

GEOTECHNICAL INVESTIGATION

BELLVISTA 2 - PRECINCT 2

BELLVISTA BOULEVARD, CALOUNDRA

BROWN CONSULTING (QLD) PTY LTD

GEOTKPAR01560AA/D (Rev3)
29 November 2010

29 November 2010

Brown Consulting (Qld) Pty Ltd
P.O. Box 997
Buddina Qld 4575

Attention: Mr Brent Thomas

Dear Sir,

**RE: Geotechnical Investigation
Bellvista 2 - Precinct 2
Bellvista Boulevard, Caloundra**

Coffey Geotechnics Pty Ltd (Coffey) was commissioned by Mr Brent Thomas of Brown Consulting (Qld) Pty Ltd on behalf of Stockland Caloundra Downs Pty Ltd to undertake geotechnical investigations and assessments for the proposed subdivision of Precinct 2 of the Bellvista 2 residential development at Bellvista Boulevard, Caloundra. The geotechnical investigations and assessments are set out in this report.

Should you wish to discuss any aspect of this report, please contact Ron McMahon in our Kunda Park office.

For and on behalf of Coffey Geotechnics Pty Ltd



Ron McMahon

Principal Engineer

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1 INTRODUCTION

Coffey Geotechnics Pty Ltd (Coffey) was commissioned by Mr Brent Thomas of Brown Consulting (Qld) Pty Ltd (Browns) on behalf of Stockland Caloundra Downs Pty Ltd to undertake geotechnical investigations and assessments for the proposed subdivision of Precinct 2 of the Bellvista 2 residential development at Bellvista Boulevard, Caloundra.

2 PROPOSED DEVELOPMENT

Precinct 2 of the proposed development involves an area of some 47.2 hectares subdivided into residential lots on the site. The residential precinct will be some 34.8 hectares in area. The works will include the placement of imported fill on the lots, the construction roads and the installation of services. Open drains between 2 and 4 metres deep will be constructed through and adjacent to the site. The proposed layout is shown in the development plan provided by Browns, a copy of which is attached.

3 FIELDWORK

Fieldwork was undertaken between 9th May and 19th May 2009 under the direction of a principal engineer from Coffey's Kunda Park office. A total of 10 boreholes were drilled to a depth of 6 metres, 6 boreholes to a depth of 4 metres and 6 boreholes to a depth of 3 metres on the site. An additional 8 boreholes were drilled immediately adjacent to the site on the southern side. Dynamic cone penetrometer (DCP) testing to depths up to 1.5 metres was conducted adjacent to each borehole. Borehole logs and DCP blow counts are attached in **Appendix A** together with explanation sheets defining the terms and symbols used. Borehole locations are shown in **Figure 1**. Three samples of subgrade soils were collected for CBR testing. The samples are identified by depth and borehole number.

A walkover inspection was conducted by engineers and soil scientists from Coffey's Kunda Park office. The topography and surface features were noted.

4 LABORATORY TESTING

Laboratory testing for ASS and erosion characteristics was undertaken. The results are reported separately in reports on those aspects of the investigations.

Laboratory testing for CBR values was undertaken in Coffey's NATA registered Kunda Park laboratory. Three samples from Precinct 2 were tested. Samples showed high CBR values in the range 17% to 55%. Test certificates are attached in **Appendix B**.

5 SITE CONDITIONS

5.1 Topography and Site Description

Precinct 2 is a more or less triangular area off the western end of Bellvista Boulevard at Caloundra. It is on the northern side of Bellvista Boulevard.

Precinct 2 is at an elevation of about RL 3 to 5.5 metres AHD along the northern boundary to the west of Bellvista Boulevard and slopes down to the southeast away from the northern boundary with an average gradient less than 1% to an elevation of about RL 2 metres in the southern parts of the site.

The site has been previously cleared of the endemic vegetation. A dense exotic grass cover is established over the site. Larger woody vegetation is generally located around the boundary of Precinct 2 in the form of regrowth and limited to areas along the existing drainage lines. Tree species identified included *Pinus radiata*, *Acacia melanoxylon*, *Lophostemon suaveolens*, *Melaleuca quinquenervia* and various *Eucalyptus* species.

5.2 Geology and Soils

According to the 1:100 000 Geological Series mapping, sheet 9444 and part 9544, prepared by the Department of Mines and Energy Queensland, the site is underlain by Quaternary alluvium (mapping unit Qa). This unit consists predominantly of sands and silty sands in this area. The alluvium is underlain at shallow depth by residual soils derived from the Late Triassic to Jurassic Landsborough Sandstones (mapping unit RJI). This sequence is predominately sandstone in this area.

The subsurface profile was inferred from the Coffey boreholes undertaken on the site. The soil profile generally consists of upper alluvial sand strata overlying stiff residual sandy clays. The upper sandy profile consists of silty sand topsoil 200 mm to 600 mm thick overlying the subsoils. Organic matter was present in the topsoils but comprised a relatively small percentage of the soil mass at depths no greater than 200 mm. The subsoils are medium dense to very dense sands and clayey sands. In some areas the subsoils are indurated. The depth of the upper sand strata varies from 0.6 metres deep to more than 2.9 metres deep overlying the residual soils.

The residual soils are sandy clays derived from the in situ weathering of the underlying Landsborough Sandstones and grade to sandstone with depth. The clays are stiff to very stiff in consistency. Laboratory testing was not undertaken but Coffey's experience with these clays and visual classification indicates that they have a high plasticity and are moderately reactive.

6 GEOTECHNICAL CONDITIONS

6.1 Founding Conditions

Founding conditions on the site will be suitable for high level footings providing fill on residential allotments is placed as controlled fill as per AS2870-1996. Settlements will be minimal and will not impact on footing design. No preloading or soft soil treatments are indicated to be required.

6.2 Shrink Swell Movements

Shrink swell movements for the natural soil profile will vary across the site depending on depth of the upper sandy strata. They will generally be less than 20 mm but in some isolated areas may be in the range 20 to 40 mm. These movements indicate that Class S or Class M footing systems as per AS2870-1996 are likely in the natural profile.

Where lots are filled, the likely classifications will be a function of the depth and nature of the fill soils. Where sandy fill soils are used, classifications are likely to be Class S providing that the fill is certified as controlled fill as per AS2870. The requirements for controlled fill are set out in Section 6.3 of this report. Where clay fill soils are used, the classification will depend of the reactivity of the clay fill. Allowable bearing capacities will be in excess of 100 kPa at depths greater than 0.3 metres.

6.3 Earthworks

The following are recommended for placement of the fill on the site:

1. Previous fill and topsoil shall be removed and stockpiled, and the subgrade rolled to a minimum dry density ratio of 95% based on Standard compactive effort. Voids remaining following removal of tree stumps, boulders and other obstructions shall be excavated and filled with suitable controlled fill.
2. Following subgrade preparation, the area shall be test rolled in accordance with AS3798-2007 to identify soft and/or wet areas. Soft and/or wet areas shall be excavated and replaced by suitable controlled fill.
3. Controlled fill shall consist of suitable materials from the site or imported material and shall be placed in layers maximum 250 mm loose thickness for sand and clayey sand soils with up to 40% fines (less than 75µm) and 200 mm loose thickness for clay fill. The fill shall be uniformly compacted to a minimum dry density ratio of 95% based on Standard compactive effort under residential lots and 98% Standard under roadways or in areas proposed for commercial or industrial development. Placement moisture contents are to be within a range $\pm 2\%$ of optimum moisture content. The maximum dry density shall be corrected for rock greater than 37.5mm in accordance with AS1289 *'Methods of Testing Soils for Engineering Purposes'*.
4. Fill derived from the weathered sandstone shall be broken down during excavation, treatment and compaction to produce a material with sufficient fines to fill the voids between coarse fragments, and preferably with less than 20% larger than 37.5mm. Cobbles and boulders larger than 150mm in diameter shall be excluded.
5. Alternative compaction specifications based on a method specification will be required for material with more than 20% larger than 37.5mm (see AS3798-2007 Section 5.4).
6. Unsuitable materials (including organic material, tree trunks, roots, organic soils, rubbish and other deleterious materials) shall be excluded.

7. All earthworks including subgrade preparation, fill placement and compaction shall be performed under Level 1 supervision (as defined in AS3798-2007), with sampling and testing to at least the frequency required in AS3798-2007. It should be noted that AS3798 states that unless fill is placed under a Level 1 Overview, the geotechnical testing authority will not be in a position to provide an opinion on the fill. This implies that the geotechnical testing authority may only certify fill as controlled fill (as required by AS2870) if a Level 1 Overview has been undertaken.
8. As far as is practical, the fill level across the site shall be raised uniformly, with each layer being completed and tested prior to placement of the following layer.

Unless otherwise determined by a geotechnical engineer, the fill should be mixed as well as practical to produce a material with relatively uniform grading. The fill is to be placed so that stability is derived from adequate compaction of the finer material embedding the larger particles, rather than mechanical interlock of rock fragments.

It is noted that proper moisture conditioning of the fill material is required to reduce the likelihood that future wetting of the fill will result in significant settlement.

6.4 Stripping Depths

Based on borehole investigations, the stripping depth required varies from 0.2 metres to 0.6 metres. The deeper stripping depths are generally in isolated locations and an average stripping depth of some 250 mm may be anticipated.

It should be noted that stripping is required to remove soils with significant organic matter or other soils which have poor structural integrity and will not provide a suitable base for the placement of future fill. It is not necessary to remove all topsoil or soils with any organic matter providing the above requirements are met. Close control on stripping depths should be maintained to ensure that excess stripping is not undertaken.

6.5 Allowable Bearing Capacity

The allowable bearing capacity of the natural soils on the site at the normal footing depth of 0.4 metres is generally in excess of 100 kPa. Weaker soils were noted at depth in some isolated areas but these areas are likely to be rectified by proof rolling and replacement as set out in Section 6.3.

The bearing capacity of the fill soils if compacted as set out in Section 6.3 can be expected to be in excess of 100 kPa.

6.6 Pavement Design

Laboratory testing for CBR values on three samples of the subgrade soils was undertaken. CBR values of 17% (BH84), 36% (BH96) and 47% (BH107) were measured. Preliminary design based on a CBR of 15% is recommended. CBR testing will be required by Council prior to design once the subgrade fill is in place. In order to achieve an economical pavement design, the use of sandy soils under roadways is recommended.

6.7 Excavations

Excavations on the site may be undertaken using conventional earthmoving equipment. Temporary excavations up to 3 metres deep may be battered back at an angle of 1.5H:1V above the water table and 2.5H:1V below the water table. Permanent excavations up to 4 metres deep should be battered back at 2.5H:1V above the water table and 3H:1V for excavations below the water table.

For deeper excavations, Coffey should be consulted to provide a site specific design. Similarly, where surcharge loadings at the top of excavations are proposed, Coffey should be consulted for a specific batter design.

