



REPORT

TO

SYDNEY FISH MARKETS PTY LTD

ON

GEOTECHNICAL INVESTIGATION

FOR

**PROPOSED REDEVELOPMENT, STAGES 2 TO 4
INCLUDING NEW ACCESS ROADWAYS AND PARKING**

AT

**SYDNEY FISH MARKETS,
BLACKWATTLE BAY, PYRMONT, NSW**

Date: 16 June 2010

Ref: 23982Srpt-Stages 2-4

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS



TABLE OF CONTENTS

1	INTRODUCTION	1
2	INVESTIGATION PROCEDURE	3
3	RESULTS OF INVESTIGATION	4
3.1	Site Description	4
3.2	Subsurface Conditions	5
3.3	Laboratory Test Results	8
4	COMMENTS AND RECOMMENDATIONS	9
4.1	Summary of Principal Geotechnical Design Issues	9
4.2	Site Preparation and Earthworks	11
	Site Drainage	12
	Subgrade Preparation	12
	General Excavation Comments	13
	Engineered Fill	13
4.3	Retaining Walls	14
4.4	Pavements	15
4.5	Footings	16
4.6	Slab On Grade Construction	18
4.7	Further Geotechnical Input	18
5	GENERAL COMMENTS	19

TABLE A: SUMMARY OF POINT LOAD STRENGTH INDEX TEST RESULTS

TABLE B: SUMMARY OF FOUR DAY SOAKED C.B.R TEST RESULTS

TABLE C: SUMMARY OF ROCK CLASSIFICATIONS

ENVIRO LAB TEST RESULTS: REPORT NO 41301-A

BOREHOLE LOGS 501 TO 524 INCLUSIVE INCLUDING CORE PHOTOS

FIGURE 1: BOREHOLE LOCATION PLAN

FIGURE 2: GRAPHICAL BOREHOLE SUMMARYS

APPENDIX A: BOREHOLE LOGS: 201, 202B, 203, 301, 302, 303, 304, 305, 401, 402, 403, 404, AND 405

REPORT EXPLANATION NOTES



1 INTRODUCTION

This report presents the results of a geotechnical investigation for Stages 2 to 4 of the proposed redevelopment to the Sydney Fish Markets at Blackwattle Bay, Pyrmont, NSW. The investigation was commissioned by Peter Simmons of Conybeare Morrison International Pty Ltd on behalf of Sydney Fish Markets Pty Ltd and was generally carried on the basis of our fee proposal Ref: P32252S, dated 6 April 2010.

The following concept architectural drawings, which were prepared by Conybeare Morrison International Pty Ltd, have been provided to us:

- Staging Plan – Drawing No.09030 SK051, dated April 2009
- Sketch Ground Floor Plan – Drawing No.100329 SK01, dated March 2010
- Access Concept – Drawing No.090429 SK01, dated April 2009

These drawings only provide very preliminary details of the proposed Stages 2 to 4 development. On further information received from Peter Simmonds in an email dated 21 May 2010, we understand that the development will be carried out in stages (i.e. 2 to 4) to allow the markets to still maintain operations and will comprise the following works:

Stages 2 and 3, following demolition of the existing buildings in the eastern portion of the site, will comprise the construction of a four-storey building as shown on the attached Figure 1. The ground floor of this building will be at RL 3.6m, and will have a delivery/pick up area over part of the ground floor. The first floor will be made up of both retail and parking areas, with the second and third floors also for parking. We have been advised that there is the possibility at a future date to add a further 2 floors to this building.



Stage 4, will involve further reconstruction to Building 34 and 35 in the north-eastern portion of the site. These buildings will be constructed to be two-storeys, with the ground floor level for the building being at RL 3.6m. There will also be a new arrival forecourt which will be at approximately RL 6m.

We also understand that there will be new access roadways as well as new pavement construction over the northern side of the site.

Excavation for the proposed new works will be to a maximum depth of about 2.0m to achieve the required ground floor level of RL 3.6 for Stages 2 to 4 of the new buildings. Locally deeper excavation may be required if necessary for new services trenches, lift pits and footing construction. Proposed footing loads have not been indicated but are anticipated to be in the moderate to high range.

As part of the current investigation, we have included information from previous investigations completed by Jeffery and Katauskas which cover the area of the Stage 2 to 4 works, in particular reports Ref:13836SPrpt, dated 13 November 1998 and Ref:16325Srpt, dated 19 December 2001.

It should also be noted that Jeffery and Katauskas have carried out a number of other geotechnical investigations over the site dating back to 1989.

The purpose of this investigation was to review results of the previous geotechnical investigations as well as obtain further geotechnical information on subsurface conditions as a basis for comments and recommendations on footing design, subgrade preparation, excavation, pavement and floor slab design and any other geotechnical issues apparent to us. The geotechnical information from our earlier reports, as noted above, has been incorporated where relevant.



2 INVESTIGATION PROCEDURE

The investigation was carried out between the 11 and 21 May 2010 and comprised the drilling of twenty-four boreholes (BH501 to BH524) using our JK350 and JK500 truck mounted drilling rigs and our JK300 track mounted drilling rig.

Following coring of the concrete slabs or asphalt pavements, the boreholes were auger drilled using a tungsten carbide (TC) bit. The twenty-four boreholes were auger drilled to depths between 0.6m (BH521) and 10.32m (BH510), below existing surface levels. BH501 to BH512 were subsequently extended to final depths of between 4.5m (BH502) and 13.31m (BH510), using rotary diamond coring techniques with water flush.

The state of compaction of the fill and strength/density of the subsurface soils were assessed from the Standard Penetration Test (SPT) 'N' values. The strength of the bedrock was assessed from observation of drilling resistance when using a tungsten carbide ('TC') auger bit, examination of the recovered rock cuttings and correlation with subsequent laboratory moisture content tests. It should be noted that rock strengths assessed in this way are only estimates, and variances of our strength order should not be unexpected. The strength of the bedrock within the cored portion of the boreholes was assessed by examination of the recovered rock core and subsequent correlation with laboratory point load strength index tests.

Groundwater observations were made during and on completion of augering and on completion of coring. Five PVC standpipe piezometers were installed between 3m to 6m depth (in BH508, BH512, BH513, BH516 and BH517) on completion of coring, to allow for groundwater monitoring and sampling to be carried out by EIS. No longer term groundwater monitoring was undertaken as part of this investigation.

The fieldwork was carried out under the direction of our geotechnical engineers, Mr Adam Mitchell and Mr Mark Tsang, who were present on a full-time basis to set out



the borehole locations, coordinate access to the locations with market manager, direct the buried service scans, log the encountered subsurface profile and nominate sampling and in-situ testing.

The borehole locations, as shown on the attached Figure 1, were set out by taped measurements from inferred site boundaries and existing surface features. The surface reduced levels shown on the borehole logs have been interpolated from spot levels shown on an undated survey plan (no drawing reference number) supplied by SHFA as well as a Survey Plan (Job Ref: 40258, dated 27/04/05) prepared by Hill & Blume Consulting Surveyors. We believe site datum is Australian Height Datum (AHD). The borehole logs are included with this report, together with Explanatory Notes, which describe the methods and procedures employed in the investigation, their limitations and define the logging terms and symbols used.

Selected soil and rock chip samples were submitted to NATA registered laboratories, for CBR, compaction, pH, chloride and sulphate testing. The results of the laboratory testing are summarised in attached Tables A, B and C as well as Report No 41301-A by Envirolab, dated 26 May 2010. The recovered rock core was photographed and selected sections of core were subjected to Point Load Strength index testing. The core photographs are presented opposite each borehole log and the strength test results are plotted on the relevant log and summarised in Table A.

3 RESULTS OF INVESTIGATION

3.1 Site Description

The Sydney Fish Markets are situated on the eastern foreshore of Blackwattle Bay, which also forms the western site boundary. The proposed development extends south to the existing fish market buildings and to the north and east to the Hymix concrete batching plant and Bank Street, respectively. Surface slopes within the site



generally range from 0° - 5°, predominantly sloping to the west, south and south-west.

At the time of the investigation, the site was predominantly used as a car park with various retail and wholesale outlets situated to the east and the north, with the main fish market building to the south. The asphaltic concrete car park was generally uneven and undulating, with cracking and re-instatement patches observed as well as some potholes. The retail/wholesale buildings were of either steel frame, concrete block or brick construction and were generally in a good external condition. Some hairline cracking was noted on the buildings to the north of the site, as well as the brick and steel frame building (Claudio's) at the south-western end of the site.

Access to the Fish Markets site is made via an access ramp off Bank Street at the north-eastern end of the site. This ramp was supported by a concrete retaining wall, in good condition, which was approximately 1.3m high at its western end rising to 3.5m towards Bank Street. This concrete wall butted up against a sandstone outcrop, behind the Stage 4 building area, which ran in a north-west to south-east direction, supporting the overflow car park which is at the same level as Bank Street.

The western side of the site along the foreshore is supported by a dilapidated sea wall, constructed of sandstone masonry, concrete and timber, ranging in height between 0.9m and 1.5m. A section of the wall behind 'Claudios' was noted to be in a very dilapidated state, with complete collapse of the sandstone masonry wall.

3.2 Subsurface Conditions

Reference to the 1:100,000 Geological Map of the Sydney Region indicates that the site is underlain by silty to peaty quartz sand, silt and clay overlying the Hawkesbury Sandstone. In summary, the boreholes encountered pavements, overlying fill which in most places overlies a sandy soil layer of varying thickness, which in turn overlies



sandstone bedrock. Further comments on the subsurface conditions encountered are provided below. Reference should be made to the borehole logs for detailed descriptions of the subsurface conditions.

Along the northern side of the site is a buried cliff line that is exposed in the north-west corner behind the Stage 4 area. To the west of this mostly buried cliff line, the rock level/shelf drops off, in an area that has been reclaimed from the bay by filling out to the sea wall noted above; this reclaimed land forms the majority of the Fish Markets site.

Pavements and Concrete

Asphalt pavements (AC) were present at thirty four of the thirty seven borehole locations, being between 20mm and 100mm thick. At the time of drilling BH304 concrete was present from the surface being 230mm thick, although this area may now be AC paved. In BH512 concrete containing 4mm reinforcement with 110mm of top cover was present from the surface being 230mm thick, as well as in BH514 where a concrete ramp, 230mm thick, has been built over the asphaltic concrete car park. Below the AC and concrete pavements, base course layers comprising mainly silty gravely sand and sandy gravel, were present in the majority of the boreholes being up to about 500mm thick.

Below the AC in BH203, 301, 302, 402, 505, 510, 511, 513, 515, 516 concrete of between 120mm and 320mm was encountered. In BH523 concrete 750mm thick was encountered below the AC, and contained both 5mm and 10mm reinforcement with 250mm of top cover.

Fill

Fill was encountered below the pavements and from the surface of BH303 in all boreholes to depths ranging from 0.4m (BH503 and 521) to 4.2m (BH511), although



some shallower boreholes carried out for pavement design terminated within the fill (BH521, 522, 523 and 524).

Generally the fill comprised silty sand, sandy gravel and silty gravelly clay. The fill contained inclusions such as igneous and sandstone gravel as well as fragments of ash, slag and wood fragments. The fill was generally assessed as moderately or well compacted, with poor compaction noted in BH401, 510, 511, 512, 513 and 517, beneath the level of observed groundwater.

Cobbles and boulders of concrete, rubble and brick were noted in BH401, 506, 507, 513, 518, 519 and 521 to depths of 1.1m. Buried concrete layers of 500mm, 300mm and 220mm were encountered in BH506, 507 and 520 respectively. BH518, 519 and 521 encountered drilling refusal within the fill and rubble at between 0.6m and 1.6m depth.

Estuarine Soils

These natural soils were encountered beneath the fill in the majority of the boreholes to depths of between 2.2m (BH513) and 8.5m (BH511). The soils were thicker where rock was deeper, ranging up to a maximum of about 5m. The soils generally comprised silty and clayey sands with occasional clay and silt bands, although BH302, 303, 304, 305, 509 and 512 comprised sandy clays as well. The sandy soils were assessed as being very loose or loose and either moist or wet. The sandy clay soils varied from firm, stiff and up to very stiff in strength.

BH517 was terminated within the natural sandy soils at a depth of 6m

Sandstone Bedrock

Sandstone bedrock was encountered directly below the fill in BH203, 301, 402, 403, 502, 503, 515 and 520 and beneath the sandy soils in BH201, 202B, 401, 404, 405, 501, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514 and 516



at depths from 0.4m (BH301) to 8.5m (BH511). On first contact the sandstone ranged from extremely low to very low strength and was extremely to distinctly weathered.

All the cored boreholes encountered sandstone bedrock of low strength or better from between 1.8m and 10m depth in BH502 and BH510, respectively.

Reference to Table C accompanying this report shows the depths to the various classes of rock encountered.

Groundwater

Groundwater was encountered in BH201, 202B, 305, 401, 402, 403, 404, 405, 501, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, and 517 during drilling. The depth encountered ranged from 1.2m to 4.7m depth in BH305 and BH509, respectively. Approximate RLs of groundwater levels encountered during drilling, range from 0.0m to 2.3mAHD.

BH203, 301, 302, 303, 304, 515, 516, 518, 519, 520, 521, 522, 523, and 524 were dry on completion. BH502 and BH503 were dry on completion of the augered section of the borehole however, standing water levels were observed at 3.2m, in both boreholes, on completion of the cored section.

The graphical borehole summaries presented in Figure 2 give a visual guide to this information.

3.3 Laboratory Test Results

CBR testing was completed on two samples taken from Boreholes BH523 and 524 on silty sand and gravely sand fill. These tests returned results of 5% and 25%.



The CBR tests from the previously drilled boreholes (BH301 to 305) on the predominately gravely silty sand fill ranged from 12% to 15%. The CBR test on the sandy clay (with sandstone bands) was 8%.

The soil pH test results on the natural sand in BH506 and BH508 and fill from BH506 and BH508 indicate that the fill profile is alkaline with pH values of 9.9 to 11.2, while the natural sand is slightly alkaline with pH values of 7.3 to 8. The same samples for the natural sand and fill profile had contents of 380mg/kg, 410mg/kg, 44mg/kg, 160mg/kg and 7.9mg/kg for sulphate, and 33mg/kg, 61mg/kg, 28mg/kg, 99mg/kg and 23mg/kg for chloride respectively. When assessed in accordance with the criteria for concrete and steel piling exposure classifications given in Tables 6.4.2(C) and 6.5.2(C) of AS2159-2009 *'Piling-Design and Installation'*, the soil chemical and pH testing has revealed that the natural sandy soils and fill are non-aggressive towards buried concrete and steel structures.

Reference should be made to the Environmental Investigation Services (EIS), report on soil and groundwater contamination (Ref: E23982S), which includes an Acid Sulphate Management Plan required for acid sulphate soils.

4 COMMENTS AND RECOMMENDATIONS

4.1 Summary of Principal Geotechnical Design Issues

Based on the results of the current boreholes and our understanding of the proposed development, we anticipate that the following will be the principal geotechnical issues to be considered in the planning, design and construction of the proposed works:



Stage 2 and 3

- Excavations of up to a maximum 2.0m are anticipated, across the north-eastern end of the proposed new buildings. This will necessitate temporary shoring of the ground below the existing building until the Stage 4 work proceeds.
- The western end of the new buildings will be constructed slightly above existing ground levels, and so the existing AC paved area underneath could be left in place.
- All footings for the new buildings and any external structures should be taken down to the underlying sandstone bedrock encountered at depths between 0.4m and 8.5m.
- Due to the sandy nature of the underlying fill and natural soils, as well as the relatively high water table, conventional bored piers are not feasible.
- Due to the moderate to high loads anticipated and the relatively high water table CFA piles would be the preferred foundation system. Installing steel casing to the top of the bedrock, and augering out the sandstone bedrock is another method which could be considered however, this is a technically difficult operation and should only be considered if experienced contractors are involved, and is unlikely to be economic.

Stage 4

- Excavations up to a maximum of 1.2m are anticipated at the southern end of the Stage 4 development, where the building adjoins the Stage 2 building construction. Shallower excavations are anticipated across the northern and eastern ends of the building.
- Existing ground levels across the western end of the development will remain relatively unchanged.



- All footings for the new buildings and any external structures should be taken down to the underlying sandstone bedrock encountered at depths between 0.4m and 1.0m in the boreholes within the building footprint.
- The development is situated close to the buried sandstone cliff line; towards the southerly margin of the proposed new development sandstone depths may increase to 5.6m, as encountered in BH504.
- Where sandstone is encountered at a shallow depth, pad or strip footings founded straight onto bedrock would be sufficient. If sandstone is encountered at a greater depth (as maybe the case at the southern edge of the development) a bored or CFA pile foundation system would need to be employed.

4.2 Site Preparation and Earthworks

Although we have not been provided with an earthworks plan, we understand that fill will only be required to bring the level up for the new ground floor slab at the western edge of the proposed development. If the new ground floor slab is to be suspended, the fill under the slab to bring the level up would not have to be engineered fill, although it should be free of topsoil, root affected soils or other deleterious materials. This latter approach should be adopted if high quality tiled floor finishes are proposed, as it can be seen the existing pavement surface is uneven and this is most probably due to variations in settlement of the existing fill which was not engineered/controlled.

