Appendix B
Geological and Groundwater Assessment

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

CHAMPIONS QUARRY - MATERIAL ASSESSMENT OF PROPOSED EXPANSION AREA.

Reaville Farm Pty Ltd
Tucki Tucki

GEOTALST01597AB-AE
15 February 2007

Coffey Geotechnics Pty Ltd ABN 93 056 929 483
4/6 Russelton Drive Alstonville NSW 2477 Australia

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

15 February 2007

Reaville Farm Pty Ltd
Hazelmount Lane
Tucki, NSW 2480A

Attention: Mr Jeff Champion

RE: Champions Quarry - Material Assessment of proposed expansion area

Coffey Geotechnics Pty Ltd is pleased to present our report on the geological investigation for the proposed expansion of the quarry known as Champions Quarry, located at the above site.

We draw your attention to the attached sheet entitled “Important Information About Your Coffey Report” which should be read in conjunction with this report.

We trust that this report meets with your requirements. If you require further information please contact the undersigned in our Alstonville office

For and on behalf of Coffey Geotechnics Pty Ltd

Tom Nicholson

Senior Engineering Geologist

Distribution:	Original held by:	Coffey Geotechnics Pty Ltd (Coffey)
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	3 Copies	Reaville Farm Pty Ltd

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1 INTRODUCTION

Coffey Geotechnics Pty Ltd (Coffey) has conducted a geotechnical assessment for a proposed expansion of Champions Quarry located at Tucki Tucki south of Lismore in New South Wales. The proposed expansion will affect Lot 5 DP857530 94 Hazelmount Lane, Lot 1 DP729118 and Lot 4 DP588125 1568A Whyralla Road, TUcki Tucki.

The aims of the study, which was commissioned by Mr Jeff Champion of Reaville Farm Pty Ltd, were to assess:

- The geological conditions of the site;
- Potential uses of quarry products from the expanded quarry;
- The potential resource of the expanded quarry;

Coffey conducted the work in general accordance with proposal no. GEOTALST01597AB-AD. This report presents the results of the site investigation.

2 SITE DESCRIPTION & PROPOSED DEVELOPMENT

The site of about 10.6ha is situated approximately 7.5 kilometres south of Whyralla near Lismore in Northern New South Wales. The site is bounded to the west by rural holdings and Whyralla Road, and to the east, south and north by rural land, generally used for grazing cattle.

Regionally the site is situated within undulating hills which are separated by relatively flat floored valleys that are in part flood prone. At the existing quarry site the ground slopes moderately to the north east and forms a north east trending local drainage catchments that flows eventually to the south east towards Tucki Swamp. The proposed expansion area comprises two ridge lines and the land north of them and between the ridges. The proposed base of the quarry is anticipated to be no lower than 10m AHD. The existing quarry face crest is located at approximately 25m AHD, and the floor of the existing quarry is located at approximately 16m AHD. Vegetation across the proposed expansion includes improved pastures and sparse tree cover. Figure 1 presents the site contour plan and borehole locations, whilst Figure 2 presents the contour data shaded as a 3D image.

The existing quarry is has an approved extraction volume of 29,000m^3 per annum, extracted from a land area of approximately 2ha, which at DA application stage was estimated to contain a resource of approximately 130,000m^3. We understand that the proposal at the time of writing is to extend extraction authorisation to 200,000 tonnes per annum. The quarry expansion area is part of the 225ha rural farm holding of Reaville Farm Pty Ltd.

Currently the quarry produces a range of fill products that range from general fill for engineering purposes to rural general road base products outside the RTA and Local Government specifications. The product is marketed as having a low reactivity compared to a basalt derived fill, and is known for its propensity to compact well with relatively little compactive effort when compared to the basalt derived materials.

3 FIELDWORK

The drilling investigation fieldwork was carried out over 12 days from 12 October 2007 to 23 October 2007. A further site walkover was conducted on 17 January 2008. The fieldwork program comprised:

- Six cored boreholes (BH1to BH6) which were drilled to from ground surface to depths below 10m AHD;
- Installation of four standpipe piezometers in BH2, BH3, BH5, and BH6 to allow the monitoring of groundwater levels.
- Site walkover observation of existing outcrops, and bailing of piezometers to allow recovery of the groundwater table to confirm the standing groundwater level.

Boreholes were initially progressed through soil strength materials by auger/rotary drilling methods, prior to NMLC coring in rock. The target level for the investigation was below 10m AHD, which has been nominated as the lowest potential level of quarrying activities.

Fieldwork was conducted by an Engineering Geologist from Coffey who logged the materials observed, took samples and recorded results of in-situ testing. Figure 1 shows the investigation locations. Engineering Logs are presented in Appendix A, with explanation sheets defining the terms and symbols used in their preparation.

3.1 Laboratory Testing

Point load strength testing (Is_{50}) was undertaken on core recovered that was stronger than soil strength material. The results of point load testing are shown on the borehole logs and have been used to calibrate the rock strengths shown on the logs.

Further testing undertaken includes a modified wet / dry strength variation test and an assessment of moisture absorption of the less weathered high strength rock mass. This testing was undertaken to indicate the likelihood of the material to suit road construction aggregate requirements for this region. The test was modified as the sample was recovered from hand crushed core, and not from a stockpile as is normal procedure. This variation means that the absolute ‘strengths’ indicated by the test are not reflective of the likely result should a standard test be undertaken from material crushed in a plant, however, the relative strength variation is likely an indicator of the actual result.

A plasticity index test was also undertaken on the crushed sandstone material from the modified wet / dry strength variation test.

Previous laboratory testing (not part of this work) conducted by Coffey from the existing quarry face includes gradings, California Bearing Ratio (CBR) tests, petrography, and assessment of a range of properties required for sand use in aggregates.

Laboratory test result sheets are presented in Appendix B.

4 SUB-SURFACE CONDITIONS

4.1 Stratigraphy

The 1:250,000 geological map of Tweed Heads (SH56-2) shows that the site is underlain by the Jurassic age Kangaroo Creek Sandstone which is described as quartz sandstone and conglomerate. The higher elevations and western portions of the site are overlain by basaltic rocks of the Lismore Basalt, which is a tertiary age member of the Lamington Volcanics. Site observations of outcrop towards the southern extent of the site indicate that the basaltic rocks are limited to an area west of the proposed expansion area and as a thin clay soil veneer above RL50m inside the proposed expansion

area. The basal contact of the basalt appears to be sub horizontal, although regional experience indicates that lateral prediction of this contact for any great distance is unreliable.

The sandstone rock mass dips approximately 2° to 5° to the west north west. This dip is visible in the existing quarry face, and observed in outcrop near BH4.

Several thin coal seams and weathered siltstone interbeds were observed in the drill core. One vein of pyrite was observed in BH5 at 12.15m.

The lower lying land south and north of the east west trending ridges that form the bulk of the expansion area comprise quaternary alluvial soils. These soils are derived from flood plain sedimentation processes and are generally limited to lower than 10m AHD.

