows from upslope areas should be diverted away from the cut face.

#### 5.3.2 Excavatability

It is assessed that excavation conditions at the site pose the most significant geotechnical constraint to the project. Laboratory testing and field observations of the Unit 2 rhyodacite indicate an extremely high strength rock with defect spacing in the order of 300mm to 1000mm.

With reference to Table 9, a typical Is<sub>50</sub> value for Unit 2C, when broken through substance is in the order of approximately 9MPa to 11MPa. With reference to Figure 2 below, blasting is likely to be required if unsuccessful with extremely hard ripping or hydraulic breaking.



Figure 2: Excavatability graph from Pettifer & Frookes (1994) with the expected range shown in the blue shaded area based on the point load index and discontinuity spacing index

Bulk excavations within the underlying very high to extremely high strength rhyodacite (Unit 2B and 2C) are unlikely to be achievable using heavy construction plant (ie: Caterpillar D10 or 30 tonne excavator) equipped with ripping tynes. The rhyodacite rock is also likely to cause significant excavation resistance to hydraulic

rock hammering, with very slow excavation rates likely and possible vibratory dilapidation concerns for surrounding structures. Conventional hardened steel ripping tooths and bits are expected to experience significant wear and disintegration during excavation within the rhyodacite materials.

Possible alternatives for excavation include;

- Drilling presplit bores to aid hydraulic hammer- this would involve using a dedicated drilling rig equipped with air percussion drilling techniques to drill a pattern closely spaced bores (say 300mm to 500mm centres) within the proposed excavation area to aid the purchase of hydraulic hammers fitted to excavators and to effectively increase the defect spacing (ie jointing) and therefore weakening, of the rock mass. This technique has been previously used on civil projects in the Nelson Bay area to facilitate rock excavation.
- Rock sawing or milling with excavators diamond bit, large diameter rock saws or milling heads attached to excavators could be used to progressively cut then rip the rhyodacite rock. Advantages of this method are good control of excavation edges and dimension during excavation and limited use of vibratory hydraulic hammers. It is noted that this type of equipment is normally used on sandstone type rock and excessive wear associated with the volcanic rock may preclude this option.
- **Blasting** the use of slow release expansive rock blasting techniques such as cone penetration fracture (RockTek) or similar that limit fly rock could be used to fracture the rock mass facilitating easier excavation.

#### 5.3.3 Support of Excavations

Temporary excavations in sand (Unit 1B) should be supported by a suitable shoring system such as sheet piles or contiguous or secant pile walls installed using continuous flight auger (CFA) grout injected piles or alternatively battered at no steeper than 1V:2H. Temporary excavations in residual soil or weathered rock should be battered at no steeper than 1V:1H or retained by a suitable shoring system such as a contiguous or secant pile wall.

Temporary excavations in Unit 2B and 2C rhyodacite should be battered at 1V:0.25H or near vertical however retention of loose bocks or highly fractured zones may be required using scaling (removal), rock bolts, shotcrete or a combination of all three. All excavations within Unit 2B and 2C rhyodacite should be inspected by a suitably qualified geotechnical professional on site during the excavation to advise on retention measures.

Permanent excavations within Unit 2B and 2C may require support such as reinforced shotcrete and / or rock anchors. Need for support of excavations in rock should be assessed on a case-by-case basis. Any rock anchors or shotcrete works proposed for the development should be designed by a suitably qualified geotechnical professional in consideration of the conditions exposed in the excavation. Construction should be undertaken by qualified contractors familiar in working with the recommended design elements

Permanent excavations within Unit 1B should be constructed at 1V:3H or flatter. Permanent excavations in Unit 2A should be constructed at 1V:2H or flatter. Permanent excavations steeper than above should be supported by an engineer-designed retaining wall and or a contiguous bored-pile wall.

#### 5.3.4 Filling

General earthworks and filling if required should be planned, executed and documented in accordance with AS3798-2007.

# 5.4 PREVIOUS ENVIRONMENTAL ASSESSMENTS

#### 5.4.1 Acid Sulphate Soils Assessment (GEOTWARA20848AA-AB)

This report dated 24 March 2009, concluded that the results of the laboratory testing conducted of recovered samples were well below the ASSMAC action criteria and indicated all samples tested were not actual or potential ASS. This combined with the residual nature of the site and minimum elevation over the site of RL6m suggested that it is highly unlikely for acid sulphate soils to be present and an ASS Management Plan would not be required for the project.

### 5.4.2 Phase 1 Environmental Site Assessment (ENVIWARA00284AA-R01)

This report dated 2 March 2009, identified four (4) areas of environmental concern (AEC's) at the site based on observations compiled during the site walkover and the site history assessment. Fill materials were widely used on the site for re-contouring purposes, and as such there was a potential for contamination to exist on the site which could impact on proposed redevelopment / land use.

It was stated that preferential pathways for contamination existed in the car parking area due to the exposure of underlying substrates, and as such, presented an area of environmental concern. Storage areas, including the waste storage area in the south-western corner of the site, and the pool chemical store were identified as likely point sources of potential contamination on the site. The potential for onsite soil contamination to be present within the four (4) AEC's associated with the proposed redevelopment of the site was considered to be low to medium.

Based on the results of this Phase 1 ESA, it was considered that a Phase 2 ESA was required to assess potential soil/groundwater contamination, and presence of acid sulfate soils associated with the proposed development at the site.

#### 5.4.3 Phase 2 Environmental Site Assessment (ENVIWARA00284AB)

Coffey reviewed the previous Phase 1 ESA in report dated 9 June 2010 and identified five areas of environmental concern. Ten boreholes were drilled to target these AECs, and also to provide spatial coverage across the site.

Selected soil samples were submitted for laboratory analysis for a number of contaminants of concern, including heavy metals, hydrocarbons, pesticides, asbestos and chloride. The laboratory results were assessed against the criteria relevant to the site redevelopment (residential with minimal access to soils). The assessment indicated that contaminant concentrations were either below laboratory reporting limits or the adopted investigation levels. Asbestos was not detected in the samples analysed, and a maximum chloride concentration of 63mg/kg was recorded.

The report concluded that based on the laboratory results, the likelihood for significant contamination to be present at the site was low, and further investigations (including management or remediation) was not required at that time.

#### 5.4.4 Summary

Site specific environmental assessment completed as of 9 June 2010 concluded that potential for contamination was low. No evidence of contamination was observed during this investigation, however any releases that may have occurred since June 2010 would not have necessarily been detected during this investigation.

# 6. CLOSURE

Tetra Tech Coffey appreciates the opportunity to be of service. Further advice on the uses and limitations of this report is presented in the attached document, *'Important Information about your Tetra Tech Coffey Report'*.

# 7. REFERENCES

Pettifer, G. a. (1994). A revision of the graphical method for assessing excavatability in rock. *Quatrely Journal* of Engineering Geology and Hydrogeology, v. 27, 145-164.

# LIMITATIONS



# IMPORTANT INFORMATION ABOUT YOUR TETRA TECH COFFEY REPORT

As a client of Tetra Tech Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by Tetra Tech Coffey to help you interpret and understand the limitations of your report.

#### Your report is based on project specific criteria

Your report has been developed on the basis of your unique project specific requirements as understood by Tetra Tech Coffey and applies only to the site investigated. Project criteria typically include the general nature of the project; its size and configuration; the location of any structures on the site; other site improvements; the presence of underground utilities; and the additional risk imposed by scope-of-service limitations imposed by the client. Your report should not be used if there are any changes to the project without first asking Tetra Tech Coffey to assess how factors that changed subsequent to the date of the report affect the report's recommendations. Tetra Tech Coffey cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

#### Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Tetra Tech Coffey to be advised how time may have impacted on the project.

#### Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of Tetra Tech Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

#### Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Tetra Tech Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Tetra Tech Coffey cannot be held responsible for such misinterpretation.

#### Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Tetra Tech Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. Your report should not be applied to any project other than that originally specified at the time the report was issued.

#### Interpretation by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Tetra Tech Coffey to work with other project design professionals who are affected by the report. Have Tetra Tech Coffey explain the report implications to design professionals affected by them and then review plans and specifications produced to see how they incorporate the report findings.

#### Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, drawings, etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples. These logs etc. should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

#### Geoenvironmental concerns are not at issue

Your report is not likely to relate any findings, conclusions, or recommendations about the potential for hazardous materials existing at the site unless specifically required to do so by the client. Specialist equipment, techniques, and personnel are used to perform a geoenvironmental assessment. Contamination can create major health, safety and environmental risks. If you have no information about the potential for your site to be contaminated or create an environmental hazard, you are advised to contact Tetra Tech Coffey for information relating to geoenvironmental issues.

#### Rely on Tetra Tech Coffey for additional assistance

Tetra Tech Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As the project progresses through design towards construction, speak with Tetra Tech Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

#### Responsibility

Reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Tetra Tech Coffey to other parties but are included to identify where Tetra Tech Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Tetra Tech Coffey closely and do not hesitate to ask any questions you may have.

# DRAWINGS



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# APPENDIX A: ENGINEERING BOREHOLE LOGS



# Soil Description Explanation Sheet (1 of 2)

#### DEFINITION:

In engineering terms soil includes every type of uncemented or partially cemented inorganic or organic material found in the ground. In practice, if the material can be remoulded or disintegrated by hand in its field condition or in water it is described as a soil. Other materials are described using rock description terms.

#### **CLASSIFICATION SYMBOL & SOIL NAME**

Soils are described in accordance with the Unified Soil Classification (UCS) as shown in the table on Sheet 2.

#### PARTICLE SIZE DESCRIPTIVE TERMS

NAME	SUBDIVISION	SIZE
Boulders Cobbles		>200 mm 63 mm to 200 mm
Gravel	coarse medium fine	20 mm to 63 mm 6 mm to 20 mm 2.36 mm to 6 mm
Sand	coarse medium fine	600 μm to 2.36 mm 200 μm to 600 μm 75 μm to 200 μm

#### MOISTURE CONDITION

- Dry Looks and feels dry. Cohesive and cemented soils are hard, friable or powdery. Uncemented granular soils run freely through hands.
- **Moist** Soil feels cool and darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.
- Wet As for moist but with free water forming on hands when handled.

#### CONSISTENCY OF COHESIVE SOILS

TERM	UNDRAINED STRENGTH su (kPa)	FIELD GUIDE
Very Soft	<12	A finger can be pushed well into the soil with little effort.
Soft	12 – 25	A finger can be pushed into the soil to about 25mm depth.
Firm	25 – 50	The soil can be indented about 5mm with the thumb, but not penetrated.
Stiff	50 – 100	The surface of the soil can be indented with the thumb, but not penetrated.
Very Stiff	100 – 200	The surface of the soil can be marked, but not indented with thumb pressure.
Hard	>200	The surface of the soil can be marked only with the thumbnail.
Friable	_	Crumbles or powders when scraped by thumbnail.

#### DENSITY OF GRANULAR SOILS **DENSITY INDEX (%)** TERM Less than 15 Very loose 15 – 35 Loose 35 - 65 Medium Dense 65 - 85Dense Greater than 85 Very Dense MINOR COMPONENTS TERM ASSESSMENT GUIDE **PROPORTION OF** MINOR COMPONENT IN: Trace of Presence just detectable by feel Coarse grained or eye, but soil properties little or soils: <5% no different to general properties Fine grained soils: of primary component. <15% With Presence easily detected by feel Coarse grained or eye, soil properties little different to general properties of some soils: 5 - 12% Fine grained soils: primary component. 15 - 30% SOIL STRUCTURE CEMENTING ZONING Continuous Weakly Easily broken up by Layers across exposure cemented hand in air or water. or sample. Effort is required to Discontinuous Lenses Moderately shape. cemented break up the soil by hand in air or water. Pockets Irregular inclusions of different material. **GEOLOGICAL ORIGIN WEATHERED IN PLACE SOILS** Structure and fabric of parent rock visible. Extremely weathered material Residual soil Structure and fabric of parent rock not visible. TRANSPORTED SOILS Aeolian soil Deposited by wind. Alluvial soil Deposited by streams and rivers. Colluvial soil Deposited on slopes (transported downslope by gravity). Fill Man-made deposit. Fill may be significantly more variable between tested locations than naturally occurring soils Lacustrine soil Deposited by lakes. Marine soil Deposited in ocean basins, bays, beaches and estuaries.



# Soil Description Explanation Sheet (2 of 2)

			OUL OF ADD			extricit.											
		(Excluding p	FIELD IDENT articles larger that	IFICATION F n 60 mm and	PROCEDURES USC I basing fractions on es	stimated	mass)	USC	PRIMARY NAME								
f materials าm		rse 2.36	rse 2.36	rse 2.36	rse 2.36	rse 2.36	rse 2.36	1rse 2.36	arse 2.36	EAN /ELS or no es)	Wide range intermediate	in grain size and subs e particle sizes	stantial ar	nounts of all	GW	GRAVEL	
		/ELS alf of coa ger than m	CLE GRA (Little fine	Predominar intermediate	ntly one size or a range e sizes missing.	e of sizes	with more	GP	GRAVEL								
an 50% c	(ed eye)	GRA e than ha on is lar m	/ELS TH ES ciable int of ss)	Non-plastic	fines (for identification	ı procedu	res see ML below)	GM	SILTY GRAVEL								
More tha	o the nak	Mon	GRA WI FIN Appre amou	Plastic fines	s (for identification proc	cedures s	ee CL below)	GC	CLAYEY GRAVEL								
XAIINED SOILS   than 63 mm is la particle visible to	visible to	1rse 2.36	rse 2.36 AN DS or no s)		Wide range in grain sizes and substantial amounts of all intermediate sizes			SW	SAND								
	t particle	bout the smallest particle SANDS More than half of coa fraction is smaller than mm	Iller than CLE SAN (Little fine	Predominantly one size or a range of sizes with some intermediate sizes missing.			SP	SAND									
ARSE G less	smalles		SAN e than hi on is sme m	SAN e than h on is sma m	SAN e than h on is sma m	SAN e than h on is sm	NDS ITH VES reciabl ount of les)	Non-plastic	Non-plastic fines (for identification procedures see ML below).			SM	SILTY SAND				
C	bout the		SAN WI FIN (Appre e amo	Plastic fines (for identification procedures see CL below).			SC	CLAYEY SAND									
<u>د .«</u>	e is a		IDENT	IFICATION I	PROCEDURES ON FF	RACTION	IS <0.2 mm										
e thai	articl	S & YS limit an 50	'S & \YS I limit an 50	S & ∖YS an 50	S & ∖YS I limit an 50	S& √YS I limit an 50	S & YS Ilimit an 50	S & YS limit an 50	0	0	DRY STRENG	тн	DILATANCY		TOUGHNESS		
t Mor an 63 5 mm	d mu								None to Low	Quick t	to slow		None	ML	SILT		
OILS ss tha 0.07	075 r	SILT CLA CLA iquic ss th	Medium to High	None			Medium	CL	CLAY								
ED S ial les than	(A 0.		Low to medium	Slow to	o very slow		Low	CL	ORGANIC SILT								
RAIN nater naller		a i i i i i i i i i i i i i i i i i i i	Low to medium	Slow to	very slow		Low to medium	МН	SILT								
√e GI 6 of r sn		-TS 8 -AYS -AYS -AYS -AYS -AYS -AYS -AYS -AYS	High	None			High	СН	CLAY								
FIN 50%		Lig C S	Medium to High	None			Low to medium	ОН	ORGANIC CLAY								
HIGHLY C	RG	ANIC SOILS	Readily identifie	d by colour,	odour, spongy feel and	d frequen	tly by fibrous texture.	PT	PEAT								

#### SOIL CLASSIFICATION INCLUDING IDENTIFICATION AND DESCRIPTION

• Low plasticity – Liquid Limit w<sub>L</sub> less than 35%. • Medium plasticity – w<sub>L</sub> between 35% and 50%. • High plasticity – w<sub>L</sub> greater than 50%.

COMMON DEFECTS IN SOIL

TERM	DEFINITION	DIAGRAM	TERM	DEFINITION	DIAGRAM
PARTING	A surface or crack across which the soil has little or no tensile strength. Parallel or sub parallel to layering (eg bedding). May be open or closed.		SOFTENED ZONE	A zone in clayey soil, usually adjacent to a defect in which the soil has a higher moisture content than elsewhere.	STORE CONTRACT
JOINT	A surface or crack across which the soil has little or no tensile strength but which is not parallel or sub parallel to layering. May be open or closed. The term 'fissure' may be used for irregular joints <0.2 m in length		TUBE	Tubular cavity. May occur singly or as one of a large number of separate or inter-connected tubes. Walls often coated with clay or strengthened by denser packing of grains. May contain organic matter.	
SHEARED ZONE	Zone in clayey soil with roughly parallel near planar, curved or undulating boundaries containing closely spaced, smooth or slickensided, curved intersecting joints which divide the mass into lenticular or wedge shaped blocks.	Ø	TUBE CAST	Roughly cylindrical elongated body of soil different from the soil mass in which it occurs. In some cases the soil which makes up the tube cast is cemented.	
SHEARED SURFACE	A near planar curved or undulating, smooth, polished or slickensided surface in clayey soil. The polished or slickensided surface indicates that movement (in many cases very little) has occurred along the defect.		INFILLED SEAM	Sheet or wall like body of soil substance or mass with roughly planar to irregular near parallel boundaries which cuts through a soil mass. Formed by infilling of open joints.	