For any new pavement areas, or if ground floor slab is not suspended, the comments and recommendation provided below should be followed. Earthworks recommendations in this report should be read in conjunction with AS3798-2007: *'Guidelines on Earthworks for Commercial and Residential Developments'*.



Site Drainage

Good drainage should be provided both during construction and for the long term maintenance of the site. The principle aim of the drainage should be to promote run off but avoid erosion. The earthworks should be carefully planned and scheduled to maintain cross-falls during construction, avoid breaks for holidays etc.

Subgrade Preparation

The following subgrade preparation is recommended under any new pavement areas or floor slabs if not suspended and prior to the placement of engineered fill:

- Strip the subgrade of all hard surfacing and/or vegetation, root affected soils or other deleterious materials. The sandy fill may be separated, screened for deleterious materials and reused as engineered fill.
- Following stripping, proof roll the subgrade using a minimum of 6 passes of a smooth drum roller with a static weight of no less than 6 tonnes. All proof rolling should be completed in the presence of an experienced geotechnical engineer or geotechnician. As there is the potential for transmitted vibrations to damage nearby structures, proof rolling should be completed using only as much vibration as the structures can tolerate, in the worst case under static loads only.
- The purpose of proof rolling is to improve the near surface density of the soils and identify any soft or unstable areas. Any soft or unstable areas identified should be excavated down to a sound base and reinstated with engineered fill as described below.



General Excavation Comments

Excavations at the eastern end of the proposed development are anticipated to be to a maximum depth of (say) 2.0m. The water table is assessed to be at a greater depth than the excavation required for a finished floor level of RL 3.6m.

After removal of the existing pavements, excavation of the fill, and sandy soils should be readily achievable using conventional means such as the buckets of hydraulic excavators.

Where space allows, excavation through the fill and natural sandy soils may be temporary battered at a slope angle of 1 Vertical (V) in 1.5 Horizontal (H). Such batters should remain stable in the short term provided all surcharge loads, including construction loads, are kept well clear of the crest of the batters. All stormwater run-off should be directed away from all temporary slopes to reduce erosion.

Where the above batters cannot be accommodated the excavations would need to be supported by a retention system installed prior to the start of the excavations, such as a contiguous pile wall. Contiguous pile walls will be necessary due to the sandy nature of the soils and will also be beneficial in keeping adjacent ground movements to a low order. CFA piles would be the preferred method for such walls due to the relatively high water table, and should be founded within the rock below the base of the excavations.

Engineered Fill

Some of the existing fill and natural sandy soils on site are considered re-usable for engineered fill, provided that they are prepared as detailed below. All fill should be compacted in layers no greater than 150mm loose thickness. Granular materials should be compacted to at least 98% Standard Maximum Dry Density (SMDD) or 75% Density Index. Compaction without vibration in proximity to the existing building will be difficult and the use of engineered fill is best avoided.



We anticipate that service trench backfill will be compacted using a vibrating plate attached to an excavator or similar. Where this is not the case and compaction is undertaken using a hand operated vibrating plate we recommend that layer thicknesses be reduced to 100mm to help achieve the desired level of compaction.

Compaction Control

Compaction control should consist of density tests completed at a minimum frequency of 1 test/layer/300m² or 3 test/layer, whichever is the greater. Level 2 is the lowest category of compaction control that may be completed. For localised backfill areas such as service trenches, excavated soft spots etc, the frequency of testing should be 1 test/2 layers/50m². These recommendations should be read in conjunction with AS3798-2007.

4.3 Retaining Walls

The final retention requirements will depend on the final offsets of the excavations from the existing structures, the depth to good quality bedrock, as well as possible water seepage through the retained section.

Given the limited height to be retained the walls may be designed as cantilevered walls. Where some adjacent ground movements are tolerable and adjacent structures are located beyond a horizontal distance from the walls of at least twice the retained height, the walls may be designed using an active earth pressure coefficient, K_a , of 0.33 and a bulk unit weight of 20kN/m³. Where structures are located within twice the retained height and movements are to be kept low, a higher earth pressure coefficient close to the 'at rest' earth pressure coefficient, K_0 , of 0.6 should be used.

The above coefficients assume horizontal backfill surfaces and where inclined backfill is proposed the coefficients would need to be increased or the inclined backfill taken



as a surcharge load. All surcharge loads, including adjacent structures, should be allowed for in the design. Full hydrostatic pressures should be considered unless measures are undertaken to provide complete and permanent drainage of the ground behind the wall.

Where the pile wall is socketed in bedrock below the base of the excavation a lateral toe resistance of 200kPa may be used.

4.4 Pavements

Based on the laboratory CBR test results, for the silty sand and the gravelly sand fill subgrade a design soaked CBR value of 6.0% is appropriate for flexible pavements to allow for the variability of the fill. The exposed subgrade should be inspected and any clay soil removed to a depth of at least 400mm and replaced with good quality granular engineered fill

A subbase layer of minimum 100mm of DGB20, compacted to at least 98% of Modified Maximum Dry Density (MMDD) should be used beneath any concrete on-ground floor slabs and pavements. This will provide more uniform slab support and will reduce the 'pumping' of 'fines' at joints. For flexible pavements, all roadbase layers should be similarly compacted to at least 98% MMDD.

Subsoil drains should be considered along the perimeter of pavements, with inverts not less than 0.2m below subgrade level, depending on the likelihood of seepage penetration. Drainage trenches should be excavated with a significant longitudinal fall to appropriate discharge points so as to reduce the risk of water ponding. The pavement subgrade should be graded to promote water flow or infiltration towards subsoil drains if used.



It should be recognised that where the subgrade comprises uncontrolled fill of variable depth, there is a slight risk of long term settlements affecting the pavements and minimum cross-falls to drainage points should be avoided.

4.5 Footings

The proposed building should be uniformly founded in the sandstone bedrock of extremely low strength or better, which was encountered in the boreholes between 0.4m and 8.5m below existing ground level.

Due to the depth of the sandy fill profile, and the underlying natural sandy soils that overlie the bedrock in places, conventional bored piers are not feasible.

We consider that there are two main options for the footing system for the new Stage 2-3 development:

- CFA Piles – Could be readily constructed to the underlying sandstone bedrock unless buried obstructions are found in the fill (some cobble, boulders and buried slabs are noted in the boreholes)
- Bored Piers with steel casing – Prior to pier boring, steel casing would be progressed through fill and natural sandy soils, and keyed into underlying sandstone bedrock. The material within the steel casing is bored out, and the concrete tremmied from the base of the hole immediately after completion of boring. This process can be very difficult to carry out to good standards and only experienced contractors with a proven track record should attempt it. It is unlikely to be adopted.

Given the high loads arising from the multi-storey buildings, the piles should be taken into at least Class IV sandstone bedrock and may be designed (for serviceability) as 1.5MPa for end bearing and 10% of the bearing values for side adhesion provided



clean, rough sockets are formed in the sandstone of the relevant class. If higher bearing pressures are required the piles should be taken into at least Class III sandstone bedrock and may be designed (for serviceability) as 3.5MPa. Class III was not encountered in the vicinity of BH510 and BH511 (southern end of proposed Stage 2-3 development) and so bearing pressures would need to be reduced to (say) 1.5MPa in this area. If higher bearing pressures are required, further geotechnical boreholes in this area to confirm Class III bedrock may be required.

The proposed buildings for the Stage 4 development will predominantly be supported on shallow footings where the depth to rock may be as little as 0.4m below existing ground levels. It is noted that the upper bedrock profile is extremely weathered and of extremely low strength (Class V), and as such any high level footings would need to be closely inspected to make sure they would achieve the required bearing pressures. An allowable bearing pressure of 600kPa can be adopted for footings bearing upon the Class V sandstone. However, if sandstone is encountered at a deeper depth, at (say) the southerly extent of the building, a partially piled foundation system would need to be employed following the same criteria as detailed above.

Both CFA piles and bored piers generate spoil and in this circumstance the amount of soil requiring off site disposal should be considered, as the soils may be acid sulphate soils that may require treatment. Displacement auger piles could also be considered, though these piles may have a reduced capacity for socketing into rock.

We recommend that at least the initial stages of pile construction be inspected by a geotechnical engineer to confirm that appropriate bearing has been achieved. The need for additional inspections can be determined at that time based on apparent variability and strength of the strata.



The soil pH values indicate that the soils are slightly alkaline to alkaline at 7.3 to 11.2, and would be classified as 'non-aggressive' exposure classification for both concrete and steel piles.

4.6 Slab On Grade Construction

Slab-on-ground construction is considered feasible on condition that the subgrade is prepared in accordance with the recommendations given in Section 4.2 above. Nevertheless, proof-rolling will not always reveal or repair all problems with uncontrolled fill and there would be a slight risk of differential movement and/or cracking. Slabs must be detached from deep or piered footings or fully suspended.

A subbase layer of minimum 100mm of DGB20, compacted to at least 98% of Modified Maximum Dry Density (MMDD) should be used beneath any concrete on-ground floor slab and pavements. This will provide more uniform slab support and will reduce the 'pumping' of 'fines' at joints. For flexible pavements, all roadbase layers should be similarly compacted to at least 98% MMDD.

4.7 Further Geotechnical Input

The following summarises the further geotechnical input which may be required and which has been previously discussed in the preceding sections of this report:

- Inspections of proof rolling and density testing.
- Inspection of the initial stages of pile or pier boring.
- Inspection of strip and/or pad footings for required bearing pressures.



5 GENERAL COMMENTS

The recommendations presented in this report include specific issues to be addressed during the construction phase of the project. In the event that any of the construction phase recommendations presented in this report are not implemented, the general recommendations may become inapplicable and Jeffery and Katauskas Pty Ltd accept no responsibility whatsoever for the performance of the structure where recommendations are not implemented in full and properly tested, inspected and documented.

The long term successful performance of floor slabs could be dependent on the satisfactory completion of the earthworks. In order to achieve this, the quality assurance program should not be limited to routine compaction density testing only. Other critical factors associated with the earthworks may include subgrade preparation, selection of fill materials, control of moisture content and drainage, etc. The satisfactory control and assessment of these items may require judgment from an experienced engineer. Such judgment often cannot be made by a technician who may not have formal engineering qualifications and experience. In order to identify potential problems, we recommend that a pre-construction meeting be held so that all parties involved understand the earthworks requirements and potential difficulties. This meeting should clearly define the lines of communication and responsibility.

Occasionally, the subsurface conditions between the completed boreholes may be found to be different (or may be interpreted to be different) from those expected. Variation can also occur with groundwater conditions, especially after climatic changes. If such differences appear to exist, we recommend that you immediately contact this office.

This report provides advice on geotechnical aspects for the proposed civil and structural design. As part of the documentation stage of this project, Contract Documents and Specifications may be prepared based on our report. However, there



may be design features we are not aware of or have not commented on for a variety of reasons. The designers should satisfy themselves that all the necessary advice has been obtained. If required, we could be commissioned to review the geotechnical aspects of contract documents to confirm the intent of our recommendations has been correctly implemented.

If there is any change in the proposed development described in this report then all recommendations should be reviewed.

This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose. Copyright in this report is the property of Jeffery and Katauskas Pty Ltd. We have used a degree of care, skill and diligence normally exercised by consulting engineers in similar circumstances and locality. No other warranty expressed or implied is made or intended. Subject to payment of all fees due for the investigation, the client alone shall have a licence to use this report. The report shall not be reproduced except in full.

Should you have any queries regarding this report, please do not hesitate to contact the undersigned.

A MITCHELL
Geotechnical Engineer

Reviewed by:

P STUBBS
Principal
For and on behalf of
JEFFERY AND KATAUSKAS PTY LTD

Ref No: 23982S
Table A: Page 1 of 1

TABLE A
SUMMARY OF FOUR DAY SOAKED C.B.R. TEST RESULTS

BOREHOLE NUMBER	523	524
DEPTH (m)	1.00 - 1.50	0.30 - 0.80
Surcharge (kg)	4.5	4.5
Maximum Dry Density (t/m ³)	1.902 STD	1.942 STD
Optimum Moisture Content (%)	10.9	10.9
Moulded Dry Density (t/m ³)	1.86	1.91
Sample Density Ratio (%)	98	98
Sample Moisture Ratio (%)	102	96
Moisture Contents		
Insitu (%)	22.9	7.7
Moulded (%)	11.1	10.5
After soaking and		
After Test, Top 30mm(%)	13.1	13.2
Remaining Depth (%)	12.7	13.0
Material Retained on 19mm Sieve (%)	0	0
Swell (%)	0.0	0.0
C.B.R. value: @5.0mm penetration	6	25

NOTES:

- Refer to appropriate Borehole logs for soil descriptions
- Test Methods :
 - (a) Soaked C.B.R. : AS 1289 6.1.1
 - (b) Standard Compaction : AS 1289 5.1.1
 - (c) Moisture Content : AS 1289 2.1.1



NATA Accredited Laboratory
Number:1327

This document is issued in accordance with NATA's
accreditation requirements.
This document shall not be reproduced except
in full.

Approved Signatory
(A. Tata Kondal)


Date: 31/5/10

All services provided by STS are subject to our standard terms and conditions. A copy is available on request.

Ref No: 23982S
Table B: Page 1 of 3

TABLE B
SUMMARY OF POINT LOAD STRENGTH INDEX TEST RESULTS

BOREHOLE NUMBER	DEPTH m	I _{s (50)} MPa	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)
501	3.07-3.11	0.9	18
	3.78-3.82	0.5	10
	4.19-4.22	0.5	10
	4.79-4.82	0.2	4
	5.20-5.24	0.6	12
	5.89-5.91	1.1	22
502	1.72-1.76	0.3	6
	2.05-2.09	0.3	6
	3.20-3.23	0.2	4
	3.90-3.93	0.7	14
	4.30-4.33	1.2	24
503	2.74-2.77	0.6	12
	3.18-3.22	0.9	18
	3.84-3.87	0.4	8
	4.40-4.43	1.3	26
	4.97-5.00	1.3	26
	5.55-5.59	1.7	34
504	8.27-8.30	1.7	34
	9.14-9.17	0.5	10
	9.70-9.73	1.1	22
	10.28-10.33	0.7	14
505	7.24-7.27	0.2	4
	7.80-7.84	0.6	12
	8.13-8.16	0.5	10
	8.82-8.85	0.5	10

NOTES: See Page 3 of 3

Ref No: 23982S
 Table B: Page 2 of 3

TABLE B
SUMMARY OF POINT LOAD STRENGTH INDEX TEST RESULTS

BOREHOLE NUMBER	DEPTH m	$I_{s(50)}$ MPa	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)
506	4.82-4.85	0.1	2
	5.26-5.29	0.1	2
	6.61-6.65	0.5	10
	7.27-7.31	1.4	28
	7.75-7.78	1.4	28
	8.09-8.13	0.9	18
507	5.30-5.34	0.3	6
	5.76-5.79	0.1	2
	6.06-6.10	0.3	6
	6.52-6.54	0.5	10
	7.04-7.07	0.6	12
	7.46-7.50	0.2	4
508	8.10-8.14	0.7	14
	8.65-8.68	0.2	4
	9.09-9.13	0.2	4
	9.38-9.41	0.2	4
	10.33-10.37	0.5	10
	10.95-10.99	0.6	12
509	11.09-11.13	0.4	8
	5.47-5.50	0.6	12
	5.95-5.98	0.3	6
	6.16-6.20	0.4	8
	6.71-6.74	0.4	8
	7.32-7.36	0.9	18
	7.85-7.89	0.4	8
	8.39-8.43	1.2	24

NOTES: See Page 3 of 3

Ref No: 23982S
Table B: Page 3 of 3

TABLE B
SUMMARY OF POINT LOAD STRENGTH INDEX TEST RESULTS

BOREHOLE NUMBER	DEPTH m	$I_{s(50)}$ MPa	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)
510	10.94-10.97	0.1	2
	11.21-11.24	0.2	4
	11.71-11.74	0.2	4
	12.28-12.31	0.2	4
	12.85-12.89	0.1	2
	13.28-13.32	0.2	4
511	10.60-10.64	0.2	4
	10.96-11.00	0.2	4
	11.19-11.22	0.2	4
512	6.50-6.54	0.4	8
	7.09-7.12	0.9	18
	7.70-7.74	0.4	8
	8.09-8.13	0.4	8
	8.66-8.70	0.6	12
	9.32-9.36	0.3	6

NOTES:

1. In the above table testing was completed in the Axial direction.
2. The above strength tests were completed at the 'as received' moisture content.
3. Test Method: RTA T223.
4. The Estimated Unconfined Compressive Strength was calculated from the point load Strength Index by the following approximate relationship and rounded off to the nearest whole number :

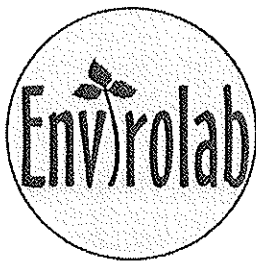
$$U.C.S. = 20 I_{s(50)}$$

TABLE C

ROCK CLASSIFICATIONS DEPTH/RL OF TOP OF STRATA (m/mAHD)							
No.	Surface RL	Class V	Class IV	Class III	Class II	Class I	End of Borehole
BH501 *	2.7	2.5 0.2	5.4 -2.7	3.0 -0.3	-	-	6.0 -3.3
BH502	3.5	0.8 2.7	-	-	3.3 0.2	-	4.5 -1.0
BH503	3.8	0.4 3.4	-	2.6 1.2	4.1 -0.3	-	5.6 -1.8
BH504	4.8	5.6 -0.8	-	8.0 -3.2	-	-	10.33 -5.53
BH505	5.6	5.7 -0.1	7.0 -1.4	8.5 -2.9	-	-	9.05 -3.45
BH506	3.0	4.3 -1.3	-	6.3 -3.3	-	-	8.2 -5.2
BH507	3.0	4.65 -1.7	5.2 -2.2	6.2 -3.2	-	-	8.15 -5.15
BH508	3.8	7.7 -3.9	8.6 -4.8	10.1 -6.3	-	-	11.55 -7.75
BH509	4.6	4.9 -0.3	-	5.4 -0.8	-	-	8.63 -4.03
BH510	3.3	8.2 -4.9	10.8 -7.5	-	-	-	13.31 -10.01
BH511	3.3	8.5 -5.2	10.5 -7.2	-	-	-	12.24 -8.94
BH512	4.3	-	6.5 -2.1	6.9 -2.6	-	-	9.35 -5.05

* Lower class rock underlying higher class rock.