The stratigraphy interpreted from the boreholes is summarised in Table 1, Core photographs are presented as Figures 3 to 10 and the stratigraphy is shown graphically in Figures 11 to 15.

Table 1: Stratigraphy assessed in borehole drilling.

Borehole	BH1	BH2	BH3	BH4	BH5	BH6
Ground level at Surface (AHD)	29.3	28.7	36.2	50.2	47.2	29.2
Unit and Description	**Depth to interval in metres**					
Topsoil / Residual Soil: ranges from SAND, medium grained orange brown with traces of clay and organic materials to sandy CLAY, medium plasticity, dark brown firm to stiff.	0 -0.5	0-1	0 - 1	0 - 1	0 -1.3	0-1.3
Extremely to Moderately Weathered Sandstone: fine to medium grained with some coarse interbeds, colour ranges from white, orange brown, pale brown, and red brown.	0.5 - 20.3	1 - 8	1 - 17.5	1 - 14.8*	1.3 - 13.2 and 27.75-35.5	1.3-11.2
Slightly Weathered to Fresh Sandstone: fine to coarse grained grey and pale grey.	-	8 -20.3	17.5 - 21.65	14.8 - 42.3	13.2 - 27.75* and 35.5 – 41.6	11.2 – 21.95
***Siltstone**: fine grained, laminated grey to black, with some sandstone interbeds.	-	-	-	11.5 - 14.6	27.5 - 31.05	-

Further details of the materials intersected by the boreholes are given on the Engineering Logs presented in Appendix A, with explanation sheets defining the terms and symbols used in their preparation.

4.2 Groundwater

Groundwater was intersected in all boreholes and was measured by dipping from the ground surface. Note these groundwater levels may be affected by the drilling water used to lubricate the drill string.

Table 1 below presents the groundwater levels as dipped following completion of drilling.

Note that significant rainfall was recorded in early January 2008, which lead to local and regional flooding. During the water monitoring round of 18 January, groundwater was observed flowing from surface seepages at several locations around the east west trending ridgeline near BH4 and BH5, and upslope of BH6.

Table 2: Groundwater Levels recorded following completion of drilling

Borehole	GPS to WGS1984 UTM 56J		Surface R.L. (m AHD)	Standing Water Level Depth (m)	Measurement Date
	m E	m N			
BH1	531336	6798300	29.3	10.45	23/10/2007
BH2	531199	6798403	28.7	3.3 1.2	23/10/2007 18/1/07
BH3	531657	6797945	36.2	10.33	23/10/2007 18/1/07
BH4	531440	6797931	50.2	9.52 2.7	23/10/2007 18/1/07
BH5	531105	6797994	47.2	5.8 6.4	23/10/2007 18/1/07
BH6	531450	6797729	29.2	17.8 1.1	23/10/2007 18/1/07

Ground water levels may fluctuate after rain or as a consequence of other climatic effects.

5 MATERIALS ASSESSMENT

5.1 Kangaroo Creek Sandstone and its use as a Quarry Product

The Kangaroo Creek Sandstone is the premier sandstone aggregate parent material in the northern rivers region, however variation within the unit can lead to deficiencies that limit its use as certain products. Typically the sandstone contains lenses of siltstone and conglomerate and the grainsize is variable, ranging from rare fine grained sandstone inter-beds to some conglomerate inter-beds.

Historically the moderately weathered to fresh rock of the Kangaroo Creek sandstone has been used crushed and used as base and sub base products variously under the RTA and Northern Rivers Local Government specifications. Much of the product requirements under the RTA specification are guided by the treatment of the quarry product (crushing) and the method of extraction (blasting or ripping), however some of the variables such as the wet / dry strength variation and plasticity index are guided by the parent material. Generally the less weathered material is non plastic, however we have found that the wet / dry strength variation can often be the limiting factor in the adherence to the RTA specifications for roads other than class 2(d).

5.2 Existing Products

The existing products produced by Champions quarry can broadly be described as unprocessed construction products. At present the material is won from the quarry face by excavator or loader, stockpiled by material type, and trucked to site. No crushing or pre-treatment is undertaken.

5.3 Previous testing data

Previous testing undertaken by Coffey has included:

- Gradings
- Atterburg Limits testing
- California Bearing Ratio (CBR) tests, and
- one petrographic analysis of a washed sample of sand, with the aim of assessing the suitability of the sand for use as a concrete sand. The petrographic analysis included a visual assessment of the possible alkalai reactivity of the sand, and an assessment of the free silica content of the sand.
- An assessment (by Boral Australian Construction Materials) of a range of properties of the same washed sand to test its suitability for use as a concrete sand. Attributes assessed included chloride and sulfate content, assessment of the percentage material finer than 2 micron, sugar content, volume of light particles, organic matter content and assessment of methylene blue adsorption value.

The results of the previous testing indicate that the material won from the upper 8m of the weathering profile at Champions Quarry is generally clayey sand to sand with some clay, of low plasticity, with a CBR of around 30.

When a sample was washed and graded the resultant sand grading was within the envelope required for concrete aggregate (sand), and has an estimated free silica content of about 84%, with potential for a mild or slow deleterious alkali-silica reactivity in concrete. Results of the testing by Boral indicate an

elevated sulfate content of 0.15%, which is higher than the specification of <0.01%. The sugar content, chloride content, light particles, organic matter content and Methylene Blue Absorption Value were all within the range of the specifications.

5.4 Testing results from this investigation

Point load testing was undertaken on the rock core recovered. The results indicate that the rock strength generally increases with decreasing weathering intensity. In general the slightly weathered to fresh sandstone was medium to very high strength, whilst the more weathered material (often coloured) was generally lower strength, though some high strength and very high strength zones may be encountered in the weathered materials where ironstone is present. BH3 was a notable exception, with high and very high strength materials in highly weathered rock at depth.

As part of this investigation (but over and above that in our proposal) Coffey undertook a modified wet/ dry strength variation test on less weathered sandstone from BH2. The results of this testing indicate that the material has a relatively low dry strength when crushed to an aggregate. This is in variance to the results of the point load strength tests undertaken on the rock core from the same interval which indicate that the material has a medium to very high strength. The rock in hand specimen was observed to crumble under firm hand pressure and sand could be rubbed from the sample.

Further to this, the diametral point load test results are significantly lower than the axial point load strength test results, indicating a bedding parting weakness (which is common for horizontally bedded materials). This may explain the relatively low dry strength as an aggregate.

5.5 Potential Products

Potential products for the sandstone won from Champions quarry can be grouped into two broad categories. These are broadly the weathered, pale yellow and orange to red coloured upper portion of the deposit, similar to that being quarried at present, and the less weathered deeper portion of the deposit, which is often pale grey to grey.

For the extremely to moderately weathered sandstone:

- General fill for subdivisions, roadway alignments, and landscaping
- When washed it is possible that concrete sand (where colour is not important) may be produced, however the sulphide content of the initial samples tested indicate sulphide may be an issue.
- Brickies loam if graded to remove coarse sand and gravel fractions and blended to local brickies requirements

For the less weathered medium to very high strength sandstone:

- General Fill
- Possibly higher strength zones may be used for armourments and rip rap.
- Aggregate products for local roads under the Northern Rivers Local Government specification if tested to meet the strength requirements. Initial testing indicates that the strength requirements are unlikely to be met.