# **Rock Description Explanation Sheet (1 of 2)**

The descriptive terms used by Coffey are given below. They are broadly consistent with Australian Standard AS1726-1993.   DEFINITIONS: Rock substance, defect and mass are defined as follows:   In engineering terms rock substance is any naturally occurring aggregate of minerals and organic material which canno disintegrated or remoulded by hand in air or water. Other material is described using soil descriptive terms. Effectively homogenous material, may be isotropic or anisotropic.   Defect Discontinuity or break in the continuity of a substance or substances.   Mass Any body of material which is not effectively homogeneous. It can consist of two or more substances without defects, o or more substances with one or more defects.							
SUBSTANCE DES	TERMS:	ROCK SUBSTANCE STRENGTH TERMS					
ROCK NAME	Simple rock names are used rather than precise geological classification.		Term	Abbre- viation	Point Load Index, I <sub>s(50)</sub> (MPa)	Field Guide	
PARTICLE SIZE	Grain size terms for sandstone are:		Very Low	VL	Less than 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with a knife; pieces up to	
Coarse grained	Mainly (	Mainly 0.6mm to 2mm					
Medium grained	Mainly (						
Fine grained	Mainly (	Mainly 0.06mm (just visible) to 0.2mm				30mm thick can be broken by finger	
FABRIC	Terms f etc. ) ar	Terms for layering of penetrative fabric (eg. bedding, cleavage etc. ) are:		L	0.1 to 0.3	pressure. Easily scored with a knife:	
Massive	No laye	ring or penetrative fabric.	LOW			indentations 1mm to 3mm	
Indistinct	Layering	Layering or fabric just visible. Little effect on properties.				pick point; has a dull	
Distinct	Layering parallel	Layering or fabric is easily visible. Rock breaks more easily parallel to layering of fabric.				sound under hammer. Pieces of core 150mm long by 50mm diameter	
CLASSIFICATION OF WEATHERING PRODUCTS Term Abbreviation Definition						may be broken by hand. Sharp edges of core may be friable and break	
Residual Soil	RS	Soil derived from the weathering of rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.	Medium	М	0.3 to 1.0	during handling. Readily scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.	
Extremely Weathered Material	xw	Material is weathered to such an extent that it has soil properties, ie, it either disintegrates or can be remoulded in water. Original rock fabric still visible.					
Highly Weathered Rock	нw	Rock strength is changed by weathering. The whole of the rock substance is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Some minerals are decomposed to clay minerals. Porosity may be increased by leaching or may be decreased due to	High	н	1 to 3	A piece of core 150mm long by 50mm can not be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.	
Moderately Weathered Rock	MW	the deposition of minerals in pores. The whole of the rock substance is discoloured, usually by iron staining or bleaching, to the extent that the colour of the fresh rock is no longer	Very High	VH	3 to 10	Hand specimen breaks after more than one blow of a pick; rock rings under hammer.	
Slightly Weathered Rock	recognisable. SW Rock substance affected by weathering to the e that partial staining or partial discolouration of the rock substance (usually by limonite) has taken		Extremely High	EH	More than 10	Specimen requires many blows with geological pick to break; rock rings under hammer.	
		The colour and texture of the fresh rock is recognisable; strength properties are essentially those of the fresh rock substance.	Notes on Rock Substance Strength: In anisotropic rocks the field guide to strength applies to the strength perpendicular to the anisotropy. High strength				
Fresh Rock FR Rock substance unaffected by weathering.				rocks n	nay break read	ily parallel to the planar	
Notes on Weathering: AS1726 suggests the term "Distinctly Weathered" (DW) to cover the range of substance weathering conditions between XW and SW. For projects where it is not practical to delineate between HW and MW or it is judged that there is no advantage in making such a distinction. DW may be used with the definition given in AS1726. Where physical and chemical changes were caused by hot gasses and liquids associated with igneous rocks, the term "altered" may be substituted for "weathering" to give the abbreviations XA, HA, MA, SA and DA.			The term "extremely low" is not used as a rock substance strength term. While the term is used in AS1726-1993, the field guide therein makes it clear that materials in that strength range are soils in engineering terms. The unconfined compressive strength for isotropic rocks (and anisotropic rocks which fall across the planar anisotropy) is typically 10 to 25 times the point load index Is(50). The ratio may vary for different rock types. Lower strength rocks often have lower ratios than higher strength rocks.				


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# **Rock Description Explanation Sheet (2 of 2)**

COMMON D	EFECTS IN ROCK MASSES				DEFECT	SHAPE TERMS
Term	Definition	Diagram	Map Symbol	Graphic Log (Note 1)	Planar	The defect does not vary in orientation
Parting	A surface or crack across which the rock has little or no tensile strength. but which		20		Curved	The defect has a gradual change in orientation
	or planar anisotropy in the rock substance. May be open or closed.		20 Cleava	ge (Note 2)	Undulatin	g The defect has a wavy surface
Joint	A surface or crack across which the rock	1.5.			Stepped	The defect has one or more well defined steps
	is not parallel or sub parallel to layering or planar anisotropy in the rock substance. May be open or closed.		¥ <sup>60</sup>	(Note 2)	Irregular	The defect has many sharp changes of orientation
Sheared Zone (Note 3)	Zone of rock substance with roughly parallel near planar, curved or undulating boundaries cut by closely	A	35	1.5	Note: The partly influ observatio ROUGHN	assessment of defect shape is enced by the scale of the n. ESS TERMS
	defects. Some of the defects are usually curved and intersect to divide the mass into lenticular or wedge shaped blocks	7.1.1	7	14	Slickensi	ded Grooved or striated surface, usually polished
Sheared	A near planar, curved or undulating				Polished	Shiny smooth surface
Surface (Note 3)	surface which is usually smooth, polished or slickensided.	N. S.	40	2.40	Smooth	Smooth to touch. Few or no surface irregularities
					Rough	Many small surface irregularities (amplitude
Crushed Seam (Note 3)	Seam with roughly parallel almost planar boundaries, composed of disoriented, usually angular fragments of the host rock substance which may be more		50	م م		Feels like fine to coarse sand paper.
	weathered than the host rock. The seam has soil properties	.,.	.1	17	Very Rou	gh Many large surface irregularities (amplitude generally more than 1mm).
Infilled Seam	Seam of soil substance usually with distinct roughly parallel boundaries formed by the migration of soil into an		65			Feels like, or coarser than very coarse sand paper.
	open cavity or joint, infilled seams less than 1mm thick may be described as		4		COATING	TERMS
	veneer or coating on joint surface.	1111		1.21	Clean	No visible coating
Extremely Weathered	Seam of soil substance, often with gradational boundaries. Formad by weathering of the rock substance in		32		Stained	No visible coating but surfaces are discoloured
ocam	place.	Seam	THE	H.	Veneer	A visible coating of soil or mineral, too thin to measure; may be patchy
Notes on De	fects:				Veneer	A visible coating up to 1mm thick.
1. Usually be dip.	prehole logs show the true dip of defects a	nd face sketch	es and sectio	ns the apparent		described using appropriate defect terms (eg, infilled seam).
2. Partings a	and joints are not usually shown on the gra	phic log unless	considered s	significant.		usually described as a vein.
3. Sheared a	zones, sheared surfaces and crushed sean	ns are faults in	geological te	rms.	BLOCK S	HAPE TERMS
					Blocky	Approximately equidimensional
					Tabular	Thickness much less than length or width
					Columnar	Height much greater than cross section



									Borehole ID. sheet:	<b>BH01-21</b> 1 of 2
Engi	ne	erin	gl	-0	g -	Bo	rehole		project no.	754-NTLGE20264
lient:	Sa	lamand	er P	rope	rties	Pty I	td		date started:	06 Dec 2021
rincipal:									date complete	d: 06 Dec 2021
roject:	Sa	lamand	er S	hore	s Ge	otecł	nical Investigation		logged by:	HL
ocation:	14	7 Soldie	ers F	Point	road	, Sole	liers Point, NSW 2317		checked by:	SJB
osition: E:	41300	8; N: 63804	04 (MC	GA94)			surface elevation: 7.63 m (AHD)	angle	from horizontal: 90	)°
rill model: (	Seopro	be, Track n	nounte	d		-1 -11-	drilling fluid:	casing	diameter : HW	
G S	ormati	lon			mate	riai sub	material description		<u>, ≹</u> hand	
support support 2 penetrati	water	samples & field tests	RL (m)	depth (m)	graphic loç	soil group symbol	SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	400 (kba) 400 (kba) 400 (kba)	soil origin, structure and additional observations
			-	-		SP	SAND: fine to medium grained, dark brown to grey, with fine to medium grained sub-angular gravels. 0.2m: becomes black, no gravels	D	L	
			-7	-		 SP	SAND: fine to medium grained, grey.	_		
				- 1.0-			0.6m: becomes grey			
		SPT 2, 4, 4	F	-						
		N=0		-						
			-0	-			1.8m: becomes vellow to pale brown	— <u>—</u> —		
			_	2.0-						
				-						
	12-21	SPT 1, 2, 4	-5	-			2.5m: becomes pale grey to white	W		
	90 P	N=6	-	3.0-						
- Buis	ountere		-	-						
HW ca	Eno		-4	-						
				-						
		SPT 6, 16, 20	-	4.0-			4.0m: becomes dark grey, slight odour		D	
		N=36	-	-						
			-3	-						
			_	5.0 —						
				-						
		SPT 10, 13, 19	-2	-						
		N=32	-	6.0-						
			F	-						
			-1	-	]					
<b>↓</b>	a		-	-			Baselede DH04.04 at 15 at 15 at 15 at 15			
			F	7.0-	1		Borenole BHU1-21 continued as cored hole			
				-						
			-0		1					
ethod T diatub D auger S auger A hand / washi	drilling screw auger oore oller	g* ing*	Sup M C pen	port mud casing etration	N N	nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP band penetrometer (*Pa)	soil grou material based on A	up symbol & description \S 1726:2017 dition	consistency / relative density           VS         very soft           S         soft           F         firm           St         stiff           VSt         very stiff           H         bard
W     washbore       RR     rock roller       *     bit shown by suffix       e.g.     AD/T       B     blank bit       T     TC bit       W     water outflow					•Oct-12 w el on date	ater shown	N         standard penetrometer (KPa)         D           N         standard penetration test (SPT)         M           N*         SPT - sample recovered         W           Nc         SPT with solid cone         W           VS         vane shear; peak/remouded (kPa)         W           R         refusal         V	dry 1 moist V wet Vp plastic I Vl liquid lir	imit nit	rn nard Fb friable VL very loose L loose MD medium dense D dense



		C								Borehole	e ID.	BH01-21	
Ene		~~	~: ~		rad Darak					sheet:		2 of 3	
Enč	JIN	ee	rin	g Log - Co	pred Borer	1016	•			project r	10.	754-NTLGE20264	<u>8-1</u>
client:	S	Salan	nand	er Properties Pty	Ltd					date sta	rted:	06 Dec 2021	
principa	I:									date con	npleted:	06 Dec 2021	
project:	S	Salan	nand	er Shores Geoteo	hnical Investigati	ion				logged b	y:	HL	
location	: 1	47 S	oldie	ers Point road, So	ldiers Point, NSV	/ 2317	7			checked	by:	SJB	
position:	E: 413	3008; N	: 63804	04 (MGA94 )	surface elevation: 7.6	surface elevation: 7.63 m (AHD) a					ntal: 90°		
drill mode	l: Geo	probe,	Track n	nounted	drilling fluid:				casin	g diameter :	HW		
drilling i	nform	ation	mate	rial substance					rock	mass defec	ts		
thod & pport ter	(m)	oth (m)	Iphic log	<b>material d</b> <b>ROCK TYPE</b> : gra colour, structure, i	escription in characterisics, minor components	athering &	estimated strength & Is50 X= axial; O= diametral	samples, field tests & ls(50) (MPa)	e run RQD	defect spacing (mm)	a(type, inclin	dditional observations and defect descriptions ation, planarity, roughness, coat thickness, other)	ing,

	pport	ter	E.	pth (I	aphic	colour, structure, minor com	ponents	eratic	X = axial; O = diametral	(MPa)	re ru RQD	(11	,	thickness, o	ther)
_	ns Bu	wa	R	de	gra			we	월 7 8 म <del>2</del> 9	d = diametral	S &	8 <sup>6</sup>	2 2 2 2 2 2 8 2 8 8 2 8 8 8 8 8 8 8 8 8	particular	general
0F_0_10_00.3.2020-08-25_Log_COF BOREHOLE: CORED_SALAMANDER SHORES.GPJ_< <drawingfile>&gt;_03/02/2022 11:48</drawingfile>	nne suuri	Wat	<u> </u> - - - - - - - - -					we		a = axat; d = diametral	cor & 1			particular	general 
RY.GLB rev:			-1	-		started coring at 6.00m									-
CDF_0_10_00.3_LIBRA	MMLC	Encountered	-0	7.0	× × × × × × × × ×	RHYODACITE brown, black, pink a anhedral to subhedral fine grains, ~/ ~35% alkali feldspar, 20% plagioclas	ınd white, 10% quartz, se, <5% biotite.	HW		SPT 8/25mm N=R	88%			<ul> <li>SM, 25°, PL, CL-ML</li> <li>JT, 10°, PL, VR, - CN</li> <li>JT, 20°, PL, VR, - CN</li> <li>JT, 0°, IR, VR, - CN</li> <li>JT, 70°, PL, SO, Fe SN</li> </ul>	 - - - -
	met DT NMI NQ HQ PQ RR	hod dia LCNN wii wii roo	atube ALC co reline o reline o reline o ck rolle	ore (51.9 core (47 core (63 core (85 er	9 mm) .6mm) .5mm) .0mm)	support C casing M mud N none water level on date shown water inflow complete drilling fluid loss partial drilling fluid loss partial drilling fluid loss water pressure test result (lugeons) for depth interval shown	graphic log / core core rec (graphic symi no core core run & RQD barrel w RQD = Rock Qu	recover overed pols indicate recovere ithdrawr ality De	material) ed n signation (%	weatherin, RS resic XW extre HW high MW mod SW sligh FR fresh W replaced v strength VL very lo L low M mediu H high VH very h EH extrer	g & alter lual soil mely w ly weath erately v ttly weath with A for a bow um igh nely hig	ration eathen nered weath thered alteration	ed ered	defect type     PT       PT     parting       JT     joint       SS     sheared surface       SZ     sheared surface       SX     sheared surface       SM     seam       roughness     G       VR     very rough       SO     smooth       POL     polished       SL     slickensided	Danarity PL planar CU curved JN undulating ST stepped R Irregular CO clean SN stained /N veneer CO coating



			C									Bor	ehol	e ID.	BH01	-21
E,	20	uin		rin	a   0a -	Corec	1 Borok	n	<b>_</b>			she	et:		3 of 3	
	IY	<b>,</b>			y Luy -	COIE			7			proj	ect r	וס.	754-N	TLGE20264
clien	nt:	S	Salan	nand	er Properties	s Pty Ltd						date	e sta	rted:	06 Dec	c 2021
princ	cipal	:										date	e cor	npleted:	06 Dec	c 2021
proje	ect:	S	Salan	nand	er Shores G	eotechnica	al Investigati	on				logg	ged k	by:	HL	
locat	tion:	1	47 S	oldie	ers Point roa	d, Soldiers	Point, NSV	/ 231	7			che	ckec	l by:	SJB	
positi	on:	E: 41	3008; N	: 63804	04 (MGA94)	sur	face elevation: 7.6	3 m (AH	D)		angle	e from	horiza	ontal: 90°		
drill n	nodel	I: Geo	probe,	Track n	nounted	dri	lling fluid:				casir	ng dian	neter	: HW		
drilli	ing iı	nform	ation	mate	erial substance	aterial descriptio	n	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	estimated	samples.	rock	mass def	defe ect	cts ad	ditional obse	ervations and
thod & port	er	(E	th (m)	phic log	ROCK T colour, st	YPE: grain charac ucture, minor cor	terisics, nponents	athering ration	strength & Is50 X= axial; Q= diametral	field tests & Is(50) (MPa)	e run ROD	spao (m	cing m)	(type, inclina	defect des ition, planari thickness	criptions ty, roughness, coa s, other)
sup	wat	ᆋ	deb	gra				wea	로 그 로 프 <del>프</del> 프	a = axial; d = diametral	COTE & F	8 <u>6</u> 8	3000	particular		ger
AMLC	Encountered	1	- - - 9.0 —		RHYODACITE: b anhedral to subhe ~35% alkali feldsp (continued)	rown, black, pink dral fine grains, ~ ar, 20% plagiocla	and white, -40% quartz, ase, <5% biotite.	FR			88%			JT, 5°, IR JT, 20°, F JT, 45°, F JT, 45°, F	2, VR, - CN PL, SO, Fe S PL, SO, Fe S PL, SO, Fe S	5N 5N
		2	- - - 10.0-	× × × × × × × ×							100%			JT, 30°, F	PL, RO, - CN R, VR, - CN PL, VR, - CN	1
		3	-		Borehole BH01-21 Target depth	terminated at 10	).11 m									
		-	- 11.0 - -													
		4	- - 12.0 — -													
		5	-													
		6	-	-												
		-	- 14.0 — -													
		7	- - 15.0 —	•												
		8	-	-												
met DT NMI NQ HQ PQ RR	hod dia LCNN wii wii wii roo	atube MLC c reline reline ck roll	ore (51. core (47 core (63 core (85 er	9 mm) 7.6mm) 3.5mm) 5.0mm)	support C casing M mu water   10/10/12, w level on dat water inflow complete du partial drillir	d N none ater e shown / illing fluid loss ng fluid loss	graphic log / core core red (graphic syn no core core run & RQD barrel v	e recovered nbols indicate	<b>ry</b> • material) ed	weatherin RS resic XW extre HW high MW mod SW sligh FR frest *W replaced strength VL very I L low M medii	g & alte dual soid emely w ly weath lerately ntly wea n with A for a ow	ration* l veathered weather weathered thered	ed	defect type PT parting JT joint SS sheare SZ sheare CO contao CS crushe SM seam roughness VR very n RO rough	g ed surface ed zone ot ed seam rough	planarity PL planar CU curved UN undulating ST stepped IR Irregular <b>coating</b> CN clean SN stained
					(lugeons) fo interval sho	r depth wn	RQD = Rock Q	uality De	signation (%)	H high VH very h EH extrer	nigh mely hig	gh		SO smoo POL polisi SL slicke	oth hed ensided	VN veneer CO coating