Rock classification based upon the system described by Pells et al, Foundations on Sandstone and Shale in the Sydney Region, Australian Geomechanics, Dec 1998.



EnviroLab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 41301-A

Client:

Environmental Investigation Services
PO Box 976
North Ryde BC
NSW 1670

Attention: Brendan Page

Sample log in details:

Your Reference:	<u>E23982K, Pyrmont</u>
No. of samples:	21 Soils, 2 Waters
Date samples received:	21/05/10
Date completed instructions received:	21/05/10

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	28/05/10
Date of Preliminary Report:	not issued
Issue Date:	26/05/10

NATA accreditation number 2901. This document shall not be reproduced except in full.
This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025.
Tests not covered by NATA are denoted with *.

Results Approved By:

Priya Samarawickrama
Inorganics Team Leader

EnviroLab Reference: 41301-A
Revision No: R 00

Page 1 of 5



Miscellaneous Inorg - soil						
Our Reference:	UNITS	41301-A-1	41301-A-3	41301-A-4	41301-A-10	41301-A-13
Your Reference	-----	BH506	BH506	BH506	BH508	BH508
Depth	-----	0.5-1.0	3.0-3.45	4.3-4.5	1.5-1.95	6.1-6.45
Date Sampled		19/05/2010	19/05/2010	19/05/2010	20/05/2010	20/05/2010
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	26/05/10	26/05/10	26/05/10	26/05/10	26/05/10
Date analysed	-	26/05/10	26/05/10	26/05/10	26/05/10	26/05/10
pH 1:5 soil:water	pH Units	11.2	7.3	8.0	9.9	7.8
Chloride, Cl 1:5 soil:water	mg/kg	33	61	28	99	23
Sulphate, SO ₄ 1:5 soil:water	mg/kg	380	410	44	160	7.9

Method ID	Methodology Summary
LAB.1	pH - Measured using pH meter and electrode in accordance with APHA 20th ED, 4500-H+.
LAB.81	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA 21st ED, 4110-B.

Client Reference: E23982K, Pyrmont

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Miscellaneous Inorg - soil						Base Duplicate %RPD		
Date prepared	-			26/05/10	41301-A-1	26/05/10 26/05/10	LCS-1	26/05/10
Date analysed	-			26/05/10	41301-A-1	26/05/10 26/05/10	LCS-1	26/05/10
pH 1:5 soil:water	pH Units		LAB.1	[NT]	41301-A-1	11.2 11.2 RPD: 0	LCS-1	99%
Chloride, Cl 1:5 soil:water	mg/kg	2	LAB.81	<2.0	41301-A-1	33 25 RPD: 28	LCS-1	102%
Sulphate, SO4 1:5 soil:water	mg/kg	2	LAB.81	<2.0	41301-A-1	380 370 RPD: 3	LCS-1	105%

Report Comments:

Asbestos was analysed by Approved Identifier: Not applicable for this job

Asbestos was authorised by Approved Signatory: Not applicable for this job

INS: Insufficient sample for this test NT: Not tested PQL: Practical Quantitation Limit <: Less than >: Greater than

RPD: Relative Percent Difference NA: Test not required LCS: Laboratory Control Sample NR: Not requested

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike: A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample): This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria:

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the sample batch were within laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for

SVOC and speciated phenols is acceptable. Surrogates: 60-140% is acceptable for general organics and 10-140% for



Borehole No.

501

1/2

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Method: SPIRAL AUGER
 JK350

R.L. Surface: ≈ 2.7m

Date: 14-5-10

Datum: AHD

Logged/Checked by: A.M./*RS*

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASB	ASS	DS									
ON COMPLETION DURING DRILLING						0		-	ASPHALTIC CONCRETE: 70mm.t FILL: Sandy gravel, fine to coarse grained igneous gravel.	M	-	-	APPEARS MODERATELY COMPACTED
					N = 8 5,4,4	1			FILL: Sand, fine to medium grained, brown and grey, with clay bands and sub angular to sub rounded fine to medium grained igneous and slag gravel.				
					N = B 2,3,5	2		SM	SILTY SAND: fine to medium grained, yellow brown and grey.	M	-	-	SLIGHT HYDROCARBON ODOUR
						3		-	SANDSTONE: medium to coarse grained, light grey and orange brown.	XW DW	EL-VL L-M	-	RESIDUAL
									REFER TO CORED BOREHOLE LOG				VERY LOW 'TC' BIT RESISTANCE LOW TO MODERATE RESISTANCE
						4							
						5							
						6							
						7							

JEFFERY & KATAUSKAS PTY LTD

JOB NO. 239825

BH501

START CORING AT 3.0m

3

4

5

END OF BOREHOLE AT 6.0m





Borehole No.
501
2/2

CORED BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD																					
Project: SYDNEY FISH MARKET REDEVELOPMENT																					
Location: SYDNEY FISH MARKETS, PYRMONT, NSW																					
Job No. 23982S				Core Size: NMLC				R.L. Surface: ≈ 2.7m													
Date: 14-5-10				Inclination: VERTICAL				Datum: AHD													
Drill Type: JK350				Bearing: -				Logged/Checked by: A.M./													
Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX I _s (50)												DEFECT DETAILS		
							EL	VL	L	M	H	VH	EH	500	300	100	50	30	10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific General	
		2																			
		3		START CORING AT 3.0m																	
FULL RET- URN		4		SANDSTONE: fine to medium grained, light grey.	SW	M					X										
											X										
				SANDSTONE: fine to coarse grained, grey, orange and red brown.	DW						X										
											X										
		5									X										
											X										
		6		END OF BOREHOLE AT 6.0m							X										
		7																			
		8																			
		9																			

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

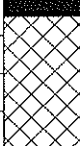
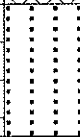
Method: SPIRAL AUGER
JK350

R.L. Surface: ≈ 3.5m

Date: 14-5-10

Datum: AHD

Logged/Checked by: A.M./

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASB	ASS	DS									
						0		-	ASPHALTIC CONCRETE: 100mm.t FILL: Sandy gravel, fine to coarse grained igneous, brown and grey, fine to coarse grained sand.	M	-	-	APPEARS WELL COMPACTED
					N = 18 11,18/ 150mm	1		-	SANDSTONE: fine to medium grained, yellow brown.	DW	L-M	-	LOW TO MODERATE 'TC' BIT RESISTANCE
									REFER TO CORED BOREHOLE LOG				MODERATE RESISTANCE
						2							
						3							
						4							
						5							
						6							
						7							

JEFFERY & KATAUSKAS PTY LTD

JOB NO. 239825

BH502

START CORING AT 1.5m

1



2



CORE LOSS 0.82m



3



4



END OF BOREHOLE AT 4.5m





Borehole No.

502

2/2

CORED BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Core Size: NMLC

R.L. Surface: ≈ 3.5m

Date: 14-5-10

Inclination: VERTICAL

Datum: AHD

Drill Type: JK350

Bearing: -

Logged/Checked by: A.M./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX I _s (50)	DEFECT DETAILS														
								DEFECT SPACING (mm)						DESCRIPTION Type, inclination, thickness, planarity, roughness, coating.								
								EL	VL	L	M	H	VH	EH	500	300	100	50	30	10	Specific	General
		1		START CORING AT 1.50m																		
FULL RET- URN ▼ ON COMPLET- ION		2		SANDSTONE: medium to coarse grained, orange and red brown.	DW	L-M				X												
				as above, but with quartz inclusions. CORE LOSS 0.82m		L				X												
		3		SANDSTONE: medium to coarse grained, light grey and orange brown, with quartz inclusions.	DW	L				X												- XWS, 30mm.t
				SANDSTONE: fine to medium grained, light grey, with dark grey laminae.	SW	M-H																
		4								X												- J, 0°, P, CLAY COATED
										X												
		5		END OF BOREHOLE AT 4.5m																		
		6																				
		7																				
		8																				



Borehole No.

503

1/2

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Method: SPIRAL AUGER
JK350

R.L. Surface: ≈ 3.8m

Date: 14-5-10

Datum: AHD

Logged/Checked by: A.M./

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASB	ASS	DS									
DRY DURING DRILLING						0		-	ASPHALTIC CONCRETE: 80mm.t	M	-	-	
								-	FILL: Gravelly sand, fine to medium grained, brown, fine to coarse grained sub angular igneous, slag and sandstone gravel.	XW	EL-VL	-	VERY LOW 'TC' BIT RESISTANCE
					N = 29 7,12,17	1			SANDSTONE: fine to coarse grained, yellow brown and light grey.	DW	VL-L		VERY LOW TO LOW RESISTANCE
						2			SANDSTONE: fine to medium grained, light grey.		L		MODERATE RESISTANCE
											M		HIGH RESISTANCE
						3			REFER TO CORED BOREHOLE LOG				
						4							
						5							
						6							
						7							

JEFFERY & KATAUSKAS PTY LTD

JOB NO. 239825

BH503

START CORING AT 2.60m

2

3

4

5

END OF BOREHOLE AT 5.60m





Borehole No.
503
2/2

CORED BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD																				
Project: SYDNEY FISH MARKET REDEVELOPMENT																				
Location: SYDNEY FISH MARKETS, PYRMONT, NSW																				
Job No. 23982S				Core Size: NMLC				R.L. Surface: ≈ 3.8m												
Date: 17-5-10				Inclination: VERTICAL				Datum: AHD												
Drill Type: JK350				Bearing: -				Logged/Checked by: A.M./B												
Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX I _s (50)										DEFECT DETAILS			
							EL	VL	L	M	H	VH	EH	500	300	200	150	100	50	10
		2		START CORING AT 2.60m																
ON COMPLETION FULL RET-URN		3		SANDSTONE: fine to medium grained, light grey, with dark grey laminae.	DW	M				X										
				SANDSTONE: fine to coarse grained, orange brown and red brown.	SW					X										
		4		SANDSTONE: fine to medium grained, light grey with dark grey laminae.		H				X										- J, 0°, P, S, IS
										X										- CS, 20mm.t
		5									X									
				SHALE: dark grey.	DW	L														
				SANDSTONE: fine to medium grained, light grey, with dark grey laminae.	SW	H				X										
		6		SANDSTONE: fine to coarse grained, orange brown and red brown.																
				END OF BOREHOLE AT 5.6m																
		7																		
		8																		
		9																		



Borehole No.

504

1/3

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Method: SPIRAL AUGER
JK350

R.L. Surface: ≈ 4.8m

Date: 14-5-10

Datum: AHD

Logged/Checked by: A.M./

Groundwater Record	ES ASB ASS DS	SAMPLES	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
				0		-	ASPHALTIC CONCRETE: 100mm.t	M	-	-	
			N = 6 6,3,3	1		-	FILL: Gravelly sand, fine to medium grained, brown, fine to coarse grained sub angular to sub rounded sandstone and slag gravel.				APPEARS MODERATELY TO WELL COMPACTED
			N = 16 7,9,7	2		-	FILL: Gravelly sand, fine to coarse grained, brown, yellow brown and red brown, fine to coarse grained sub angular sandstone, slag and igneous gravel, with clay lenses.				
				3		SM	FILL: Sandy gravel, fine to medium grained sub angular ash and slag gravel, dark brown and black, fine to medium grained sand.	M	L	-	ALLUVIAL
			N = 6 5,3,3	4		-	FILL: Silty sand, fine to medium grained, brown and yellow brown, with clay bands and sandstone gravel.				
				5		-	SILTY SAND: fine to medium grained, brown, dark grey and yellow brown, with organic clayey silt bands				
			N = 3 0,1,2	6		-	SILTY SAND: fine to coarse grained, dark grey and light grey, with a trace of organic clayey silt bands and decomposed organic material.	W	VL	-	SLIGHT HYDROCARBON ODOUR ALLUVIAL
				7		-	SANDSTONE: fine to medium grained, yellow brown and grey.	XW	EL-VL	-	VERY LOW 'TC' BIT RESISTANCE
								DW	L		



Borehole No.
504
2/3

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD													
Project: SYDNEY FISH MARKET REDEVELOPMENT													
Location: SYDNEY FISH MARKETS, PYRMONT, NSW													
Job No. 23982S			Method: SPIRAL AUGER JK350				R.L. Surface: ≈ 4.8m						
Date: 14-5-10			Logged/Checked by: A.M.				Datum: AHD						
Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASB	ASS	DS									
									SANDSTONE: fine to medium grained, yellow brown and grey.	DW	L		MODERATE RESISTANCE
									REFER TO CORED BOREHOLE LOG				
						8							
						9							
						10							
						11							
						12							
						13							
						14							

JEFFERY & KATAUSKAS PTY LTD

JOB NO. 239825

BH504

START CORING AT 7.33m

7

CORE LOSS 0.67m

8

9

10

END OF BH AT 10.33m





Borehole No.

504

3/3

CORED BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Core Size: NMLC

R.L. Surface: ≈ 4.8m

Date: 17-5-10

Inclination: VERTICAL

Datum: AHD

Drill Type: JK350

Bearing: -

Logged/Checked by: A.M./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$												DEFECT DETAILS	
																			DEFECT SPACING (mm)	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating.
							EL	VL	L	M	H	VH	EH	500	300	100	50	20		
		7		START CORING AT 7.38m																
				CORE LOSS 0.67m																
75% RET-URN		8		SANDSTONE: fine to coarse grained, light grey with red banding.	DW-SW	M														- XWS, 110mm.t
				SANDSTONE: fine to coarse grained, yellow brown, red brown and light grey, with light grey laminae.																- 8.48-9.0m J, SUB VERTICAL, Un, R
		9																		- Be, 20°, P, S, IS
		10																		- Be, 20°, SILTY SAND INFILL
				END OF BOREHOLE AT 10.33m																- Be, 5°, CLAY INFILL
		11																		
		12																		
		13																		



Borehole No.

505

1/2

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Method: SPIRAL AUGER
JK500

R.L. Surface: ≈ 5.6m

Date: 20--5-10

Datum: AHD

Logged/Checked by: A.M./

Groundwater Record	SAMPLES			Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASB	ASS									
					0			ASPHALTIC CONCRETE: 80mm.t CONCRETE: 220mm.t	-	-	-	
				N = 10 4,4,6	1			FILL: Gravelly sand, fine to medium grained, brown, fine to coarse grained, sub angular to sub rounded igneous and sandstone gravel and a trace of slag gravel.	M	-	-	APPEARS MODERATELY COMPACTED
				N > 20 7,10, 10/20mm REFUSAL	2							APPEARS WELL COMPACTED
					3		SM	SILTY SAND: fine to medium grained, orange brown, with clayey silt bands.	M	-	-	ALLUVIAL
				N = 11 7,6,5	4			SILTY SAND: fine to coarse grained, grey and dark grey, with clayey silt bands and a trace of decomposed wood.	M	MD		
					5			SILTY SAND: medium to coarse grained, light grey.	M	MD		
				N = 13 2,5,8	6					W		
					6		-	SANDSTONE: fine to medium grained, light grey, with clay bands.	DW	L	-	LOW TO MODERATE 'TC' BIT RESISTANCE
					7			REFER TO CORED BOREHOLE LOG				

▼
DURING
DRILL
ING

JEFFERY & KATAUSKAS PTY LTD

JOB NO. 239825

BH505 START CORING AT 6.05m

6

CORE LOSS 0.95m

7

8

9

END OF BOREHOLE AT 9.05m





Borehole No.