6.8 Groundwater

Groundwater was recorded at depths generally between 0.1 and 1 metre in boreholes on the site. The groundwater appeared to be a perched water table in the upper sand profile which is underlain by the residual clay soils.

Investigations were undertaken during periods of higher than average rainfall and it may be that during drier periods, the groundwater trapped in the upper sands is transpired out of the profile or seeps vertically or laterally off the site. During periods of prolonged dry weather, it is expected that the groundwater in the upper parts of the site will not be present.

However, the site is relatively flat with slow surface drainage and the profile consists of sandy soil overlying low permeability clays. It should be anticipated that, during periods of prolonged heavy rainfall, the water table may be higher than that recorded in boreholes during these investigations. All structure and drain design and construction planning should anticipate the possibility of high groundwater levels.

For and on behalf of Coffey Geotechnics Pty Ltd



Ron McMahon

Principal Engineer

Important information about your **Coffey** Report

As a client of Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by 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 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 Coffey to assess how factors that changed subsequent to the date of the report affect the report's recommendations. 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 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 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 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 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 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.

Important information about your **Coffey** Report

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 Coffey to work with other project design professionals who are affected by the report. Have 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 Coffey for information relating to geoenvironmental issues.

Rely on Coffey for additional assistance

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 Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

Responsibility

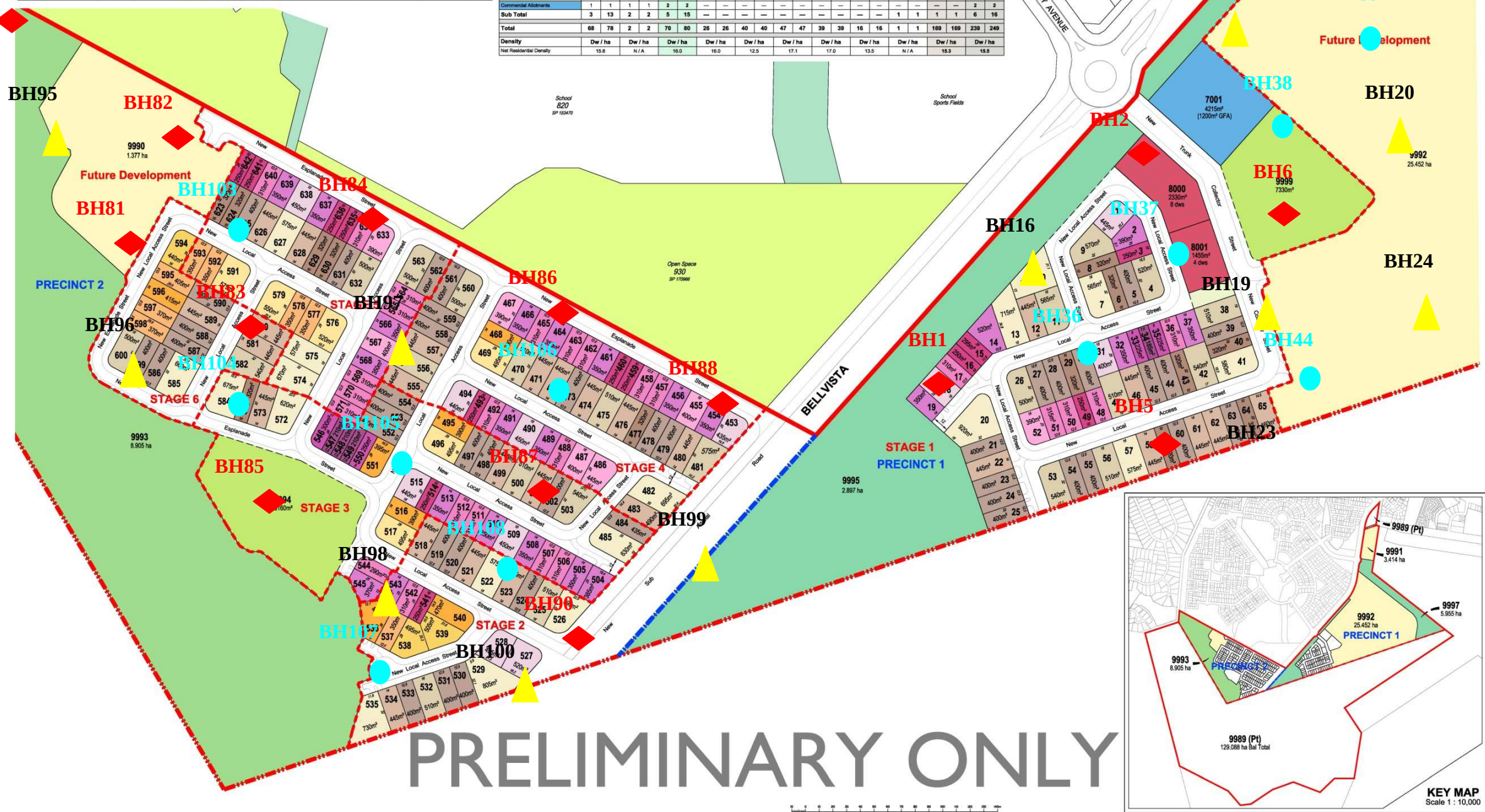
Reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem,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

* For further information on this aspect reference should be made to "Guidelines for the Provision of Geotechnical information in Construction Contracts" published by the Institution of Engineers Australia, National headquarters, Canberra, 1987.

LAND USE BUDGET - APPLICATION 1											
Land Use	Stage 1	Balance	Sub Total	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Balance	Sub Total	Total Site
Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)
Area of Subject Site	9.393	10.282	19.675	2.807	3.191	2.743	2.295	1.194	33.832	45.852	65.527
Sealable Area	9.393	10.282	2.716	2.807	3.191	2.743	2.295	1.194	33.832	45.852	9.393
Single Family Allotments	2.716	—	2.716	1.212	1.989	1.989	1.908	0.719	—	6.899	9.393
Medium Density Allotments	0.379	—	0.379	—	—	—	—	—	—	0.379	0.379
Commercial Site	0.422	—	0.422	—	—	—	—	—	—	0.422	0.422
Super Allotments	—	1.377	1.377	—	—	—	—	—	27.876	27.876	29.253
Total Area of Allotments	3.517	1.377	4.894	1.212	1.989	1.989	1.908	0.719	27.876	34.766	39.860
Subtotal	—	—	—	—	—	—	—	—	—	—	—
Road	—	—	—	0.967	—	—	—	—	0.967	0.967	0.967
Sub Arterial Road	—	—	—	—	—	—	—	—	—	—	—
Collector Street	0.489	—	0.489	—	—	—	—	—	—	0.489	0.489
Local Access Street	1.132	—	1.132	0.408	0.806	0.803	0.786	0.474	—	3.327	4.449
Pedestrian Connections/Thresholds	0.038	—	0.038	—	—	—	—	—	—	0.038	0.038
Total Area of New Road	1.645	—	1.645	1.395	0.806	0.803	0.786	0.474	—	4.314	5.309
Open Space	—	—	—	—	—	—	—	—	—	—	—
Active Park	0.733	—	0.733	—	—	—	—	—	0.816	1.549	1.549
Passive Open Space	—	8.905	8.905	—	—	—	—	—	—	8.905	8.905
Stormwater Conveyance	3.498	—	3.498	—	—	—	—	—	5.506	5.506	9.454
Total Open Space	4.231	8.905	13.136	—	—	—	—	—	5.996	6.772	19.909
Street Type	Length (m)	Length (m)	Length (m)	Length (m)	Length (m)	Length (m)	Length (m)	Length (m)	Length (m)	Length (m)	Length (m)
Shared Access Driveway	82	—	82	30	57	34	—	—	—	121	261
Esplanade Street	188	—	188	292	292	292	—	—	—	862	862
Local Access Street	630	—	630	226	291	292	198	—	—	1258	1988
Collector Street	73	—	73	—	—	—	—	—	—	73	73
Trunk Collector Street	187	—	187	—	—	—	—	—	—	187	187
Sub Arterial Road	—	—	—	247	—	—	—	—	—	247	247
Total Length of New Road	952	—	952	503	533	569	504	519	—	2428	3380

YIELD BREAKDOWN - APPLICATION 1																				
Single Family Dwellings	Stage 1	Balance Precinct 1	Sub Total Precinct 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Balance Precinct 2	Sub Total Precinct 2	Total									
25m Deep Product																				
Terrace 7.5m	1	2%	—	1	2%	—	0%	3	8%	—	4	2%								
Terrace 8.0m	2	3%	—	2	3%	—	0%	2	5%	—	2	1%	4	2%						
Villa 10m	4	6%	—	4	6%	1	4%	1	3%	3	6%	4	10%	—	9	5%	13	6%		
Premium Villa 12.5m	5	8%	—	5	8%	1	4%	5	13%	7	18%	—	—	—	20	12%	25	11%		
Courtyard 14m	5	8%	—	5	8%	1	4%	5	15%	7	15%	4	10%	—	18	11%	23	10%		
Traditional 15m	1	2%	—	1	2%	0%	—	4	9%	2	5%	2%	—	—	6	4%	7	3%		
Premium Traditional 15m	3	6%	—	3	6%	2	5%	3	8%	1	3%	—	—	—	8	5%	11	5%		
Subtotal	21	32%	—	21	32%	5	19%	19	48%	24	51%	18	46%	—	66	39%	87	37%		
28m Deep Product																				
Villa 10m	—	0%	—	—	0%	—	0%	—	0%	—	—	—	—	—	—	0%	—	—	0%	
Premium Villa 12.5m	—	0%	—	—	0%	1	4%	—	0%	4	10%	3	18%	—	8	5%	8	3%		
Courtyard 14m	—	0%	—	—	0%	2	8%	3	8%	1	2%	—	0%	1	8%	7	4%	7	3%	
Traditional 15m	—	0%	—	—	0%	2	8%	—	0%	—	0%	—	0%	1	8%	3	2%	3	1%	
Premium Traditional 15m	—	0%	—	—	0%	—	2	5%	1	2%	3	8%	—	0%	—	6	4%	6	3%	
Subtotal	—	0%	—	—	0%	5	19%	5	13%	2	4%	7	18%	5	31%	—	24	14%	24	10%
32m Deep Product																				
Villa 10m	7	11%	—	7	11%	—	0%	1	2%	4	10%	—	—	—	8	4%	13	6%		
Premium Villa 12.5m	15	23%	—	15	23%	6	23%	7	18%	3	8%	5	31%	—	27	16%	42	18%		
Courtyard 14m	7	11%	—	7	11%	4	15%	3	8%	8	17%	2	5%	3	19%	—	20	12%	27	12%
Traditional 15m	9	14%	—	9	14%	2	8%	2	5%	11%	2	5%	2	13%	—	13	8%	22	9%	
Premium Traditional 15m	6	9%	—	6	9%	4	15%	3	8%	1	2%	3	8%	1	8%	—	12	7%	16	6%
Subtotal	44	68%	—	44	68%	16	62%	16	40%	21	45%	14	36%	11	89%	—	78	48%	122	52%
Total Residential Allotments	65	100%	—	65	100%	26	100%	40	100%	47	100%	39	100%	16	100%	—	168	100%	233	100%
Super Lots	Lots	Dw	Lots	Dw	Lots	Dw	Lots	Dw	Lots	Dw	Lots	Dw	Lots	Dw	Lots	Dw	Lots	Dw	Lots	Dw
Medium Density	2	12	—	2	12	—	—	—	—	—	—	—	—	—	—	—	—	—	2	12
Balance Super Allotment	—	—	1	1	1	1	—	—	—	—	—	—	1	1	1	1	2	2	2	2
Commercial Allotments	1	1	1	1	2	2	—	—	—	—	—	—	—	—	—	—	—	2	2	2
Sub Total	3	13	2	2	5	15	—	—	—	—	—	—	1	1	1	1	6	16	16	16
Total	68	78	2	2	70	80	26	26	40	47	47	39	39	16	1	1	169	169	239	249
Density	Dw / ha	Dw / ha	Dw / ha	Dw / ha	Dw / ha	Dw / ha	Dw / ha	Dw / ha	Dw / ha	Dw / ha	Dw / ha	Dw / ha	Dw / ha	Dw / ha	Dw / ha	Dw / ha	Dw / ha	Dw / ha	Dw / ha	Dw / ha
Net Residential Density	15.6	N/A	16.0	16.0	16.0	12.5	17.1	17.0	13.5	N/A	15.3	15.8	—	—	—	—	—	—	—	—