	description	drawn	approved	date
c	Initial revision	HL	JD	15/02/2022
VISIO				
e				



								Borehole ID.	BH02-21
Eng	ine	erin	g l	Log	g -	Bo	rehole	project no.	754-NTLGE202648
lient:	Sa	lamand	er P	rope	rties	Pty I	td	date started:	07 Dec 2021
principal:				·				date completed	1: 07 Dec 2021
proiect:	Sa	lamand	ler S	hore	s Ge	otecl	nical Investigation	logged by:	HL
	14	7 Soldie	ore F	Point	rnan	l Salı	Viere Point NSW 2317	checked by:	с IR
osition; E	• 4129	77· N· 63803	R6 (MC	3494 )	1044	,	surface elevation: 7.01 m (AHD)	angle from horizontal: 90	•
rill model:	Geopr	obe, Track r	nounte	d			drilling fluid:	casing diameter : HW	
drilling in	forma	tion	1		mate	erial sub	stance		
support support	s water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components	but the second s	soil origin, structure and additional observations
			7			SP	ASPHALT: 100mm, black.		
	¦			-		SP	Gravelly SAND: fine to medium grained, brown, angular to sub-angular, fine to medium grained gravels		
	¦		Ē.	-			SAND: fine to medium grained, grey. 0.5m: becomes black to dark grey		
	¦		-6	1.0-					
		SPT 2, 1, 1 N=2		-					
		11-2	+						
				-					
	i		-5	2.0-					
	12-21	SPT 2, 4, 4	1	-			2.5m: becomes pale grey to grey	w	
	1-70	N=8	-4	3.0-					
				-					
			F						
- Buj									
fW cas	Encot	SPT	-3	4.0-			4.0m: becomes grey to dark grey	MD - D	
	¦	7, 17, 19 N=36							
			F	-					
			22	50-					
			<b>_</b>						
		SPT	$\downarrow$	-			5 Em; boomos traco of silt alight adarm		
		28, \30/77mm	/		]		John becomes trace of Silt, Slight Odour		
	i	<u>N=R</u>	-1	6.0-					
	;								
	¦		F	-					
	¦			70-					
		SPT 15, 19, 25		-			7.0m: becomes dark brown		
		N=44	+	-					
	i I			nort			samples & field tests	soil arous symbol 9	consistancy / minting density
Finitia Finitiatu Diatuge	ıbe er drillin	ıg*	M C	mud casing	N	nil	B bulk disturbed sample D disturbed sample	material description based on AS 1726-2017	VS very soft S soft
S auge A hand	er screv I auger	ving*	pen	etration	ı		E environmental sample SS split spoon sample		F firm St stiff
R rock	roller				no res rangir	sistance ng to al	U## undisturbed sample ##mm diameter n HP hand penetrometer (kPa) D N standard construction text (SPT)	noisture condition ) dry 4 moist	VSt very stiff H hard Fb friable
bit sl	hown b	y suffix	wat	ter	-Oct-12 w	ater	N         Standard penetration test (SP1)         N           N*         SPT - sample recovered         V           Nc         SPT with solid cone         V	n moist V wet Vp plastic limit	VL very loose L loose
.g. AD/T blanl	k bit				ei on date ter inflow	snown	VS vane shear; peak/remouded (kPa) V R refusal	Vİ İiquid limit	MD medium dense D dense
/ V bit	ut.			- wa	ter outflov	v	HB hammer bouncing		VD very dense



		_							Boreho	ile ID.	BH02-21
Enai	ne	erin	al	_0(	a -	Bo	rehole		sheet:		2 of 3
	<u> </u>	lamand	<u> </u>		J				project	no.	754-NILGE202040
llent.	Jai	lamanu	ыг	Tope	1 แธง	Fiyi	.10		date su	arteu.	07 Dec 2021
rincipai:	0-				- 0-	-4			date co	mpletea:	07 Dec 2021
roject:	Sai	lamano	er 5.	hore	s Ge	Oteci			logged	by:	HL
ocation:	147	7 Soldie	ers P	oint	road	, Sol	diers Point, NSW 2317	<u> </u>	checke	d by:	SJB
osition: E:	412973 Seopro	7; N: 638038 be Track n	36 (MG	;A94) -d			surface elevation: 7.01 m (AHD) drilling fluid:	angle casin	from horiz diameter	∠ontal: 90° ··HW	
drilling inf	ormati	ion	100		mate	erial sub	istance		J ulc		
pport opport	ter	samples & field tests	(LL)	pth (m)	aphic log	il group mbol	material description SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components	bisture	isistency / ative density	hand penetro- meter (kPa)	soil origin, structure and additional observations
<u>sul</u> suls	WB	<u> </u>	- <del>1</del> -1	de	 gĭ	SP SP	SAND: fine to medium grained. grev. (continued)	¥ 8	ัง <u>ชั</u>	400	
	Encountered	SPT 10, 13, 12 N=25	 2	- - - 9.0 - - -			8.5m: becomes grey				
				- - 10.0-			CLAY: grey.	<wp< td=""></wp<>	VSt		
		SP1 13/30mm N=R		-	-		Borehole BH02-21 continued as cored hole				
			4	- - 11.0 <i>—</i> -							
			5	- - 12.0 <i>—</i> - -							
			6	- - 13.0 — - -							
			7	- - 14.0 <i>—</i> - -							
			8	- - 15.0 <i>—</i> -	-						
		 	sur	- port			samples & field tests	soil gro	up symbol	&	consistency / relative density
D auger S auger A hand / washi R rock r bit sh .g. AD/T blank	e drilling screwi auger oore oller own by bit	ז* ing* ∕ suffix	pen wat	etration	N no res rangin d refusa -Oct-12 wa rel on date	nil sistance ig to al ater ater shown	B       bulk disturbed sample         D       disturbed sample         E       environmental sample         SS       split spoon sample         U##       undisturbed sample ##mm diameter         HP       hand penetrometer (kPa)         N       standard penetration test (SPT)         N*       SPT - sample recovered         Nc       SPT with solid cone         VS       vane shear, peak/remouded (kPa)	material based on D dry M moist W wet Wp plastic Wi liquid li	descriptio AS 1726:2 ndition	אח 017	VS         very soπ           S         soft           F         firm           St         stiff           VSt         very stiff           H         hard           Fb         friable           VL         very loose           L         loose           MD         medium dense



			C		FET						Borehol	e ID.	BH02-21	
S		-in		-in	alaa Coroc	J Darah		~			sheet:		3 of 3	
	ΠĈ	JII	lee	m	g Log - Corec		IOI	e			project r	10.	754-NTLGE202	<b>2648-</b> 1
clie	nt:	5	Salan	nand	er Properties Pty Ltd						date sta	rted:	07 Dec 2021	
prin	cipa	l:									date cor	npleted:	07 Dec 2021	
proj	ect:	5	Salan	nand	ler Shores Geotechnica	l Investigati	on				logged b	by:	HL	
loca	ation:	: 1	47 S	Soldie	ers Point road, Soldiers	Point, NSW	/ 2317	7			checked	l by:	SJB	
posit	tion:	E: 41	2977; N	: 63803	86 (MGA94 ) sur	face elevation: 7.01	1 m (AH	D)		angle	e from horizo	ontal: 90°		
drill drill	mode	l: Geo	probe,	Track n	nounted dril	ling fluid:				casir	ng diameter	: HW		
				ත ත	material description	n	ഷ് ന	estimated	samples,		defect	ad	lditional observations and	
hod & port	er	E)	th (m)	phic lo	ROCK TYPE: grain charac colour, structure, minor cor	terisics, nponents	atherin	& Is50 X=axial;	& ls(50) (MPa)	e run ROD	(mm)	(type, inclina	ation, planarity, roughness thickness, other)	, coating,
met sup	wat	교 -1	deb	gra			wea	, 고 포 프 폰 표	a = axial; d = diametral	COTE & F	300 300 300	particular		general
		2	- - - 9.0 - - - - - - - - - - -											
		3	10.0 -	×	started coring at 10.03m RHYODACITE: mottled orange and	d pale grey.	SW					- 		
5			-	×			HW - XW			17%		JT, 50°,	PL, VR, - CN	-
			-	×			SW -					JT, 40°, JT, 40°, JT, 40°, JT, 40°, JT, 40°, JT, 40°, JT, 45°	PL, CL-ML PL, RO, - CN PL RO - CN	
		4	11.0 -				HW -					- SM, 45°,	, PL, CL-ML	_
			-	×	RHYODACITE: mottled orange and	d pale grey,	SW -					JT, 85°, I	S (Toomm) PL, - CN, (Healed)	-
	untered	-	-	l× Ĵ	<ul> <li>annedral to subhedral tine grains, ~</li> <li>~35% alkali feldspar, 20% plagioda</li> <li>11.3m; becomes brown, black, pink</li> </ul>	40% quartz, ase, <5% biotite.				52%		─ JT, 45°,	PL, RO, Fè SN	-
- NMLQ	Enco			×Û								— JT, 70°,	PL, RO, Fe SN	-
		5	12.0 -	]× Û							╎╒╝╎╎	JT, 5°, IF JT, 45°,	R, VR, - CN PL, RO, Fe SN	-
			-	×							│ │ │ ┃ │ │ │ │ <sub>┣</sub> ┷┩ │ │	— JT, 80°, I	PL, RO, - CN, (Healed)	-
			-	××						0.00/		JT, 20°, JT, 20°,	PL, RO, - CN PL, RO, - CN	-
) ) )		6	13.0 —	×						0270	╷╷╻╻╷╷ ╻╷╻╹╷╷╷	JT, 60°, I	PL, RO, Fe SN PL Rock fragments, Clay	_
			-	× ×								Sand JT, 55°,	PL, RO, Fe SN	/· _
		-	-		Borehole BH02-21 terminated at 13	l.53 m					<mark>┤╷┦╷╷╷</mark>	_ ∽ JT, 75°,	PL, RO	
		7	- 14.0		l arget depth									-
		-1	-	-										-
		-	-											-
														-
		8	15.0 —											-
			-											-
i D		F	-											-
			-	1										
me DT NM NG HG PQ RR	thod dia ILCNI wi wi wi	atube MLC c reline reline ck roll	ore (51. core (4 core (6 core (8 er	9 mm) 7.6mm) 3.5mm) 5.0mm)	support C casing M mud N none water ↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓	graphic log / core core rec (graphic sym no core core run & RQD barrel w RQD = Rock Qt	e recover covered hools indicate recover vithdrawn uality De	<b>ry</b> material) ed n esignation (%)	weatherin           RS         resid           XW         extre           HW         high           MW         mod           SW         sligh           FR         fresh           "wreplaced"         strength           VL         very h           L         low           M         media           H         high           VL         very h	g & alte dual soil emely w ly weatl erately ntly weat ntly weat nt	ration* eathered hered weathered thered alteration	defect type PT partin JT joint SS shear SZ shear CO conta CS crush SM seam roughness VR very RO roug SO smo POL polis	e planarity g PL planar CU curvec ed surface UN undula ed zone ST steppe ct IR Irregul ed seam rough CN clean h SN staine oth VN venee hed CO coatin	l ating ad ar



drawn	HL		client:	SALAMANDER PROPER	TIES PTY LTD ATF
approved	SJB		project:		SHOPES
date	15/02/2022	TE TETRA TECH		SALAMANDEN	SHOKES
scale	NTS	CONTEN	title:	GEOTECHNICAL INVEST	IGATION – STAGE 2
original size	A4		project no:	754-NTLGE202648-1	figure no: -







	description	drawn	approved	date	drawn	HL			
I	Initial revision	HL	JD	15/02/2022	approved	ed SJB		_	_
					date	15/02/2022	-	Æ	TETRA
-					scale	NTS			
					original size	A3	1		



									Borehole ID.	BH03-21
Engi	in	erin	lg l		g -	Во	rehole		sneet:	1 of 2 754-NTI GE20264
client:	Sá	alamanc	ler P	rope	rties	Pty I	td		date started:	09 Dec 2021
principal:				- 1					date completed	: 09 Dec 2021
project:	Sá	alamanc	ler S	hore	s Ge	otecl	nical Investigation		loaged by:	HL
ocation:	14	7 Soldi	ers P	Point	road	. Sol	liers Point. NSW 2317		checked by:	SJB
osition: E	: 4130	49; N: 63803	382 (MG	GA94)		,	surface elevation: 12.56 m (AHD)	angle	from horizontal: 90	•
drill model:	Geopr	obe, Track	mounte	d			drilling fluid:	casinę	g diameter : HW	
drilling in	forma	tion			mate	rial sub	stance material description		, ≩ hand	
method & support 1 2 penetratio	3 water	samples & field tests	KL (m)	depth (m)	graphic log	soil group symbol	SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	2 2 00 2 2 0	soil origin, structure and additional observations
HW casing	Encountered	SPT 8, 5, 4 N=9 SPT 15/60mm N=R	-12 -11 -11			SP 	SIL IY SAND: time to coarse grained, dark brown, with clay and fine to coarse grained, sub-angular gravels. 1.0m: 80mm sandstone cobble Sandy CLAY: low plasticity, orange, pale brown and grey, medium to coarse grained sand. Borehole BH03-21 continued as cored hole		L                               	
			- -9 -8 - 7 -7 -6 -5	3.0 - - - - - - - - - - - - - - - - - -						
method DT diatu AD auge AS auge HA hand W wash RR rock * bit sh e.g. AD/T B blanh T TC b	be r drillin r scre bore roller nown b	ng* wing* r	sup M C pen wat	port mud casing etration er er ■ 10- wat wat wat	N no res rangin refusa -Oct-12 wa el on date ter inflow ter outflow	nil istance g to l ater shown	samples & field tests         B       bulk disturbed sample         D       disturbed sample         E       environmental sample         SS       split spoon sample         U##       undisturbed sample ##mm diameter         HP       hand penetrometer (kPa)         N       standard penetration test (SPT)         N*       SPT - sample recovered         V       Nc         VS       vane shear; peak/remouded (kPa)         R       refusal         HB       hammer bouncing	soil gro material based on D dry M moist W wet Wp plastic WI liquid li	up symbol & description AS 1726:2017 Indition	consistency / relative density           VS         very soft           S         soft           F         firm           St         stiff           VSt         very stiff           H         hard           Fb         friable           VL         very loose           L         loose           MD         medium dense           D         dense           VD         very dense



E	ngineering Log - Cored Borehole										sheet:			<b>BH03-2</b> 2 of 2	1	
	ΠÇ	<u>,                                    </u>	EE		y Luy	- Corec			5			project	10.	754-NTL	GE20264	18-
clier	nt:	5	Salan	and	er Propertie	es Pty Ltd						date sta	rted:	09 Dec 2	021	
prin	cipa	l:										date co	npleted:	09 Dec 2	021	
proj	ect:	S	Salan	nand	er Shores G	Seotechnica	al Investigati	ion				logged l	oy:	HL		
loca	tion	: 1	47 S	oldie	ers Point roa	ad, Soldiers	Point, NSV	V 231	7			checked	d by:	SJB		
posit	tion:	E: 413	3049; N:	63803	82 (MGA94)	sur	face elevation: 12.	.56 m (Ał	HD)		angle	e from horizo	ontal: 90°			
drill r	mode	el: Geo	probe,	Track n		dril	lling fluid:				casir	ng diameter	: HW			
urm	ing i		alion	mate	enal substance	material description	n	ళ	estimated	samples,	TOCK	defect	ad	ditional observat	ions and	
od & ort	_	Ê	(m) r	hic log	ROCK colour, s	TYPE: grain charac structure, minor cor	terisics, nponents	hering	& Is50 X= axial:	k ls(50)	n D	spacing (mm)	(type, inclina	defect descript ation, planarity, ro thickness, oth	ions oughness, coa ier)	atin
meth supp	wate	RL (r	deptl	grapl				weat	O=diametral ⊐ ⊐ ≍ ± ±	a = axial; d = diametral	core & R(	30 300 3000 3000	particular		gei	ner
		-12 -11		77777	started coring at	2.32m										
Î		-10	-		Sandy CLAY: lo grey, fine ot med	ow plasticity, dark l ium grained sand.	brown to dark	XW						0mm) PL RO - CN		
NMLC	Encountered	9 8 7 6	3.0		Borehole BH03-2 Target depth	ans, ~40% quartz agioclase, <5% bio prown, black, pink : 21 terminated at 6.4	42 m	XW SW- DW			0% 49% 0%		J, 45°, J, 50°, P Sand J, J, 80°, J, J, 80°, Sand J, J, 80°, J, J, 80°, J, J, 70°, P J, 10°, P J, 10°, P J, 10°, P	PL, RO, - CN PL, RO, - CN CU, RO, - CN UN, Rock fragm UN, CL-ML PL, RO, - CN PL, RO, - CN PL, RO, - CN PL, RO, - CN PL, RO, - CN, Sa PL, RO, - CN, Sa PL, VR, - CN PL, RO, - CN, Sa PL, C, - CN, Sa PL, C, - CN, Sa PL, C, - CN, Sa PL, RO, - CN L, RO, - CN PL, RO, Fe SN PL, RO, Fe SN PL, RO, Fe SN PL, RO, Fe SN PL, RO, Fe SN	ents, Clay, it it it it it it	ſ
mel	thod	-5	-		support		graphic log / cor	re recove		weathering	g & alte	               	defect type	PL, RO, Fe SN PL, RO, - CN PL, RO, - CN	anarity	
DT NM NQ PQ RR	di ILCNI wi wi wi ro	atube MLC co ireline ireline ireline ck rolle	ore (51.9 core (47 core (63 core (85 er	9 mm) (.6mm) (.5mm) (.0mm)	C casing M m water 10/10/12, level on da water inflo complete of partial drill water press interval sh	ud N none water atte shown w drilling fluid loss ing fluid loss sure test result for depth own	core re (graphic sy no core core run & RQE barrel v RQD = Rock Q	covered mbols indicate e recover withdrawn Quality De	<sup>material)</sup> ed n signation (%)	RS resic XW extre HW highl MW mod SW sligh FR fresh "W replaced v strength L low M mediu H high VH very h EH extrer	Iual soil mely w ly weath erately tly wea with A for a bw um igh nely hic	eathered nered weathered thered alteration	PT partin JT joint SS shear SZ shear CO conta CS crush SM seam roughness VR very RO roug SO smo POL polis SL slick	g PL CL CL ed surface UI ed zone ST ct IR ed seam frough CL h St oth VI hed CC ensided	<ul> <li>planar</li> <li>curved</li> <li>vurdulating</li> <li>stepped Irregular</li> <li>vating</li> <li>vating</li> <li>vatined</li> <li>veneer</li> <li>coating</li> </ul>	





	description	drawn	approved	date	drawn	HL	
c	Initial revision	HL	JD	15/02/2022	approved	SJB	
evisio					date	15/02/2022	TE TET
re					scale	NTS	
					original size	A3	

lient:	SALAMANDER PROPI	ERTIES PTY LTD ATF					
roject:	SALAMANDI	ER SHORES					
decrechnical investigation – stage 2							
roject no:	754-NTLGE202648-1	figure no: -					