505

2/2

CORED BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Core Size: NMLC

R.L. Surface: ≈ 5.6m

Date: 17-5-10

Inclination: VERTICAL

Datum: AHD

Drill Type: JK500

Bearing: -

Logged/Checked by: A.M./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX I _s (50)	DEFECT DETAILS	
								DEFECT SPACING (mm)	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating.
							EL VL L M H VH EH	500 300 200 100 50 20 10	Specific General
		5							
		6		START CORING AT 6.05m CORE LOSS 0.95m					
50% LOSS		7							
FULL RET-URN		7		SANDSTONE: fine to coarse grained, light grey, with yellow brown and red brown staining and cross bedding.	DW	L	X		- XWS, 80mm.t
		8				M	X		
		9					X		- J, 40°, P, S, CLAY - Be, 20°, P, S, IS - J, 40°, P, S, CLAY COATED - Be, 20°, P, S, IS
		9		END OF BOREHOLE AT 9.05m					
		10							
		11							

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

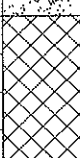
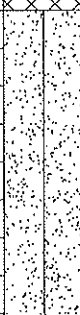
Method: SPIRAL AUGER
JK500

R.L. Surface: ≈ 3.0m

Date: 19-5-10

Datum: AHD

Logged/Checked by: A.M./

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASB	ASS	DS									
 DURING DRILLING					SPT 20/20mm REFUSAL	0		-	ASPHALTIC CONCRETE: 100mm.t FILL: Gravelly sand, fine to coarse grained, red brown, fine to medium grained sub angular to sub rounded igneous gravel.	M	-	-	APPEARS WELL COMPACTED
						1		-	CONCRETE: 500mm.t	-	-	-	
					N = 5 2,2,3	2		-	FILL: Gravelly sand, fine to medium grained, yellow brown and grey, fine to medium grained sub angular sandstone, igneous and slag gravel.	M	-	-	APPEARS POORLY COMPACTED
						3		SM	SILTY SAND: fine to medium grained, grey, with a trace of clay fines and decomposing timber fragments.	W	VL	-	HYDROCARBON ODOUR
					N = 2 1,1,1	4		-	SANDSTONE: fine to medium grained, light grey.	DW	VL	-	SLIGHT HYDROCARBON ODOUR
						5			REFER TO CORED BOREHOLE LOG				ALLUVIAL
						6							VERY LOW TO LOW 'TC' BIT RESISTANCE
						7							

JEFFERY & KATAUSKAS PTY LTD

JOB NO. 239825

BH506

START CORING AT 4.48m

CORE LOSS
0.11m

5

CL

6

CORE LOSS 0.34m.

7

8

END OF BH AT 8.20m



Borehole No.
506
2/2

CORED BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD Project: SYDNEY FISH MARKET REDEVELOPMENT Location: SYDNEY FISH MARKETS, PYRMONT, NSW												
Job No. 23982S Date: 19-5-10 Drill Type: JK500			Core Size: NMLC Inclination: VERTICAL Bearing: -			R.L. Surface: ≈ 3.0m Datum: AHD Logged/Checked by: A.M./R						
Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$		DEFECT SPACING (mm)		DEFECT DETAILS DESCRIPTION Type, inclination, thickness, planarity, roughness, coating.	
							EL VL L M H VR EH	500 300 100 50 30 10	Specific	General		
		3										
		4		START CORING AT 4.48m								
ON COMPLETION		5		CORE LOSS 0.11m SANDSTONE: fine to medium grained, light grey, with dark grey laminae.	DW	VL-L		X				- CS, 45mm.t - CS, 20mm.t
		6		as above, but fine to coarse grained.				X				
		7		CORE LOSS 0.34m								
		8		SANDSTONE: fine to medium grained, light grey, with dark grey laminae and cross bedding and orange staining.	DW-SW	M		X				- Be, 0°, Un, R, IS - Be, 0°, Un, R, IS
FULL RETURN		7				H		X				- J, 5°, P, S, IS - J, 45°, P, S, IS
		8				M		X				- Be, 0°, Un, S, IS
		9		END OF BOREHOLE AT 8.20m								



Borehole No.

507

1/2

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Method: SPIRAL AUGER
JK500

R.L. Surface: ≈ 3.0m

Date: 19-5-10

Datum: AHD

Logged/Checked by: A.M./

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASB	ASS	DS									
 DURING DRILLING ON COMPLETION						0		-	ASPHALTIC CONCRETE: 100mm.t FILL: Gravelly sand, fine to coarse grained, red brown, fine to medium grained sub angular igneous gravel.	M	-	-	APPEARS WELL COMPACTED
					SPT 20/10mm REFUSAL	1		-	CONCRETE: 300mm.t	-	-	-	
					N = 9 4,5,4	2		-	FILL: Gravelly sand, fine to medium grained, light grey and dark grey, fine to coarse grained sub angular slag and igneous gravel, with decomposing timber.	M	-	-	HYDROCARBON ODOUR APPEARS MODERATELY COMPACTED
					N = 3 2,1,2	3		SM	SILTY SAND: fine to coarse grained, dark grey and light grey, with a trace of decomposing timber.	W	VL	-	SLIGHT HYDROCARBON ODOUR ALLUVIAL
					N > 19 1,19/10mm REFUSAL	4		-	SANDSTONE: fine to medium grained, grey and yellow brown.	DW	L-M	-	LOW 'TC' BIT RESISTANCE
						5		-	REFER TO CORED BOREHOLE LOG				
						6							
						7							

JEFFERY & KATAUSKAS PTY LTD

JOB NO. 239825

BH507 START CORING AT 5.15m

5

CORE
LOSS
0.08m

6

7

8

END OF BH @ 8.15m



Borehole No.

507

2/2

CORED BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Core Size: NMLC

R.L. Surface: ≈ 3.0m

Date: 19-5-10

Inclination: VERTICAL

Datum: AHD

Drill Type: JK500

Bearing: -

Logged/Checked by: A.M. *RB*

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX I _s (50)	DEFECT DETAILS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
								DEFECT SPACING (mm)						DESCRIPTION Type, inclination, thickness, planarity, roughness, coating.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
								EL	VL	L	M	H	VH	EH	500	300	100	50	20	10	Specific	General																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
		4																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														



Borehole No.

508

1/3

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Method: SPIRAL AUGER
JK500

R.L. Surface: ≈ 3.8m

Date: 20-5-10

Datum: AHD

Logged/Checked by: A.M.

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASB	ASS	DS									
						0		-	ASPHALTIC CONCRETE: 100mm.t FILL: Gravelly sand, fine to medium grained, brown, fine to coarse grained sub angular to sub rounded igneous and slag gravel.	-	-	-	SLIGHT HYDROCARBON ODOUR
					SPT 10/10mm REFUSAL	1		-	CONCRETE: 100mm.t FILL: Silty sand, fine to coarse grained, dark grey and brown, with fine to coarse grained sub angular igneous, sandstone and slag gravel and clayey silt bands.	M	-	-	SLIGHT HYDROCARBON ODOUR APPEARS WELL COMPACTED
					N = 17 17,11,6	2							
						3		SM	SILTY SAND: medium to coarse grained, dark grey, with organic clayey silt bands and decomposing timber.	M	VL	-	SLIGHT HYDROCARBON ODOUR ALLUVIAL
					N = 2 1,1,1	4			SILTY SAND: medium to coarse grained, light grey.	W	VL	-	
						5					L		
					N = 0 1,0,0	6		SC	SILTY CLAYEY SAND: fine to medium grained, light grey.	W	MD	-	
					N = 10 5,5,5	7		SM	SILTY SAND: fine to coarse grained, light grey and yellow brown.				

▶ DURING DRILLING

▼ DURING DRILLING

▼ ON COMPLETION



Borehole No.
508
2/3

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD												
Project: SYDNEY FISH MARKET REDEVELOPMENT												
Location: SYDNEY FISH MARKETS, PYRMONT, NSW												
Job No. 23982S		Method: SPIRAL AUGER JK500				R.L. Surface: ≈ 3.8m						
Date: 20-5-10		Logged/Checked by: A.M./										
Groundwater Record	SAMPLES			Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASB	ASS									
							SM	SILTY SAND: fine to coarse grained, light grey and yellow brown.	W	MD		
				N > 11 5,11/ 150mm REFUSAL	8		-	SANDSTONE: fine to coarse grained, light grey yellow brown, with clay bands.	XW	EL-VL	-	VERY LOW 'TC' BIT RESISTANCE
									DW	L		LOW TO MODERATE RESISTANCE
					9			REFER TO CORED BOREHOLE LOG				
					10							
					11							
					12							
					13							
					14							

JEFFERY & KATAUSKAS PTY LTD

JOB No. 239825

BH508

START CORING AT 8.55m

8

9

10

11

END OF BH AT 11.55m





Borehole No.

508

3/3

CORED BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Core Size: NMLC

R.L. Surface: ≈ 3.8m

Date: 20-5-10

Inclination: VERTICAL

Datum: AHD

Drill Type: JK500

Bearing: -

Logged/Checked by: A.M./*AS*

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX I _s (50)	DEFECT DETAILS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
								DEFECT SPACING (mm)						DESCRIPTION Type, inclination, thickness, planarity, roughness, coating.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
								EL	VL	L	M	H	VR	EL	500	300	100	50	20	Specific	General																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
		7																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															</



Borehole No.

509

1/2

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Method: SPIRAL AUGER
 JK300

R.L. Surface: ≈ 4.6m

Date: 21-5-10

Datum: AHD

Logged/Checked by: M.L.T.

Groundwater Record	ES	ASB	ASS	DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0		-	ASPHALTIC CONCRETE: 70mm.t FILL: Gravelly sand, fine to medium grained, dark brown and brown, fine to coarse grained igneous, concrete, sandstone and quartz gravel and up to cobble size.	M	-	-	APPEARS WELL COMPACTED
					N = 6 2,2,4	1		CL	SANDY CLAY: low to medium plasticity, light brown, orange brown and red brown, fine to medium grained sand, and a trace of roots.	MC > PL	St	-	ALLUVIAL
						2						150 170 170	
					N = 6 5,4,2	3		CL/SC	SANDY CLAY/CLAYEY SAND: low to medium plasticity, fine to medium grained, light grey, orange brown and red brown.	MC < PL/ M	VSt/ H/ L	440 420 220	
						4		SC	CLAYEY SAND: fine to medium grained, pink, red brown and light grey.	M	L		
					N > 21 1,12, 9/50mm REFUSAL	5		-	SANDSTONE: fine to medium grained, light grey. REFER TO CORED BOREHOLE LOG	DW	L-M	-	LOW 'TC' BIT RESISTANCE
						6							
						7							

DURING DRILLING

DURING DRILLING

JEFFERY & KATAUSKAS PTY LTD

239825

BH509

START CORING AT 5.05m

5.05

6

7

8

END BH509 AT 8.63m



Borehole No.

509

2/2

CORED BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Core Size: NMLC

R.L. Surface: ≈ 4.6m

Date: 21-5-10

Inclination: VERTICAL

Datum: AHD

Drill Type: JK350

Bearing: -

Logged/Checked by: M.L.T./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX I _s (50)	DEFECT DETAILS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
								DEFECT SPACING (mm)						DESCRIPTION Type, inclination, thickness, planarity, roughness, coating.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
								EL	VL	L	M	H	VH	EF	500	300	100	50	30	10	Specific	General																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
		4																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											



Borehole No.
510
1/3

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD		Project: SYDNEY FISH MARKET REDEVELOPMENT		Location: SYDNEY FISH MARKETS, PYRMONT, NSW							
Job No. 23982S		Method: SPIRAL AUGER JK350		R.L. Surface: ≈ 3.3m							
Date: 21-5-10		Logged/Checked by: A.M./									
Groundwater Record	SAMPLES		Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASB									
 DURING DRILL- ING				0		-	ASPHALTIC CONCRETE: 50mm.t CONCRETE: 200mm.t	-	-	-	
				1		-	FILL: Sandy gravel, fine to coarse grained angular igneous gravel. FILL: Gravelly sand, fine to medium grained, brown, yellow brown and grey, with metal wire fragments.	M	-	-	APPEARS WELL COMPACTED SLIGHT HYDROCARBON ODOUR
			N = 24 10,12,12	2							
				3							APPEARS POORLY COMPACTED
			N = 7 4,3,4	4		SM	SILTY SAND: fine to coarse grained, light grey, with organic clayey silt bands.	W	VL	-	ALLUVIAL
		N = 2 1,0,1	5								
			6		SC	SILTY CLAYEY SAND: fine to medium grained, light grey.	M	L			
		N = 8 2,3,5	7								



Borehole No.

510

2/3

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Method: SPIRAL AUGER
 JK350

R.L. Surface: $\approx$ 3.3m

Date: 21-5-10

Datum: AHD

Logged/Checked by: A.M./

Groundwater Record	ES ASB ASS DS	SAMPLES	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
 ON COMPLETION			N = 10 4,4,6	8		SC	SILTY CLAYEY SAND: fine to medium grained, light grey.	M	L		
				9		-	SANDSTONE: fine to coarse grained, light grey, with a trace of yellow.	XW	EL-VL	-	VERY LOW 'TC' BIT RESISTANCE
				10					L		LOW TO MODERATE RESISTANCE
				11			REFER TO CORED BOREHOLE LOG				
				12							
				13							
				14							

JEFFERY & KATAUSKAS PTY LTD

JOB NO. 239825

BH510

START CORING AT 10.32m

CORE LOSS 0.46m

11

12

13

END OF BH AT 13.31m



Borehole No.

510

3/3

CORED BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S **Core Size:** NMLC **R.L. Surface:** ≈ 3.3m

Date: 21-5-10 **Inclination:** VERTICAL **Datum:** AHD

Drill Type: JK350 **Bearing:** - **Logged/Checked by:** A.M.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX I _s (50)	DEFECT DETAILS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
								DEFECT SPACING (mm)						DESCRIPTION Type, inclination, thickness, planarity, roughness, coating.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
								EL	VL	L	M	H	VH	EH	500	300	100	50	30	10	Specific	General																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
		9																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															



Borehole No.

511

1/3

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Method: SPIRAL AUGER
 JK350

R.L. Surface: ≈ 3.3m

Date: 21-5-10

Datum: AHD

Logged/Checked by: A.M. *RS*

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASB	ASS	DS									
▼ DURING DRILL-ING						0		-	ASPHALTIC CONCRETE: 50mm.t CONCRETE: 180mm.t	-	-	-	
						1		-	FILL: Gravelly sand, fine to coarse grained, dark brown, fine to coarse grained sub angular igneous, concrete, slag and sandstone gravel.	M	-	-	SLIGHT HYDROCARBON ODOUR
					N = 10 8,6,4	2							APPEARS MODERATELY COMPACTED
						3			FILL: Gravelly sand, fine to coarse grained, dark brown and dark grey, fine to coarse grained angular to sub angular slag and sandstone gravel.	W	L		APPEARS POORLY COMPACTED
▼ ON COMPLETION					N = 6 1,2,4	4							
						5		SM	SILTY SAND: fine to coarse grained, light grey and dark grey, with clayey silt bands and decomposing wood. as above, but without wood.	W	VL	-	STRONG HYDROCARBON ODOUR
					N = 1 1,0,1	6							ALLUVIAL
						7					L		
					N = 7 3,3,4								



Borehole No.
511
2/3

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD													
Project: SYDNEY FISH MARKET REDEVELOPMENT													
Location: SYDNEY FISH MARKETS, PYRMONT, NSW													
Job No. 23982S			Method: SPIRAL AUGER JK350					R.L. Surface: ≈ 3.3m					
Date: 21-5-10			Datum: AHD										
Logged/Checked by: A.M./													
Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASB	ASS	DS									
					N = 6 2,3,3	8		SM	SILTY SAND: fine to coarse grained, light grey and dark grey, with clayey silt bands.	W	L		ALLUVIAL
						9		-	SANDSTONE: medium to coarse grained, grey and yellow brown.	XW	EL-VL	-	VERY LOW 'TC' BIT RESISTANCE
									DW	L		LOW RESISTANCE	
						10			REFER TO CORED BOREHOLE LOG				
						11							
						12							
						13							
						14							

JEFFERY & KATAUSKAS PTY LTD

JOB No. 239825

BH511

START CORING AT 9.24m

9

CORE LOSS 1.21m

10

11

12

END OF BH AT 12.24m



Borehole No.
511
3/3

CORED BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD Project: SYDNEY FISH MARKET REDEVELOPMENT Location: SYDNEY FISH MARKETS, PYRMONT, NSW																						
Job No. 23982S Date: 21-5-10 Drill Type: JK350				Core Size: NMLC Inclination: VERTICAL Bearing: -				R.L. Surface: ≈ 3.3m Datum: AHD Logged/Checked by: A.M./ <i>R</i>														
Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$										DEFECT DETAILS					
							EL	VL	L	M	H	VH	EH	500	300	100	50	20	10	DEFECT SPACING (mm)	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific General	
		8																				
		9		START CORING AT 9.24m																		
		10		CORE LOSS 1.21m																		
FULL RET- URN		11		SANDSTONE: fine to coarse grained, light grey.	DW	L																
		11		SANDSTONE: fine to coarse grained, orange brown and light grey.																		
		12																				
		13		END OF BOREHOLE AT 12.24m																		
		14																				



Borehole No.