BH80



revision	description	drawn	approved	date	BH drilled to 6m ASS to 3m BH drilled to 4m ASS to 4m BH drilled to 3m ASS to 3m ASS samples taken at 0.25m	drawn	RY	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client:	BROWN CONSULTING (QLD) PTY LTD	
	DCP testing to 1.5m in all BH locations					approved	AC		project:	BELLVISTA 2	
	4 CBR subgrade samples					date	29-11-2010		title:	PRECINCT 1 & 2 BOREHOLE LOCATIONS	
	2 Emerson in topsoil and 6 Emerson in subsoil					scale	NTS		project no:	GEOTKPAR01560AA/D	figure no: FIGURE 1
	4 soil samples (1kg) at varying depths up to 2m					original size	A3				

Appendix A

Coffey Borehole Logs, DCP Testing and Explanation Sheets

Borehole No. **BH80**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTKPAR01560AA**

Client: **BROWN CONSULTING (QLD) PTY LTD**

Date started: **13.5.2009**

Principal:

Date completed: **13.5.2009**

Project: **BELLVISTA 2**

Logged by: **DF**

Borehole Location: **REFER TO SITE PLAN**

Checked by: **RFM**

drill model and mounting: EDSON CPI Easting: 508424.5 slope: -90° R.L. Surface: NOT MEASURED
hole diameter: 100 mm Northing 7035383.367 bearing: datum: GDA94

drilling information					material substance									
method	penetration	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations	
ADT	1 2 3	N						SM	SILTY SAND: fine to medium grained, dark grey, with organics present.	M	L		INDURATED SAND	
						1		SP	SAND: fine to medium grained, grey, trace of silt.		D			
											VD			
						2		SP	SAND: fine to medium grained, pale grey and brown, with clay fines. ...colour changing to grey.	W	MD		DIST PP=150kPa	
						3		SC	CLAYEY SAND: fine to medium grained, pale grey, medium plasticity fines.					
								CH	SANDY CLAY: medium to high plasticity, pale grey, fine to medium grained sand.	M	St	X		
						4							DIST PP=200kPa	
						5								
						6						X		
									Borehole BH80 terminated at 6m				LIMIT OF INVESTIGATION	
						7								
						8								

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud N nil C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ 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	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit	consistency/density index 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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Borehole No. **BH81**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTKPAR01560AA**

Client: **BROWN CONSULTING (QLD) PTY LTD**

Date started: **13.5.2009**

Principal:

Date completed: **13.5.2009**

Project: **BELLVISTA 2**

Logged by: **DF**

Borehole Location: **REFER TO SITE PLAN**

Checked by:

drill model and mounting: EDSON CPI Easting: 508508.759 slope: -90° R.L. Surface: 4.772
hole diameter: 100 mm Northing 7035232.378 bearing: datum: GDA94

drilling information						material substance																			
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa				structure and additional observations							
	1	2	3											100	200	300	400								
ADT				N								M	L												
							4	1		SM	SILTY SAND: fine to medium grained, dark grey, trace of organics.														
										SP	SAND: fine to medium grained, dark grey, with silt.			D											
										SP	SAND: fine to medium grained, pale brown, trace of silt and clay fines.			VD											
														MD											
												W													
										SC	CLAYEY SAND: fine to medium grained, pale brown and orange, low plasticity fines.	M													
							3	2		CH	SANDY CLAY: high plasticity, pale grey, fine to medium grained sand.		VSt			X			DIST PP=250kPa						
							2																		
								3								X			DIST PP=280kPa						
							1	4		SP	SAND: fine to medium grained, pale grey, trace of clay fines.	W	MD												
							0	5																	
							-1	6		CL	SANDY CLAY: low plasticity, pale grey, fine to medium grained sand.	M	St												
											Borehole BH81 terminated at 6m								LIMIT OF INVESTIGATION						
							-2	7																	
							-3	8																	
method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT						support M mud N nil C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow					notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ 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					classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit					consistency/density index 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				

Borehole No. **BH82**

Engineering Log - Borehole

Client: **BROWN CONSULTING (QLD) PTY LTD**

Principal:

Project: **BELLVISTA 2**

Borehole Location: **REFER TO SITE PLAN**

Sheet 1 of 1

Project No: **GEOTKPAR01560AA**Date started: **13.5.2009**Date completed: **13.5.2009**

Logged by: **DF**

Checked by: ***RFM***

drill model and mounting:						EDSON CPI		Easting: 508571.194		slope: -90°		R.L. Surface: 4.765				
hole diameter:						100 mm		Northing 7035312.664		bearing:		datum: GDA94				
drilling information						material substance										
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations	
	1	2	3											100 200 300 400		
ADT				N						SM	SILTY SAND: fine to medium grained, dark grey, trace of organics.	M	L		DIST PP=250kPa	
										SP	SAND: fine to medium grained, trace of silt.	M/W	MD			
										SP	SAND: fine to medium grained, grey. ...colour changing to pale grey and pale brown, trace of gravel.					
										SP	SAND: fine to medium grained, pale grey and pale brown/orange, with clay fines.	W				
										CH	SANDY CLAY: medium to high plasticity, pale grey and pale brown/orange. ...colour changing to pale grey and red.	M	VSt	X		
										CH	SANDY SILTY CLAY: high plasticity, pale grey and red, fine to medium grained sand, trace of gravel.			X		DIST PP=240kPa
														X	DIST PP=230kPa	
											Borehole BH82 terminated at 6m				LIMIT OF INVESTIGATION	

Borehole No. **BH84**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTKPAR01560AA**

Client: **BROWN CONSULTING (QLD) PTY LTD**

Date started: **19.5.2009**

Principal:

Date completed: **19.5.2009**

Project: **BELLVISTA 2**

Logged by: **DF**

Borehole Location: **REFER TO SITE PLAN**

Checked by: **RFM**

drill model and mounting: EDSON CPI Easting: 508690.658 slope: -90° R.L. Surface: 4.209
hole diameter: 100 mm Northing 7035242.752 bearing: datum: GDA94

drilling information						material substance												
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter			structure and additional observations	
	1	2	3											100 kPa	200 kPa	300 kPa		400 kPa
ADT				N	▼		-4			SM	SILTY SAND: fine to medium grained, dark grey, trace of organics.	M/W	L					
					▲					SP	SAND: fine to medium grained, grey, trace of silt.	W	MD					
							-3	1		SC	CLAYEY SAND: fine to medium grained, pale grey and brown, low plasticity fines, trace of gravel.							
							-2	2		CL	SANDY CLAY: medium plasticity, pale grey and orange, fine to medium grained sand.	M	St					
							-2			SC	CLAYEY SAND: fine to medium grained, pale grey, low plasticity fines.		MD					
						ASS	-1	3										
							0			CL	SANDY CLAY: medium plasticity, pale brown/orange and pale grey, fine to coarse sand.		St		x			DIST PP=200kPa
							-1	5		CH	SANDY CLAY: medium to high plasticity, orange/red and pale grey, fine to medium grained sand.		VSt		x			DIST PP=260kPa
							-2	6							x			DIST PP=280kPa
							-2				Borehole BH84 terminated at 6m							LIMIT OF INVESTIGATION
							-3	7										
							-3											
							-4											
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method	support	notes, samples, tests	classification symbols and soil description	consistency/density index
AS AD RR W CT HA DT B V T *bit shown by suffix e.g. ADT	M mud C casing penetration 1 2 3 4  no resistance ranging to refusal water 10/1/98 water level on date shown ▲ water inflow ▼ water outflow	U ₅₀ undisturbed sample 50mm diameter U ₆₃ 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	based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit	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

Borehole No. **BH85**

Engineering Log - Borehole

Client: **BROWN CONSULTING (QLD) PTY LTD**

Principal:

Project: **BELLVISTA 2**

Borehole Location: **REFER TO SITE PLAN**

Sheet 1 of 1

Project No: **GEOTKPAR01560AA**

Date started: **13.5.2009**

Date completed: **13.5.2009**

Logged by: **DF**

Checked by: ***RFM***

drill model and mounting:						EDSON CPI		Easting:		508653.599		slope:		-90°		R.L. Surface:		3.872	
hole diameter:						100 mm		Northing		7035032.852		bearing:				datum:		GDA94	
drilling information										material substance									
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter				structure and additional observations	
	1	2	3											100 kPa	200 kPa	300 kPa	400 kPa		
ADT				N						SM	SILTY SAND: fine to medium grained, dark grey, with organics.	M	L						
										SP	SAND: fine to medium grained, dark grey, trace of silt. ...colour changing to dark brown.		MD						
										SC	CLAYEY SAND: fine to medium grained, pale grey and pale brown, medium plasticity fines.								
										SP	SAND: fine to coarse grained, brown and grey, trace of clay fines.	M/W							
										CH	SANDY CLAY: medium to high plasticity, pale grey, fine to medium grained sand.	M	VSt						

Borehole No. **BH86**

Engineering Log - Borehole

Client: **BROWN CONSULTING (QLD) PTY LTD**

Principal:

Project: **BELLVISTA 2**

Borehole Location: **REFER TO SITE PLAN**

Sheet 1 of 1

Project No: **GEOTKPAR01560AA**Date started: **15.5.2009**Date completed: **15.5.2009**