			-					Borehole ID.	BH04-21
Enai	ne	erin	a I	0	a -	Bo	rehole	sheet:	1 of 2
			9.		9			project no.	754-NTLGE202648
lient:	Sai	amande	er Pl	rope	erties	Pty I	.10	date started:	09 Dec 2021
rincipal:								date completed:	10 Dec 2021
roject:	Sal	amande	er Si	hore	es Ge	otecl	nnical Investigation	logged by:	HL
ocation:	147	7 Soldie	rs P	Point	road	, Sol	diers Point, NSW 2317	checked by:	SJB
osition: E:	412979	9; N: 638036	64 (MG	6A94)			surface elevation: 7.67 m (AHD)	angle from horizontal: 90°	
drilling info	ormati	on	ounted	u	mate	rial sub	stance		
tion		samples &			Бc	d.	material description	<u>Ar</u> hand	
support 1 2 penetra	water	field tests	RL (m)	depth (m	graphic I	soil grou symbol	SOIL NAME: plasticity or particle characteristics, colour, secondary and minor components	moisture consistent 2000 400 (kba) 400 (kba) 4	soil origin, structure and additional observations
			-7	-		_GW _GW  SP	Sandy GRAVEL: fine grained, sub-angular to angular, pale brown, fine to coarse sand, with clay, compacted. Sandy GRAVEL: fine to medium grained, sub-angular to angular, brown, medium to coarse grained sand. SAND: fine grained, grey.	D L	
		SPT	-	1.0-		 SP	<b>SAND</b> : fine grained, grey.		
- dia		2, 2, 1 N=3	-	-			1.25m: becomes brown		
HW ca			-6				2.0m: becomes pale brown and fine to medium grained		
 ≠     ¥-     	09-12-21	SPT 2, 4, 7 N=11	-5	- - 3.0-					
	Encountered	SPT	-4	4.0-					
		4, 4, 4 N=8	-	-			4.5m becomes black		
— HWT			-3	- 5.0 — -					
		SPT 18, 17, 15	-2	-					
		N-32	-	6.0 <del>-</del> -					
¥		SPT 12, 13, 6 N=19	-1 -	7.0-		SM	6.65m: rhyodacite gravels, ~80mm, potentially thin /rhyodative bands SILTY SAND: fine to medium grained, dark grey to black, some clay. 6.95m: with rhyodacite gravels		
			-0	-					
		\SPT \18/50mm	-			CL	Sandy CLAY: low plasticity, pale grey, medium to	<wp -="" h="" td="" vst=""  =""  <=""><td></td></wp>	
1 diatub 1 diat	e drilling screwi auger oore oller own by bit	ı* ing* suffix	sup M T C C pen wate	port mud casing etration er er er lev wai	N no resi rangin refusa -Oct-12 wa el on date ter inflow	nil istance g to l ater shown	samples & field tests       B     bulk disturbed sample       D     disturbed sample       E     environmental sample       SS     split spoon sample       U##     undisturbed sample ##mm diameter       HP     hand penetrometer (kPa)       N     standard penetration test (SPT)       N*     SPT - sample recovered       W     Nc       VS     vane shear; peak/remouded (kPa)	soil group symbol & material description ased on AS 1726:2017 sture condition dry moist wet plastic limit liquid limit	consistency / relative density       VS     very soft       S     soft       F     firm       St     stiff       VSt     very stiff       H     hard       Fb     friable       VL     very loose       L     loose       MD     medium dense



		0									Borehol	e ID.	BH04-	21
Enn	vin	00	rin		Coror	1 Rorat	vold	<b>`</b>			sheet:		2 of 2	
Elly	<b>J</b> 111	EC		y Luy				;			project	no.	754-NT	LGE20264
lient:	S	Salan	nand	er Propertie	es Pty Ltd						date sta	arted:	09 Dec	2021
rincipal	l:										date co	mpleted:	10 Dec	2021
roject:	S	Salan	nand	er Shores C	Seotechnica	al Investigati	on				logged l	by:	HL	
ocation:	1	47 S	oldie	ers Point roa	ad, Soldiers	: Point, NSИ	/ 2317	7			checke	d by:	SJB	
osition:	E: 412	2979; N	: 638036	64 (MGA94)	sur	face elevation: 7.6	7 m (AHI	D)		angle	e from horiz	ontal: 90°		
rill model	l: Geo	probe,	Track n	nounted	dril	lling fluid:				casin	g diameter	: HW		
Irilling iı	nform	ation	mate	rial substance	material descriptio	<u></u>	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	estimated	samples,	rock	mass defe defect	cts ad	ditional observ	ations and
support water	RL (m)	depth (m)	graphic log	ROCK colour, s	TYPE: grain charac structure, minor cor	terisics, nponents	weathering alteration	strength & Is50 X= axial; O= diametral ⊐ ⊒ ≅ ± = = =	field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	spacing (mm)	(type, inclina particular	defect descr ation, planarity, thickness, c	iptions roughness, coat other) gene
Encountered	1 2 	9.0		RHYODACITE: anhedral to subh ~35% alkali felds 8.11m: becomes 8.34m: becomes 8.43m: becomes 8.6m: 40mm pale	mottled pale grey a iedral fine grains, ~ spar, 20% plagioda i mostly red to brov e grey band dark grey	and orange, -40% quartz, ase, <5% biotite. vn vn	SW			46% 28% 43% 84% 82%	╎ ╎ ╎ ╎ ╎ ╎ ╎ ╎ ╎ ╎ ╎ ╎ ╎ ╎ ╎ ╎ ╎ ╎ ╎	<ul> <li>JT, 50°, 1</li> <li>JT, 15°, 1</li> <li>JT, 15°, 1</li> <li>JT, 15°, 1</li> <li>JT, 25°, 1</li> <li>JT, 10°, 1</li> <li>JT, 40°, 1</li> &lt;</ul>	PL, RO, Fe SN PL, RO, Fe SN PL, RO, Clay, . L, RO, Clay, . L, RO, Clay, . PL, RO, Clay, . PL, RO, Fe SN PL, RO, Clay, . PL, RO, Fe SN L, RO, Clay, . PL, RO, Fe SN PL, RO, Fe SN PL, RO, Fe SN PL, RO, Fe SN PL, RO, CH SN PL, RO, Fe SN PL, RO, CH SN	10 mm 0 mm nents, Clay, nents, Clay, 2 mm IL, 2 mm IL
		- - - - - - - - - - - - - - - - - - -								53%	╴╴╴╴╶╴╶╴╴╴╴╴╴╴╴╴╴╴╴╴╴╴╴╴╴╴╴╴╴╴╴╴╴╴╴╴╴	$ \begin{array}{c} 1, 45^\circ, 1\\ 1, 1, 45^\circ, 1\\ 3 \\ - J, 1, 45^\circ, 1\\ - J, 1, 6^\circ, 1\\ - J, 1, 6^\circ, 1\\ - J, 45^\circ, 1\\ - J, 45^\circ, 1\\ - J, 45^\circ, 1\\ - J, 10^\circ, 1\\ - J, 10^\circ, 1\\ - J, 10^\circ, 1\\ - J, 20^\circ, 1\\ - J, 75^\circ, 1$	PL, RO, Fe SN PL, RO, Fe SN PL, MU, 3 mm PL, RO, - CN PL, RO, Fe SN PL, RO, Fe SN PL, RO, Fe SN PL, RO, - CN PL, RO, Fe SN PL, RO, Fe SN	, (Healed) D
	8	<del>15.0 -</del> - - -	. ×	Borehole BH04-2 Target depth	21 terminated at 15	i.00 m						U JT, 10°, ( U JT, 40°, I JT, 40°, I JT, 75°, I JT, 40°, I JT, 70°, I	CU, RO, - CN UN, VR, Fe SN PL, VR, - CN UN, VR, Fe SN PL, RO, MU C	
nethod )T dia JMLCNN VQ win 1Q win 2Q win 2R roo	atube MLC co reline reline reline ck rolle	ore (51. core (47 core (63 core (85 er	9 mm) 7.6mm) 3.5mm) 5.0mm)	support C casing M m water 10/10/12, level on da water inflo complete partial dril water pres (lugeons) interval sh	ud N none water ate shown w drilling fluid loss ling fluid loss ssure test result for depth nown	graphic log / core core red (graphic syn no core core run & RQD barrel v RQD = Rock Q	recovered     recovered     recovered     vithdrawr uality De	ry <sup>material)</sup> ed n signation (%)	weathering RS resid XW extree HW highly MW mode SW slight FR fresh "Wreplaced VL very lo L low M mediu H high VH very mediu	<b>J &amp; alter</b> ual soil mely w y weath erately v erately weath ith A for a w m m	ration* eathered hered weathered thered ilteration	defect type PT parting JT joint SS sheard CS crushe SM seam roughness VR very RO roug SO smoo POL polis	g ed surface ed zone ct ed seam rough h bth hed pscided	planarity PL planar CU curved UN undulating ST stepped IR Irregular coating CN clean SN stained VN veneer CO coating





BH04-21, SPT at 4.0m, N=8



BH04-21, SPT at 5.5m, N=32

drawn	HL		client:	SALAMANDER PROPER	TIES PTY LTD ATF
approved	SJB		project:		SHOPES
date	15/02/2022	TE TETRA TECH		SALAMANDER	SHORES
scale	NTS	CONTEN	title:	GEOTECHNICAL INVEST	IGATION – STAGE 2
original size	A4		project no:	754-NTLGE202648-1	figure no: -





	description	drawn	approved	date	drawr	wn <b>HL</b>				
sion		HL	JD	15/02/2022	appro	roved SJB				
					date	e 15/02/2022	TE	Γ	TETR	TETRA
					scale	le NTS		-1	OFFE	
					origin size	inal A3				

# APPENDIX B: LABORATORY TEST RESULTS



Coffey Testing Pty Ltd ABN 92 114 364 046 16 Callistemon Close Warabrook NSW 2304

Matorial To	et Poport				Report No: NEW	C21S-10185-1 Issue No: 1
Client: Tetra 16 Ca Newc Principal: Project No.: TEST Project Name: 754-N	Tech Coffey Pty Ltd (Newcastle allistemon Close astle NSW 2304 NEWC00596AA TLGE202648-1 - Salamander Shores I	e) Hotel - Bannisters		NATA V	Accredited for compliance wi Testing. NATA is a signatory Recognition Arrangement for the equivalence of testing, m inspection and proficiency te reports. Approved Signatory: Chris B (Construction Materials Man: NATA Accredited Laboratory	ith ISO/IEC 17025 - to the ILAC Mutual the mutual recognition o ledical testing, calibration sting scheme providers lackford ager) Number:431
	I KN: -			- Jula Intole	Date of Issue: 17/12/2021	
Sample Details Sample ID / Client ID Date Sampled: Source: Material: Specification: Sampling Method: Project Location: Sample Location: Other Test Resu Description	Ilts	Result	Limits	Particle S Method: Drying by: Date Tested: Note: Sieve Size 2.36mm 1.18mm 600µm 425µm 300µm 150µm 75µm	ize Distribution AS 1289.3.6.1 Oven 16/12/2021 Sample Washed % Passing 100 100 99 91 53 7 7 7	Limits
Commonto				Chart % Passing	ere sere	
Comments *Results relate only to the	e items tested or sampled.					



Coffey Testing Pty Ltd ABN 92 114 364 046 16 Callistemon Close Warabrook NSW 2304

Phone: +61 2 4016 2300

Lound				Report No: NEWC21S-10186-1			
Material Te	st Report					Issue No: 1	
Client: Tetra 16 Cal Newca Principal: Project No.: TESTI Project Name: 754-NT Lot No.: -	Tech Coffey Pty Ltd (Newcast llistemon Close astle NSW 2304 NEWC00596AA LGE202648-1 - Salamander Shores <b>TRN:</b>	rs		Accredited for compliance wi Testing. NATA is a signatory Recognition Arrangement for the equivalence of testing, m inspection and proficiency te- reports. Approved Signatory: Chris Bi (Construction Materials Man NATA Accredited Laboratory Data & Lenuer, 17/4/2020	th ISO/IEC 17025 - to the ILAC Mutual the mutual recognition of edical testing, calibration, sting scheme providers lackford ager) Number:431		
Comple Detaile							
Sample Details Sample ID / Client ID: Date Sampled: Source: Material: Specification: Sampling Method: Project Location: Sample Location: Sample Location:	NEWC21S-10186 / - 07/12/2021 On-Site Existing Ground No Specification Submitted by client* Salamander Bay, NSW BH04-21 - 1.0 - 1.45m			Note: Sieve Size 9.5mm 6.7mm 4.75mm 2.36mm 1.18mm 600µm	AS 1289.3.6.1 Oven 16/12/2021 Sample Washed % Passing 100 100 100 99 99 99	Limits	
Description	Method	Result	Limits	300µm 150µm 75µm	50 12 12		
				Chart			
				% Passing	Sieve	Lysum Lysum Grann Baam	
Comments							

# \*Results relate only to the items tested or sampled.



Coffey Testing Pty Ltd ABN 92 114 364 046 16 Callistemon Close Warabrook NSW 2304

Phone: +61 2 4016 2300

					Report No: NEWC21S-10187-1			
Material	Tes	t Report					Issue No: 1	
Client: T 1 Principal: Project No.: T Project Name: 7 Lot No.: -	Tetra Te 6 Callis Newcas TESTNE 54-NTLC	cch Coffey Pty Ltd (Newcast stemon Close tle NSW 2304 EWC00596AA E202648-1 - Salamander Shores TRN:	le) Hotel - Banniste -	rs		Accredited for compliance w Testing. NATA is a signatory Recognition Arrangement fon the equivalence of testing, m inspection and proficiency te reports. Approved Signatory: Chris B (Construction Materials Man NATA Accredited Laboratory Date of Issue: 17/12/2021	th ISO/IEC 17025 - to the ILAC Mutual the mutual recognition of leedical testing, calibration, sting scheme providers lackford ager) Number:431	
Sample Detai	ile				Particle S	izo Distribution		
Sample ID / Clier Date Sampled: Source: Material: Specification: Sampling Method Project Location Sample Location	d: :	NEWC21S-10187 / - 09/12/2021 On-Site Existing Ground No Specification Submitted by client* Salamander Bay, NSW BH04-21 - 2.5 - 2.95m			Method: Drying by: Date Tested: Note: Sieve Size 19.0mm 13.2mm 9.5mm 6.7mm 2.36mm	AS 1289.3.6.1 Oven 16/12/2021 Sample Washed % Passing 100 100 99 99 99	Limits	
Other Test R	esult	6			1.18mm 600um	98 98		
		Metriou	Kesuit	LiiiitS	300µm 150µm 75µm	44 2 2		
					Chart			
					% Passing	Sieve	67ms 95m 132m 190m	
Comments								

\*Results relate only to the items tested or sampled.