- Concrete aggregates such as concrete sand if the sandstone is washed and processed. Based on the sulphide (pyrite) veins intersected in the cored boreholes it is possible that the sulphate content of the crushed sandstone may exceed that deemed suitable for concrete sand.
- Crushed sandstone base and sub base for category 2(d) roads under the RTA 3051N specification.
- **Possibly** crushed sandstone base and sub base for category 1, 2(a), 2(b) and 2(c) under the RTA 3051N specification, **if** the wet / dry strength variation does not exceed the specification limits, and the strength requirements are met.

It is likely that the conglomerate or siltstone lenses would only be used for general fill.

It is unlikely that the quarry products would be suitable for use as sealing aggregates.

5.6 Excavation Conditions

The soil strength materials and extremely to highly weathered rock would be expected to be won with an excavator and rippers on an average sized bulldozer such as a Caterpillar D8.

The sandstone described as medium to high strength may be won with heavy ripping by a large dozer after preliminary loosening with a rock breaker or rock saw. It is possible though that pre splitting with blasting may be required.

The very high strength sandstone may require either heavy rock breaking equipment, rock saws or possibly blasting to excavate it from the quarry face.

It is possible that excavation may encounter zones of rock that are stronger, iron cemented or less jointed than that intersected in the boreholes. Such zones may require heavier ripping, preliminary loosening with a hydraulic rock breaker, or blasting prior to general bulk excavation.

5.7 Temporary & Permanent Batter Slopes

Pit design will require the use of temporary and permanent batter slopes. In the soil strength materials and highly weathered sandstone we would recommend the use of batter slopes no steeper than 1H:1V (45°). In the moderately weathered to fresh rock batter slopes of 0.25H:1V (76°) with benches may be considered for preliminary pit design.

We recommend that a formal pit design be undertaken to confirm the stability of these angles once set backs and pit development shapes are fully understood.

For the purpose of the preliminary volume estimates we have used an average batter slope angle of 60°.

5.8 Volume Estimate

For the assessment of the potential volume of the quarry J.E.Siemon Pty Ltd were commissioned to assess the resource using the provided topographic data and the borehole lithology derived by Coffey. The computed volumes are based on a number of assumptions. These are:

- The volume assessment was undertaken with vertical pit walls. This will over calculate the volume of the extractable resource by a small volume, but is appropriate for assessing the in situ resource, given the resolution and assumptions of the data set at hand. We would expect

the volume occupied by the pit walls on the eastern and western sides of the quarry (minimal pit walls are required on the north and south margins of the quarry) may be in the order of 1% to 3% of the total pit volume.

- The floor of potential quarry works will be 10m AHD. (This is 11.2mRL on the earlier survey data provided to Coffey.)
- The depth of overburden (topsoil and organic contaminated layers) averages 1m depth across the site.
- The depth of weathered rock varies from borehole to borehole. The volume estimate is based on that recorded in the boreholes. The amount of weathering will vary significantly from point to point.
- The material below the base of the weathered rock to the quarry floor (10m AHD) is grouped as slightly weathered to fresh sandstone. This includes the lower portion of BH3 and the siltstone observed in BH5.

Computed volumes are presented in Table 3 below.

Table 3: Estimated Volumes of materials

Material	**Volume (Mm3)**
Overburden	0.4
Weathered Rock	1.9
Slightly Weathered to Fresh weathered Sandstone	3.1
TOTAL ESTIMATED VOLUME	5.4

6 CLOSING COMMENT

This report is based on a limited number of investigation locations. The number of investigation locations was chosen as a balance between investigation cost and data required to assess the relatively predictable near horizontally bedded sandstone lithology. Whilst we have endeavoured to assess the lithology accurately natural variation is expected across the site.

For and on behalf of Coffey Geotechnics Pty Ltd

Tom Nicholson

Senior Engineering Geologist

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

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.

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SPECIALISTS MANAGING THE EARTH

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.

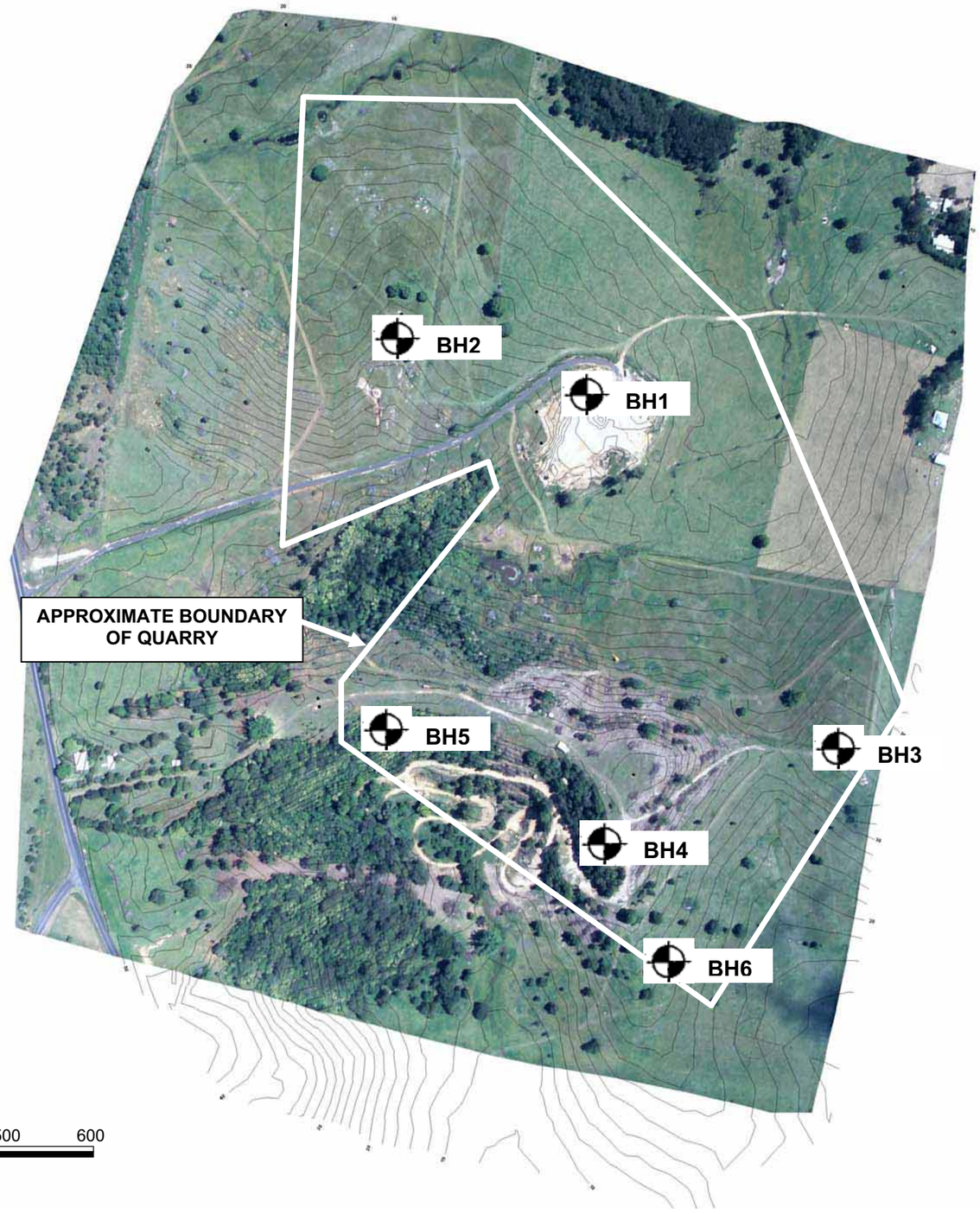
Responsibility

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.