512

1/2

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Method: SPIRAL AUGER
JK300

R.L. Surface: ≈ 4.3m

Date: 21-5-10

Datum: AHD

Logged/Checked by: M.L.T./

Groundwater Record	SAMPLES	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES ASB ASS DS		0		-	CONCRETE: 320mm.t				4mm DIAMETER REINFORCEMENT, 110mm & 240mm TOP COVER
		N = 1 1,0,1	1		-	FILL: Gravelly sand, fine to coarse grained, light grey, fine to medium grained sub angular igneous and concrete gravel. FILL: Gravelly sand, fine to coarse grained, dark brown and brown, fine to coarse grained sandstone and igneous gravel and up to cobble size and metal fragments.	W M	VL	-	APPEARS POORLY COMPACTED
		N = 6 2,4,2	2			FILL: Sand, fine to coarse grained, light grey and orange brown, with fine to coarse grained sandstone and ironstone gravel.				
			3			FILL: Sandy clay, low plasticity, red brown and orange brown, with fine to medium grained, igneous, sandstone and ironstone gravel and plastic pieces.				
		N = 1 1,0,1	4		SP	SAND: fine to coarse grained, grey.	M	VL		ALLUVIAL
			5		CL	SANDY CLAY: low plasticity, dark grey.	MC > PL	S		
		SPT 0,0,0	6		SP	SAND: fine to coarse grained, grey and brown, with clay bands.	W	(VL)		
			7		CL/SC	SANDY CLAY/CLAYEY SAND: low plasticity, fine to coarse grained, light grey mottled orange brown, with fine to coarse grained sandstone gravel.	MC > PL/ W	(St-L)		
		N > 10 9,10/ 50mm REFUSAL	8		SC	CLAYEY SAND: fine to coarse grained, light grey.	M	(MD)		
			9			REFER TO CORED BOREHOLE LOG				

JEFFERY & KATAUSKAS PTY LTD

239825

BH512

START CORING AT 6.35m

6

6.35m

CORE
LOSS
0.07m

7

8

9

END OF BH AT 9.35m



Borehole No.

512

2/2

CORED BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S **Core Size:** NMLC **R.L. Surface:** ≈ 4.3m
Date: 21-5-10 **Inclination:** VERTICAL **Datum:** AHD
Drill Type: JK350 **Bearing:** - **Logged/Checked by:** A.M./[Signature]

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX I _s (50)	DEFECT DETAILS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
								DEFECT SPACING (mm)												DESCRIPTION Type, inclination, thickness, planarity, roughness, coating.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
								EL	VL	L	M	H	VH	EH	500	300	100	50	20	Specific	General																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
		6		START CORING AT 6.35m																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
FULL RET- URN		7		CORE LOSS 0.07m	DW	M	X													- Be, 15°, P, S - Be, 15°, P, S - Be, 0°, P, S																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
	SANDSTONE: fine to medium grained, light grey, orange brown and red brown massive.			X																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
	as above, but light grey mottled orange brown.			X																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														



Borehole No.

513

1/1

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Method: SPIRAL AUGER
JK350

R.L. Surface: ≈ 2.3m

Date: 11-5-10

Datum: AHD

Logged/Checked by: A.M. *RS*

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	USO	DB	DS									
ON COMPLETION DURING DRILLING						0		-	ASPHALTIC CONCRETE: 50mm.t CONCRETE: 180mm.t CONCRETE/CONCRETE RUBBLE	-	-	-	
						1		-	FILL: Silty clayey sand, fine to medium grained, dark grey.	M	-	-	APPEARS POORLY COMPACTED
					N = 5 2,3,2	2		SP	SAND: fine to coarse grained, grey and dark grey, with quartz.	W	L	-	SLIGHT HYDROCARBON ODOUR ALLUVIAL
						3		-	SANDSTONE: fine to coarse grained, light grey.	DW	VL	-	VERY LOW 'TC' BIT RESISTANCE
						4		-	SANDSTONE: fine to coarse grained, light grey and yellow brown.	DW	VL-L	-	VERY LOW TO LOW RESISTANCE
						5		-			L-M	-	LOW TO MODERATE RESISTANCE
						6			END OF BOREHOLE AT 6.0m				MONITORING WELL INSTALLED TO 4.2m. CLASS 18 50mm DIA. MACHINE SLOTTED PVC FROM 4.2m-1.2m CASING FROM 1.2m TO SURFACE, 2mm SAND FILTER PACK 4.2m-1.0m, BENTONITE SEAL 1.2m-0.3m BACKFILLED WITH SAND & CUTTINGS TO SURFACE, COMPLETED WITH A STEEL GATIC COVER AND LOCKABLE CAP
						7							



Borehole No.

514

1/1

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S
Date: 11-5-10

Method: SPIRAL AUGER
JK250

R.L. Surface: ≈ 2.1m
Datum: AHD

Logged/Checked by: A.M./

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASB	ASS	DS									
 DURING DRILL -ING & ON COMPLET -ION						0			CONCRETE: 230mm.t				
								-	ASPHALTIC CONCRETE: 150mm.t	-	-	-	
								-	FILL: Clayey gravelly sand, fine to medium grained, orange brown and grey, fine to coarse grained sub angular to sub rounded igneous and sandstone gravel.	M	-	-	SLIGHT HYDROCARBON ODOUR
					N = 10 5,7,3	1			FILL: Silty sand, fine to medium grained, light grey ad and yellow brown, with fine to coarse grained sub rounded sandstone gravel.				APPEARS MODERATELY COMPACTED
					N = 7 3,3,4			SM	SILTY SAND: fine to medium grained, grey and yellow brown.	M	L	-	
						2			as above, but grey, with shell fragments.	W	L		ALLUVIAL
						3					VL		
					N = 2 0,1,1								
						4		-	SANDSTONE: fine to medium grained, yellow brown, with clay bands.	DW	VL-L	-	LOW 'TC' BIT RESISTANCE
						5			SANDSTONE: fine to medium grained, light brown.		L-M		LOW TO MODERATE RESISTANCE
						6			END OF BOREHOLE AT 6.0m				
						7							



Borehole No.

515

1/1

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Method: SPIRAL AUGER
JK350

R.L. Surface: ≈ 3.9m

Date: 11-5-10

Datum: AHD

Logged/Checked by: A.M./

Groundwater Record	ES	ASB	ASS	DS	SAMPLES	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0		-	ASPHALTIC CONCRETE: 100mm.t	-	-	-	
									-	CONCRTE: 140mm.t	M	-	-	
						N = 6 2,2,4				FILL: Gravelly sand, fine to medium grained, orange brown and red brown, fine grained sub angular to sub rounded sandstone gravel.				APPEARS MODERATELY COMPACTED
							1		-	SANDSTONE: fine to medium grained, yellow brown.	XW	EL-L	-	VERY LOW 'TC' BIT RESISTANCE
											DW	L-M		LOW RESISTANCE
							2							MODERATE RESISTANCE
										as above, but light grey.		M		HIGH RESISTANCE
							3			END OF BOREHOLE AT 2.8m				'TC' BIT REFUSAL
							4							
							5							
							6							
							7							



Borehole No.

516

1/1

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Method: SPIRAL AUGER
 JK350

R.L. Surface: ≈ 3.0m

Date: 11-5-10

Datum: AHD

Logged/Checked by: A.M./

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	U50	DB	DS									
DRY ON COMPLETION						0		-	ASPHALTIC CONCRETE: 50mm.t	-	-	-	
								-	CONCRTE: 220mm.t	-	-	-	
					N = 25 7,6,17			-	FILL: Silty sand, fine to coarse grained, dark grey and yellow brown, fine to coarse grained sub angular igneous and sandstone gravel.	M	-	-	APPEARS WELL COMPACTED
						1		SP	SAND: fine to coarse grained, light grey and yellow brown.	M	-	-	HYDROCARBON ODOUR
					N = 43 19,21,22			-	SANDSTONE: fine to medium grained, yellow brown and light grey, with clay bands.	XW	EL-VL	-	RESIDUAL VERY LOW 'TC' BIT RESISTANCE
						2			SANDSTONE: fine to medium grained, light grey.	DW	L		LOW TO MODERATE RESISTANCE
											M		MODERATE TO HIGH RESISTANCE
						3			END OF BOREHOLE AT 3.0m				'TC' BIT REFUSAL
						4							MONITORING WELL INSTALLED TO 3.0m. CLASS 18 50mm DIA. MACHINE SLOTTED PVC FROM 3.0m TO 1.0m, CASING FROM 1.0m TO SURFACE, 2mm SAND FILTER PACK TO 3.0m TO 0.8m, BENTONITE SEAL FROM 0.8m TO 0.3m. BACKFILLED WITH SAND AND CUTTINGS TO SURFACE AND COMPLETED WITH A STEEL GATIC COVER AND LOCKABLE CAP
						5							
						6							
						7							

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

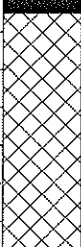
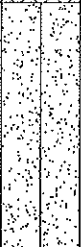
Method: SPIRAL AUGER
 JK350

R.L. Surface: ≈ 3.3m

Date: 13-5-10

Datum: AHD

Logged/Checked by: A.M. *RS*

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	US	DB	DS									
ON COMPLETION DURING DRILLING					N = 11 4,6,5	0		-	ASPHALTIC CONCRETE: 100mm.t FILL: Gravelly sand, fine to medium grained, grey brown, with fine to coarse grained sub angular to sub rounded igneous and sandstone gravel and ash. FILL: Sand, fine to medium grained, yellow brown, with fine to coarse grained sandstone and sla gravel.	M	-	-	APPEARS MODERATELY COMPACTED
					N = 14 10,7,7	1			FILL: Gravelly sand, fine to medium grained, yellow brown and dark grey, fine to coarse igneous and sandstone gravel.				
					N = 2 1,1,1	2			FILL: Silty sand, fine to medium grained, grey and dark brown, with clay and fine to coarse grained slag gravel.	W	VL		
					N = 4 1,2,2	3		SM	SILTY SAND: fine to medium grained, grey.	W	VL	-	STRONG HYDROCARBON ODOUR ALLUVIAL MONITORING WELL INSTALLED TO 5.5m. CLASS 18 50mm DIA. MACHINE SLOTTED PVC FROM 5.5m-2.5m, CASING 2.5m TO SURFACE, 2mm SAND FILTER PACK TO 1.5m, BENTONITE SEAL FROM 1.5m-0.3m, BACKFILLED WITH SAND & CUTTINGS TO SURFACE & COMPLETED WITH A STEEL GATIC COVER AND LOCKABLE CAP
						4			SILTY SAND: fine to medium grained, grey and light grey, with shell fragments.		(L)		
						5			END OF BOREHOLE AT 6.0m				
						6							
						7							

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Method: SPIRAL AUGER
JK350

R.L. Surface: ≈ 3.0m

Date: 13-5-10

Datum: AHD

Logged/Checked by: A.M./

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASB	ASS	DS									
DRY ON COMPLETION						0		-	ASPHALTIC CONCRETE: 100mm.t FILL: Sandy gravel, fine to coarse grained sub angular to sub rounded concrete brick and sandstone gravel, red brown and brown, fine to medium grained sand, with ash and slag.	M	-	-	APPEARS WELL COMPACTED
					SPT 18/150m REFUSAL	1			as above, but yellow brown, with concrete gravel and cobbles.	M-D			
						2			END OF BOREHOLE AT 1.6m				'TC' BIT REFUSAL IN FILL
						3							
						4							
						5							
						6							
						7							



Borehole No.

519

1/1

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Method: SPIRAL AUGER
JK350

R.L. Surface: $\approx$ 4.1m

Date: 13-5-10

Datum: AHD

Logged/Checked by: A.M./

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASB	ASS	DS									
DRY ON COMPLETION						0		-	ASPHALTIC CONCRETE: 100mm.t FILL: Sandy gravel, sandstone and igneous gravel, dark brown and grey, fine to coarse grained sand, with sandstone cobbles and boulders.	M	-	-	APPEARS WELL COMPACTED
					N = 43 10,22,21	1			FILL: Sandstone and concrete rubble.	D	-	-	
									END OF BOREHOLE AT 1.1m				'TC' BIT REFUSAL IN FILL
						2							
						3							
						4							
						5							
						6							
						7							



Borehole No.

520

1/1

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Method: SPIRAL AUGER
JK350

R.L. Surface: ≈ 6.7m

Date: 13-5-10

Datum: AHD

Logged/Checked by: A.M./

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASB	ASS	DS									
DRY ON COMPLETION						0		-	ASPHALTIC CONCRETE: 100mm.t	M	-	-	APPEARS WELL COMPACTED
								-	FILL: Sandy gravel, fine to coarse grained sub angular sandstone, igneous and concrete gravel, brown and grey, fine to coarse grained sand, with ash fragments.	-	-	-	
								-	CONCRETE: 220mm.t	M	-	-	VERY LOW 'TC' BIT RESISTANCE
						1		-	FILL: Gravel, medium to coarse grained sub angular igneous. SANDSTONE: fine to medium grained, yellow brown.	XW	EL	-	
								-	SANDSTONE: fine to medium grained, yellow brown.	DW	L-M	-	LOW RESISTANCE
									END OF BOREHOLE AT 1.5m				'TC' BIT REFUSAL
						2							
						3							
						4							
						5							
						6							
						7							

Nc =
11
9
12



Borehole No.

521

1/1

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Method: SPIRAL AUGER
 JK350

R.L. Surface: ≈ 6.7m

Date: 13-5-10

Datum: AHD

Logged/Checked by: A.M./

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	ASB	ASS	DS									
DRY ON COMPLETION						0		-	ASPHALTIC CONCRETE: 80mm.t FILL: Sandy gravel, sandstone, igneous and concrete gravel, brown and grey, fine to coarse grained sand, with ash fragments. FILL: Concrete and brick cobbles and boulders. END OF BOREHOLE AT 0.6m	M	-	-	
						1							'TC' BIT REFUSAL IN FILL
						2							
						3							
						4							
						5							
						6							
						7							



Borehole No.

522

1/1

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Method: SPIRAL AUGER
JK350

R.L. Surface: ≈ 6.3m

Date: 13-5-10

Datum: AHD

Logged/Checked by: A.M. *RB*

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASB	ASS	DS									
DRY ON COMPLETION					Nc = 18 22 17 13 10 10 10 6 6	0		-	ASPHALTIC CONCRETE: 100mm.t	-	-	-	
								-	CONCRETE: 200mm.t	-	-	-	
								-	FILL: Gravelly sand, fine to medium grained, brown, fine to medium grained sub angular to sub rounded brick, sandstone and igneous gravel.	M	-	-	APPEARS WELL COMPACTED
						1		-	FILL: Silty sand, fine to medium grained, yellow brown, with fine to coarse grained sub angular to sub rounded sandstone and igneous gravel, and clay bands.	M	-	-	APPEARS MODERATELY COMPACTED
									END OF BOREHOLE AT 1.65m				
						2							
						3							
						4							
						5							
						6							
						7							



Borehole No.

523

1/1

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Method: SPIRAL AUGER
JK350

R.L. Surface: ≈ 4.5m

Date: 13-5-10

Datum: AHD

Logged/Checked by: A.M./

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASB	ASS	DS									
DRY ON COMPLETION						0		-	ASPHALTIC CONCRETE: 50mm.t CONCRETE: 750mm.t	-	-	-	
					N = 18 8,9,9	1		-	FILL: Silty sand, fine to coarse grained, yellow and orange brown, with fine to medium grained sub angular igneous gravel.	M	-	-	APPEARS WELL COMPACED
									END OF BOREHOLE AT 1.5m				
						2							
						3							
						4							
						5							
						6							
						7							



Borehole No.