Coffey Testing Pty Ltd ABN 92 114 364 046 16 Callistemon Close Warabrook NSW 2304

Meterial T	aat Danant				Report No: NEW	C21S-10188-1 Issue No: 1
Client: Tetr. 16 C New Principal: Project No.: TES Project Name: 754-1 Lot No.: -	a Tech Coffey Pty Ltd (Newcastle Callistemon Close rcastle NSW 2304 TNEWC00596AA NTLGE202648-1 - Salamander Shores H TRN: -	Tech Coffey Pty Ltd (Newcastle) listemon Close istle NSW 2304 NEWC00596AA LGE202648-1 - Salamander Shores Hotel - Bannisters TRN: -				th ISO/IEC 17025 - to the ILAC Mutual the mutual recognition of edical testing, calibration, sting scheme providers lackford ager) Number:431
Sample Details				Particle S	ize Distribution	1
Sample ID / Client II Date Sampled: Source: Material: Specification: Sampling Method: Project Location: Sample Location:	): NEWC21S-10188 / - 09/12/2021 On-Site Existing Ground No Specification Submitted by client* Salamander Bay, NSW BH04-21 - 5.5 - 5.95m			Method: Drying by: Date Tested: Note: Sieve Size 2.36mm 1.18mm 600µm 425µm 300µm	AS 1289.3.6.1 Oven 16/12/2021 Sample Washed % Passing 100 100 99 89 55	Limits
Other Test Res	ults			150µm	8	
				Chart		
				% Passing	under state of the	Table Participant Part
Comments *Results relate only to th	le items tested or sampled.					



Coffey Testing Pty Ltd ABN 92 114 364 046 16 Callistemon Close Warabrook NSW 2304

Phone: +61 2 4016 2300

						Report No: NEW	C21S-10189-1
<b>Material</b>	Tes	t Report					Issue No: 1
Client:	Tetra Te 16 Callis Newcas	ech Coffey Pty Ltd (Newcastl stemon Close tle NSW 2304	e)			Accredited for compliance wi Testing. NATA is a signatory Recognition Arrangement for the equivalence of testing, m inspection and proficiency test reports.	th ISO/IEC 17025 - to the ILAC Mutual the mutual recognition of edical testing, calibration, sting scheme providers
Project No	TESTN	=WC00596AA				Ohn'R.	
Project Name:	754-NTL0	GE202648-1 - Salamander Shores	Hotel - Banniste	rs	Hac-MRA	Approved Signatory: Chris BI (Construction Materials Mana	ackford ager)
Lot No.: -		TRN: -			The data half	NATA Accredited Laboratory Date of Issue: 17/12/2021	Number:431
Sample Deta	ails				Particle S	ize Distribution	
Sample ID / Clie	nt ID:	NEWC21S-10189 / -			Method:	AS 1289.3.6.1	
Date Sampled:		10/12/2021			Drying by:	Oven	
Source:		On-Site			Date Tested:	16/12/2021	
Material: Specification:	ad.	Existing Ground No Specification			Note:	Sample Washed	
Project Location	n:	Salamander Bay, NSW			Sieve Size	% Passing	Limits
Sample Locatio	n:	BH04-21 - 6.65 - 7.10m			37.5mm	100	
					26.5mm	93	
					19.0mm 13.2mm	75 64	
					9.5mm	63	
Other Test R	?esult	e			6.7mm	59	
Description	Count	Mathad	Beault	Limite	4.75mm	55	
					1.18mm 600µm 425µm 300µm 150µm 75µm	46 42 36 24 13 12	
					Chart		
					% Passing 100 100 100 100 100 100 100 10	en en en en en en en en en en en en en e	86mm 1610m 1810m 1810m 2730m 2730m
Comments							

\*Results relate only to the items tested or sampled.



# **Material Test Report**

 

 Client:
 Tetra Tech Coffey Pty Ltd (Newcastle) 16 Callistemon Close Newcastle NSW 2304

 Principal:
 TESTNEWC00596AA

 Project No.:
 TESTNEWC00596AA

 Project Name:
 754-NTLGE202648-1 - Salamander Shores Hotel - Bannisters

 Lot No.:
 TRN: 

# **Sample Details**

Sample ID / Client ID:	NEWC21S-10190 / -
Date Sampled:	10/12/2021
Source:	On-Site
Material:	Existing Ground
Specification:	No Specification
Sampling Method:	Submitted by client*
Project Location:	Salamander Bay, NSW
Sample Location:	BH04-21 - 7.77 - 7.92m

# Test Results

Description	Method	Result	Limits
Sample History	AS 1289.1.1	Air-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	6.5	
Mould Length (mm)		124.9	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	32	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	20	
Plasticity Index (%)	AS 1289.3.3.1	12	
Date Tested		16/12/2021	

# Comments

\*Results relate only to the items tested or sampled.

#### Newcastle Laboratory

Coffey Testing Pty Ltd ABN 92 114 364 046 16 Callistemon Close Warabrook NSW 2304

Phone: +61 2 4016 2300

# Report No: NEWC21S-10190-1

Issue No: 1



Accredited for compliance with ISO/IEC 17025 -Testing. NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection and proficiency testing scheme providers reports.

Opinite.

Approved Signatory: Chris Blackford (Construction Materials Manager) NATA Accredited Laboratory Number:431 Date of Issue: 17/12/2021



Coffey Testing Pty Ltd ABN 92 114 364 046 16 Callistemon Close Warabrook NSW 2304

Phone: +61 2 4016 2300

Lound					Report No: NEW	C21S-10181-1
Material	Test Report					Issue No: 1
Client: Principal: Project No.: Project Name: 7 Lot No.: -	Fetra Tech Coffey Pty Ltd (Newcastl 16 Callistemon Close Newcastle NSW 2304 FESTNEWC00596AA 754-NTLGE202648-1 - Salamander Shores <b>TRN:</b> -	e) Hotel - Bannister	s		Accredited for compliance wi Testing. NATA is a signatory Recognition Arrangement for the equivalence of testing, m inspection and proficiency te reports. Approved Signatory: Chris B (Construction Materials Man: NATA Accredited Laboratory Date of Issue: 17/12/2021	th ISO/IEC 17025 - to the ILAC Mutual the mutual recognition of edical testing, calibration, sting scheme providers lackford ager) Number:431
Sample Deta	ils			Particle S	ize Distributior	1
Sample ID / Clien Date Sampled: Source: Material: Specification: Sampling Metho Project Location Sample Location Other Test R Description	nt ID: NEWC21S-10181 / - 06/12/2021 On-Site Existing Ground No Specification d: Submitted by client* :: Salamander Bay, NSW n: BH01-21 - 1.0 - 1.45m esults <u>Method</u>	Result	Limits	Method: Drying by: Date Tested: Note: Sieve Size 9.5mm 6.7mm 4.75mm 2.36mm 1.18mm 600µm 425µm 300µm 150µm 75µm	AS 1289.3.6.1 Oven 16/12/2021 Sample Washed % Passing 100 100 100 99 98 87 43 9 9 9	Limits
Comments				Chart % Passing	Neve	African contract of the second s
*Results relate only	to the items tested or sampled.					

#### Form No: 18909, Report No: NEWC21S-10181-1



Coffey Testing Pty Ltd ABN 92 114 364 046 16 Callistemon Close Warabrook NSW 2304

Matorial 1	ost Poport			Report No: NEW	C21S-10182-1 Issue No: 1
Client: Te 16 Ne Principal: Project No.: TE Project Name: 75 Lot No.: -	EST NEPOT tra Tech Coffey Pty Ltd (Newcastle Callistemon Close wcastle NSW 2304 STNEWC00596AA 4-NTLGE202648-1 - Salamander Shores H TRN: -	) otel - Bannisters		Accredited for compliance will Testing. NATA is a signatory Recognition Arrangement for the equivalence of testing, me inspection and proficiency test reports. Approved Signatory: Chris Bl. (Construction Materials Mana NATA Accredited Laboratory Date of Issue: 17/12/2021	h ISO/IEC 17025 - to the ILAC Mutual the mutual recognition of dical testing, calibration, ting scheme providers ackford ger) Number:431
Sample Detail	6		Particle S	ize Distribution	
Sample ID / Client Date Sampled: Source: Material: Specification: Sampling Method Project Location: Sample Location:	ID: NEWC21S-10182 / - 06/12/2021 On-Site Existing Ground No Specification Submitted by client* Salamander Bay, NSW BH01-21 - 4.0 - 4.45m		Method: Drying by: Date Tested: Note: Sieve Size 2.36mm 1.18mm 600µm 425µm 300µm	AS 1289.3.6.1 Oven 16/12/2021 Sample Washed % Passing 100 100 99 86 45	Limits
Other Test Re	sults		150µm	40	
			Chart		
			% Passing 100 100 100 100 100 100 100 10	ung ung ung ung ung ung ung ung ung ung	
Comments *Results relate only to	the items tested or sampled.				



Coffey Testing Pty Ltd ABN 92 114 364 046 16 Callistemon Close Warabrook NSW 2304

	-					Report No: NEW	C21S-10183-1 Issue No: 1
Material	I es	St Report	le)			Accredited for compliance wit	h ISO/IEC 17025 -
	16 Calli Newcas	stemon Close stle NSW 2304			NATA	Testing. NATA is a signatory Recognition Arrangement for the equivalence of testing, me inspection and proficiency tes reports.	to the ILAC Mutual the mutual recognition of edical testing, calibration, sting scheme providers
Principal:					anna anna anna anna anna anna anna ann	Churk.	
Project No.:		EWC00596AA	Hotal Danniata	~	Hac-MRA	Approved Signatory: Chris Bl	ackford
Lot No.: -	704-11110	TRN:	-	5	The Columnition	NATA Accredited Laboratory Date of Issue: 17/12/2021	ger) Number:431
Sample Deta	ails				Particle S	ize Distribution	l
Sample ID / Clie	ent ID:	NEWC21S-10183 / -			Method:	AS 1289.3.6.1	
Date Sampled:		07/12/2021 On Site			Drying by: Date Tested:	0ven 16/12/2021	
Material:		Existing Ground					
Specification:	_	No Specification			Note:	Sample Washed	
Sampling Meth	od: n·	Submitted by client*			Sieve Size	% Passing	l imits
Sample Locatio	n:	BH02-21 - 2.5 - 2.95m			6.7mm	100	Linits
					4.75mm	100	
					1.18mm	100	
					600µm	100	
Other Test F	Result	S			425µm 300um	91 40	
Description		Method	Result	Limits	150µm	2	
					Chart		
					% Passing	Handra Handra	american and a second and as
Commente							
*Results relate only	y to the ite	ems tested or sampled.					



Coffey Testing Pty Ltd ABN 92 114 364 046 16 Callistemon Close Warabrook NSW 2304

Phone: +61 2 4016 2300

1 LOTING						Report No: NEW	/C21S-10184-1
<b>Material</b>	Tes	st Report					Issue No: 1
Client: Principal: Project No.: Project Name: Lot No.: -	Tetra To 16 Calli Newcas TESTN 754-NTL0	ech Coffey Pty Ltd (Newcast stemon Close stle NSW 2304 EWC00596AA GE202648-1 - Salamander Shores TRN:	le) Hotel - Bannister -	75		Accredited for compliance w Testing. NATA is a signator Recognition Arrangement fo the equivalence of testing, n inspection and proficiency te reports. Approved Signatory: Chris E (Construction Materials Man NATA Accredited Laborator Date of Issue: 17/12/2021	ith ISO/IEC 17025 - / to the ILAC Mutual r the mutual recognition o nedical testing, calibration siting scheme providers slackford (ager) y Number:431
Sample Deta	ails				Particle S	ize Distributio	า
Sample ID / Clie Date Sampled: Source: Material: Specification: Sampling Metho Project Location Sample Location Other Test R Description	ent ID: n: n: Result	NEWC21S-10184 / - 07/12/2021 On-Site Existing Ground No Specification Submitted by client* Salamander Bay, NSW BH02-21 - 5.5 - 5.95m S Method	Result	Limits	Method: Drying by: Date Tested: Note: Sieve Size 2.36mm 1.18mm 600µm 425µm 300µm 150µm 75µm	AS 1289.3.6.1 Oven 16/12/2021 Sample Washed % Passing 100 100 99 91 58 6 5	Limits
					Chart % Passing	ung ung ung ung ung ung ung ung ung ung	
Comments *Results relate only	to the ite	ems tested or sampled.					

#### Form No: 18909, Report No: NEWC21S-10184-1

SYDNEY LABORATORY

**Coffey Testing Pty Ltd** 

ABN 92 114 364 046 31 Hope Street, Melrose Park NSW 2114 Australia ph: +61 2 8876 0500

# Coffey >

client: COFFEY TE	STING PTY LTI	D			iob no: <b>TEST</b>	SYDS 00107AA
Principal: TETRATEC	H COFFEY PTY	LTD			,	
project: TESTNEWC	00596AA - SAL	AMANDER SH	HORES HOTE	L - BANNISTE	report date: 31 Janu	uary 2022
ocation: SALAMAND	ER BAY NSW				borehole: BH01	-21
test procedure	: AS 4133.1	.1.1 and 41	33.4.2.1		date received: 10 Janu	Jary 2022
test apparatus	: Matest 300	0 kN compr	ression mac	hine 9015	page 1	of 1
All samples were tested in Top platen 300 mm, Bottoi	an "As Received n platen 200 mn	ז" condition. ז. Timer 26850	0			
QESTLab work order ID		height	uniaxial	wet density	sample description	
depth	date tested	average diameter	compressive strength	strength moisture		Client's Sample ID
QESTLab sample ID	test duration	height/dia ratio	MPa	content	bedding/foliation	failure mechanism
SYDS22W00001		141 mm		2.6 t/m <sup>3</sup>	Granite	
8.72 to 9.00 m	14 Jan 22	51.8 mm	76.9	0.5 %		NEWC213-10191
SYDS22S00001	4.35 min	2.71:1		0.5 %		Defect/Shear

### 8.72 to 9.00 m

\Ct-fs\zct\Sydney\Data\50. ROCK TESTING\\_TESTSYD-Rocks-2022\TESTSYDS00107AA - Salamander Shores Motel\[BH01-21.xlsm]Report

NATA BC MRA

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Authorised Signature: Alan Cocks Rock Testing Manager

31 Jan 2022 ary books Date:


SYDNEY LABORATORY

**Coffey Testing Pty Ltd** 

ABN 92 114 364 046 31 Hope Street, Melrose Park NSW 2114 Australia

#### ph: +61 2 8876 0500

## Test report - uniavial compressive strength

		D				
Stient: COFFETTE	STING PTTLT H COFFFY PTY	ע חד ו י				SYDS UUTUTAA
TESTNEW	2005964A - SAI	AMANDER SH	IORES HOTE	I - RANNISTE	report date: 31 Jan	12nu 2022
ocation: SALAMAND	FR BAY NSW				horehole: <b>BH02</b>	- <b>91</b>
test procedure	· AS 4133 1	1 1 and 41.	22 1 2 1		date received: 10 Jan	- <b>2 1</b> Iary 2022
test annaratus	Matest 30	1.1  and  + 1.1	ression ma	chine 9015	page 1	of 1
All samples were tested in	an "As Receive	d" condition	10001011110		page i	01 1
Top platen 300 mm, Bottoi	n platen 200 mr	n. Timer 26850	)			
QESTLab work order ID		height	uniaxial	wet density	sample description	
denth	data tastad	cuorado diameter	compressive	meieturo	••••••••••••••••••••••••••••••••••••••	Client's Sample ID
		average diameter	strength	content	bedding/foliation	failure machaniam
QESTLab sample ID	test duration	height/dia ratio	МРа		<b>O</b> 111	failure mechanism
SYDS22W00001	11.100.00	140 mm	000	2.6 t/m <sup>3</sup>	Granite	NEWC21S-10192
11.37 to 11.63 m	14 Jan 22	51.8 mm	203	0.8 %		
SYDS22500002	5.58 min	2.70:1		ļ į		Axial
		11.37 to 1	1.63 m			

\Ct-fs\zct\Sydney\Data\50. ROCK TESTING\\_TESTSYD-Rocks-2022\TESTSYDS00107AA - Salamander Shores Motel\[BH02-21.xlsm]Report



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NATA Accredited Laboratory No. 431

Authorised Signature: Alan Cocks Rock Testing Manager

a ex boules

Date:

31 Jan 2022



SYDNEY LABORATORY

**Coffey Testing Pty Ltd** 

ABN 92 114 364 046 31 Hope Street, Melrose Park NSW 2114 Australia ph: +61 2 8876 0500

# 

	• •		
client:	COFFEY TESTING PTY LTD	job no:	TESTSYDS 00107AA
Principal:	TETRATECH COFFEY PTY LTD		
project:	TESTNEWC00596AA - SALAMANDER SHORES HOTEL - BANNISTE	report date:	31 January 2022
location:	SALAMANDER BAY NSW	borehole:	BH04-21
	test procedure: AS 4133.1.1.1 and 4133.4.2.1	date received:	10 January 2022
	test apparatus: Matest 3000 kN compression machine 9015		page 1 of 1
All sample	s were tested in an "As Received" condition.		
Top platen	300 mm, Bottom platen 200 mm. Timer 26850		

Test report - uniaxial compressive strength

QESTLab work order ID		height	uniaxial	wet density	sample description	
depth	date tested	average diameter	compressive strength	moisture	bedding/foliation	Client's Sample ID
QESTLab sample ID	test duration	height/dia ratio	MPa	content	bodanig/rollation	failure mechanism
SYDS22W00001		133 mm		2.6 t/m <sup>3</sup>	Granite	NEWC218-10102
11.26 to 11.52 m	14 Jan 22	51.7 mm	<b>189</b>	0.0%		NEWC213-10193
SYDS22S00003	7.17 min	2.58:1		0.9 /0		Axial/defect





11.26 to 11.52 m

\Ct-fs\zct\Sydney\Data\50. ROCK TESTING\\_TESTSYD-Rocks-2022\TESTSYDS00107AA - Salamander Shores Motel\[BH04-21.xlsm]Report