Figures

NORTH



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Horizontal Scale (metres)

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drawn	RV
approved	
date	5/2/08
scale	1:5,500 APPROX
original size	A3

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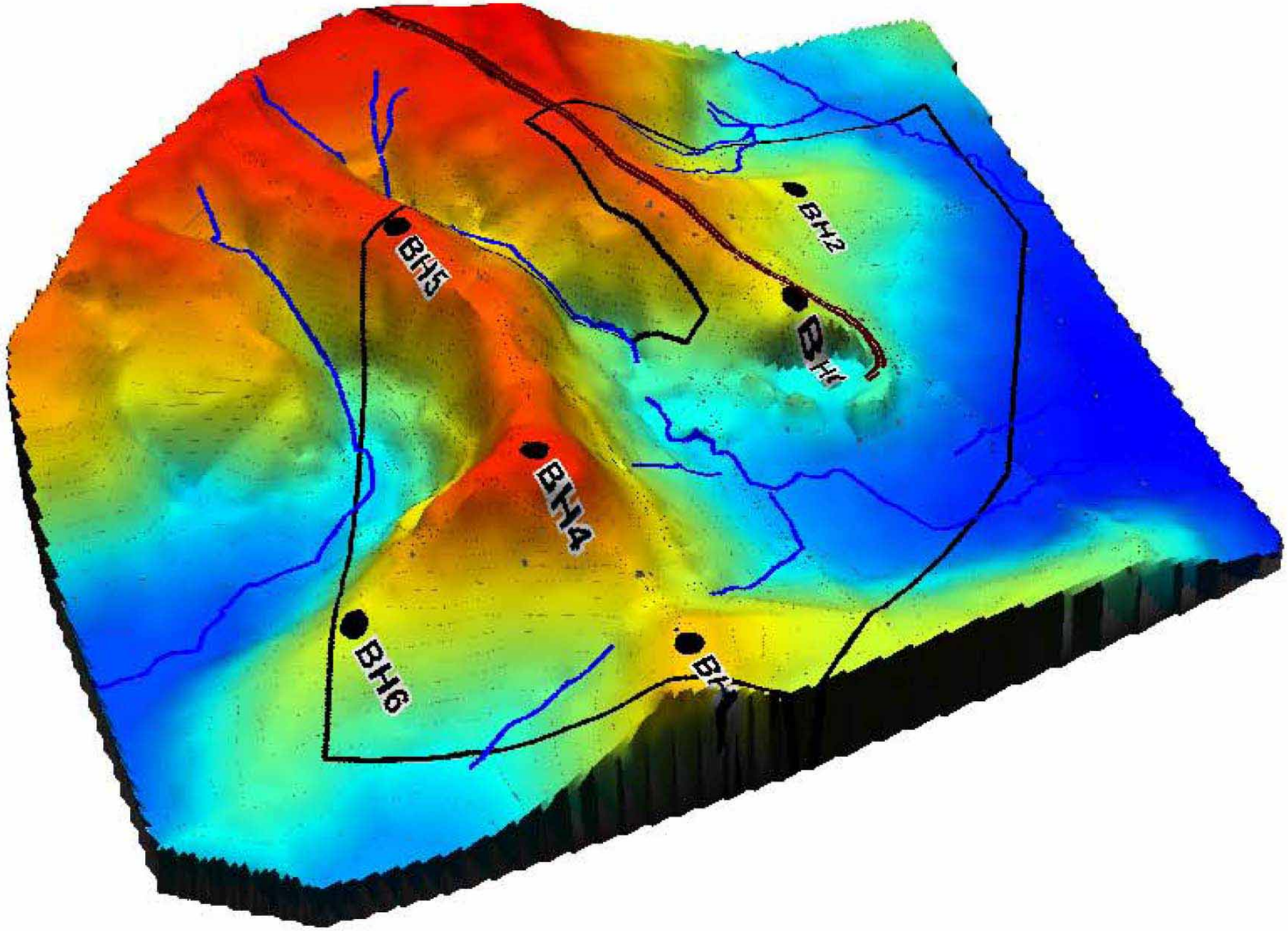
client: JEFF CHAMPION – REAVILL FARM PTY LTD

project: CHAMPIONS QUARRY MATERIAL ASSESSMENT

title: SITE PLAN

project no: GEOTALST01597AB-AE | figure no: FIGURE 1



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approved	
date	**5/2/08**
scale	**N.T.S.**
original size	**A3**

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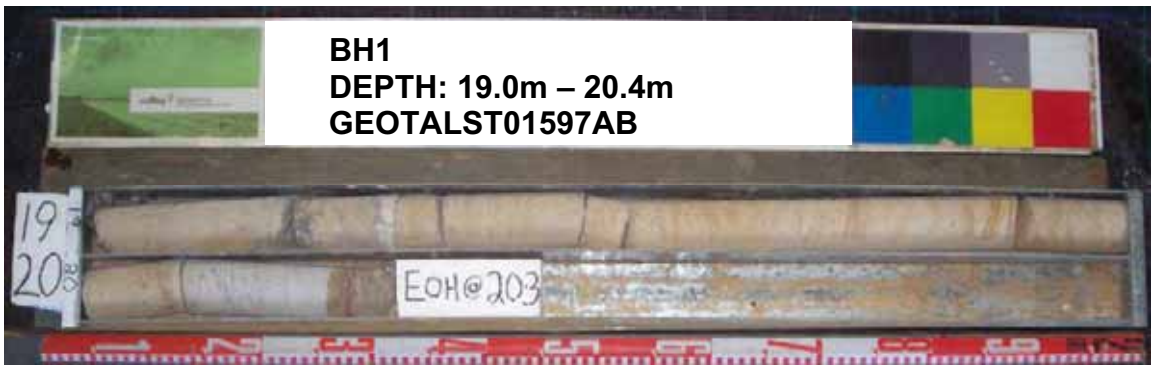
SPECIALISTS MANAGING THE EARTH