Logged by: **DF**

Checked by: **RFM**

drill model and mounting:				EDSON CPI				Easting: 508834.272				slope: -90°				R.L. Surface: 3.476			
hole diameter:				100 mm				Northing: 7035182.233				bearing:				datum: GDA94			
drilling information										material substance									
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations				
	1	2	3																
ADT				N						SM	SILTY SAND: fine to medium grained, dark grey, trace of organics.	M	L						
							3			SP	SAND: fine to medium grained, dark grey, trace of silt.		MD						
										SP	SAND: fine to medium grained, dark grey. ...colour changing to pale grey.	W							
							1			SC	CLAYEY SAND: fine to medium grained, pale grey, low plasticity fines.								
							2			CH	SANDY CLAY: medium to high plasticity, pale grey and orange/red, fine to medium grained sand.	M	St	X	DIST PP=160kPa				
													VSt	X	DIST PP=250kPa				
							2			SC	CLAYEY SAND: fine to medium grained, pale grey, medium plasticity fines.	W	MD						
							1												
							3			CL	SANDY CLAY: medium plasticity, pale grey, fine to coarse grained sand.	M	VSt	X	DIST PP=240kPa				
							0				...colour changing to pale grey and red.								
							4			CH	SANDY CLAY: high plasticity, pale grey, fine to medium grained sand.			X	DIST PP=260kPa				
							5												
							-1							X	DIST PP=280kPa				
							-2												
							6												
											Borehole BH86 terminated at 6m				LIMIT OF INVESTIGATION				
							-3												
							7												
							-4												
							8												
method				support				notes, samples, tests				classification symbols and soil description				consistency/density index			
AS AD RR W CT HA DT B V T *bit shown by suffix e.g. ADT				M mud C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow				N nil U ₅₀ undisturbed sample 50mm diameter U ₆₃ 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				based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit				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			

Borehole No. **BH89**

Engineering Log - Borehole

Client: **BROWN CONSULTING (QLD) PTY LTD**

Principal:

Project: **BELLVISTA 2**

Borehole Location: **REFER TO SITE PLAN**

Sheet 1 of 1

Project No: **GEOTKPAR01560AA**Date started: **16.5.2009**Date completed: **16.5.2009**

Logged by: **DF**

Checked by: ***RFM***

drill model and mounting:				EDSON CPI		Easting: 508730.257		slope: -90°		R.L. Surface: 3.362					
hole diameter:				100 mm		Northing: 7034842.641		bearing:		datum: GDA94					
drilling information						material substance									
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations
1	2	3									soil type: plasticity or particle characteristics, colour, secondary and minor components.			100 200 300 400	
ADT			N				3			SM SP	SILTY SAND: fine to medium grained, dark grey, trace of organics. SAND: fine to medium grained, grey, trace of silt. ...colour changing to pale brown.	M M/W	L MD		
							1			CL CH	SANDY CLAY: medium palsticity, pale brown, fine to medium grained sand. SANDY CLAY: high plasticity, pale grey and red, fine to medium grained sand. ...medium to high plasticity, colour changing to pale grey.	M	St VSt		DIST PP=250kPa
							2								
							2								
							1								DIST PP=260kPa
							3								
							0								DIST PP=250kPa
							4								
							-1								
							5			SP	SAND: fine to medium grained, pale grey, trace of clay.	W	MD		
							-2			SC	CLAYEY SAND: fine to medium grained, pale grey, medium plasticity fines.				
							6								
							-3				Borehole BH89 terminated at 6m				LIMIT OF INVESTIGATION
							7								
							-4								
							8								
method						support		notes, samples, tests				classification symbols and soil description		consistency/density index	
AS AD RR W CT HA DT B V T						M mud C casing penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow		U ₅₀ undisturbed sample 50mm diameter U ₆₃ 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				based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit		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	
*bit shown by suffix e.g. ADT															

Borehole No. **BH91**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTKPAR01560AA**

Client: **BROWN CONSULTING (QLD) PTY LTD**

Date started: **16.5.2009**

Principal:

Date completed: **16.5.2009**

Project: **BELLVISTA 2**

Logged by: **DF**

Borehole Location: **REFER TO SITE PLAN**

Checked by: **RFM**

drill model and mounting: EDSON CPI Easting: 508877.2 slope: -90° R.L. Surface: 2.634
hole diameter: 100 mm Northing 7034826.753 bearing: datum: GDA94

drilling information						material substance													
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa			structure and additional observations		
	1	2	3											100	200	300		400	
ADT				N	▼					SM	SILTY SAND: fine to medium grained, dark grey, trace of organics.	M	L					DIST PP=200kPa	
					▲		2			SP	SAND: fine to medium grained, dark brown, trace of silt. ...colour changing to grey.	M/W	MD						
							1			SP	SAND: fine to medium grained, pale grey, trace of clay fines.	W							
							1			CH	SANDY CLAY: high plasticity, pale grey, fine to medium grained sand.	M	St/VSt	X					
							2				CH	SILTY CLAY: high plasticity, pale grey and red, with fine grained sand.		VSt					
							0			CH					X		DIST PP=250kPa		
							3												
							4												
							-1			CH									DIST PP=350kPa
							4												
							-2			CH								DIST PP=220kPa	
							5												
							-3			SC	CLAYEY SAND: fine to medium grained, pale grey, low plasticity fines.	W	MD			X			
							6				Borehole BH91 terminated at 6m							LIMIT OF INVESTIGATION	
							-4												
							7												
							-5												
							8												
method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT						support M mud C casing penetration 1 2 3 4  no resistance ranging to refusal water ▼ 10/1/98 water level on date shown ▲ water inflow ◀ water outflow		notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ 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				classification symbols and soil description based on unified classification system moisture D dry M moist W wet W _p plastic limit W _L liquid limit				consistency/density index 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			

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud N nil C casing penetration 1 2 3 4  no resistance ranging to refusal water 10/1/98 water level on date shown  water inflow water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ 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	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit	consistency/density index 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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Borehole No. **BH92**

Engineering Log - Borehole

Client: **BROWN CONSULTING (QLD) PTY LTD**

Principal:

Project: **BELLVISTA 2**

Borehole Location: **REFER TO SITE PLAN**

Sheet 1 of 1

Project No: **GEOTKPAR01560AA**Date started: **16.5.2009**Date completed: **16.5.2009**

Logged by: **DF**

Checked by: **RFM**

drill model and mounting:				EDSON CPI		Easting: 508980.639		slope: -90°		R.L. Surface: 2.872						
hole diameter:				100 mm		Northing: 7034926.036		bearing:		datum: GDA94						
drilling information						material substance										
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa 100 200 300 400	structure and additional observations	
	1	2	3													
ADT				N								L	L			
								2		SM	SILTY SAND: fine to medium grained, dark grey, trace of organics.					
								1		SP	SAND: fine to medium grained, pale grey. ...colour changing to dark brown.	M/W	MD			
										SC	CLAYEY SAND: fine to medium grained, pale grey and pale brown, medium plasticity fines.	M				
										CH	SANDY CLAY: medium to high plasticity, pale grey and pale brown. ...colour changing to pale grey.		St	X	DIST PP=150kPa	
													VSt	X	DIST PP=240kPa	

Borehole No. **BH93**

Engineering Log - Borehole

Client: **BROWN CONSULTING (QLD) PTY LTD**

Principal:

Sheet 1 of 1

Project No: **GEOTKPAR01560AA**Date started: **16.5.2009**Date completed: **16.5.2009**Project: **BELLVISTA 2**

Logged by: **DF**

Borehole Location: **REFER TO SITE PLAN**

Checked by: **RFM**

drill model and mounting:		EDSON CPI		Easting: 509019.054		slope: -90°		R.L. Surface: 2.576							
hole diameter:		100 mm		Northing 7034793.189		bearing:		datum: GDA94							
drilling information					material substance										
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations
ADT	1	2	3	N								M	L		
								2		SP	SILTY SAND: fine to medium grained, dark grey, trace of organics.		MD		
								1		SP	SAND: fine to medium grained, dark grey, trace of silt. ...colour changing to grey.	W			
										CH	SAND: fine to medium grained, pale grey and brown, trace of clay fines.				
						ASS					SANDY CLAY: medium to high plasticity, pale grey and pale brown, fine to medium grained sand. ...colour changing to pale grey.	M	St/VSt	X	DIST PP=150kPa
								-1						X	DIST PP=220kPa
								0						X	DIST PP=240kPa
								3							
								-1							
								4							
								-2							
								5		SC	CLAYEY SAND: fine to coarse grained, pale grey, medium plasticity fines, trace of medium grained gravel.	W	MD		
								-3							
								6							
								-4			Borehole BH93 terminated at 6m				LIMIT OF INVESTIGATION
								7							
								-5							
								8							
method				support		notes, samples, tests		classification symbols and soil description				consistency/density index			
AS auger screwing*				M mud N nil		U ₅₀ undisturbed sample 50mm diameter				VS very soft					
AD auger drilling*				C casing		U ₆₃ undisturbed sample 63mm diameter				S soft					
RR roller/tricone						D disturbed sample				F firm					
W washbore						N standard penetration test (SPT)				St stiff					
CT cable tool						N* SPT - sample recovered				VSt very stiff					
HA hand auger						Nc SPT with solid cone				H hard					
DT diatube						V vane shear (kPa)				Fb friable					
B blank bit						P pressuremeter				VL very loose					
V V bit						Bs bulk sample				L loose					
T TC bit						E environmental sample				MD medium dense					
*bit shown by suffix e.g. ADT						R refusal				D dense					
										VD very dense					

Borehole No. **BH94**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTKPAR01560AA**

Client: **BROWN CONSULTING (QLD) PTY LTD**

Date started: **15.5.2009**

Principal:

Date completed: **15.5.2009**

Project: **BELLVISTA 2**

Logged by: **DF**

Borehole Location: **REFER TO SITE PLAN**

Checked by:

drill model and mounting: EDSON CPI Easting: 509131.338 slope: -90° R.L. Surface: 2.500
hole diameter: 100 mm Northing 7034850.219 bearing: datum: GDA94

drilling information					material substance											
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations	
	1	2	3													
ADT				N						SM	SILTY SAND: fine to medium grained, dark grey, trace of organics.	M	L			
							2			SP	SAND: fine to medium grained, dark grey/brown, trace of silt.		MD			
							1				...trace of clay fines.	D/M	VD			
												M	MD			
							1			CH	SANDY CLAY: medium to high plasticity, pale grey and pale brown, fine to medium grained sand. ...high plasticity, colour changing to pale grey.		VSt	x		DIST PP=220kPa
							2				...medium to high plasticity.					
							0							x		DIST PP=230kPa
						ASS	3									
							-1									
							4			CL	SANDY CLAY: medium plasticity, pale grey, fine to medium grained sand.		St/VSt			
							-2							x		DIST PP=200kPa
							5			SC	CLAYEY SAND: fine to medium grained, pale grey, medium plasticity fines.	W	MD			
							-3			SP	SAND: fine to medium grained, pale grey, trace of clay fines.					
							6			SC	CLAYEY SAND: fine to medium grained, pale grey, medium plasticity fines.					
							-4				Borehole BH94 terminated at 6m					LIMIT OF INVESTIGATION
							7									
							-5									
							8									