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Authorised Signature: Alan Cocks Rock Testing Manager

31 Jan 2022 ary books Date:

SYDS\_001R

A TETRA TECH COMPANY	FFE	A TECH													Project No:	754-N	TLG	E202	648-1
Point Lo	ad	Streng	th Ind	ex T	est l	Resi	ılts								Sheet:	1	0	of	4
Client:	Sala	mander Prop	perties Pty	Ltd AT	F										Office:	Newc	astle	•	
Principal:															Date:	25-1-2	2022		
Project:	Sala	mander Sho	res Hotel												By:	DB			
Location:	147	Soldiers Poir	nt Rd, Solo	diers Po	oint NSV	V 2317									Checked:	HL			
Test Method: Test Machine: Calibration Date:	AS 4 0 8-4-2	133.4.1-2007 (2 2019	2016)					Sampling Technique: Storage History: Moisture Condition: Loading Rate:	Point Lo	oad Teste s tested in	r n an 'as r	eceived'	condition		Sampling Date: Testing Date: Tested By:	6-12-2 25-1-2 DB	021 022		
Pook Typo		Location	Depth			Diar	netral Tes	ts			Axial, B	lock, an	d Irregul	ar Lump	Tests	Moist	ure	St	rength
коск туре		Location	(m)	D (mm)	L (mm)	P (kN)	I <sub>s(50)</sub> (MPa)	Failure Mode	(mm)	D (mm)	L (mm)	P (kN)	I <sub>s</sub> (MPa)	I <sub>s(50)</sub> (MPa)	Failure Mode	(%	)	Clas	sification
Rhyodacite Rhyodacite Rhyodacite		bh01 bh01 bh01	7.94 8.67 9.73	52 52 52	40 40 32	30.03 24.27 22.25	11.3 9.14 8.38	Bad break Through substance Through substance											EH VH VH

C

	TRA TECH	4												Project No:	754-NT	LGE2	02648-1	
Point Lo	ad Streng	gth Ind	lex T	est	Resi	ılts								Sheet:	2	of	4	
Client:	Salamander Pro	operties Pty	Ltd AT	F										Office:	Newca	stle		
Principal:														Date:	25-1-20	22		
Project:	Salamander Sh	ores Hotel												By:	DB			
Location:	147 Soldiers Po	int Rd, Solo	diers Po	oint NSV	V 2317									Checked:	HL			
Test Method: Test Machine: Calibration Date:	AS 4133.4.1-2007 0 8-4-2019	(2016)					Sampling Technique: Storage History: Moisture Condition: Loading Rate:	Point Lo	ad Teste s tested i	r n an 'as r	eceived'	condition		Sampling Date: Testing Date: Tested By:	7-12-202 25-1-202 DB	!1 !2		
		Depth			Diar	netral Test	ts			Axial, B	lock, an	d Irregul	ar Lump 1	Tests	Moistu	e	Strength	
Rock Type	Location	(m)	D (mm)	L (mm)	P (kN)	I <sub>s(50)</sub> (MPa)	Failure Mode	W (mm)	D (mm)	L (mm)	P (kN)	l <sub>s</sub> (MPa)	I <sub>s(50)</sub> (MPa)	Failure Mode	Conter	<sup>it</sup> C	lassificatio	n
Rhyodacite	BH02-21	10.60	52	49	0.13	0.05	Parallel to bedding	52	42	( )	0.14	0.05	0.05	Through substance		-	VL	
Rhyodacite	BH02-21	11.68	52	40	29.74	11.19	Parallel to bedding	52	44		32.2	11.05	11.44	Through substance			EH	
Rhyodacite	BH02-21	12.82	52	36	29.83	11.23	Through substance										EH	

C

	TRA TECH													Project No:	754-N	TLG	E202	2648-1
Point Lo	ad Streng	th Ind	ex T	est l	Resi	ılts								Sheet:	3		of	4
Client:	Salamander Pro	perties Pty	Ltd AT	F										Office:	Newca	astle	•	
Principal:														Date:	25-1-2	022		
Project:	Salamander Sho	res Hotel												By:	DB			
Location:	147 Soldiers Poi	nt Rd, Solo	diers Po	oint NSV	V 2317									Checked:	HL			
Test Method: Test Machine:	AS 4133.4.1-2007 (2	2016)					Sampling Technique: Storage History: Moisture Condition:	Point Lo	ad Teste	er n an 'as r	eceived'	condition		Sampling Date: Testing Date: Tested By:	9-12-20 25-1-20 DB	)21 )22		
Calibration Date:	8-4-2019						Loading Rate	Gample	s lesteu i	11 411 43 1	eceiveu	condition						
		D (1			Diar	netral Tes	sts			Axial, B	lock, ar	d Irregul	ar Lump	Tests	Moist	ure	0	
Rock Type	Location	Deptn (m)	D (mm)	L (mm)	P (kN)	I <sub>s(50)</sub> (MPa)	Failure Mode	W (mm)	D (mm)	L (mm)	P (kN)	I <sub>s</sub> (MPa)	I <sub>s(50)</sub> (MPa)	Failure Mode	Conte	ent	Clas	trength
Rhyodacite	BH03-21	2.84	52	30	1.91	0.72	Bad break		()	()	()	( u)	( u)		(,,,,	,		м
Rhyodacite	BH03-21	3.69	52	42	7.18	2.7	Along defect											н
Rhyodacite	BH03-21	4.94	52	47	24.19	9.11	Through substance											VH
Rhyodacite	BH03-21	5.49	52	38	6.21	2.34	Along defect											н
Rhyodacite	BH03-21	6.30	52	40	19.64	7.39	Through substance											νн

C

	TRA TECH	•												Project No:	754-NT	LGE	202648-1
Point Lo	oad Streng	jth Ind	lex T	est	Resı	ults								Sheet:	4	of	4
Client:	Salamander Pro	perties Pty	/ Ltd AT	F										Office:	Newca	stle	
Principal:														Date:	25-1-20	22	
Project:	Salamander Sho	ores Hotel												By:	DB		
Location:	147 Soldiers Poi	nt Rd, Sole	diers Po	oint NSV	V 2317									Checked:	HL		
Test Method: Test Machine: Calibration Date:	AS 4133.4.1-2007 ( 0 8-4-2019	2016)					Sampling Technique: Storage History: Moisture Condition: Loading Rate:	Point Lo Samples	ad Teste s tested i	er n an 'as r	eceived'	condition		Sampling Date: Testing Date: Tested By:	10-12-20 25-1-202 DB	)21 22	
Rock Type	e Location	Depth	D	L	Diar P	netral Tes I <sub>s(50)</sub>	ts Eailure Mode	W	D	Axial, B L	lock, ar P	id Irregul I <sub>s</sub>	ar Lump <sup>·</sup> I <sub>s(50)</sub>	Tests	Moistu Contei	re <sup>nt</sup> C	Strength
Rhyodacite Rhyodacite Rhyodacite Rhyodacite Rhyodacite	BH04-21 BH04-21 BH04-21 BH04-21 BH04-21 BH04-21	9.48 10.35 11.57 12.26 13.47 14.25	52 52 52 52 52 52 52	40 37 30 40 45 30	8.06 8.02 28.36 18.42 15.96 0.49	3.03 3.02 10.67 6.93 6.01 0.18	Bad break Bad break Through substance Through substance Along defect	52	43 31		5	1.76	1.81 0.22	Bad break Bad break			VH VH EH H/VH VH L

# APPENDIX C: PREVIOUS BOREHOLE LOGS



## **Engineering Log - Borehole**

Client: Principal:

SAKE DEVELOPMENT PTY LTD

Project:

BOREHOLE BH1- BH2.GPJ COFFEY.GDT 3.23.09

#### PROPOSED HOTEL REDEVELOPMENT

Borehole Location: REFER TO FIGURE 1

	drili	mod	el a	Ind	nour	nting: I	and (	Cruiser			Easting:	slope:	-90°				R.L	L. Surface: 10
	hole	e diar	net	er:		;	51 mn	n			Northing	bearing;					dat	tum: AHD
	dri	illin	gi	ifo	mai	tion		<u> </u>	mate	erial si	Ibstance				;			
	method	<ul> <li>T</li> <li>Denetration</li> </ul>	3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle colour, secondary and mino	characteristics or components.	à,	moisture condition	consistency/ density index	100 pocket	400 meter	structure and additional observations
	ADT			N			9.5	0.5		GC CL	FILL: ASHPALT FILL: Clayey GRAVEL, fine to me rounded to sub angular, brown m brown, medium plasticity clay, wit coarse grained sand. Sandy CLAY: medium plasticity, yellow and white, fine to coarse g	dium grained, s ottled red and d h some fine to prown mottled rained sand.	 sub jark	M M/W	H			PAVEMENT GRAVEL
				7			_9.0	- 1.0 - -	×××		RHYODACITE: fine grained with p quartz and black feldspar, pink, rr	ohenocrysts of notiled black an	d		VD			HIGHLY WEATHERED
ł		888	38X 				-8:5	<u>  1.5</u>			white. Borehole BH 1 continued as core	d hole	{			╈	+	· [
					None Observed		_8.0 _7.5 _7.0	2. <u>0</u> 										
e 3 Rev.2	metil AS AD RR W CT	hod		au au roll wa cal	ger sc ger di er/tric shboi bie to bie to	crewing* nilling* cone re ol	6.5 6.0 Sui M C pei	3.5 - - - - - - - - - - - - - - - - - - -	N no resistanging to	nit	notes, samples, tests U <sub>so</sub> undisturbed sample 50mm U <sub>so</sub> undisturbed sample 63mm D disturbed sample N standard penetration test ( N* SPT - sample recovered Nc SPT with solid cone	diameter s diameter b SPT) n	stassificat soil descr jased on i system noisture	tion syr iption unified c	nbols an	đ		consistency/density index         VS       very soft         S       soft         F       firm         St       stiff         VSt       very stiff         H       hard
Form GEO 5.3 Issu	TA DT B V T *bits e.g.	shown	ו by	dia bla V E TC suffi AC	id adj lube nk bit it bit x T	i Udi	wa	ter 10/1/98 on date water in water c	erusat 3 water le 9 shown nflow putflow	evel	V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal	N V V V	M moi N wet Np plas N <sub>L</sub> liqu	st stic limit id limit				Fb friable VL very loose L loose D dense VD very dense

Project No: GEOTWARA20848AA Date started: 23.2.2009

Date completed: 23.2.2009

**BH 1** 1 of 3

GDT

٧N

Logged by:

Borehole No.

Sheet

Checked by:

(	2	O	ff	e	V ®	🥓 geotechn	ics						-	Porch			
			* *	<u> </u>	y									Obeet	JIE NO.	BH 1	
E	n	gi	ine	eri	ng	Log - Cored B	ore	ho	le					Sneet Project	t No:	GEOTN	ARA20848AA
Cli	ent	:		ŝ	SAKI	E DEVELOPMENT PTY L	TD							Date s	tarted:	23.2.20	09
Pri	nci	pal:												Date c	ompleted:	23.2.20	09
Pro	jeo	ct:		F	PROI	POSED HOTEL REDEVE	LOPM	ENT						Logge	d by:	GDT	
Boi	eh	ole	Locat	ion: <b>f</b>	REFE	ER TO FIGURE 1								Check	ed by:	CM)	
drill bole	mo • di:	del 8 amet	k mour	iting: La	nd Cru mm	iser Drilling fluid: Water	Easting	a. J:			slope: bearin	a:	-90°		R.L. Si datum:	urface: 10	) GH
dr	illin	ng is	nform	ation	mat	erial substance						r	ock ma	iss def	ects		
					og overy	material		u Di	estir stre	nated	ls <sub>(50)</sub> MPa		defe spaci	ct ng	c	letect descrip	ption
ethod	re-lift	ater		depth	aphic I re rec	rock type; grain characteristics, co structure, minor components		eather ceratio			D- diam- etral	aD %	mn		type, inclin	coating, thickr	ty, rougriness, ness
Ĕ	8	we	RL	metres	5.8			aft ≣	≤ר≽	s ≖ ₹ ⊞	A- axial	Ř	858	≧ĝ par	ticular		general
				_													1
																	-
			_9.5	0.5													-
				_													-
				-													-
				10													-
			_9.0	1. <u>0</u>													
																	-
						Continued from pon-cored bore	nie										_
MLC M			_ <del>_0.5</del>	<u>   1.6    </u>	××	RHYODACITE: fine grained with phenocrysts of quartz and black feld	spar,	HW				Γ	Ľ,		· JT, 45°, IR, F	RO, CO, clay	
Ż		q			××	pink, grey mottled black and white.		511				ĺ				⊃∩ C∩ arev	dav
		eve		-	××									E	·JT, 0°, PL, R ·JT, 30°, IR, F	0, CO, grey, 0, CO, grey, i RO, CN	clay -
		ne Ot	_8.0	2.0	× ×										-JT, 10°, IR, F	RO, CN	
		No			××							99					_
				-	××												-
			_7.5	2.5	××												
				_	× × ×	RHYODACITE: CLAY, laminated, ye arey mottled green.	llow,	HA							- JT, 40°, IR, F	RO, CN	-
	-			_	×	RHYODACITE: fine grained with		FR				$\vdash$					_
			_7.0	3.0	×	, prienocrysia, grey mouleu plink.											
				_	×												4
					×												1 -
			e =	35	××							100			-JT, 32°. PL.	RO, VN, irons	
			_ປ.ວ		××												
				-	× ×										- JT, 85°, (Her black stained	matite?), PL, F I	RO, VN, _
					××										- JT, 45°, IR, F	RO, CN	-
me	tho	d	<u>6.0  </u>	; 4.0	l×	core-lift	water	1/02		1 83	weatherin FR fr	ng resh		: :	defect typ	e	roughness VR_veourouch
AS AD			aug aug	er screwi er drilling	ng	casing used	00/ 00 0	date sho	er ievel Win	I	SW s MW n	lightly node:	y weather rately we	red athered	PT part SM sea	ing m ared zonc	RO rough SO smooth
RR CB			rolle	r/tricone or blade	bit	graphic log/core recovery	► wati → part	er inflow tial drill fi	luid los	s	XW e DW d	xtren	nely weat	thered	SS she CS crus	ared surface shed seam	G∟ siickensideo
NM NG	LC , HC	Q, PQ	NMI Wire	_C core line core		core recovered	con	nplete dr	nii fluid	loss	(t strength VL ⊻	erv Ir	rsim Wa	na HVV)	planarity PL plar	har	coating CN clean
						- graphic symbols indicate material	wat	er press	ure tes	t result	L k M n	)w nediu	Im		CU curv UN und ST ster	ved ulating oped	SN stained VN veneer CO coating
						no core recovered	inte	eons) ic irval sho	wn wn	•	VH V EH e	ery h xtren	igh nely higi	1	IR irre	gular	

CORED BOREHOLE BH1- BH2.GPJ COFFEY.GDT 3.17.09

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		-	£		_ @	apotophr	loo								
(	5	U		e	y	geolecii	IICS					Bore	hole No.	BH 1	
E	n	gi	ine	eri	ng	Log - Cored E	Bore	ho	le			Shee Proje	et ect No:	3 of 3 GEOTWA	ARA20848AA
CI	ient			5	SAK	E DEVELOPMENT PTY L	TD					Date	started:	23.2.200	9
Pr	inci	pal:										Date	completed:	23.2.200	9
Pr	oje	ct:		F	RO	POSED HOTEL REDEVE	LOPM	ENT				Logo	jed by:	GDT 1	
Bo	oreh	ole	Locat	tion: <b>F</b>	REFE	ER TO FIGURE 1						Chee	cked by:	CM+	-
dri	l ma	del 8	& mour	nting: La	nd Cru	iser	Easting	:		slope:		-90°	R.L. Sı	orface: 10	
ho.	e di rilli	amel na i	ter: pform	51 nation	mm mat	Drilling fluid: Water	Northing	g:		bearin		ock mass d	datum: efects	AHC	)
					er y	material		_	estimated	15,60		defect	c	lefect descripti	on
B	lift				tic tog	rock type; grain characteristics, o	olour,	hering ation	strength	MPa D-diam-	%	spacing mm	type, inclin	ation, planarity,	roughness,
metho	core-I	water	RL	depth metres	graph core i	structure, minor component	s	weati altera	┥┘ゑェ⋛╓	etral A- axial	Rab	800000 R	particular	coaling, micknes	general
MLC				-	× ×	RHYODACITE: fine grained with phenocrysts, grey mottled pink. (co)	ntinued)	FŔ							_
z				-	× ×						Ĕ		JT, 50°, IR, R	0, CN	-
					× ×								⊷ JT, 50°, PL, F	RO, CN	
		ed	_5.5	4.5	× ×								— JT, 40°, PL, F	RO, CN	-
		bserv		_	××								— JT, 45°, PL, 8	SO, VN, clay	_
		one C		-	× ×	(						5 F	JT, 0°, PL, R	D, CN	
		Ż	_5.0	5.0	××						88 88		JT, 60°, PL, F	RO, CN RO, CN	-
				-	××								— JT, 45°, PL, F	RO, CN	_
				_	× ×										-
			45	55	× _ ×										-
			_4,5		×								- JT, 15°, IR, F	O, CN	
				-		BH 1 terminated at 5.61m									
				-			-								-
			_4.0	6.0			:								
				_											
				-											-
			_3.5	6. <u>5</u>											_
				_											-
															-
			_3.0	7.0											-
				-											_
															1
				75											
			_2.5	7. <u>5</u>											
				_											-
															-
m	≧tho	d	2.0	8.0	L	core-lift	water		an ang ang ang ang ang ang ang ang ang a	weatherin	19		defect tun	e	roughness
DT	;		diatu augo	ube er screwir	ng	casing used	10/1/ on d	/98 wati ate sho	er level wit	FR fr SW sl	esh ightly	y weathered	JT joint PT parti	ng	VR very rough RO rough
AL Ri	) २		augi rolle	er drilling r/tricone		barrel withdrawn	wate	r inflow		HW hi XW e	ighly xtren	weathered nely weathered	SZ shea SS shea	ared zone ared surface	SL slickensided
	3 ALC		claw NML	or blade C core	bit	graphic log/core recovery	< partia comp	ai drill fl plete dr	uia ioss ill fluid loss	DW di (c	istinc cover	tly weathered rs MW and HW	) CS crus	hed seam	coating
tvt.	a, 170	2, PQ	wire	ine core		- graphic symbols	<b>—</b>		ura tari masili	VL vi L lo	ery ic w	w	PL plan CU curv	ar ed dating	CN clean SN stained
						no core recovered	vate දි (luge inter	eons) fo val sho	r depth wn	M m H hi VH vi EH e:	iediu igh ery h xtren	im ligh nely high	ST step IR irreg	ped ular	CO coating