client: **JEFF CHAMPION – REAVILL FARM PTY LTD**

project: **CHAMPIONS QUARRY MATERIAL ASSESSMENT**

title: **ENHANCED COLOUR CONTOUR PLAN OF SITE**

project no: **GEOTALST01597AB-AE** figure no: **FIGURE 2**



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	date	21/1/08		title:	RECOVERED CORE SAMPLES BOREHOLE 1
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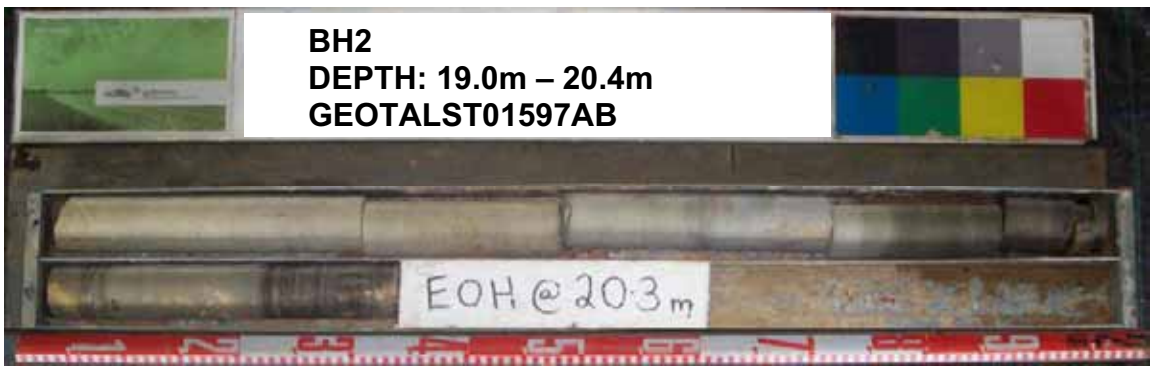

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	approved	TGN		project:	MATERIAL ASSESSMENT CHAMPIONS QUARRY
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	date	21/1/08		title:	RECOVERED CORE SAMPLES BOREHOLE 5
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drawn	RV	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client:	JEFF CHAMPION
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date	21/1/08		title:	RECOVERED CORE SAMPLES BOREHOLE 5
scale	NTS		project no: GEOTALST01597AB	figure no: FIGURE 9
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	date	21/1/08		title:	RECOVERED CORE SAMPLES BOREHOLE 6
	scale	NTS		project no: GEOTALST01597AB	figure no: FIGURE 10
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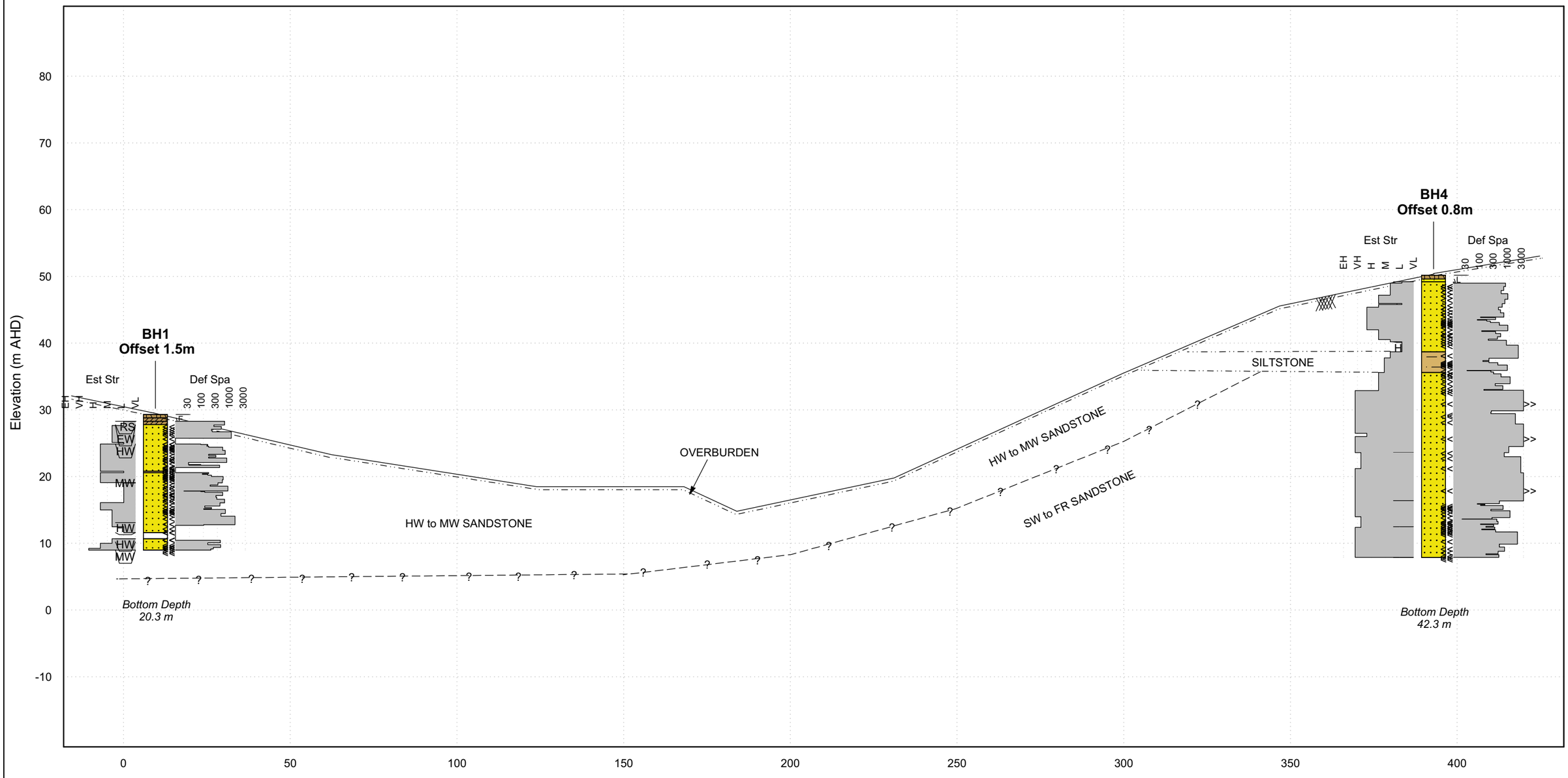
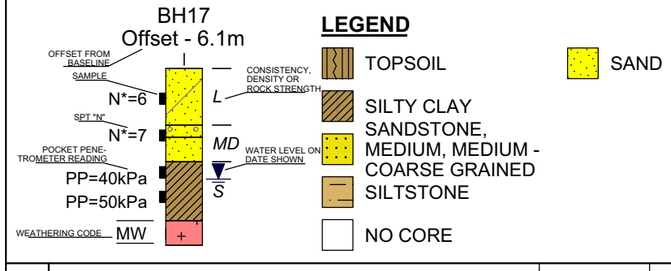