524

1/1

BOREHOLE LOG

Client: SYDNEY FISH MARKET PTY LTD
Project: SYDNEY FISH MARKET REDEVELOPMENT
Location: SYDNEY FISH MARKETS, PYRMONT, NSW

Job No. 23982S

Method: SPIRAL AUGER
 JK350

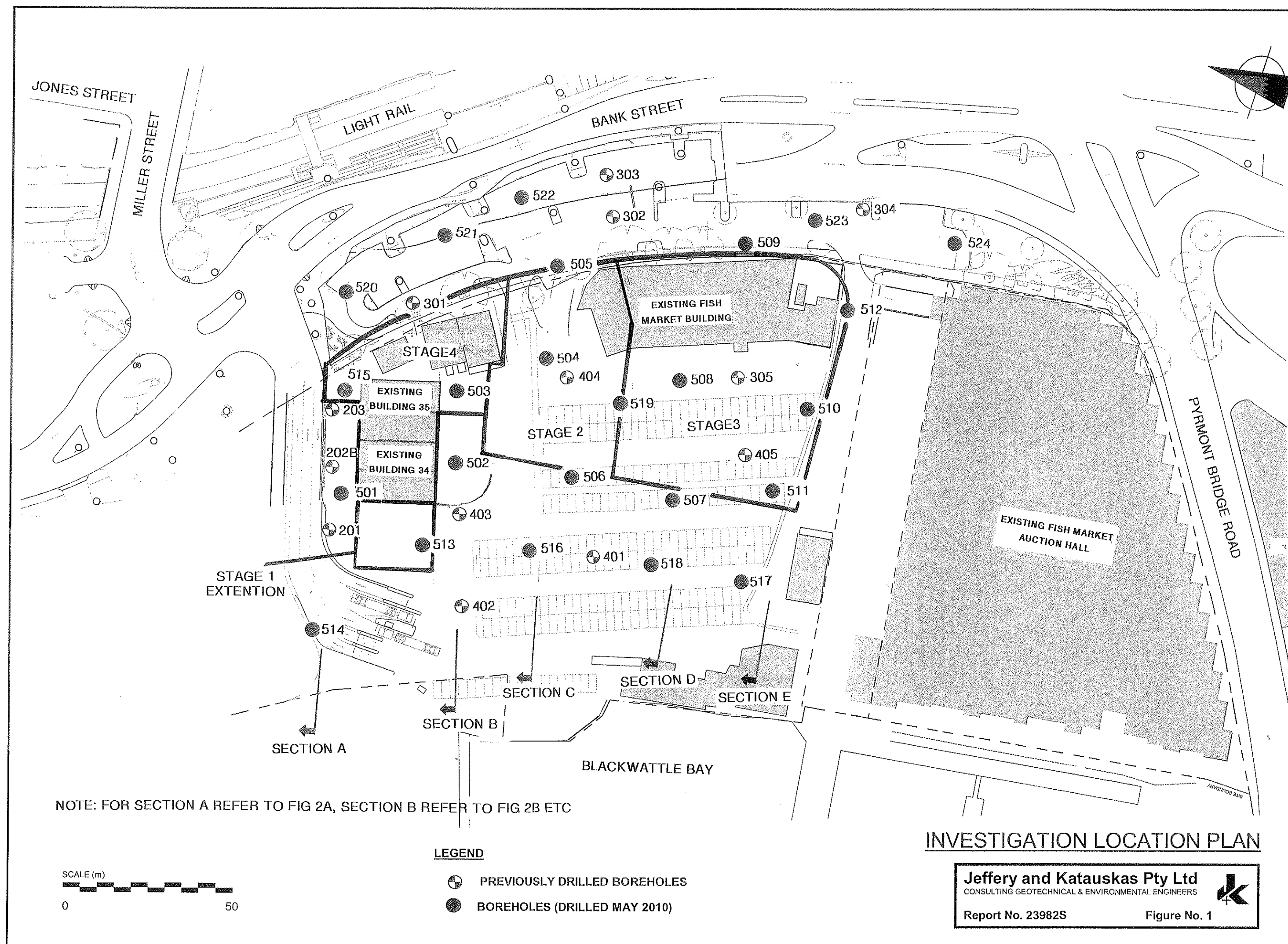
R.L. Surface: ≈ 4.3m

Date: 13-5-10

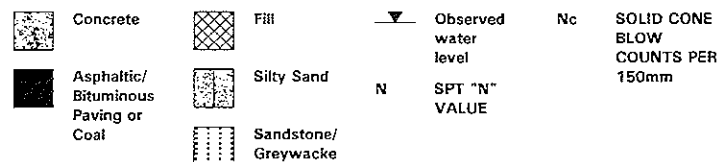
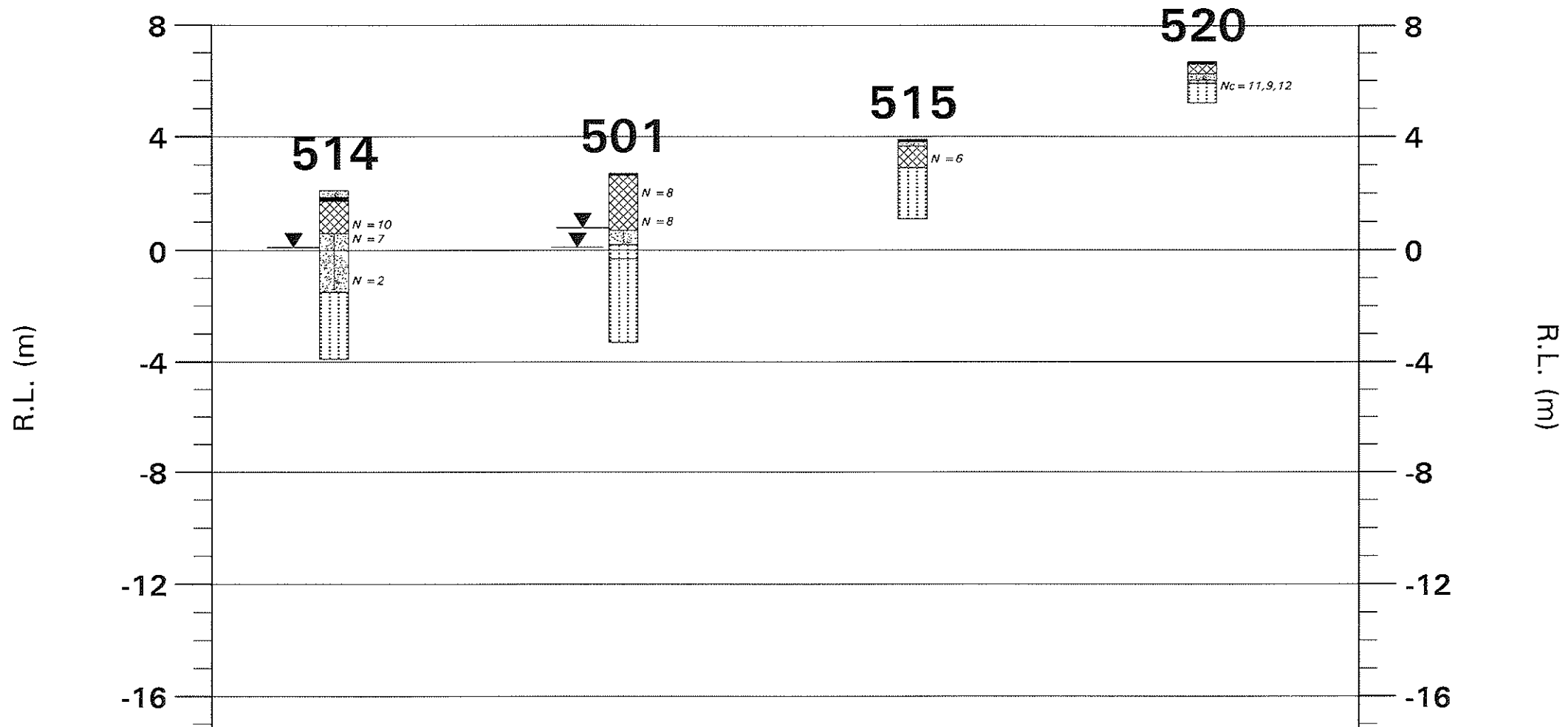
Datum: AHD

Logged/Checked by: A.M.

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks			
	ES	ASB	ASS	DS												
DRY ON COMPLETION					Nc = <table><tr><td>35</td></tr><tr><td>R</td></tr><tr><td>12</td></tr><tr><td>12</td></tr><tr><td>14</td></tr><tr><td>10</td></tr><tr><td>8</td></tr><tr><td>10</td></tr></table>	35	R	12	12	14	10	8	10	0		-
	35															
	R															
	12															
	12															
	14															
	10															
	8															
10																



GRAPHICAL BOREHOLE SUMMARY



NOTE: REFER TO BOREHOLE LOGS

Scale: 1 : 200 (vert) ; NTS (horiz)

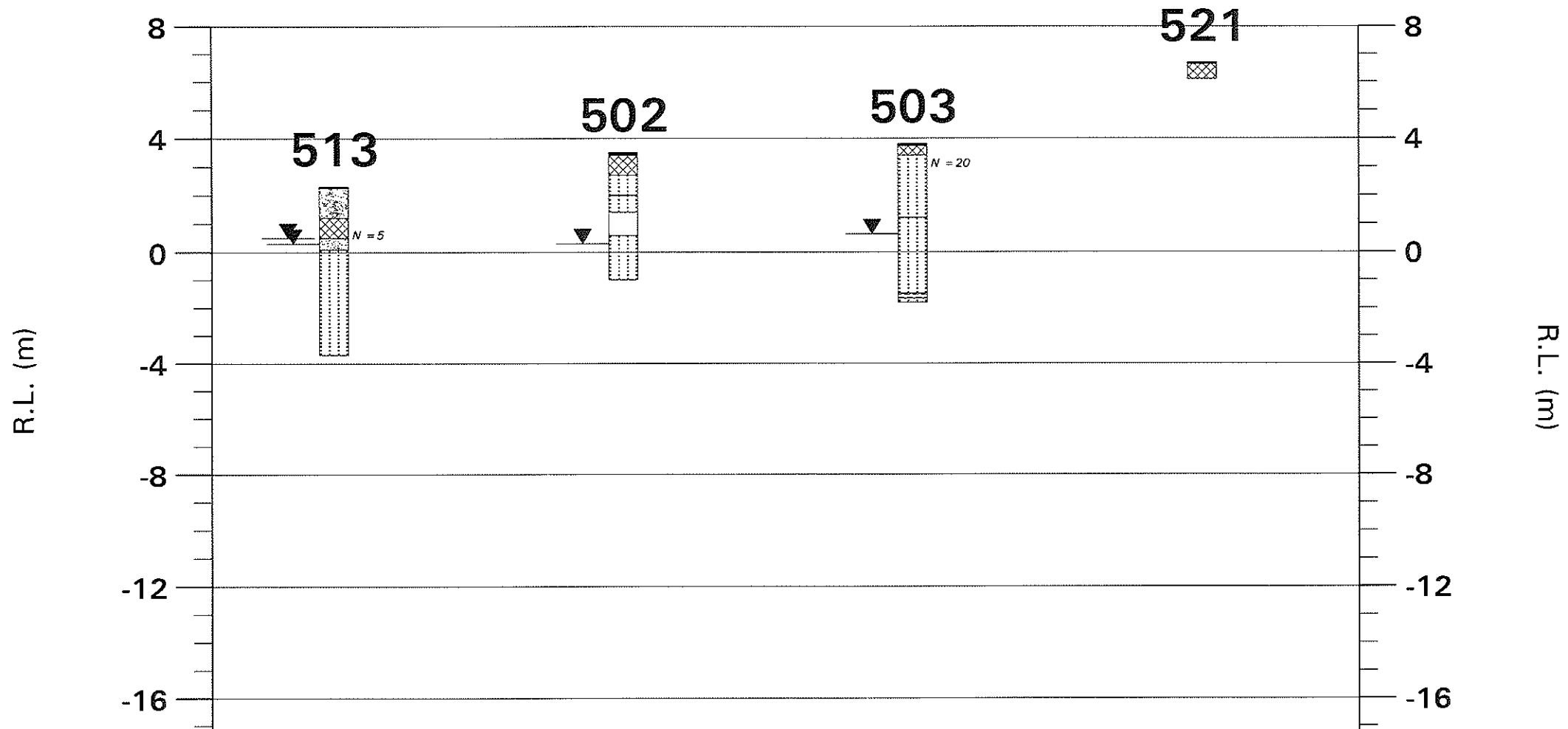
Jeffery and Katauskas Pty Ltd

Job No.: 23982S

Figure No.: 2A



GRAPHICAL BOREHOLE SUMMARY



	Asphaltic/ Bituminous Paving or Coal		Fill		Core Loss/ Empty	N	SPT "N" VALUE
	Concrete		Sand		Shale	Nc	SOLID CONE BLOW COUNTS PER 150mm
	Sandstone/ Greywacke		Observed water level				

NOTE: REFER TO BOREHOLE LOGS

Scale: 1 : 200 (vert) ; NTS (horiz)

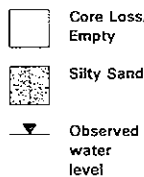
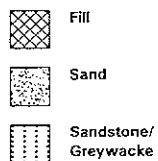
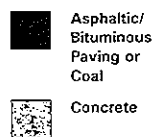
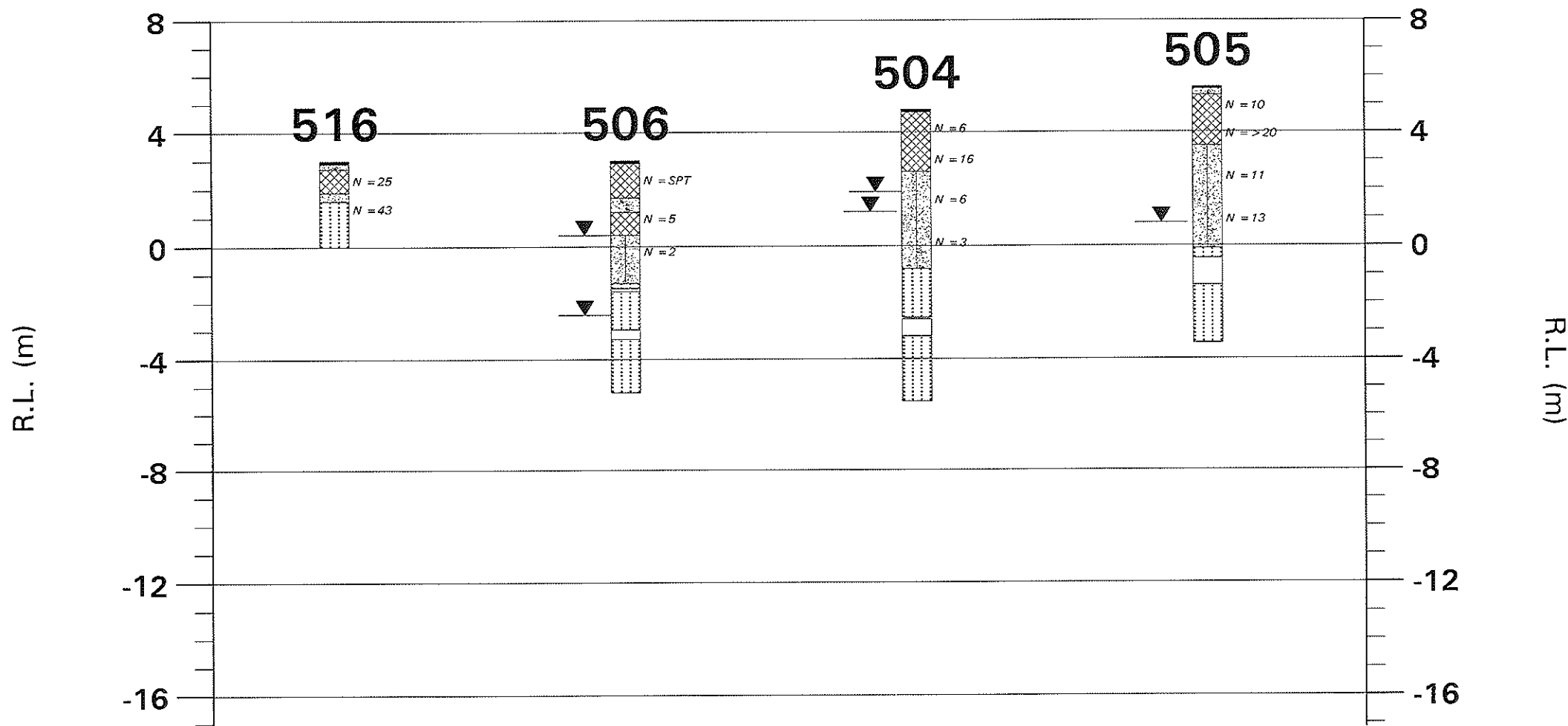
Jeffery and Katauskas Pty Ltd

Job No.: 23982S

Figure No.: 2B



GRAPHICAL BOREHOLE SUMMARY



N SPT "N" VALUE
Nc SOLID CONE BLOW COUNTS PER 150mm

Scale: 1 : 200 (vert) ; NTS (horiz)

Jeffery and Katauskas Pty Ltd

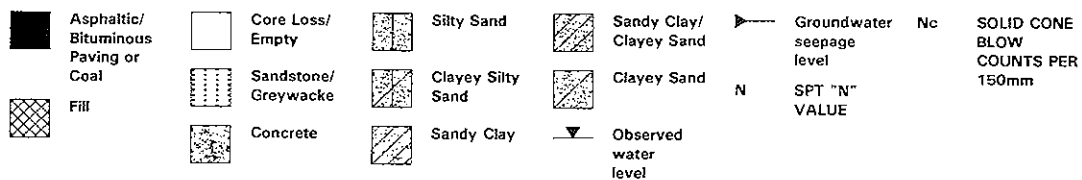
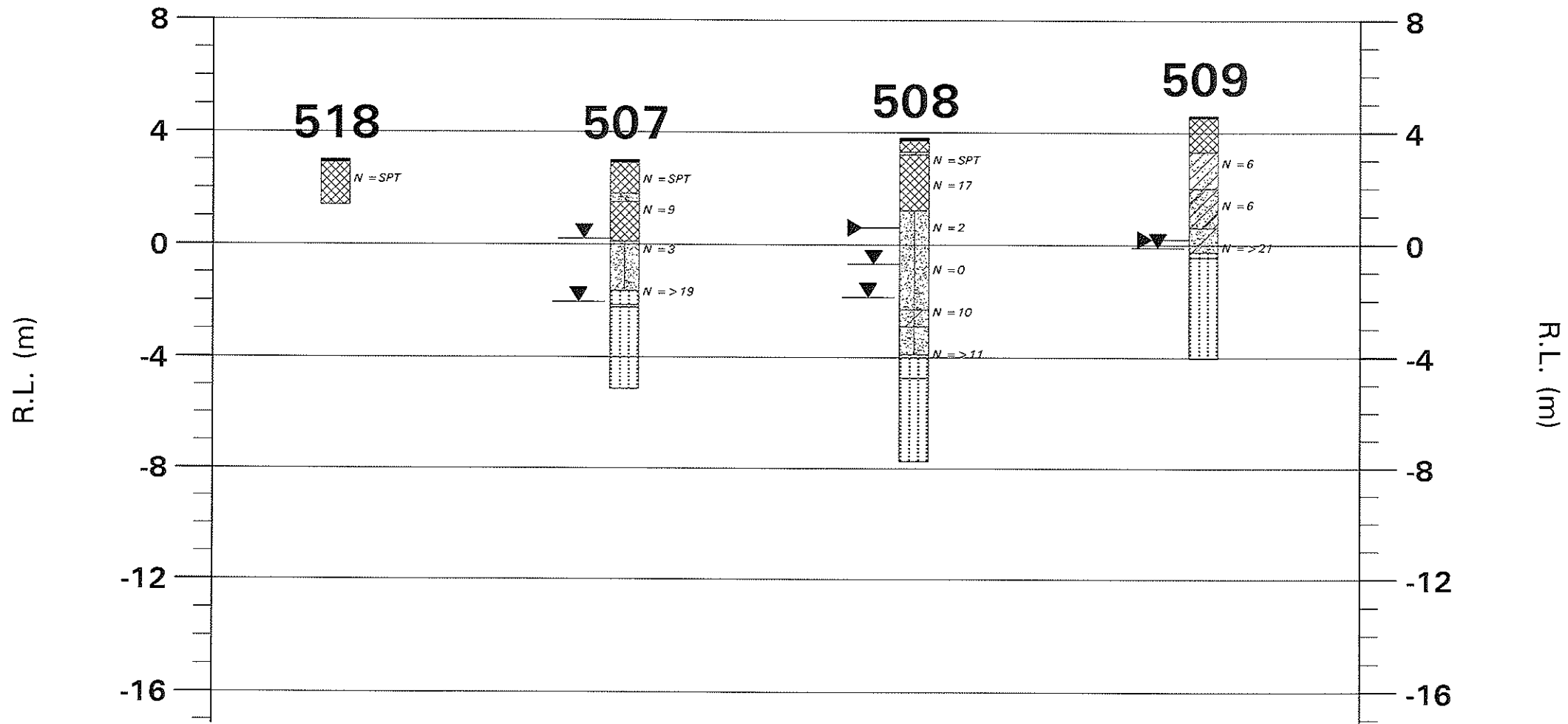
Job No.: 23982S