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud C casing penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ 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	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit	consistency/density index 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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Borehole No. **BH95**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTKPAR01560AA**

Client: **BROWN CONSULTING (QLD) PTY LTD**

Date started: **13.5.2009**

Principal:

Date completed: **13.5.2009**

Project: **BELLVISTA 2**

Logged by: **DF**

Borehole Location: **REFER TO SITE PLAN**

Checked by: **RFM**

drill model and mounting: EDSON CPI Easting: 508482.21 slope: -90° R.L. Surface: 5.095
hole diameter: 100 mm Northing 7035318.883 bearing: datum: GDA94

drilling information						material substance												
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa				structure and additional observations
	1	2	3											100	200	300	400	
ADT				N			-5			SM	SILTY SAND: fine to medium grained, dark grey, trace of organics.	M	L					DIST PP=220kPa <

Borehole No. **BH96**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTKPAR01560AA**

Client: **BROWN CONSULTING (QLD) PTY LTD**

Date started: **13.5.2009**

Principal:

Date completed: **13.5.2009**

Project: **BELLVISTA 2**

Logged by: **DF**

Borehole Location: **REFER TO SITE PLAN**

Checked by: **RFM**

drill model and mounting: EDSON CPI Easting: 508527.001 slope: -90° R.L. Surface: 4.065
hole diameter: 100 mm Northing 7035131.406 bearing: datum: GDA94

drilling information						material substance											
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter			structure and additional observations
	1	2	3											kPa	300	400	
ADT		N		ASS		3	1	SM	SILTY SAND: fine to medium grained, dark grey, with organics present.	M	L	×	DIST PP=240kPa				
						1	SP	SAND: fine to medium grained, dark grey, trace of silt. ...colour changing to dark brown.		MD							
						2	SP	SAND: fine to medium grained, grey. ...colour changing to pale grey. ...colour changing to brown and grey.	W								
						2	SC	CLAYEY SAND: fine to medium grained, orange/red and pale grey, low plasticity fines.	M								
						1	CH	SANDY CLAY: medium to high plasticity, pale grey, fine to medium grained sand.		VSt							
						3	SC	CLAYEY SAND: fine to medium grained, pale grey and orange, medium plasticity fines.	W	MD							
						4	SP	SAND: fine to medium grained, pale grey, trace of clay fines.									
						0	4	Borehole BH96 terminated at 4m							LIMIT OF INVESTIGATION		
						-1	5										
						-2	6										
						-3	7										
							8										

method	support	notes, samples, tests	classification symbols and soil description	consistency/density index
AS AD RR W CT HA DT B V T *bit shown by suffix e.g. ADT	M mud C casing penetration 1 2 3 4  water 10/1/98 water level on date shown water inflow water outflow	U ₅₀ undisturbed sample 50mm diameter U ₆₃ 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	based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit	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

Borehole No. **BH97**

Engineering Log - Borehole

Client: **BROWN CONSULTING (QLD) PTY LTD**

Principal:

Project: **BELLVISTA 2**

Borehole Location: **REFER TO SITE PLAN**

Sheet 1 of 1

Project No: **GEOTKPAR01560AA**Date started: **12.5.2009**Date completed: **12.5.2009**

Logged by: **DF**

Checked by:

[illegible]

Borehole No. **BH98**

Engineering Log - Borehole

Client: **BROWN CONSULTING (QLD) PTY LTD**

Principal:

Project: **BELLVISTA 2**

Borehole Location: **REFER TO SITE PLAN**

Sheet 1 of 1

Project No: **GEOTKPAR01560AA**Date started: **16.5.2009**Date completed: **16.5.2009**

Logged by: **DF**

Checked by: **RFM**

drill model and mounting:						EDSON CPI		Easting:		508724.357		slope:		-90°		R.L. Surface:		3.319											
hole diameter:						100 mm		Northing:		7034960.332		bearing:				datum:		GDA94											
drilling information										material substance																			
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations														
	1	2	3																										
ADT				N			-3			SM	SILTY SAND: fine to medium grained, dark grey, trace of organics.	M	L																
										SP	SAND: fine to medium grained, dark brown, trace of silt.		MD																
										SP	SAND: fine to medium grained, pale grey/brown, trace of silt and gravel.	W																	
							1			SC	CLAYEY SAND: fine to medium grained, pale grey and pale brown/orange, medium plasticity fines.	M																	
							2			CH	SANDY CLAY: medium to high plasticity, pale grey and red, fine to medium grained sand.		St																
							2			SC	CLAYEY SAND: fine to medium grained, pale grey and red, low plasticity fines.	W	MD																
							1			SP	SAND: fine to medium grained, pale grey, with clay fines.																		
							3			SC	CLAYEY SAND: fine to medium grained, pale grey, medium plasticity fines.																		
							0																						
							4			SP	SAND: fine to medium grained, pale grey, with clay fines.																		
							-1				Borehole BH98 terminated at 4m					LIMIT OF INVESTIGATION													
							5																						
							-2																						
							6																						
							-3																						
							7																						
							-4																						
							8																						
method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT						support M mud N nil C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow						notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ 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						classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit						consistency/density index 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					

Borehole No. **BH99**

Engineering Log - Borehole

Client: **BROWN CONSULTING (QLD) PTY LTD**

Principal:

Project: **BELLVISTA 2**

Borehole Location: **REFER TO SITE PLAN**

Sheet 1 of 1

Project No: **GEOTKPAR01560AA**Date started: **16.5.2009**Date completed: **16.5.2009**

Logged by: **DF**

Checked by:

drill model and mounting:						EDSON CPI		Easting:		508919.582		slope:		-90°		R.L. Surface:		2.651	
hole diameter:						100 mm		Northing:		7034978.656		bearing:				datum:		GDA94	
drilling information						material substance													
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations				
	1	2	3																
ADT			N			-2	1		SM	SILTY SAND: fine to medium grained, dark grey, trace of organics.	M	L	St/VSt	X	DIST PP=150kPa				
									SP	SAND: fine to medium grained, grey, trace of silt.									
									CH	SANDY CLAY: high plasticity, pale grey. ...medium to high plasticity. ...high plasticity.									
									SC	CLAYEY SAND: fine to medium grained, pale grey, medium plasticity fines.	W	MD	X	DIST PP=260kPa					
Borehole BH99 terminated at 4m															LIMIT OF INVESTIGATION				

Borehole No. **BH101**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTKPAR01560AA**

Client: **BROWN CONSULTING (QLD) PTY LTD**

Date started: **16.5.2009**

Principal:

Date completed: **16.5.2009**

Project: **BELLVISTA 2**

Logged by: **DF**

Borehole Location: **REFER TO SITE PLAN**

Checked by: **RFM**

drill model and mounting: EDSON CPI Easting: 508944.467 slope: -90° R.L. Surface: 3.237
hole diameter: 100 mm Northing 7034768.505 bearing: datum: GDA94

drilling information						material substance																								
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa			structure and additional observations													
	1	2	3											100	200	300		400												
ADT		1	2	3	N	ASS	-3		SM	SILTY SAND: fine to medium grained, dark grey, trace of organics.	M	L					DIST PP=160kPa DIST PP=200kPa DIST PP=260kPa DIST PP=250kPa													
							SP		SAND: fine to medium grained, dark grey, trace of silt. ...colour changing to pale grey and pale brown, trace of gravel.	W	MD																			
							SC		CLAYEY SAND: fine to medium grained, pale brown and orange, low plasticity fines.	M	St																			
							CH		SANDY CLAY: medium to high plasticity, pale brown/orange and pale grey, fine to medium grained sand. ...high plasticity, colour changing to pale grey and red.	VSt																				
							SC		CLAYEY SAND: fine to medium grained, pale grey, medium plasticity fines.		W	MD																		
							SP		SAND: fine to medium grained, pale grey.																					
							Borehole BH101 terminated at 4m																							
							-1																							
							5																							
							-2																							
6																														
-3																														
7																														
-4																														
8																														

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud N nil C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ 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	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit	consistency/density index 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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Borehole No. **BH102**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTKPAR01560AA**

Client: **BROWN CONSULTING (QLD) PTY LTD**

Date started: **15.5.2009**

Principal:

Date completed: **15.5.2009**

Project: **BELLVISTA 2**

Logged by: **DF**

Borehole Location: **REFER TO SITE PLAN**

Checked by: **RFM**

drill model and mounting: EDSON CPI Easting: 509041.233 slope: -90° R.L. Surface: 2.553
hole diameter: 100 mm Northing 7034866.612 bearing: datum: GDA94

drilling information						material substance													
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter				structure and additional observations	
	1	2	3											100 kPa	200 kPa	300 kPa	400 meter		
ADT				N								M	L						
							2			SM	SILTY SAND: fine to medium grained, dark grey, trace of organics.								
										SP	SAND: fine to medium grained, dark grey, trace of silt.		MD						
								1		SP	SAND: fine to medium grained, grey/brown. ...colour changing to pale brown/orange. ...colour changing to grey.	W							
						ASS		1											
							2			CH	SANDY CLAY: medium to high plasticity, pale grey, fine to medium grained sand.	M	St			X		DIST PP=150kPa	
								0											
							3						VSt				X		DIST PP=250kPa
								-1											
							4			CL	SANDY CLAY: medium plasticity, pale grey, fine to medium grained sand.		St						
											Borehole BH102 terminated at 4m								LIMIT OF INVESTIGATION
								-2											
							5												
								-3											
							6												
								-4											
							7												
								-5											
							8												

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud N nil C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ 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	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit	consistency/density index 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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Borehole No. **BH103**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTKPAR01560AA**

Client: **BROWN CONSULTING (QLD) PTY LTD**

Date started: **9.5.2009**

Principal:

Date completed: **9.5.2009**

Project: **BELLVISTA 2**

Logged by: **DF**

Borehole Location: **REFER TO SITE PLAN**

Checked by: **RFM**

drill model and mounting: EDSON CPI Easting: 508594.606 slope: -90° R.L. Surface: 4.393
hole diameter: 100 mm Northing 7035231.399 bearing: datum: GDA94

drilling information					material substance									
method	penetration	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations	
ADT	1 2 3	N						SM	SILTY SAND: fine to medium grained, dark grey, trace of organics.	M	L		DIST PP=200kPa DIST PP=180kPa	
					4	1		SP	SAND: fine to medium grained, pale brown and pale grey, trace of silt. ...trace of gravel.	W	MD			
					3	2		SC	SANDY CLAY: fine to medium grained, pale grey and orange, medium plasticity fines.	M	St			
					2	3		CL	SANDY CLAY: medium plasticity, pale grey and orange/red, fine to medium grained sand. ...colour changing to pale grey.					
					2	3		SP	SAND: fine to medium grained, pale grey, trace of clay fines.	W	MD			
Borehole BH103 terminated at 3m														LIMIT OF INVESTIGATION
					1	4								
					0	5								
					-1	6								
					-2	7								
					-3	8								