LEGEND

- TOPSOIL
- SILTY CLAY
- SANDSTONE, MEDIUM, MEDIUM - COARSE GRAINED
- SILTSTONE
- NO CORE
- SAND

revision	description	drawn	approved	date

0 12 24 48 72
Horizontal Scale (metres)

0 6 12 24 36
Vertical Scale (metres)

drawn	ELC
approved	
date	23-1-2008
scale	H 1:1200 V 1:600
original size	A3

coffey geotechnics

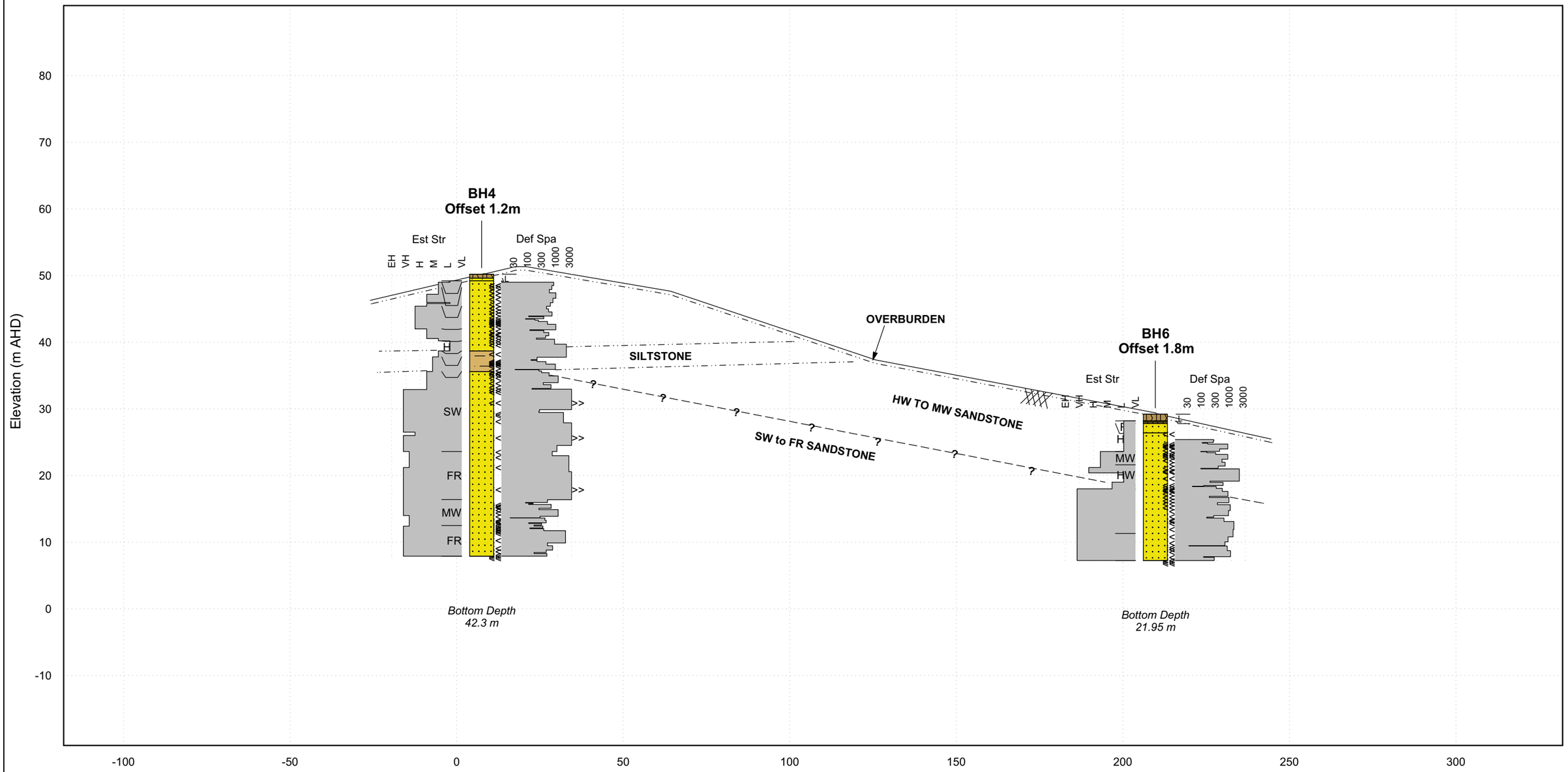
client: **CHAMPIONS QUARRY**

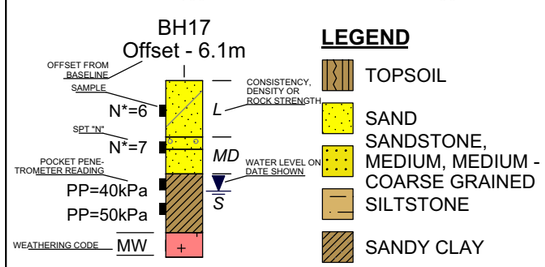
project: **RESOURCE ESTIMATE**

title: **SECTION 1**

project no: **GEOTALST01597AB-**

drawing no/figure no: **FIGURE 11**





LEGEND

- TOPSOIL
- SAND
- SANDSTONE, MEDIUM, MEDIUM - COARSE GRAINED
- SILTSTONE
- SANDY CLAY

revision	description	drawn	approved	date

0 12 24 48 72
Horizontal Scale (metres)

0 6 12 24 36
Vertical Scale (metres)