Figure No.: 2C



NOTE: REFER TO BOREHOLE LOGS

GRAPHICAL BOREHOLE SUMMARY



NOTE: REFER TO BOREHOLE LOGS

Scale: 1 : 200 (vert) ; NTS (horiz)

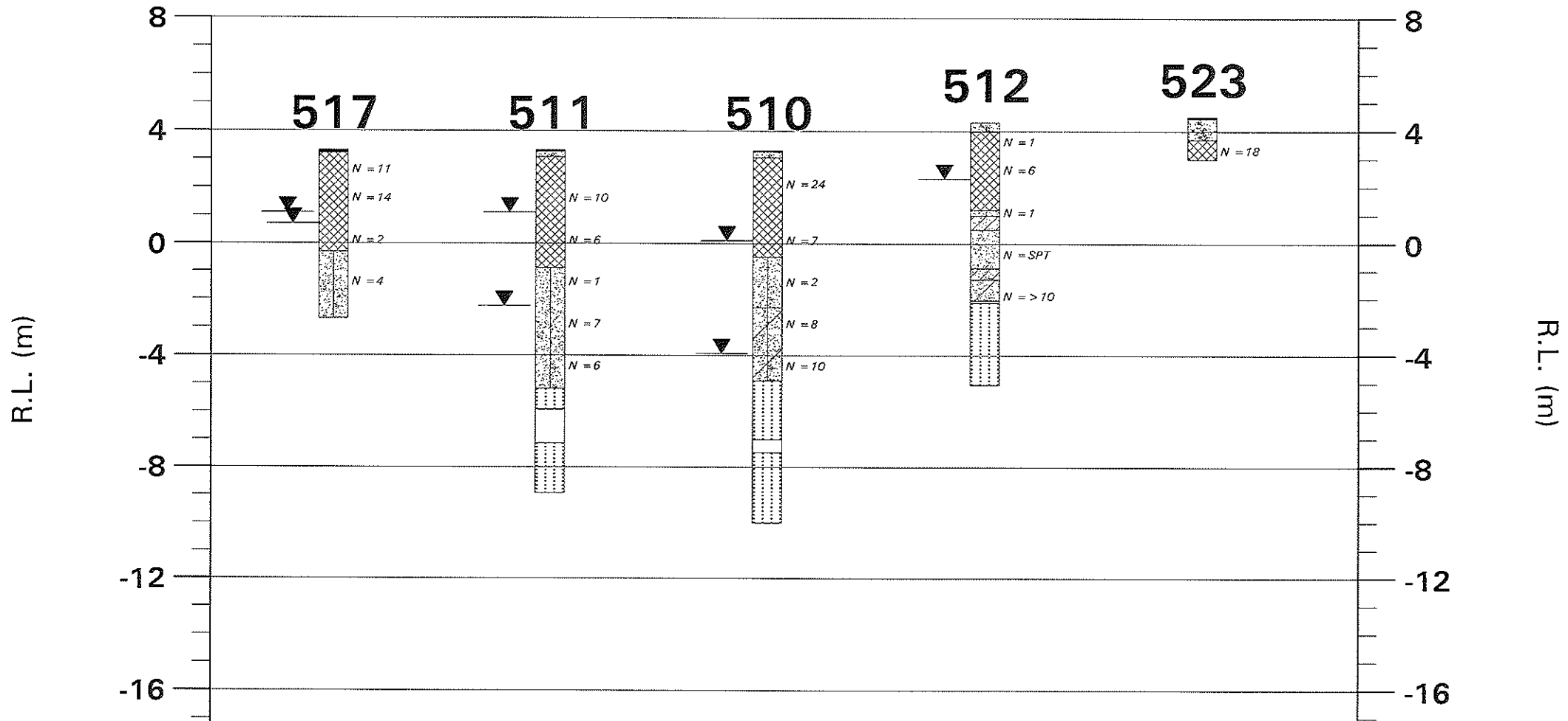
Jeffery and Katauskas Pty Ltd

Job No.: 23982S

Figure No.: 2D



GRAPHICAL BOREHOLE SUMMARY



	Asphaltic/Bituminous Paving or Coal		Core Loss/Empty		Sandy Clay		Observed water level	Nc	SOLID CONE BLOW COUNTS PER 150mm
	Fill		Concrete		Sandy Clay/Clayey Sand		SPT "N" VALUE		
	Silty Sand		Clayey Silty Sand		Clayey Sand				
	Sandstone/Greywacke		Sand						

NOTE: REFER TO BOREHOLE LOGS

Scale: 1 : 200 (vert) ; NTS (horiz)

Jeffery and Katauskas Pty Ltd

Job No.: 23982S

Figure No.: 2E



APPENDIX A



Borehole No.

201

1/1

BOREHOLE LOG

Client:

Project: FORESHORE DEVELOPMENT

Location: SYDNEY FISH MARKETS. NSW.

Job No. 11168S

Date: 22-5-95

Method: SPIRAL AUGER
GCH RIG

R.L. Surface: -

Datum: -

Logged/Checked by: D.J.

Underwater Record	Samples	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
▼ AFTER 3 HRS			0		-	ASPHALTIC CONCRETE: 30mm.f.	MC>PL	-	-	APPEARS MODERATELY TO WELL COMPACTED
	DS				-	FILL: Silty gravelly clay, medium plasticity, dark grey with fine igneous gravel.	M			
	DS	N > 31 10,15, 16/ 100mm			-	FILL: Gravelly sand, fine to medium grained, grey with fine igneous gravel.				
			1			FILL: Sandy gravel, fine to coarse sandstone gravel.				
	DS									
			2		SM	SILTY SAND: fine grained, brown, with many fine grained root fibres.	M	VL	-	-
	DS	N < 1 1/280mm								
		BOUNCING			-	SANDSTONE: medium to coarse grained, pale grey, highly weathered, weak with clay bands.	-	-	-	LOW TO MODERATE 'TC' BIT RESISTANCE
DS										
			3			END OF BOREHOLE AT 3.0m				
			4							
			5							
			6							
			7							



Borehole No.

202B

1/1

BOREHOLE LOG

Client:

Project: FORESHORE DEVELOPMENT

Location: SYDNEY FISH MARKETS. NSW.

Job No. 11168S

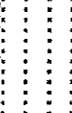
Method: SPIRAL AUGER
GCH RIG

R.L. Surface: -

Date: 22-5-95

Datum: -

Logged/Checked by: D.J./@

Groundwater Record	Samples	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
 AFTER 2.25 HRS			0		-	ASPHALTIC CONCRETE: 20mm.t. FILL: Sandy gravel, fine to coarse gravel, dark grey.	M	-	-	APPEARS MODERATELY COMPACTED
	DS	N = 27 6,10,17	1		-	FILL: Sand, fine to medium grained, orange brown, with some clay and fine to medium sandstone gravel.				
	DS									
			2		SM	SILTY SAND: fine to medium grained, brown.	W	-	-	-
					-	SANDSTONE: medium to coarse grained, pale grey with yellow mottling, highly weathered, very weak to weak.	-	-	-	LOW 'TC' BIT RESISTANCE
	DS		3			as above, but extremely weathered, extremely weak.				VERY LOW RESISTANCE
						as above, but highly to moderately weathered, weak to medium strong.				LOW TO MODERATE RESISTANCE
	DS		4			END OF BOREHOLE AT 4.0m				
			5							
			6							
			7							



Borehole No.

203

1/1

BOREHOLE LOG

Client:

Project: FORESHORE DEVELOPMENT

Location: SYDNEY FISH MARKETS. NSW.

Job No. 11168S

Method: SPIRAL AUGER
GCH RIG

R.L. Surface: -

Date: 22-5-95

Datum: -

Logged/Checked by: D.J. /

undwater Record	Samples	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLET- ION & AFTER 1.75 HRS			0		-	ASPHALTIC CONCRETE: 30mm.t. over 70mm fine crushed rock.	-	-	-	-
	DS				-	CONCRETE: 120mm.t.	M	-	-	APPEARS MODERATELY COMPACTED
	DS	N > 10 10/ 130mm BOUNCING			-	FILL: Sand, fine to medium grained, yellow brown with fine to medium sandstone gravel.	-	-	-	MODERATE 'TC' BIT RESISTANCE
	DS		1		-	SANDSTONE: medium to coarse grained, pale grey with red and yellow mottling, moderately weathered, weak to medium strong.	-	-	-	HIGH RESISTANCE
	DS		2		-	as above, but moderately to slightly weathered, medium strong to strong.	-	-	-	
			2			END OF BOREHOLE AT 2.0m				
			3							
			4							
			5							
			6							
			7							



Borehole No.

301

1/1

BOREHOLE LOG

Client: SYDNEY FISH MARKETS
Project: CARPARK RECONSTRUCTION
Location: SYDNEY FISH MARKETS, BANK STREET, PYRMONT

Job No. 13836SP
Date: 19-10-98

Method: SPIRAL AUGER
BCD 350

R.L. Surface: ~6.4m
Datum: AHD

Logged/Checked by: B.F./PW

Groundwater Record	SAMPLES			Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	USO	DB	DS								
DRY ON COMPLETION & AFTER 15 MINS					0			ASPHALTIC CONCRETE: 60mm.t				
								CONCRETE: 220mm.t				
								FILL: Silty sandy gravel, fine to coarse grained, grey and orange brown, sandstone and igneous gravel.	M			
								SANDSTONE: fine to medium grained, pale grey and orange brown.	DW	M-H		MODEERATE TO HIGH 'TC' BIT RESISTANCE
					1			END OF BOREHOLE AT 1.0m				
					2							
					3							
					4							
					5							
					6							
					7							

Borehole No.

302
1/1

BOREHOLE LOG

Client: SYDNEY FISH MARKETS
Project: CARPARK RECONSTRUCTION
Location: SYDNEY FISH MARKETS, BANK STREET, PYRMONT

Job No. 13836SP
Date: 19-10-98

Method: SPIRAL AUGER
BCD 350

R.L. Surface: ~5.36m
Datum: AHD

Logged/Checked by: B.F./PW

Groundwater Record	SAMPLES			Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	USO	DB									
DRY ON COMPLETION & AFTER 5 MINS				REFER TO SCALA SHEET	0		-	ASPHALTIC CONCRETE: 100mm.t				
				N = 32 9,17,15			-	CONCRETE: 250mm.t reinforced at 180mm.	M	-	-	APPEARS WELL COMPACTED
					1			FILL: Silty gravelly sand, fine to medium grained, grey.				
								FILL: Gravelly clayey sand, fine to medium grained, brown, grey and red brown, sandstone and ironstone gravel.				
				N = 6 3,3,3				FILL: Silty gravelly sand, fine to coarse grained, dark brown, igneous gravel.				
					2		SM	SILTY SAND: fine to medium grained, yellow brown and grey.	M	L	-	-
							CL	SANDY CLAY: medium plasticity, pale grey mottled orange brown.	MC>PL	(St-Vst)		
					3			END OF BOREHOLE AT 3.0m				
					4							
					5							
					6							
					7							



Borehole No.

303

1/1

BOREHOLE LOG

Client: SYDNEY FISH MARKETS
Project: CARPARK RECONSTRUCTION
Location: SYDNEY FISH MARKETS, BANK STREET, PYRMONT

Job No. 13836SP
Date: 19-10-98

Method: SPIRAL AUGER
BCD 350

R.L. Surface: ~6.11m
Datum: AHD

Logged/Checked by: B.F./pw

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	US	DB	DS									
					REFER TO SCALA SHEET	0			FILL: Silty gravelly sand, fine to medium grained, brown, fine to coarse grained igneous gravel.	M			APPEARS MODERATELY COMPACTED
					N > 10 10/ 150mm BOUNCING	1			as above, but with clay fines and concrete fragments. CONCRETE: 100mm.t				
									FILL: Silty gravelly sand, fine to medium grained, brown, fine to coarse grained igneous gravel, with clay fines.	MC>PL			
					N = 6 4,3,3	2		CL	FILL: Silty gravelly clay, medium plasticity, brown and orange brown. SANDY CLAY: medium plasticity, grey, orange brown and brown.	MC>PL	VSt	250 280	
						3			END OF BOREHOLE AT 3.0m				
						4							
						5							
						6							
						7							



Borehole No.

304

1/1

BOREHOLE LOG

Client: SYDNEY FISH MARKETS
Project: CARPARK RECONSTRUCTION
Location: SYDNEY FISH MARKETS, BANK STREET, PYRMONT

Job No. 13836SP
Date: 19-10-98

Method: SPIRAL AUGER
BCD 350

R.L. Surface: ~4.71m
Datum: AHD

Logged/Checked by: B.F./Pw

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	USO	DB	DS									
DRY ON COMPLETION & AFTER 5 MINS					REFER TO SCALA SHEET	0			CONCRETE: 230mm.t over silty gravelly sand base course 170mm.t.				
					N > 10 10/ 100mm BOUNCING	1		CL	SANDY CLAY: medium plasticity, orange brown and grey, with occasional high strength Iron indurated sandstone bands.	MC>PL	VSf	-	-
					N = 9 3,4,5							250 310 380	
						2			END OF BOREHOLE AT 1.95m				
						3							
						4							
						5							
						6							
						7							



Borehole No.

305

1/1

BOREHOLE LOG

Client: SYDNEY FISH MARKETS
Project: CARPARK RECONSTRUCTION
Location: SYDNEY FISH MARKETS, BANK STREET, PYRMONT

Job No. 13836SP
Date: 19-10-98

Method: SPIRAL AUGER
BCD 350

R.L. Surface: ~3.49m
Datum: AHD

Logged/Checked by: B.F./PW

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	USO	DB	DS									
					REFER TO SCALA SHEET	0			ASPHALTIC CONCRETE: 90mm.t over silty sandy gravel base course, 150mm.t.	M	-	-	APPEARS MODERATELY COMPACTED
					N = 8 8,4,4	1			FILL: Silty gravelly sand, fine to medium grained, brown, fine to medium grained igneous gravel.	M			
					N < 1 1/300mm,1	2			FILL: Gravelly clayey sand, fine to medium grained, brown mottled various colours fine to coarse grained sandstone and igneous gravel, with sandy clay layers.				APPEARS POORLY COMPACTED
					N < 1 1/450mm	3		SM	SILTY SAND: fine to medium grained, brown.	W	VL	-	-
						4		CL	SANDY CLAY: medium plasticity, pale grey.	MC>PL	(F-St)	-	-
						5			END OF BOREHOLE AT 4.5m				
						6							
						7							



Borehole No.

401 _{1/1}

BOREHOLE LOG

Client: SYDNEY HARBOUR FORESHORE AUTHORITY

Project: PROPOSED UPGRADE

Location: SYDNEY FISH MARKETS, PYRMONT. NSW

Job No. 16325S

Method: SPIRAL AUGER
JK 450

R.L. Surface: $\approx$ 2.7m

Date: 4-12-01

Datum: AHD

Logged/Checked by: P.R./ *PR*

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	USO	DB	DS									
ON COMPLETION DURING DRILLING						0		-	ASPHALTIC CONCRETE: 100mm.t	D	-	-	CONCRETE AND SANDSTONE BOULDERS $\approx$ 1.1m.t
						1			FILL: Silty sand, fine to medium grained, grey brown, with sub angular igneous gravels, fine to medium grained.				
					N = 4 2,2,2	2			FILL: Clayey sand, fine to medium grained, grey and brown, with bands of sub rounded slag gravels, fine to medium grained.	M-W			STRONG PETROLEUM ODOUR APPEARS POORLY COMPACTED
						3		SP	SILTY SAND: fine to medium grained, grey, with a trace of small pieces of decomposed wood.	W	VL	-	SLIGHT PETROLEUM ODOUR TO 3.5m DEPTH
					N < 1 1/450mm	4		SC	CLAYEY SAND: fine to medium grained, grey.	M-W	(VL)		
					SPT 1/150mm REFUSAL	5		-	SANDSTONE: fine to medium grained, grey with brown mottling and with a trace of clay bands.	DW	L-M	-	LOW 'TC' BIT RESISTANCE WITH MEDIUM BANDS
						6			END OF BOREHOLE AT 6.0m		M		MODERATE RESISTANCE
						7							



Borehole No.