Form GEO 5.5 Issue 3 Rev. 3



F:\GEOTECHNICS\JOB FILES\WARA 20800 - 20899\WARA20848AA\[GEOTWARA20848AA - AB BH1 CORE PHOTO.xls]A4 Landscape Figure



C n n:			Da	roholo
Engi	neering	LOG	- 00	renoie

Client: Principal:

# PROPOSED HOTEL REDEVELOPMENT

SAKE DEVELOPMENT PTY LTD

Proj	ect:			PRC	PO	SED	нот	EL R	EDEVELOPMENT		L	.ogged	by:	GDT
Bore	ehole	Lo	catio	n: <b>REF</b>	ER	TO F	IGUI	RE 1			C	Checke	ed by:	CIM
drill n	nodel	and	mou	nting: I	_and (	Cruiser			Easting: slope:	-90°			R.	L. Surface: 12
hole	diame	eter:		:	51 mm	1	<b>.</b>		Northing bearing:				da	tum: AHD
dril	ling	info	rma	tion	1	<del> </del>	mate	erial s	Ibstance					-1
method	5 penetration	support	water	notes samples, tests, etc	RL	depth	graphic log	classification symbol	material soil type: plasticity or particle characteristics colour, secondary and minor components.	s,	moisture condition	consistency/ density index	100 × pocket 200 × penetro 300 meter	structure and additional observations
ADT		N				-			Sandy GRAVEL: fine to coarse grained, angular brown pink, fine to coarse grained sand, trace of	r, f fines.	D	MD		ROAD BASE
					_11.6		~~~	SP	SAND: fine to medium grained, pale brown, trace fines.	e of	M	MD		AEOLIAN
					_11.0			CL	Sandy CLAY: medium plasticity, brown, fine to coarse grained sand with some fine sub angular angular gravel.	r to	M <wp< td=""><td>Η</td><td></td><td>EXTREMELY WEATHERED RHYODACITE - - - - -</td></wp<>	Η		EXTREMELY WEATHERED RHYODACITE - - - - -
		000000000			<u>_10.5</u>	- 1. <u>5</u>	× ×		RHYODACITE: fine grained with phenocrysts of quartz and black feldspar pink, brown colour. Borehole BH 2 continued as cored hole					HIGHLY WEATHERED
			None Observed		_10.0	- - 2.0 - - -								
					_9.5	2. <u>5</u> - - 3. <u>0</u>								
					_8.5	- 3. <u>5</u> -								
oum dec 0.53 issue 3 kev.2 AD RR W HA AS D HA AD HA D HA AD HA D HA D HA D HA D	od	au au ro wa cz ha dii bh bh V V T ( y Sul A	iger s iger d ller/tri ashbo ible to and au atube ank bi bit C bit fix OT	crewing* rtilling* cone re vol uger t	8.0 Sull C pell Wa Wa	4.0 pport mud casing netratio 2 3 4 ter 10/1/9 on dat water i	N no resista ranging to refusai 8 water 1 e shown inflow outflow	nil nce level	notes, samples, tests     0       U <sub>50</sub> undisturbed sample 50mm diameter       U <sub>50</sub> undisturbed sample 63mm diameter       D     disturbed sample       N     standard penetration test (SPT)       N*     SPT - sample recovered       V     vane shear (kPa)       P     pressuremeter       Bs     bulk sample       R     refusal	classifica soil desc based on system D dry M ma W we Wp pla W <sub>L</sub> liqu	tion syn ription a unified ( ) bist tt sstic limit uid limit	mbols ar	tion	consistency/density index         VS       very soft         S       soft         F       firm         St       stiff         VSt       very stiff         H       hard         Fb       friable         VL       very loose         L       loose         D       dense         VD       very dense

Borehole No.

Project No:

Date started:

Date completed:

Sheet

BH 2 1 of 3

23.2.2009

23.2.2009

GEOTWARA20848AA

BOREHOLE BH1- BH2.GPJ COFFEY.GDT 3.23.09

	coffey geotechnics														
(	ار	U		e	y	geoleciii	103					Bor	ehole No.	BH 2	<u> </u>
E	'n	ai	ine	eri	nq	Log - Cored E	Bore	ho	le			She	et iect No:	2 of 3 GEOTWA	RA20848AA
CI	ient				SAKI		TD				-	Dat	e started:	23.2.2009	
Dr	inci	nal·		-								Dat	e completed:	23.2.2009	ł
Dr.		μαι. 		2	הסכ			IENT				Loc	and hy	GDT	
Bo	uje. Ireh	unie	locat	ion <sup>.</sup> A		ER TO FIGURE 1						Che	acked by:	Cent	-
dril	Imo	del 8	k mour	iting: La	nd Cru	iser	Eastin	g:		slope:		-90°	R.L. S	urface: 12	
hol	e di:	amet	er:	51	mm	Drilling fluid: Water	Northi	ng:		bearin	ng:		datum	: AHD	
d	rilli	ng ir	nform	ation	mat	erial substance material				<u> </u>	rc	ock mass	defects	defect descriptio	n
poq	⊳-lift	er			ohic log e recover	rock type; grain characteristics, c structure, minor component	xolour, s	athering ration	estimated strength	Is <sub>(50)</sub> MPa D-diam-	0 %	defect spacing mm	type, inclir	nation, planarity, coating, thicknes	roughness, s
met	Sore	wat	RL	depth metres	gra cor			alte	╡┘ॾェ╂╬	A- axiai	ß	300 300 300 300 300 300 300 300 300 300	particular		general
				_											-
															1
			44.5												4
			_11,5	<u> </u>											_
															-
				_											-
			_11.0	1. <u>0</u>											_
				_											-
				_											ŀ
			10.5	1.5		Continued from non-cored bore	hoie		1				014 02 40	- DI CO davi	-
MLC					××	RHYODACITE: fine grained with phenocrysts of quartz and black feit	ispar,	HW SW		8		<b>b</b>		m, PL, SO, clay	_
z		pa		_	× _	pink, brown.		HW SW					—— SM, 15°, 60r	nm, IR, SO, clay	_
		bser		_	× × ×			HW							-
·		one C	_10.0	2. <u>0</u>	××						Ř		JT, 10°, PL,	RO, CN	-
		Ż			× _×			HW SW						nm, IR, RO, San	dy Clay
				-	××									RO, CN, clay	-
	H		9.5	2.5	× _			HW						m, PL, RO, clay	
				-	× _			F					JT, 25°, PL,	RO, CN	-
				-	×								JT, 25°, PL,	RO, VN, clay	-
			0.0	3.0	××								`J1, 25°, PL,	RO, VN, sand	-
			_3.0		××										
				_	×						63		, 3°, РL, №	(O, CN SO, VN, day	-
				-	×			HW F					SM, 60°, 70r JT, 60°, PL,	mm, PL, SO, clay SO, VN, clay	·
			_8.5	3.5	×	Becomes grey mottled pink and whi	ite.						JT, 30°, IR, I JT, 50°, IR, I	RO, CN RO, CN	
				-	×								JT, 37°, IR, I	RO, VN, clay RO, CN	-
				-	×								JT. 52°, PL.	RO, CN	-
L	Η		8.0	4.0	×						86	<b>  1</b>       <u> </u>	JT, 88°, IR, I	RO, CN RO, CN	
m DT	etho	d	diatu	ibe		core-lift	water <u> </u>	/1/98 wat	er level	FR f	resh Jiahth	v weathered	defect typ JT join PT per	pe It tína	roughness VR very rough RO rough
AS	> ) ?		auge auge	er screwi er drilling diricopo	ng	barrel withdrawn	- on wa	uare sho ter inflow	wii	MW n HW h	noder nighly	rately weather weathered	red SM sea SZ she	ared zone	SO smooth SL slickensided
CE	s ALC		claw NM	or blade	bit	graphic log/core recovery	pai	rtial drill f mplete di	uid loss ill fluid loss	DW c	extren distinc cover	nely weathere tly weathered rs MW and HN	ru SS she I CS cru: N)	ared surface shed seam	
N	р. но	D. PQ	wire	ine core		core recovered	]			strength VL v	i very lo	w	planarity PL plan	nar	coating CN clean
	indicate material water pressure test result M med no core recovered X (lugeons) for depth H high									ow nediu 1ich	m	UN und ST ste	fulating pped	VN veneer CO coating	
							inte	erval sho	wn	VH V EH e	very h	igh nely high	IR irre	gular	-

CORED BOREHOLE BH1- BH2.GPJ COFFEY.GDT 3.17.09

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	coffey geotechnics Borehole No. BH 2																
(	5	U		e	y	geole	CHINCE	)				Bo	orehole	No.	BH 2	I	<u></u>
F	'n	a	ine	eri	na		red Bore	ho	le			Sh	ieet	_	3 of 3		
	ien				SAK							Pr	ojectivo ste start	o: ed:	23.2.2	2009	040AA
Pr	inci	inal <sup>.</sup>			<i></i>		,,,,,,,,,,					Da	ate com	pleted:	23.2.2	2009	
Pr	nio	pai.		,	PRO	POSED HOTEL F	REDEVELOPI	MENT				Lo	aged by	r:	GDT		
Bo	oje	nole	Loca	tion:	REF	ER TO FIGURE 1						Cł	ecked l	hv <sup>.</sup>	AN	<del>[</del> -	
dri	l mo	del a	& mou	nting: La	nd Cru	iser	Easti	ng:		slope:		-90°		R.L. Si	Inface:	12	
ho	e di	amei	ter:	51	mm	Drilling fluid: Water	North	ing:		bearin	ig:	· ·		datum:		AHD	
d	rilli	ng i	nform	ation	mat ⊳	erial substance materi	al	1		<u> </u> .	ro	ock mass	defect	s d	lefect desc	ription	
5	Ŧ				c log	rock type; grain chara	acterístics, colour,	ering	strength	IS <sub>(50)</sub> MPa	*	defect spacing mm	t	ype, inclin	ation, plan	arity, roughne:	ss,
netho	core-li	vater	BI	depth	Jraphi core re	structure, minor	components	veath		D-diam- etral A-axial	В,	_8888	narticul		coating, thi	ckness	annoral
0		~		nicues	×	RHYODACITE: fine grain	red with	F T	2 J & I > 0		╞	85858			D, CO, san	3	general
MN				_	××	phenocrysts of quartz ar pink, brown. <i>(continued)</i>	id black feldspar,						.JI,	U , IR, RC	J, CN		1
				-	× ×								,	30°, PL, S	50, CN		
			_7.5	4.5	××								<b>—</b> —JT,	10°, PL, S	50, CO, cla	ау	
				-	××												-
				-	××						88						-
				- -	××	2 9 4							JT.	3°. IR. R0	D. CN		
			_7.0	5. <u>0</u>	××												
		σ		-	××												-
		serve		-	Ŷ								L	5° 01 81	O CN		-
		le Ob	_6.5	5.5	Û ×						F		,	5 . F E, IX	0,011		_
		Non		-	^ ×												-
				-	××												
			6.0	60	××												_
			_0.0	- 0.0	××						Ę		1				
				-	××							ſ	—— JT,	71°, PL, F	RO, VN		-
				-	××												
			5.5	6. <u>5</u>	××												
				-	××						⊢		SM	, 0°, 50mr	'n, łR, RO,	Sandy Clay	-1
				-	××						97		and	(and grav	φI.		-
			5.0	7.0	×	Core Loss							JT,	37°, PL, F	RO, CN		
				-		BH 2 terminated at 7m											-
				-													_
																	4
			_4.5	7. <u>5</u>													
				_													_
				-													
_		4	4.0	8.0	L,					weather	na		<u> </u>				
D D	eino -	u	diat	ube er screwi	na	casing used	water 10 or	)/1/98 wat h date shr	er level	FR fr SW s	resh lighth	y weathered		defect typ JT joint PT parti	e ing	roughnes VR very RO roug	ss rough Ih
A0 R	, ) {		aug aug rolle	er drilling r/tricone	-9	barrel withdrawn		ater inflow	,	MW n HW h	moderately weathered SM seam SO smooth highly weathered SZ sheared zone SL slickensided extremely weathered SS					oth ensided	
Ci N	B ALC		claw NMI	or blade	bit	graphic log/core recovery		artial drill f implete di	luid loss till fluid loss	DW d	distinctly weathered CS crushed seam (covers MW and HW)						
N	р, но	Q, PC	wire	line core		core recovered				strength VL v	planarity coating verylow PL planar CN dean CLI curved SN etaload						
	indicate material water pressure lest result M medium no core recovered $ec{N}$ (lugeons) for depth H high									m		UN und ST step	ulating ped	VN ven CO coat	er ing		
							in	terval sho	wn	VH V EH e	ery h xtren	igh nely high		IR irreg	jular		

Form GEO 5.5 issue 3 Rev. 3



F:\GEOTECHNICS\UOB FILES\WARA 20800 - 20899\WARA20848AA\\GEOTWARA20848AA - AB BH2 CORE PHOTO.xls]A4 Landscape Figure

С	:(		f	f	ev			Ç	je	ote	chnics						
					J			Ŭ						Boreho	ole N	э.	HA 1
Eı	ng	gi	in	e	erin	g l	_C	)q	- E	301	rehole		:	Sheet Proiect	No		1 of 1 GFOTWARA208484
Clie	nt:	<u> </u>			SA	KE .	DE	VEI	.OP	MEN	T PTY LTD			Date st	tartec	1:	9.12.2008
<sup>2</sup> rin	cip	al:											1	Date c	ompl	etec	d: <b>9.12.2008</b>
<sup>5</sup> roj	ect	t:			PF	ROPO	SSI	ED I	нот	'EL F	REDEVELOPMENT		ł	Logged	i by:		GAT. 1
Bore	ehc	ole	Lo	catio	on: <b>RE</b>	FEF	? T(	0 F	IGU	RE 1			(	Check	ed by	:	OMT
lrill n	nod	lel a	and	mou	nting:	Han	d Au	iger			Easting: stope:	-90°				R.L	. Surface: 13
ole dril	diar <b>lin</b> i	met g il	er: n <b>fo</b>	rma	tion	62 n	nm		mat	erial s	Northing bearing: ubstance					data	um: AHD
metnoa	5 penetration	in provincial of	support	water	notes sample tests, e	s, etc R	_ d	lepth	graphic log	classification symbol	material soil type: plasticity or particle characterist colour, secondary and minor componen	ics, ts.	moisture condition	consistency/ density index	100 × pocket 200 v pocket	400 meter	structure and additional observations
			N							SC	TOPSOIL: Clayey SAND, fine to medium grain dark brown, medium plasticity fines, some sub angular gravel, trace of rootlets.	rev to	М				
						_12	2.5 (	- D. <u>5</u> -			white with fine to coarse grained sand. Terminated at refusal on Highly Weathered Rhyodacite. Borehole HA 1 terminated at 0.31m						RHYODACITE
						_12	2.0	-  1. <u>0</u> -									
						_11	.5 1	- 1. <u>5</u> -									
						_11	.0 2	_ _ 2. <u>0_</u> _ _									
atho 3 2 7	bd		au au roll wa cat	ger so ger di er/tric shboi ble to nd au	rewing* illing* cone co c) ger	10 5 N C 1 1	.5 2 uppo 1 mu 2 3	2.5 ort ud sing ration 3.4 ration	N o resista nging to fusal	nil	notes, samples, tests         U <sub>so</sub> undisturbed sample 50mm diameter         U <sub>so</sub> undisturbed sample 63mm diameter         D       disturbed sample         N       standard penetration test (SPT)         N*       SPT - sample recovered         Nc       SPT with solid cone	classific; soil desc based on system molsture D dr	ation sy ription I unified	mbols ar	tion		consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard
Α T bitsh	cable tool     Intrastantate hand auger     N*     SPT - sample recovered       hand auger     water     Nc     SPT with solid cone       diatube     water     V     vane shear (kPa)       blank bit     10/1/98 water level     P     pressuremeter       V bit     10/1/98 water level     Bs     bulk sample       TC bit     E     environmental sample       shown by suffix     water outflow     R     refusal						Nc     SPT with solid cone       V     vane shear (kPa)       P     pressuremeter       Bs     bulk sample       E     environmental sample       R     refusal	D dry M ma W we Wp pla W <sub>L</sub> liqu	y pist et astic limit uid limit	t			H hard Fb friable VL very loose L loose MD medium dense D dense				