drawn	ELC
approved	
date	23-1-2008
scale	H 1:1200 V 1:600
original size	A3

coffey geotechnics

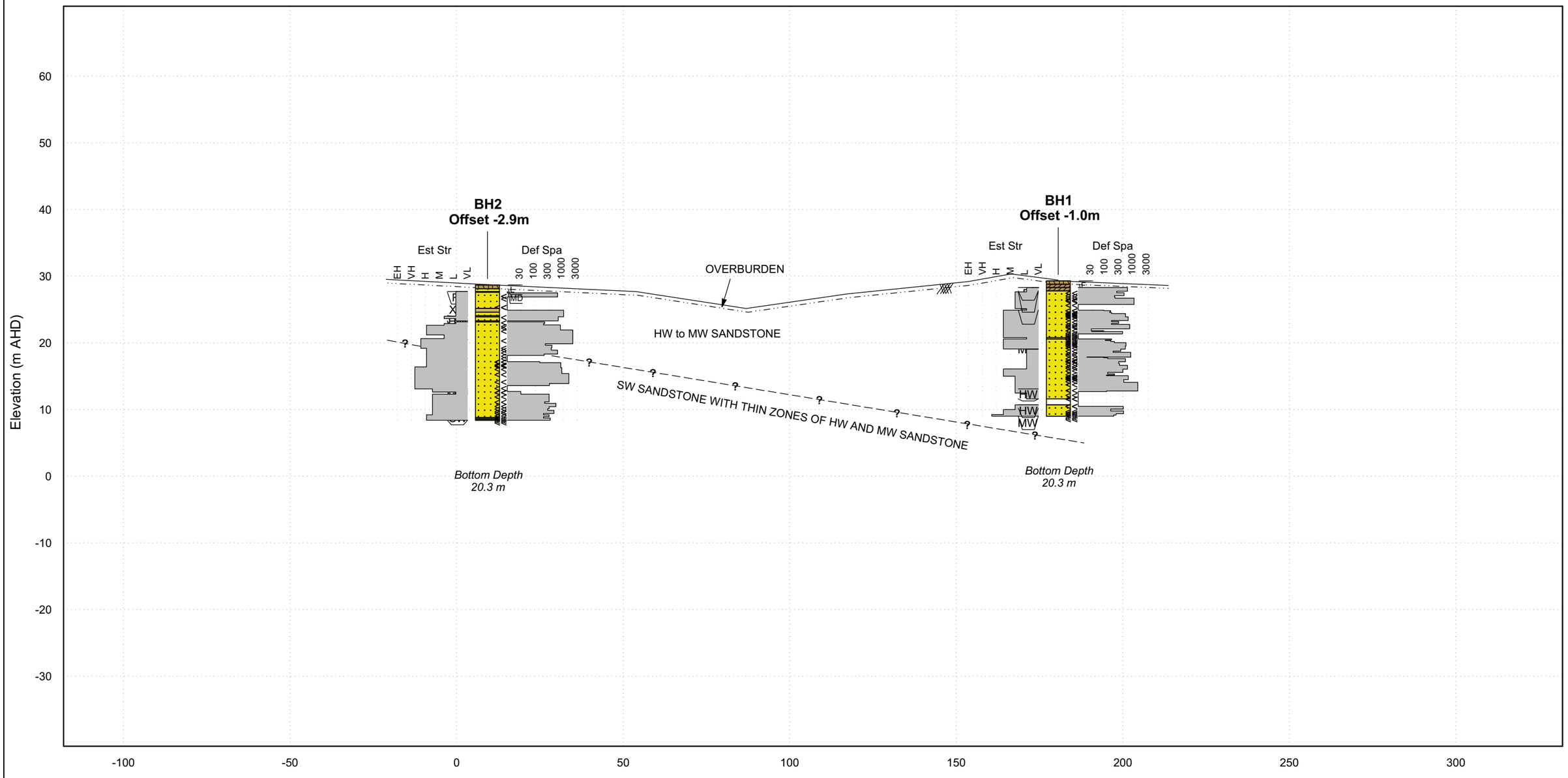
client: **CHAMPIONS QUARRY**

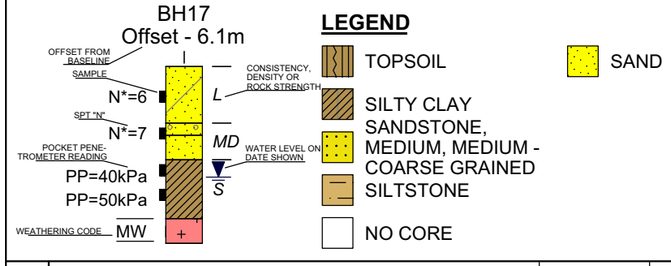
project: **RESOURCE ESTIMATE**

title: **SECTION 2**

project no: **GEOTALST01597AB-**

drawing no/figure no: **FIGURE 12**





LEGEND

- TOPSOIL
- SILTY CLAY
- SANDSTONE, MEDIUM, MEDIUM - COARSE GRAINED
- SILTSTONE
- NO CORE
- SAND

revision	description	drawn	approved	date

0 12 24 48 72
Horizontal Scale (metres)

0 6 12 24 36
Vertical Scale (metres)