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ 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	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit	consistency/density index 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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Borehole No. **BH104**

Engineering Log - Borehole

Client: **BROWN CONSULTING (QLD) PTY LTD**

Principal:

Project: **BELLVISTA 2**

Borehole Location: **REFER TO SITE PLAN**

Sheet 1 of 1

Project No: **GEOTKPAR01560AA**

Date started: **9.5.2009**

Date completed: **9.5.2009**

Logged by: **DF**

Checked by: **RFM**

drill model and mounting:				EDSON CPI		Easting: 508620.062		slope: -90°		R.L. Surface: 4.201							
hole diameter:				100 mm		Northing 7035092.394		bearing:		datum: GDA94							
drilling information							material substance										
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations		
	1	2	3														
ADT				N			-4			SM	SILTY SAND: fine to medium grained, dark grey, trace of organics.	M	L				
										SM	SILTY SAND: fine to medium grained, dark grey.		MD				
								1		SP	SAND: fine to medium grained, dark grey/brown, trace of silt. ...colour changing to pale brown.	W					
						ASS	-3			CH	SANDY CLAY: fine to medium grained, pale grey and pale brown/orange, fine grained sand. ...colour changing to pale grey and red.	M	VSt	X		DIST PP=220kPa	
								2									
							-2							X		DIST PP=250kPa	
								3						X		DIST PP=280kPa	
							-1				Borehole BH104 terminated at 3m					LIMIT OF INVESTIGATION	
							4										
							-0										
							5										
							-1										
							6										
							-2										
							7										
							-3										
							8										
method		support				notes, samples, tests		classification symbols and soil description				consistency/density index					
AS AD RR W CT HA DT B V T		auger screwing* auger drilling* roller/tricone washbore cable tool hand auger diatube blank bit V bit TC bit				M mud C casing penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow		N nil U ₅₀ undisturbed sample 50mm diameter U ₆₃ 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		based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit				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			
*bit shown by suffix e.g. ADT																	

Borehole No. **BH105**

Engineering Log - Borehole

Client: **BROWN CONSULTING (QLD) PTY LTD**

Principal:

Project: **BELLVISTA 2**

Borehole Location: **REFER TO SITE PLAN**

Sheet 1 of 1

Project No: **GEOTKPAR01560AA**Date started: **12.5.2009**Date completed: **12.5.2009**

Logged by: **DF**

Checked by: **RFM**

drill model and mounting:				EDSON CPI				Easting: 508723.516				slope: -90°				R.L. Surface: 3.568																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
hole diameter:				100 mm				Northing: 7035060.186				bearing:				datum: GDA94																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
drilling information								material substance																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa 100 200 300 400	structure and additional observations																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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ADT				N								M	L																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										

Borehole No. **BH106**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTKPAR01560AA**

Client: **BROWN CONSULTING (QLD) PTY LTD**

Date started: **12.5.2009**

Principal:

Date completed: **12.5.2009**

Project: **BELLVISTA 2**

Logged by: **DF**

Borehole Location: **REFER TO SITE PLAN**

Checked by: **RFM**

drill model and mounting: EDSON CPI Easting: 508847.031 slope: -90° R.L. Surface: 3.365
hole diameter: 100 mm Northing 7035109.224 bearing: datum: GDA94

drilling information						material substance									
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations
	1	2	3												
ADT				N			3			SM	SILTY SAND: fine to medium grained, dark grey, trace of organics.	M	L		
										SP	SAND: fine to medium grained, pasle grey and brown. ...trace of silt.	M/W	MD		
							1			SC	CLAYEY SAND: fine to medium grained, pale grey, medium plasticity fines.	M	St	x	DIST PP=150kPa
							2			CH	SANDY CLAY: medium to high plasticity, pale grey and red, fine to medium grained sand.		VSt	x	DIST PP=260kPa
							2							x	DIST PP=300kPa
							1								
							3								
							0				Borehole BH106 terminated at 3m				LIMIT OF INVESTIGATION
							4								
							-1								
							5								
							-2								
							6								
							-3								
							7								
							-4								
							8								
method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT						support M mud N nil C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow		notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ 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				classification symbols and soil description based on unified classification system moisture D dry M moist W wet W _p plastic limit W _L liquid limit		consistency/density index 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	

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud N nil C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ 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	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit	consistency/density index 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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Borehole No. **BH107**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTKPAR01560AA**

Client: **BROWN CONSULTING (QLD) PTY LTD**

Date started: **12.5.2009**

Principal:

Date completed: **12.5.2009**

Project: **BELLVISTA 2**

Logged by: **DF**

Borehole Location: **REFER TO SITE PLAN**

Checked by: **RFM**

drill model and mounting: EDSON CPI Easting: 508715.242 slope: -90° R.L. Surface: 3.513
hole diameter: 100 mm Northing 7034897.495 bearing: datum: GDA94

drilling information					material substance									
method	penetration	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations	
ADT	1 2 3	N						SM	SILTY SAND: fine to medium grained, dark grey, trace of organics.	M	MD			
					3			SP	SAND: fine to medium grained, pale brown, trace of silt.	M/W				
					1			SP	SAND: fine to medium grained, pale brown and orange, with clay fines.	W				
					2			SC	CLAYEY SAND: fine to medium grained, pale brown and red, low plasticity fines, trace of fine grained gravel.	M/W				
					2			CH	SANDY CLAY: medium to high plasticity, pale grey and pale brown, fine to medium grained sand, trace of gravel.	M	St			
					2			CH	SANDY SILTY CLAY: high plasticity, pale grey, fine to medium grained sand.		VSt			
					1									
					3									
					0				Borehole BH107 terminated at 3m					LIMIT OF INVESTIGATION
					4									
					-1									
					5									
					-2									
					6									
					-3									
					7									
					-4									
					8									

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud N nil C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ 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	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit	consistency/density index 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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Borehole No. **BH108**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTKPAR01560AA**

Client: **BROWN CONSULTING (QLD) PTY LTD**

Date started: **12.5.2009**

Principal:

Date completed: **12.5.2009**

Project: **BELLVISTA 2**

Logged by: **DF**

Borehole Location: **REFER TO SITE PLAN**

Checked by: **RFM**

drill model and mounting: EDSON CPI Easting: 508803.648 slope: -90° R.L. Surface: 3.421
hole diameter: 100 mm Northing 7034985.015 bearing: datum: GDA94

drilling information						material substance																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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ADT				N						SM	SILTY SAND: fine to medium grained, dark grey, trace of organics.	M	L																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														</

Borehole No. **BH109**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTKPAR01560AA**

Client: **BROWN CONSULTING (QLD) PTY LTD**

Date started: **12.5.2009**

Principal:

Date completed: **12.5.2009**

Project: **BELLVISTA 2**

Logged by: **DF**

Borehole Location: **REFER TO SITE PLAN**

Checked by: **RFM**

drill model and mounting: EDSON CPI Easting: 508797.886 slope: -90° R.L. Surface: 3.413
hole diameter: 100 mm Northing 7034805.5 bearing: datum: GDA94

drilling information						material substance																							
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations														
	1	2	3																										
ADT				N								M	L																
							3			SP	SILTY SAND: fine to medium grained, dark grey, trace of organics.	W	MD																
							1			SP	SAND: fine to medium grained, pale brown, trace of silt.	M/W																	
							2			SC	SAND: fine to medium grained, brown, trace of silt and clay.	M																	
							2			CL	CLAYEY SAND: fine to medium grained, pale brown/grey and red, medium plasticity fines.		St	x	DIST PP=150kPa														
							2			CH	SANDY CLAY: medium plasticity, pale grey, fine to medium grained sand.		VSt	x	DIST PP=220kPa														
							1				SANDY CLAY: medium to high plasticity, pale grey, fine to medium grained sand.			x	DIST PP=260kPa														
							3							x	DIST PP=280kPa														
							0				Borehole BH109 terminated at 3m				DIST PP=280kPa LIMIT OF INVESTIGATION														
							4																						
							-1																						
							5																						
							-2																						
							6																						
							-3																						
							7																						
							-4																						
							8																						
method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT						support M mud N nil C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow						notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ 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						classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit						consistency/density index 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					

Borehole No. **BH110**

Engineering Log - Borehole

Client: **BROWN CONSULTING (QLD) PTY LTD**

Principal:

Sheet 1 of 1

Project No: **GEOTKPAR01560AA**Date started: **16.5.2009**Date completed: **16.5.2009**Project: **BELLVISTA 2**

Logged by: **DF**

Borehole Location: **REFER TO SITE PLAN**

Checked by: **RFM**

drill model and mounting:						EDSON CPI		Easting:		508949.336		slope:		-90°		R.L. Surface:		2.719					
hole diameter:						100 mm		Northing:		7034852.051		bearing:				datum:		GDA94					
drilling information										material substance													
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa 100 200 300 400	structure and additional observations								
	1	2	3																				
ADT				N		ASS				SM	SILTY SAND: fine to medium grained, dark grey, trace of organics.	M/W	L										
							-2	1		SP	SAND: fine to medium grained, dark grey, trace of silt.	W	MD										
							-1	2		SP	SAND: fine to medium grained, pale grey.												
							-2			SC	CLAYEY SAND: fine to medium grained, pale grey, medium plasticity fines.	M											
							-2			CH	SANDY CLAY: high plasticity, pale grey, fine to medium grained sand. ...medium to high plasticity.		VSt	X				DIST PP=250kPa					
							-0			SC	CLAYEY SAND: fine to medium grained, pale grey, medium plasticity fines.		St	X				DIST PP=180kPa					
							-3						MD										
							-1	4			Borehole BH110 terminated at 3m							LIMIT OF INVESTIGATION					
							-2	5															
							-3	6															
							-4	7															
							-5	8															
method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT						support M mud N nil C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow				notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ 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						classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit				consistency/density index 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			

Borehole No. **BH111**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTKPAR01560AA**

Client: **BROWN CONSULTING (QLD) PTY LTD**

Date started: **15.5.2009**

Principal:

Date completed: **15.5.2009**

Project: **BELLVISTA 2**

Logged by: **DF**

Borehole Location: **REFER TO SITE PLAN**

Checked by: **RFM**

drill model and mounting: EDSON CPI Easting: 509087.238 slope: -90° R.L. Surface: 1.913
hole diameter: 100 mm Northing 7034820.414 bearing: datum: GDA94

drilling information						material substance																							
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations														
	1	2	3																										
ADT				N						SM	SILTY SAND: fine to medium grained, dark grey, trace of organics.	W	L																
								1		SP	SAND: fine to medium grained, pale grey and pale brown, trace of silt. ...colour changing to pale grey.		MD																
								1		SC	CLAYEY SAND: fine to medium grained, pale grey, medium plasticity fines.		D																
								2		CH	SANDY CLAY: high plasticity, pale grey, fine to medium grained sand. ...medium to high plasticity.	M	VSt																
								3																					
								4			Borehole BH111 terminated at 3m																		
								5																					
								6																					
								7																					
								8																					
method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT						support M mud N nil C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow						notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ 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						classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit						consistency/density index 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					