BOREHOLE HA1 - HA7.GPJ COFFEY.GDT 3.24.09

	-		LC.	<b>~</b> `/	Ĵ	) /		ったの	obnice								
(	5	J		ey	w	Ę	JC		UTITIC5			E	Boreho	le No		HA 2	
F	n	rir	IP	ering	. 1	oa	- F	Ror	ehole			ŝ	Sheet				004044
	lient <sup>.</sup>	<u></u>		SAK		FVF		MEN				ן ז	Project Date st	No: arted:		9.12.2008	<u>0848AA</u>
Pr	incin	al·		0/1/1				,,_,,					Date co	omple:	ted:	9.12.2008	
Pr	roiect	:		PRC	PO	SED	нот	EL R	EDEVELOPMEN	Т		L		l by:		GDI,	
Bo	oreho	Ie Lo	catio	on: REF	ER	TO F	IGUI	RE 1				(	Checke	ed by:		GMT	
dri	ll mod	el and	mou	nting:	Hand	Auger			Easting:	slope:	-90°			F	R.L. S	urface: 18	
ho	le diar	neter:	rma	tion	52 mл	n 	mate	vriale	Northing	bearing	g:			ď	atum	: AHD	
F	j.			notes			mau	5					ور در	to to	_	<u></u>	
method	Denetra 1 2	support	water	samples, tests, etc	RL	depth metres	graphic log	classificati symbol	rr soil type: plasticity c colour, secondary	aterial or particle character and minor compon-	istics, ents.	moisture condition	consistenc density ind	100 x pock 200 x pock 300 bene	400 Mete	structure and additional observat	tions
ΑH		N						SW	TOPSOIL: SAND, fine to grey speckled white, sor	medium grained, b ne organics and roc	prownish otlets.	D			Т	OPSOL	-
						-			Gravelly Clavey SAND:	fine to coarse arein	ad	м	MD				FD.
						_		30	brown mottled yellow, m sub angular gravel.	edium plasticity fine	s, some	141			R	HYODACITE	-
				D	17.5	- 05			Borehole HA 2 terminate	ed at 0.45m							
						0.0											
						-											-
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					15,5	2.5			notas samolas tosta		classific	ation er	mbols ar			consistency/density ind	ex
AS	) )	a	uger s uger d	crewing* rilling*	M	mud	N	nil	U <sub>so</sub> undisturbed sam U <sub>so</sub> undisturbed sam	ple 50mm diameter ple 63mm diameter	soil des based o	cription n unified	classifica	tion		VS very soft S soft	
RF	٤	rc W	iller/tri ashbo	cone re	per 1	netration	1 IO reeleto	oce	D disturbed sample N standard penetro	e ation test (SPT)	system					F firm St stiff	
CT HA		c h	able to and au	ol Iger			anging to efusal		N* SPT - sample re No SPT with solid of	covered one	moistur D di	e fy voist				VSt very stiff H hard	
		d b V	atube lank bi hit	t	wa W	ter 10/1/98	B water I	evel	v vane shear (kPa P pressuremeter Bs bulk sample	<b>)</b>	M M W w Wool	icist et lastic limi	t			VL very loose	e
Б т тbi	t showr	hand auger     Nc     SPT with solid cone       diatube     water     V     vane shear (kPa)       blank bit     ▼     10/1/98 water level     P     pressuremeter       V bit     ▼     on date shown     Bs     bulk sample       TC bit     ►     water inflow     R     refusal							W <sub>L</sub> lic	quid limit				MD medium d D dense	lense		
ē e.c	<b>j</b> .	Ā	DT			water o	utflow									VD very dens	e

BOREHOLE HA1 - HA7.GPJ COFFEY.GDT 3.24.09

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coney	w ر	Jeole	0111105		-	Boreho	le No.	НА 3
Engineering	Log	- Bor	ehole			Sheet Project	' No <sup>.</sup>	1 of 1 GEOTWARA20848AA
Client: SAK	E DEVE		T PTY LTD			Date st	arted:	9.12.2008
Principal:						Date co	ompleted	: 9.12.2008
Proiect: <b>PRO</b>	POSED	HOTEL R	EDEVELOPMENT			Logaed	d bv:	GDF (
Borehole Location: REFE	ER TO F	IGURE 1				Checke	ed by:	FIAT
drill model and mounting: H	land Auger		Easting:	slope: -90	)°		R.L.	Surface: 21
hole diameter: 6	2 mm	1	Northing	bearing:			datu	im: AHD
Grilling information		material s	ubstance			_ ×	<u>ہ</u> ہے	
tests, etc	depth	graphic log classification symbol	mai soil type: plasticity or	terial	moisture	consistency density inde	o A pocke	structure and additional observations
- 123 ° - ⊈    N	ite metres	}  }  SP	TOPSOIL: SAND, fine to n	redium grained, brownish	D		5884	TOPSOIL
			grey with some rootlets an	d traces of organics.				F
		SC SC	Clayey SAND: fine to coar to medium plasticity clay a	se grained, brown with low nd minor cobbles at top,	м	<u> </u>		RESIDUAL
	-		trace of cobbles less than	100mm in dimension.				-
								-
	_20.5 0. <u>5</u> _							
	_							-
								-
	-	° SP	Gravelly SAND: fine to coa	arse grained, yellow /	_	MD		EXTREMELY WEATHERED
	-	o  o	angular gravel.	rained sub angular to				-
	20,0 1.0	<u></u>	Borehole HA 3 terminated	at 1m		+		
	-							-
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	19.5 1. <u>5</u>							
	-							-
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	19.0 2. <u>0</u>							_
						:		
	185 2.5							
method AS auger screwing*	support M mud	N nil	notes, samples, tests U <sub>50</sub> undisturbed sample	e 50mm diameter soil de	ication s	mbols ar	nd	consistency/density index VS very soft
AD auger drilling' RR roller/tricone	C casing	ı	U <sub>sa</sub> undisturbed sample	e 63mm diameter based i system	on unified 1	i classifica	tion	S soft F firm
VV washbore CT cable tool		io resistance anging to efusal	N standard penetration N* SPT - sample recommendation No. SPT with solid coordination	vered moistu	ure drv			St stiff VSt very stiff H bard
DT diatube B blank bit	water	3 water level	V vane shear (kPa) P pressuremeter	, M W	moist wet			Fb friable VL very loose
V V bit T TC bit	on date	e shown	Bs bulk sample E environmental sam	ple Wp	plastic lim liquid limit	it		L ioose MD medium dense
*bit shown by suffix e.c. ADT	water in water of water of water of water of the water	ntiow	R refusal					D dense VD verv dense

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<b>_</b>	ont	9.			576		<u>57</u>					F	Project	No	: 	GEOTWARA20848AA
	ent.				SAP			LOF				L	Date st	ante	:u.	9.12.2000
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PR	ojeci		000	tion		:ED		noi Iicui		(EDEVELOPINEN I		L	Logged	លេខ ភេគ		Art
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dı	rillin	g in	forn	atio	on	1	İ	mat	erial s	ubstance					<u>.</u>	
method	nenetratio	balland	support		notes samples, ests, etc	RI	depth	graphic log	classification symbol	material soil type: plasticity or particle character colour, secondary and minor compon	ristics,	moisture condition	consistency/ density index	00 × pocket	00 B penetro	structure and additional observations
- 4	12	23	N .	-		1.12	menes		0	TOPSOIL: fine to coarse grained, black with	1 rootlets.	M		ų T		TOPSOIL
т 							-		SW	Gravelly SAND: fine to coarse grained, pale with minor sub angular to angular gravel, tra cobbles <100mm in dimension, trace of org	e brown ace of anics.					RESIDUAL
						_18.5	0. <u>5</u> -		CL	Sandy CLAY: medium plasticity, pale brown yellow and grey, fine grained sand.	1, mottled	<wp< td=""><td>Η</td><td></td><td></td><td>EXTREMELY WEATHERED RHYODACITE</td></wp<>	Η			EXTREMELY WEATHERED RHYODACITE
							-	. /.	sc	Clayey SAND: fine to coarse grained, pale mottled red and white, medium plasticity fin	oink, es.	М				-
						_17.0 _17.0	1.0             									
AS AD RR W CT HA DT B V T *bit e.g.	method     16.5     2.5       AS     auger screwing*     M     Muddle       AD     auger drilling*     C     casing       RR     roller/tricone     penetration     1.2     3.4       W     washbore     1.2     3.4       CT     cable tool     ran       HA     hand auger     ran       DT     diatube     water       B     blank bit     ✓     10/1/98 v       V     V bit     ✓     on date s       T     TC bit     ✓     water infl       e.g.     ADT     ✓     ✓						mud casing petratio 2 3 4 ter 10/1/9 on date water i water of	N no resista ranging to refusal 3 water 1 e shown nflow putflow	nil Ince	Notes, samples, tests       U <sub>so</sub> undisturbed sample 50mm diameter       U <sub>so</sub> undisturbed sample 63mm diameter       D     disturbed sample       N     standard penetration test (SPT)       N*     SPT - sample recovered       Nc     SPT with solid cone       V     vane shear (kPa)       P     pressuremeter       Bs     bulk sample       E     environmental sample       R     refusal	moisture D drs M misture M m W we Wp pla W_ liq	anon syn cription o unified o o unified o	classifica:	ia tion		VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense

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Ξı	ng	gi	n	ee	ering	j L	og	- E	Зоі	rehole			;	Sheet Proiect	No:		1 of 1 GEOTWARA2084	18
lie	nt:	_			SAK	E D	EVE	LOP	MEN	T PTY LTD				Date st	arted	:	9.12.2008	
rin	cip	al:											I	Date co	omple	eted:	9.12.2008	
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ore	orehole Location: REFER TO FIGURE 1											(	Checke	ed by:		CEMT		
ill n	nod	el a	nd i	mou	nting:	Hand	Auger			Easting:	slope:	-90°				R.L. 5	Surface: 17	
ole (	diar	met	er:	ma	tion	52 mn	ו 	mot	orial a	Northing	bearin	g:				datur	n: AHD	
1	io	9 "			notes			mau						× ۵	¥ ç			
	penetrat		support	vater	samples, tests, etc	19	depth	graphic log	classificatio	mi soil type: plasticity o	aterial r particle character	ristics,	noísture condition	consistency fensity inde	o dy bocke	o meter	structure and additional observations	
. 83	12	3	N	_		INC.	metres		SP	SAND: fine to coarse gra	ined, pale brown w	vith grass	 			; <del>;</del>   /	EOLIAN	
0000000							-			at top and rootlets.								
2002/00/20				ļ	D	1		. /	SC	Clayey SAND: fine to me with medium plasticity cla	dium grained, darl y.	k brown	W	MD		E F	EXTREMELY WEATHERED	_
	Ť		$\neg$				_	<u> </u>		Terminated at refusal on Rhyodacite.	Highly Weathered							
							_			Borehole HA 5 terminated	d at 0.25m							
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the	bq.					14.5 sup	2.5 port			notes, samples, tests		classific	ation sy	nbols an	d	╧╋	consistency/density index	
			aug aug	jer so jer dr	rewing* illing*	M C	mud casing	N	nil	U <sub>so</sub> undisturbed samp U <sub>so</sub> undisturbed samp	ble 50mm diameter ble 63mm diameter	soil dese based or	cription n unified	classificat	ion		VS very soft S soft	
	roller/tricone penetration D disturbed sample syst washbore 1 2 3 4 N standard penetration test (SPT)							moisture	e			4	St stiff VSt verv stiff					
hand auger vater vater V vane shaar (KPa) M							D dr M m	- ry ioist				H hard Fb friable						
blank bit V bit 10/1/98 water level P pressuremeter W bit on date shown Bs bulk sample Wp								W wi Wp pl	et Iastic limit				VL very loose L loose					
ch		. <b>k</b>	TC	bît			water îr	fiow		E environmental sa	mple	W, liq	quid limit				MD medium dense	

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F	nc	iir	e	erino	ı I	oa	- F	ദവ	rehole			:	Sheet			1 of 1		
Cli	ent:			SAP		EVE	LOP	MEN		<u></u>			Project Date st	i No: tarte	d:	9.12.2	WARA2084 )08	87
Pri	ncipa	d:		0/11		_ , _							Date c	omo	u. lete	d: 9.12.2	 008	
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Зо	rehol	e Lo	catio	on: REF	ER	 TO F	IGUI	 RE 1		-			Checke	ed b	v:	(-OM		
linit	mode	land	mou	nting:	Hand	Auger			Easting:	slope:	-90°				R.L	. Surface:	14	
ol	e diam	eter:			62 mn	n	<b>.</b>		Northing	bearin	g:				dat	um: ,	AHD	
ar	iiing S	BIRC	orma				mate	erial s	ubstance			1	- ×	-	ģ			_
nethod	penetrati	upport	/ater	notes samples, tests, etc		depth	Iraphic log	lassificatio: ymbol	n soil type: plasticity	aterial	istics,	noisture condition	onsistency lensity inde	o y pocke	o e meter	str addition	ucture and al observations	
ς	12:	3 <sup>07</sup>	>			metres		SP	TOPSOIL: SAND, fine to	coarse grained, wi	th	M	VL	28	88	TOPSOIL		
•						-	KII S	SC	organics and rootlets.	edium grained, darl	cbrown	w	<u> </u>			RESIDUAL		
							·	CI	to brown with medium pl gravel <10mm.	asticity clay, trace o	of angular	<\N/n	VSt			EXTREME	WEATHERED	· _
						_			Sandy CLAY: medium p yellow and red, trace of t and fine grained gravel,	lasticity, brown mot ine to coarse graine sub angular to angu	tled ed sand ular.	M				RHYODACITE		
					_13.5	0. <u>5</u>	////		mottled yellow with fine g Terminated at refusal on Rhyodacite. Borehole HA 6 terminate	Highly Weathered								
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5		aı aı	iger so iger di	crewing* rilling*	M C	mud casing	N	nil	U <sub>50</sub> undisturbed sam U <sub>63</sub> undisturbed sam	ple 50mm diameter ple 63mm diameter	soil des based o	cription n unified	classifica	tion		VS S	very soft soft	
R		auger dniing C casing U <sub>es</sub> Undsturbed sample barmin diameter bas roller/fricone penetration D disturbed sample sys washbore <u>1.2.3.4</u> consistent N standard penetration test (SPT)						system					F St	firm stiff				
۲ ۹		cable tool no resistance refugation of the standard auger no resistance refusal N* SPT - sample recovered moi fraging to Nc SPT with solid cone D						moistur D di	ne fy				VSt H	very stiff hard				
•	diatube water V vane shear (kPa) M blank bit ¥ 10/1/98 water level P pressuremeter W V bit → on date shown Bs bulk samole Wt							M m W w Wo ∽	ioist et lastic limit	ł			FD VL	mable very loose loose				
it	shown	v Tr by sud	Dit Dibit fix			water i	∍ snown nflow		E environmental sa R refusal	ample	Wp p W <sub>L</sub> lie	quid limit				MD D	medium dense dense	
лт .g.	GHUWH	Ai	DT			water o	outflow		1. 1610381							VD	very dense	

BOREHOLE HA1 - HA7 GPJ COFFEY GDT 3.24.09

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Enair	neerind	ı L	.oa	- E		Sheet	No	1 of 1		
Client:	SAK							Date st	arted	9.12.2008
Dripoipol:	07.				****	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		Date of	omnioto	a. 9 12 2008
Principal.	00/		050					Date G	Jubiere	0. <b>9.12.2000</b>
Project:	PRC	)PO	3ED 70-	MUI		EDEVELOPINEN I		Logged	1 DY:	( Pint-
Borehole Lo	nole Location: REFER 10 FIGURE 1									
hole diameter	nodel and mounting: Hand Auger Basting: slope: -90 diameter: 62 mm Northing bearing:								R.L	Surface: /
drilling inf	ormation			mate	erial si	ubstance				
method penetration	notes samples, tests, etc	DI	depth	graphic log	classification symbol	material soil type: plasticity or particle charact	eristics, protects	consistency/ density index	0 × pocket 0 v penetro- 0 meter	structure and additional observations
<u> </u>	, > 	- KL	metres		SP	TOPSOIL: SAND, fine to medium grained	, grey with M		5885 5885	TOPSOIL
			_	<u>I</u> <u>S</u> IIS	¢D	rootlets.	wn white M	4		
		_	_		J.	and pale grey, angular gravel (<10mm), tr to medium grained.	ace of fine			
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						Borehole HA 7 terminated at 2m				
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		4.5	2.5			nates complex tasts	alaasi6-stis	umbola		ponciotonou/donoity/ Index
AS a	auger screwing*	ger screwing* M mud				Notes, samples, tests U <sub>so</sub> undisturbed sample 50mm diameter	soil description	ymools al 1 1 classifica	ia tion	VS very soft
RR r	auger unning" foller/tricone washbore	netratio	n		D disturbed sample	system	- uassiiiGa		F firm St stiff	
CT C	cable tool		Ţ	no resista ranging to refusel	nce	N* SPT - sample recovered	moisture			VSt very stiff H hard
	iailu zuger diatube alank bit	wa	iter	anusal		V vane shear (kPa)	M moist			Fb friable
V V bit T T C bit V V bit L T T C bit V V V bit L T T C bit V V V bit L T T C bit V V V bit L T T C bit V V V bit L V V bit V V V bit L V V bit V V V V bit V V V V V V V V V V V V V V V V V V V						nit t		L loose MD medium dense		
T TC bit E environmental sample W <sub>L</sub> liquid •bit shown by suffix → water inflow R refusal e.o. ADT → water outflow							ingura iliti	•		D dense VD very dense

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