drawn	ELC
approved	
date	23-1-2008
scale	H 1:1200 V 1:600
original size	A3

coffey geotechnics

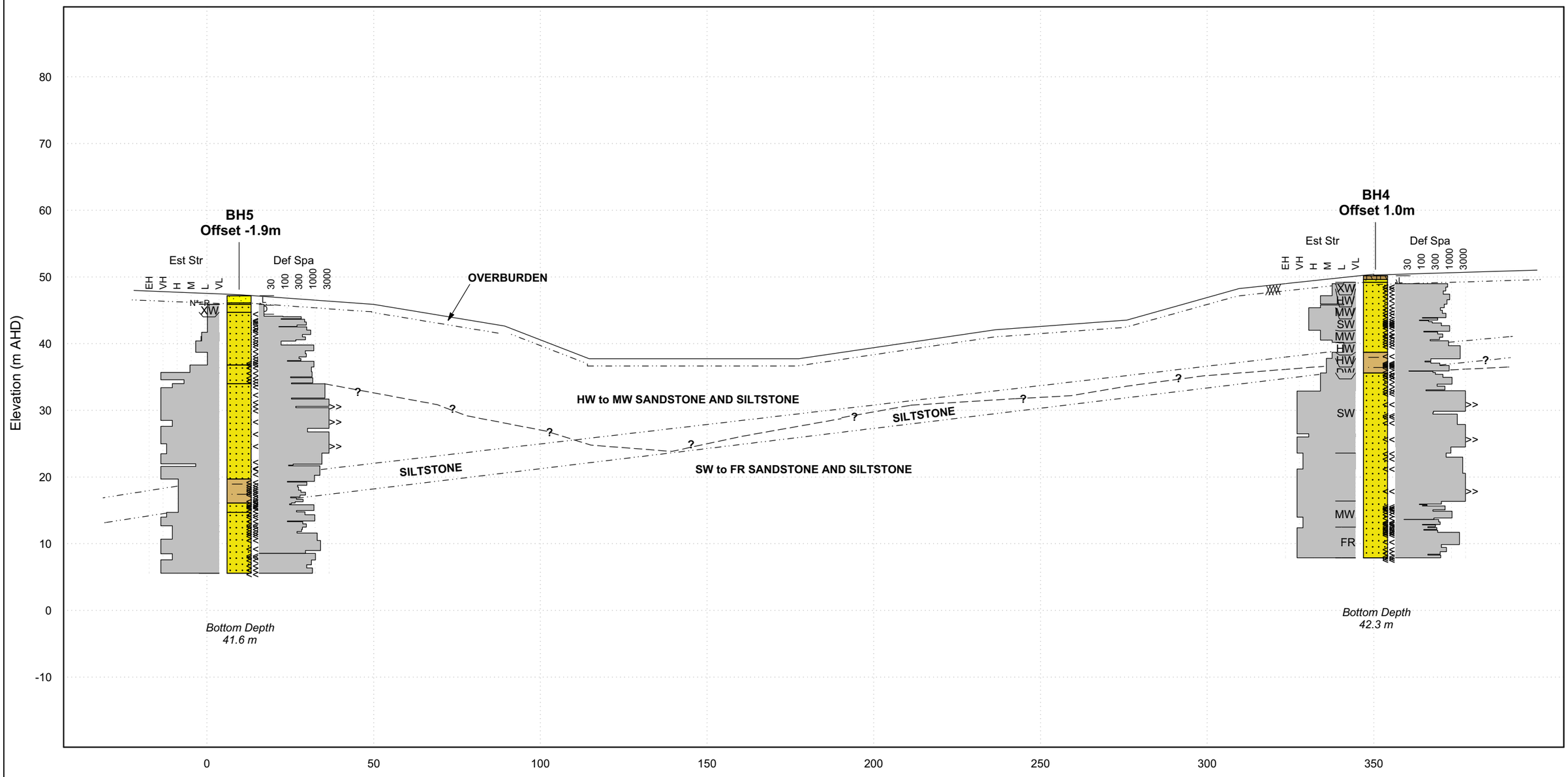
client: **CHAMPIONS QUARRY**

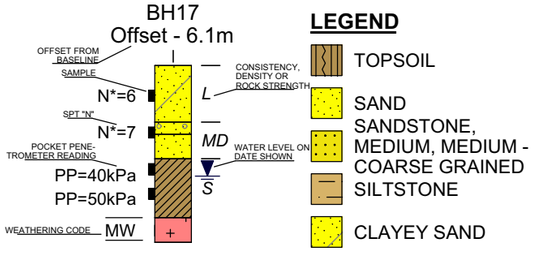
project: **RESOURCE ESTIMATE**

title: **SECTION 3**

project no: **GEOTALST01597AB-**

drawing no/figure no: **FIGURE 13**





LEGEND

- TOPSOIL
- SAND
- SANDSTONE, MEDIUM, MEDIUM - COARSE GRAINED
- SILTSTONE
- CLAYEY SAND

revision	description	drawn	approved	date

Horizontal Scale (metres): 0 12 24 48 72

Vertical Scale (metres): 0 6 12 24 36

drawn	ELC
approved	
date	23-1-2008
scale	H 1:1200 V 1:600
original size	A3

coffey geotechnics

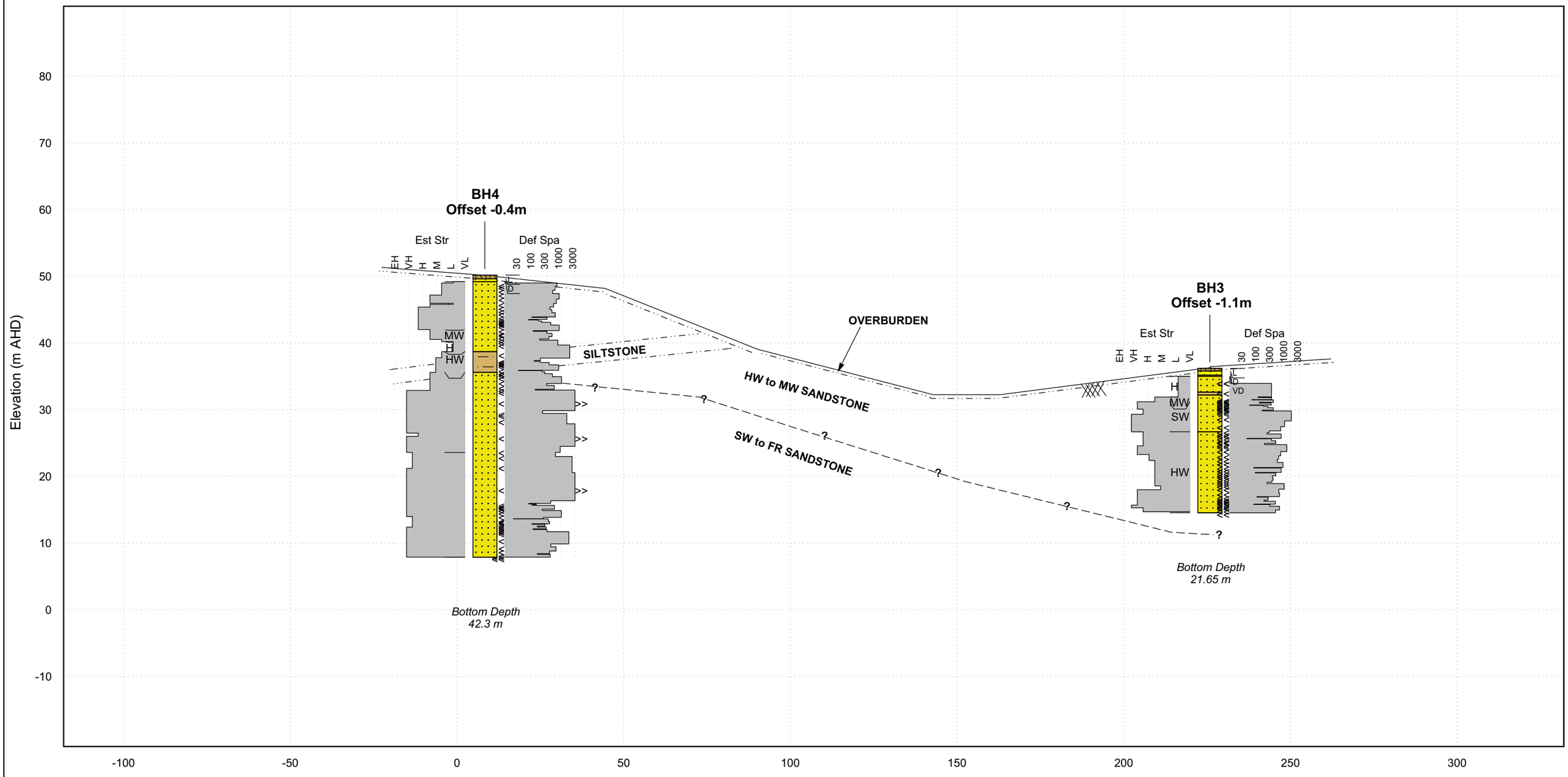
client: **CHAMPIONS QUARRY**

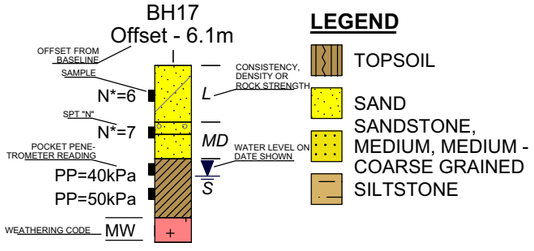
project: **RESOURCE ESTIMATE**

title: **SECTION 4**

project no: **GEOTALST01597AB-**

drawing no/figure no: **FIGURE 14**





LEGEND

- TOPSOIL
- SAND
- SANDSTONE, MEDIUM, MEDIUM - COARSE GRAINED
- SILTSTONE

revision	description	drawn	approved	date

0 12 24 48 72
Horizontal Scale (metres)

0 6 12 24 36
Vertical Scale (metres)

drawn	ELC
approved	
date	23-1-2008
scale	H 1:1200 V 1:600
original size	A3

coffey geotechnics

client: **CHAMPIONS QUARRY**

project: **RESOURCE ESTIMATE**

title: **SECTION 5**

project no: **GEOTALST01597AB-**

drawing no/figure no: **FIGURE 15**