Dynamic Cone Penetrometer

Client	BROWN CONSULTING (QLD) PTY LTD			Hammer Mass	9.1± 0.1 kg	
Principal				Hammer Drop	510 ☒	600 ☐
Project	BELLVISTA 2			Cone	☒	Blunted ☐
Location	REFER TO SITE PLAN			By	DF	date
Test Location:		BH80	BH81	BH82		BH84
Depth (m)		13-May-09	13-May-09	13-May-09		19-May-09
0.1		1	1	1		1
0.2		1	1	1		1
0.3		2	2	1		1
0.4		4	4	1		1
0.5		18	18	2		1
0.6		>20	>20	2		1
0.7				2		2
0.8				2		2
0.9				5		2
1.0				4		3
1.1				5		3
1.2				5		3
1.3				4		3
1.4				5		3
1.5				5		4
1.6						
1.7						
1.8						
1.9						
2.0						
2.1						
2.2						
2.3						
2.4						
2.5						
2.6						
2.7						
2.8						
2.9						
3.0						
3.1						
3.2						
3.3						
3.4						
3.5						
3.6						
3.7						
Remarks:						
Unit 1/36 Kerryl Street, KUNDA PARK, Qld 4556 PH: (07) 5445 4952 FAX: (07) 5445 3764						

Dynamic Cone Penetrometer

Client	BROWN CONSULTING (QLD) PTY LTD			Hammer Mass	9.1± 0.1 kg	
Principal				Hammer Drop	510 ☒	600 ☐
Project	BELLVISTA 2			Cone	☒	Blunted ☐
Location	REFER TO SITE PLAN			By	DF	date
Test Location:	BH85	BH86			BH89	
Depth (m)	13-May-09	15-May-09			16-May-09	
0.1	1	1			1	
0.2	2	1			1	
0.3	2	1			1	
0.4	3	2			2	
0.5	3	3			2	
0.6	4	3			2	
0.7	4	3			3	
0.8	5	3			3	
0.9	2	4			3	
1.0	2	3			3	
1.1	3	3			4	
1.2	4	4			4	
1.3	5	4			4	
1.4	5	4			5	
1.5	6	4			4	
1.6						
1.7						
1.8						
1.9						
2.0						
2.1						
2.2						
2.3						
2.4						
2.5						
2.6						
2.7						
2.8						
2.9						
3.0						
3.1						
3.2						
3.3						
3.4						
3.5						
3.6						
3.7						
Remarks:						
Unit 1/36 Kerryll Street, KUNDA PARK, Qld 4556 PH: (07) 5445 4952 FAX: (07) 5445 3764						

Dynamic Cone Penetrometer

Client	BROWN CONSULTING (QLD) PTY LTD			Hammer Mass	9.1± 0.1 kg	
Principal				Hammer Drop	510 ☒	600 ☐
Project	BELLVISTA 2			Cone	☒	Blunted ☐
Location	REFER TO SITE PLAN			By	DF	date
Test Location:	BH91	BH92	BH93	BH94	BH95	BH96
Depth (m)	16-May-09	16-May-09	16-May-09	15-May-09	13-May-09	13-May-09
0.1	1	1	1	1	1	1
0.2	1	1	2	2	1	1
0.3	1	2	2	4	1	1
0.4	1	1	3	12	1	2
0.5	1	2	2	>20	2	2
0.6	2	2	3		2	2
0.7	1	3	4		2	2
0.8	2	3	4		3	3
0.9	2	3	4		10	3
1.0	3	4	5		11	4
1.1	3	4	9		12	4
1.2	3	5	10			4
1.3	3	6	12			5
1.4	4	4				5
1.5	4	5				5
1.6		6				
1.7						
1.8						
1.9						
2.0						
2.1						
2.2						
2.3						
2.4						
2.5						
2.6						
2.7						
2.8						
2.9						
3.0						
3.1						
3.2						
3.3						
3.4						
3.5						
3.6						
3.7						
Remarks:						
Unit 1/36 Kerryll Street, KUNDA PARK, Qld 4556 PH: (07) 5445 4952 FAX: (07) 5445 3764						

Dynamic Cone Penetrometer

Client	BROWN CONSULTING (QLD) PTY LTD			Hammer Mass	9.1± 0.1 kg	
Principal				Hammer Drop	510 ☒	600 ☐
Project	BELLVISTA 2			Cone	☒	Blunted ☐
Location	REFER TO SITE PLAN			By	DF	date
Test Location:	BH97	BH98	BH99		BH101	BH102
Depth (m)	12-May-09	16-May-09	16-May-09		16-May-09	15-May-09
0.1	1	1	1		1	1
0.2	1	2	1		1	1
0.3	2	3	1		1	1
0.4	3	4	1		1	1
0.5	8	2	1		1	2
0.6	10	1	2		2	3
0.7	18	1	3		2	3
0.8	>20	2	3		2	4
0.9		2	3		3	8
1.0		3	3		3	5
1.1		3	3		3	6
1.2		4	4		3	5
1.3		4	4		4	6
1.4		4	6		4	6
1.5		5	6		4	6
1.6						
1.7						
1.8						
1.9						
2.0						
2.1						
2.2						
2.3						
2.4						
2.5						
2.6						
2.7						
2.8						
2.9						
3.0						
3.1						
3.2						
3.3						
3.4						
3.5						
3.6						
3.7						
Remarks:						
Unit 1/36 Kerryll Street, KUNDA PARK, Qld 4556 PH: (07) 5445 4952 FAX: (07) 5445 3764						

Dynamic Cone Penetrometer

Client	BROWN CONSULTING (QLD) PTY LTD			Hammer Mass	9.1± 0.1 kg	
Principal				Hammer Drop	510 ☒	600 ☐
Project	BELLVISTA 2			Cone	☒	Blunted ☐
Location	REFER TO SITE PLAN			By	DF	date
Test Location:	BH103	BH104	BH105	BH106	BH107	BH108
Depth (m)	09-May-09	09-May-09	12-May-09	12-May-09	12-May-09	12-May-09
0.1	1	1	1	1	1	1
0.2	1	1	1	1	2	1
0.3	1	2	1	1	1	1
0.4	1	2	1	1	2	1
0.5	2	2	2	1	1	1
0.6	1	3	2	2	1	2
0.7	1	3	3	2	1	2
0.8	1	3	3	2	2	2
0.9	2	3	4	2	3	2
1.0	3	4	5	3	3	3
1.1	3	6	7	3	3	3
1.2	3	7	8	4	4	3
1.3	4	7	8	4	4	3
1.4	4	8	10	5	5	4
1.5	5	8		5	5	4
1.6						
1.7						
1.8						
1.9						
2.0						
2.1						
2.2						
2.3						
2.4						
2.5						
2.6						
2.7						
2.8						
2.9						
3.0						
3.1						
3.2						
3.3						
3.4						
3.5						
3.6						
3.7						
Remarks:						
Unit 1/36 Kerryll Street, KUNDA PARK, Qld 4556 PH: (07) 5445 4952 FAX: (07) 5445 3764						

Dynamic Cone Penetrometer

Client	BROWN CONSULTING (QLD) PTY LTD			Hammer Mass	9.1± 0.1 kg	
Principal				Hammer Drop	510 ☒	600 ☐
Project	BELLVISTA 2			Cone	☒	Blunted ☐
Location	REFER TO SITE PLAN			By	DF	date
Test Location:	BH109	BH110	BH111			
Depth (m)	12-May-09	16-May-09	15-May-09			
0.1	1	1	1			
0.2	1	1	1			
0.3	1	1	1			
0.4	1	1	2			
0.5	2	1	2			
0.6	2	1	3			
0.7	3	2	4			
0.8	3	2	5			
0.9	3	3	5			
1.0	4	3	6			
1.1	4	3	8			
1.2	4	3	8			
1.3	5	4	10			
1.4	5	4	10			
1.5	6	4	11			
1.6						
1.7						
1.8						
1.9						
2.0						
2.1						
2.2						
2.3						
2.4						
2.5						
2.6						
2.7						
2.8						
2.9						
3.0						
3.1						
3.2						
3.3						
3.4						
3.5						
3.6						
3.7						
Remarks:						
Unit 1/36 Kerryl Street, KUNDA PARK, Qld 4556 PH: (07) 5445 4952 FAX: (07) 5445 3764						

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		>200 mm
Cobbles		63 mm to 200 mm
Gravel	coarse	20 mm to 63 mm
	medium	6 mm to 20 mm
	fine	2.36 mm to 6 mm
Sand	coarse	600 μ m to 2.36 mm
	medium	200 μ m to 600 μ m
	fine	75 μ m to 200 μ m

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 S_u (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

TERM	DENSITY INDEX (%)
Very loose	Less than 15
Loose	15 - 35
Medium Dense	35 - 65
Dense	65 - 85
Very Dense	Greater than 85

MINOR COMPONENTS

TERM	ASSESSMENT GUIDE	PROPORTION OF MINOR COMPONENT IN:
Trace of	Presence just detectable by feel or eye, but soil properties little or no different to general properties of primary component.	Coarse grained soils: <5% Fine grained soils: <15%
With some	Presence easily detected by feel or eye, soil properties little different to general properties of primary component.	Coarse grained soils: 5 - 12% Fine grained soils: 15 - 30%

SOIL STRUCTURE

ZONING	CEMENTING
Layers Continuous across exposure or sample.	Weakly cemented Easily broken up by hand in air or water.
Lenses Discontinuous layers of lenticular shape.	Moderately cemented Effort is required to break up the soil by hand in air or water.
Pockets Irregular inclusions of different material.	

GEOLOGICAL ORIGIN

WEATHERED IN PLACE SOILS

Extremely weathered material Structure and fabric of parent rock visible.

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.

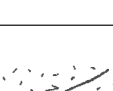
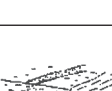
Soil Description Explanation Sheet (2 of 2)

SOIL CLASSIFICATION INCLUDING IDENTIFICATION AND DESCRIPTION

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 60 mm and basing fractions on estimated mass)					USC	PRIMARY NAME
COARSE GRAINED SOILS More than 50% of materials less than 63 mm is larger than 0.075 mm	GRAVELS More than half of coarse fraction is larger than 2.0 mm	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.		GW	GRAVEL
			Predominantly one size or a range of sizes with more intermediate sizes missing.		GP	GRAVEL
		GRAVELS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below)		GM	SILTY GRAVEL
			Plastic fines (for identification procedures see CL below)		GC	CLAYEY GRAVEL
	SANDS More than half of coarse fraction is smaller than 2.0 mm	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate sizes		SW	SAND
			Predominantly one size or a range of sizes with some intermediate sizes missing.		SP	SAND
		SANDS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).		SM	SILTY SAND
			Plastic fines (for identification procedures see CL below).		SC	CLAYEY SAND
FINE GRAINED SOILS More than 50% of material less than 63 mm is smaller than 0.075 mm	SILTS & CLAYS Liquid limit less than 50	IDENTIFICATION PROCEDURES ON FRACTIONS <0.2 mm.				
		DRY STRENGTH	DILATANCY	TOUGHNESS		
		None to Low	Quick to slow	None	ML	SILT
		Medium to High	None	Medium	CL	CLAY
	SILTS & CLAYS Liquid limit greater than 50	Low to medium	Slow to very slow	Low	OL	ORGANIC SILT
		Low to medium	Slow to very slow	Low to medium	MH	SILT
		High	None	High	CH	CLAY
		Medium to High	None	Low to medium	OH	ORGANIC CLAY
HIGHLY ORGANIC SOILS	Readily identified by colour, odour, spongy feel and frequently by fibrous texture.			Pt	PEAT	
• Low plasticity – Liquid Limit W _L less than 35%. • Medium plasticity – W _L between 35% and 50%.						

• Low plasticity – Liquid Limit W_L less than 35%. • Medium plasticity – W_L between 35% and 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.	
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.		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.	

Appendix B

Laboratory Test Results

California Bearing Ratio

Report No: CBR:KPAR09S-01161

Issue No: 1

This report replaces all previous issues of report no 'CBR:KPAR09S-01161'.

Client: Coffey Geotechnics Pty Ltd
1/36 Kerryll Street
Kunda Park QLD 4558

Principal:

Job No: INFOKPAR00055AA

Project: GEOTKPAR01560AA Bellvista

Lot No: **TRN:**



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Approved Signatory: Leon Rossi
(Geotechnician)
NATA Accredited Laboratory Number: 431
Date of Issue: 11/06/2009

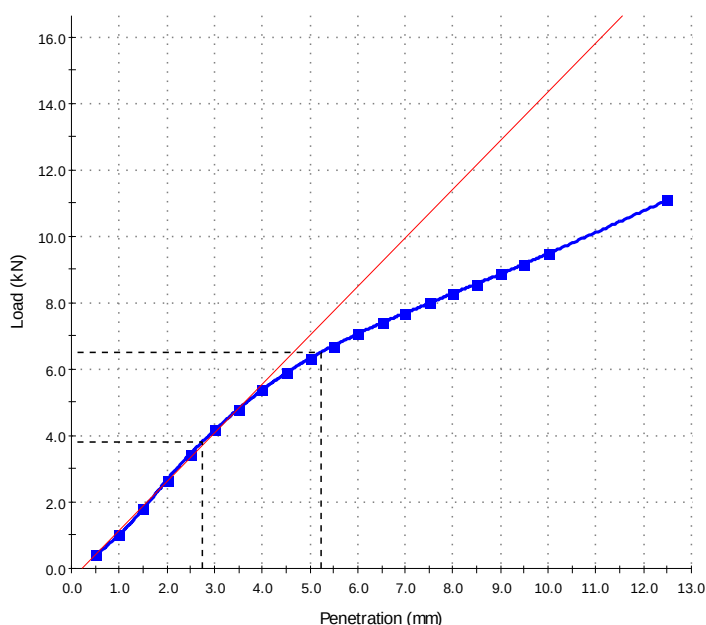
Sample Details

Product:	In-situ	Date Sampled:	26/05/2009
Source:	On-site	Sampling Method:	AS1289.1.2.1 Clause 6.5
Location:	BH84 0.5m - 1.0m	Sample ID:	KPAR09S-01161
Client Ref:	00012		

Test Results

Description	Result
Test Method	AS 1289.6.1.1
Maximum Dry Density (t/m ³)	1.750
Optimum Moisture Content (%)	16.2
CBR 2.5mm (%)	29
CBR 5.0mm (%)	33
Preparation	Soaked
Initial Moisture Content (%)	14.8
Achieved Dry Density (t/m ³)	1.763
Achieved Moisture Content (%)	14.8
Swell (%)	0.2
Period of Soaking (days)	4
Moisture Content of Top 30mm (%)	19.1
Moisture of Penetrated End (%)	19.1
Compaction Type	Standard
Surcharge Mass (kg)	4.50
Laboratory Moisture Ratio After Compaction (%)	91
Laboratory Density Ratio After Compaction (%)	101
Oversize Material	Excluded
Oversize Material (%)	0.0

Chart



CBR (%): 33

Rate of Penetration 1.0

Comments

N/A

California Bearing Ratio

Report No: CBR:KPAR09S-01164

Issue No: 1

This report replaces all previous issues of report no 'CBR:KPAR09S-01164'.

Client: Coffey Geotechnics Pty Ltd
1/36 Kerryll Street
Kunda Park QLD 4558

Principal:

Job No: INFOKPAR00055AA

Project: GEOTKPAR01560AA Bellvista

Lot No: **TRN:**



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Date of Issue: 11/06/2009

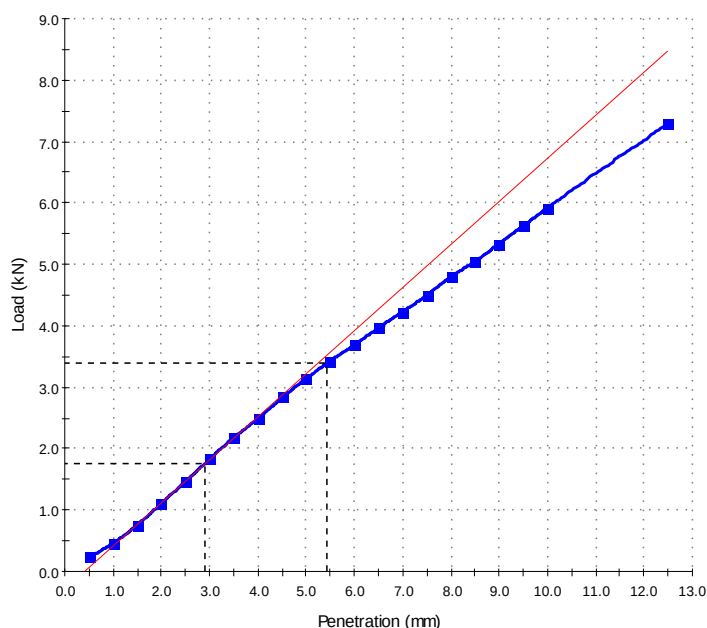
Sample Details

Product:	In-situ	Date Sampled:	26/05/2009
Source:	On-site	Sampling Method:	AS1289.1.2.1 Clause 6.5
Location:	BH96 0.4m - 0.8m	Sample ID:	KPAR09S-01164
Client Ref:	00014		

Test Results

Description	Result
Test Method	AS 1289.6.1.1
Maximum Dry Density (t/m ³)	1.800
Optimum Moisture Content (%)	12.8
CBR 2.5mm (%)	13
CBR 5.0mm (%)	17
Preparation	Soaked
Initial Moisture Content (%)	13.1
Achieved Dry Density (t/m ³)	1.781
Achieved Moisture Content (%)	13.1
Swell (%)	-1.6
Period of Soaking (days)	4
Moisture Content of Top 30mm (%)	15.8
Moisture of Penetrated End (%)	15.8
Compaction Type	Standard
Surcharge Mass (kg)	4.50
Laboratory Moisture Ratio After Compaction (%)	103
Laboratory Density Ratio After Compaction (%)	99
Oversize Material	Excluded
Oversize Material (%)	0.0

Chart



CBR (%): 17

Rate of Penetration 1.0

Comments

N/A

California Bearing Ratio

Report No: CBR:KPAR09S-01163

Issue No: 1

This report replaces all previous issues of report no 'CBR:KPAR09S-01163'.

Client: Coffey Geotechnics Pty Ltd
1/36 Kerryll Street
Kunda Park QLD 4558

Principal:

Job No: INFOKPAR00055AA

Project: GEOTKPAR01560AA Bellvista

Lot No: **TRN:**



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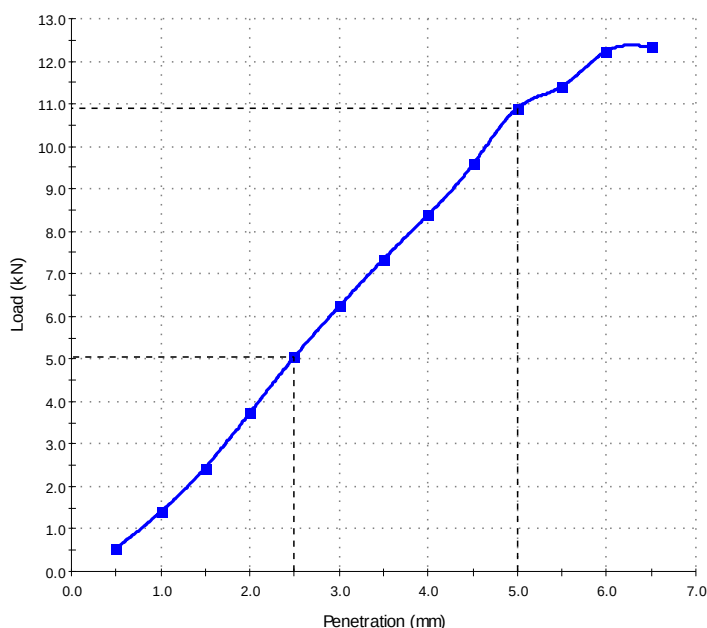
Sample Details

Product:	In-situ	Date Sampled:	26/05/2009
Source:	On-site	Sampling Method:	AS1289.1.2.1 Clause 6.5
Location:	BH107 0.3m - 0.6m	Sample ID:	KPAR09S-01163
Client Ref:	00013		

Test Results

Description	Result
Test Method	AS 1289.6.1.1
Maximum Dry Density (t/m ³)	1.950
Optimum Moisture Content (%)	8.7
CBR 2.5mm (%)	38
CBR 5.0mm (%)	55
Preparation	Soaked
Initial Moisture Content (%)	8.6
Achieved Dry Density (t/m ³)	1.947
Achieved Moisture Content (%)	8.6
Swell (%)	-0.1
Period of Soaking (days)	4
Moisture Content of Top 30mm (%)	9.9
Moisture of Penetrated End (%)	9.9
Compaction Type	Standard
Surcharge Mass (kg)	4.50
Laboratory Moisture Ratio After Compaction (%)	99
Laboratory Density Ratio After Compaction (%)	100
Oversize Material	Excluded
Oversize Material (%)	0.0

Chart



CBR (%): 55

Rate of Penetration 1.0

Comments

N/A