402_{1/1}

BOREHOLE LOG

Client: SYDNEY HARBOUR FORESHORE AUTHORITY

Project: PROPOSED UPGRADE

Location: SYDNEY FISH MARKETS, PYRMONT. NSW

Job No. 16325S

Method: SPIRAL AUGER
JK 450

R.L. Surface: $\approx$ 2.0m

Date: 4-12-01

Datum: AHD

Logged/Checked by: P.R./*k*

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	USO	DB	DS									
DRY ON COMPLETION						0			ASPHLATIC CONCRETE: 80mm.t over CONCRETE: 320mm.t				
					N = 13 10,8,5	1		-	FILL: Silty sand, fine to medium grained, dark grey, with sub rounded sandstone gravels and with a trace of clay fines and ash bands.	M	-	-	APPEARS WELL COMPACTED
						2		-	SANDSTONE: fine to medium grained, yellow brown and grey banded and with a trace of clay bands.	XW-DW	VL	-	VERY LOW TO LOW 'TC' BIT RESISTANCE
						3				DW	L-M		LOW RESISTANCE
AFTER 3 HRS						3			END OF BOREHOLE AT 3.0m				
						4							
						5							
						6							
						7							



Borehole No.

403_{1/1}

BOREHOLE LOG

Client: SYDNEY HARBOUR FORESHORE AUTHORITY

Project: PROPOSED UPGRADE

Location: SYDNEY FISH MARKETS, PYRMONT. NSW

Job No. 16325S

Method: SPIRAL AUGER
JK 450

R.L. Surface: $\approx$ 2.7m

Date: 4-12-01

Datum: AHD

Logged/Checked by: P.R./*PR*

Groundwater Record	SAMPLES			Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	U50	DB									
TRY ON COMPLET- ION AFTER 3 HRS					0		-	ASPHALTIC CONCRETE: 100mm.t	D	-	-	APPEARS MODERATELY COMPACTED
				SPT 25/150mm	1		-	FILL: Silty sand, fine to medium grained, grey and brown, with sub angular igneous gravels and pieces of wood.	XW	EL-VL	-	VERY LOW 'TC' BIT RESISTANCE
					2		-	SANDSTONE: fine to medium grained, grey and brown banded with clay bands.	DW			
					3		-			L-M		LOW TO MODERATE RESISTANCE
					3			END OF BOREHOLE AT 3.0m				
					4							
					5							
					6							
					7							



Borehole No.

404_{1/2}

BOREHOLE LOG

Client: SYDNEY HARBOUR FORESHORE AUTHORITY

Project: PROPOSED UPGRADE

Location: SYDNEY FISH MARKETS, PYRMONT. NSW

Job No. 16325S

Method: SPIRAL AUGER
JK 450

R.L. Surface: $\approx$ 4.5m

Date: 4-12-01

Datum: AHD

Logged/Checked by: P.R./B

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	USO	DB	DS									
RY ON COMPLET- ION						0			ASPHALTIC CONCRETE: 100mm.t	D	-	-	APPEARS WELL COMPACTED
					N = 22 5,6,16	1			FILL: Silty sand, fine to medium grained, grey, with sub angular igneous gravels, fine to medium grained and with a trace of sandstone cobbles.	M			
					N = 3 3,2,1	2			FILL: Silty sand, fine grained, dark grey, with sub- rounded ash and slag gravels, fine to medium grained and with a trace of clay fines and small pieces of wood.				APPEARS POORLY COMPACTED
					N = 4 1,1,3	3			FILL: Silty sand, fine to medium grained, grey brown, with a trace of sub angular sandstone and brick gravels and with a trace of clay fines.	M-W			
DURING DRILLING						4							
					N = 6 1,1,5	5		SM	SILTY SAND: fine to medium grained, dark grey, with a trace of slightly organic clayey silt bands and decomposing organic material.	W	L	50	HP TAKEN ON CLAYEY SILT BANDS
						6							
						7		SC	CLAYEY SAND: fine to medium grained, grey.	M-W	L	-	-
									SANDSTONE: fine to medium grained, grey and yellow brown banded with clay bands.	XW	EL-VL	-	VERY LOW 'TC' BIT RESISTANCE
										DW	L-M		LOW TO MODERATE



Borehole No.

404_{2/2}

BOREHOLE LOG

Client: SYDNEY HARBOUR FORESHORE AUTHORITY Project: PROPOSED UPGRADE Location: SYDNEY FISH MARKETS, PYRMONT. NSW												
Job No. 16325S Date: 4-12-01			Method: SPIRAL AUGER JK 450 Logged/Checked by: P.R. <i>PK</i>				R.L. Surface: $\approx$ 4.5m Datum: AHD					
Groundwater Record	SAMPLES			Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	USO	DB									
								SANDSTONE: fine to medium grained, grey and yellow brown banded with clay bands.	DW	L-M		RESISTANCE
								END OF BOREHOLE AT 7.5m				
					8							
					9							
					10							
					11							
					12							
					13							
					14							



Borehole No.

405_{1/2}

BOREHOLE LOG

Client: SYDNEY HARBOUR FORESHORE AUTHORITY

Project: PROPOSED UPGRADE

Location: SYDNEY FISH MARKETS, PYRMONT. NSW

Job No. 16325S

Method: SPIRAL AUGER
JK 450

R.L. Surface: $\approx$ 3.1m

Date: 4-12-01

Datum: AHD

Logged/Checked by: P.R./

Groundwater Record	SAMPLES			Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	U50	DB	DS								
ON COMPLET- ION DURING DRILLIN					0		-	ASPHALTIC CONCRETE: 100mm.t FILL: Silty sand, fine to medium grained, grey, with sub angular brick and igneous gravels, concrete inclusions max 150mm.t	D-M	-	-	APPEARS MODERATELY COMPACTED
				N = 11 8,5,6	1			FILL: Silty sand, fine to medium grained, dark grey, with a trace of sub rounded sandstone gravels and pieces of metal.	M			
				N = 11 2,2,9	2							PETROLEUM ODOUR TO 4.0m
					3		SM	SILTY SAND: fine to medium grained, grey, with a trace of clay fines, shell fragments and fine to medium sub rounded sandstone gravels.	W	VL		
				N = 2 1,1,1	4							
				N = 1 1/300mm, 1	5		SC	CLAYEY SAND: fine to medium grained, grey.	W	(VL)	-	
				N = 6 1,3,3	6			as above, but with thin clay bands.		L		
					7							



Borehole No.

405_{2/2}

BOREHOLE LOG

Client: SYDNEY HARBOUR FORESHORE AUTHORITY

Project: PROPOSED UPGRADE

Location: SYDNEY FISH MARKETS, PYRMONT. NSW

Job No. 16325S

Method: SPIRAL AUGER
JK 450

R.L. Surface: $\approx$ 3.1m

Date: 4-12-01

Datum: AHD

Logged/Checked by: P.R.

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	US	DB	DS									
								SC	CLAYEY SAND: fine to medium grained, grey, with thin clay bands.	W	L		SPT SANK 300mm UNDER OWN WEIGHT
					N = 3 1,1,2	8			as above, but with no clay bands.		VL		
						9			SANDSTONE: fine to medium grained, grey and brown, with a trace of clay bands and medium strength bands.	DW	VL-L		LOW 'TC' BIT RESISTANCE WITH OCCASIONAL VERY LOW AND MODERATE BANDS
						10							
						11			END OF BOREHOLE AT 10.5m				
						12							
						13							
						14							



REPORT EXPLANATION NOTES

INTRODUCTION

These notes have been provided to amplify the geotechnical report in regard to classification methods, field procedures and certain matters relating to the Comments and Recommendations section. Not all notes are necessarily relevant to all reports.

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Geotechnical engineering involves gathering and assimilating limited facts about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such facts obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and time when the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726, the SAA Site Investigation Code. In general, descriptions cover the following properties – soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geotechnical practice.

Soil types are described according to the predominating particle size and behaviour as set out in the attached Unified Soil Classification Table qualified by the grading of other particles present (eg sandy clay) as set out below:

Soil Classification	Particle Size
Clay	less than 0.002mm
Silt	0.002 to 0.06mm
Sand	0.06 to 2mm
Gravel	2 to 60mm

Non-cohesive soils are classified on the basis of relative density, generally from the results of Standard Penetration Test (SPT) as below:

Relative Density	SPT 'N' Value (blows/300mm)
Very loose	less than 4
Loose	4 – 10
Medium dense	10 – 30
Dense	30 – 50
Very Dense	greater than 50

Cohesive soils are classified on the basis of strength (consistency) either by use of hand penetrometer, laboratory testing or engineering examination. The strength terms are defined as follows.

Classification	Unconfined Compressive Strength kPa
Very Soft	less than 25
Soft	25 – 50
Firm	50 – 100
Stiff	100 – 200
Very Stiff	200 – 400
Hard	Greater than 400
Friable	Strength not attainable – soil crumbles

Rock types are classified by their geological names, together with descriptive terms regarding weathering, strength, defects, etc. Where relevant, further information regarding rock classification is given in the text of the report. In the Sydney Basin, 'Shale' is used to describe thinly bedded to laminated siltstone.

SAMPLING

Sampling is carried out during drilling or from other excavations to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on plasticity, grain size, colour, moisture content, minor constituents and, depending upon the degree of disturbance, some information on strength and structure. Bulk samples are similar but of greater volume required for some test procedures.

Undisturbed samples are taken by pushing a thin-walled sample tube, usually 50mm diameter (known as a U50), into the soil and withdrawing it with a sample of the soil contained in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling used are given on the attached logs.

INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application. All except test pits, hand auger drilling and portable dynamic cone penetrometers require the use of a mechanical drilling rig which is commonly mounted on a truck chassis.



Test Pits: These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils if it is safe to descend into the pit. The depth of penetration is limited to about 3m for a backhoe and up to 6m for an excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

Hand Auger Drilling: A borehole of 50mm to 100mm diameter is advanced by manually operated equipment. Premature refusal of the hand augers can occur on a variety of materials such as hard clay, gravel or ironstone, and does not necessarily indicate rock level.

Continuous Spiral Flight Augers: The borehole is advanced using 75mm to 115mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling and insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface by the flights or may be collected after withdrawal of the auger flights, but they can be very disturbed and layers may become mixed. Information from the auger sampling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively lower reliability due to mixing or softening of samples by groundwater, or uncertainties as to the original depth of the samples. Augering below the groundwater table is of even lesser reliability than augering above the water table.

Rock Augering: Use can be made of a Tungsten Carbide (TC) bit for auger drilling into rock to indicate rock quality and continuity by variation in drilling resistance and from examination of recovered rock fragments. This method of investigation is quick and relatively inexpensive but provides only an indication of the likely rock strength and predicted values may be in error by a strength order. Where rock strengths may have a significant impact on construction feasibility or costs, then further investigation by means of cored boreholes may be warranted.

Wash Boring: The borehole is usually advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from "feel" and rate of penetration.

Mud Stabilised Drilling: Either Wash Boring or Continuous Core Drilling can use drilling mud as a circulating fluid to stabilise the borehole. The term 'mud' encompasses a range of products ranging from bentonite to polymers such as Revert or Biogel. The mud tends to mask the cuttings and reliable identification is only possible from intermittent intact sampling (eg from SPT and U50 samples) or from rock coring, etc.

Continuous Core Drilling: A continuous core sample is obtained using a diamond tipped core barrel. Provided full core recovery is achieved (which is not always possible in very low strength rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation. In rocks, an NMLC triple tube core barrel, which gives a core of about 50mm diameter, is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as CORE LOSS. The location of losses are determined on site by the supervising engineer; where the location is uncertain, the loss is placed at the top end of the drill run.

Standard Penetration Tests: Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils as a means of indicating density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposes" – Test F3.1.

The test is carried out in a borehole by driving a 50mm diameter split sample tube with a tapered shoe, under the impact of a 63kg hammer with a free fall of 760mm. It is normal for the tube to be driven in three successive 150mm increments and the 'N' value is taken as the number of blows for the last 300mm. In dense sands, very hard clays or weak rock, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

- In the case where full penetration is obtained with successive blow counts for each 150mm of, say, 4, 6 and 7 blows, as
$$N = 13$$
4, 6, 7
- In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm, as
$$N > 30$$
15, 30/40mm

The results of the test can be related empirically to the engineering properties of the soil.

Occasionally, the drop hammer is used to drive 50mm diameter thin walled sample tubes (U50) in clays. In such circumstances, the test results are shown on the borehole logs in brackets.

A modification to the SPT test is where the same driving system is used with a solid 60° tipped steel cone of the same diameter as the SPT hollow sampler. The solid cone can be continuously driven for some distance in soft clays or loose sands, or may be used where damage would otherwise occur to the SPT. The results of this Solid Cone Penetration Test (SCPT) are shown as "N_c" on the borehole logs, together with the number of blows per 150mm penetration.

Static Cone Penetrometer Testing and Interpretation: Cone penetrometer testing (sometimes referred to as a Dutch Cone) described in this report has been carried out using an Electronic Friction Cone Penetrometer (EFCP). The test is described in Australian Standard 1289, Test F5.1.

In the tests, a 35mm diameter rod with a conical tip is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig which is fitted with an hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the frictional resistance on a separate 134mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are electrically connected by wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck.

As penetration occurs (at a rate of approximately 20mm per second) the information is output as incremental digital records every 10mm. The results given in this report have been plotted from the digital data.

The information provided on the charts comprise:

- Cone resistance – the actual end bearing force divided by the cross sectional area of the cone – expressed in MPa.
- Sleeve friction – the frictional force on the sleeve divided by the surface area – expressed in kPa.
- Friction ratio – the ratio of sleeve friction to cone resistance, expressed as a percentage.

The ratios of the sleeve resistance to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1% to 2% are commonly encountered in sands and occasionally very soft clays, rising to 4% to 10% in stiff clays and peats. Soil descriptions based on cone resistance and friction ratios are only inferred and must not be considered as exact.

Correlations between EFCP and SPT values can be developed for both sands and clays but may be site specific.

Interpretation of EFCP values can be made to empirically derive modulus or compressibility values to allow calculation of foundation settlements.

Stratification can be inferred from the cone and friction traces and from experience and information from nearby boreholes etc. Where shown, this information is presented for general guidance, but must be regarded as interpretive. The test method provides a continuous profile of engineering properties but, where precise information on soil classification is required, direct drilling and sampling may be preferable.

Portable Dynamic Cone Penetrometers: Portable Dynamic Cone Penetrometer (DCP) tests are carried out by driving a rod into the ground with a sliding hammer and counting the blows for successive 100mm increments of penetration.

Two relatively similar tests are used:

- Cone penetrometer (commonly known as the Scala Penetrometer) – a 16mm rod with a 20mm diameter cone end is driven with a 9kg hammer dropping 510mm (AS1289, Test F3.2). The test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various Road Authorities.
- Perth sand penetrometer – a 16mm diameter flat ended rod is driven with a 9kg hammer, dropping 600mm (AS1289, Test F3.3). This test was developed for testing the density of sands (originating in Perth) and is mainly used in granular soils and filling.

LOGS

The borehole or test pit logs presented herein are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on the frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will enable the most reliable assessment, but is not always practicable or possible to justify on economic grounds. In any case, the boreholes or test pits represent only a very small sample of the total subsurface conditions.

The attached explanatory notes define the terms and symbols used in preparation of the logs.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than “straight line” variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

Where groundwater levels are measured in boreholes, there are several potential problems:

- Although groundwater may be present, in low permeability soils it may enter the hole slowly or perhaps not at all during the time it is left open.
- A localised perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changes and may not be the same at the time of construction.
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must be washed out of the hole or ‘reverted’ chemically if water observations are to be made.



More reliable measurements can be made by installing standpipes which are read after stabilising at intervals ranging from several days to perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from perched water tables or surface water.

FILL

The presence of fill materials can often be determined only by the inclusion of foreign objects (eg bricks, steel etc) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult with limited testing and sampling to reliably determine the extent of the fill.

The presence of fill materials is usually regarded with caution as the possible variation in density, strength and material type is much greater than with natural soil deposits. Consequently, there is an increased risk of adverse engineering characteristics or behaviour. If the volume and quality of fill is of importance to a project, then frequent test pit excavations are preferable to boreholes.

LABORATORY TESTING

Laboratory testing is normally carried out in accordance with Australian Standard 1289 *'Methods of Testing Soil for Engineering Purposes'*. Details of the test procedure used are given on the individual report forms.

ENGINEERING REPORTS

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal (eg. a three storey building) the information and interpretation may not be relevant if the design proposal is changed (eg to a twenty storey building). If this happens, the company will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical aspects and recommendations or suggestions for design and construction. However, the Company cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions – the potential for this will be partially dependent on borehole spacing and sampling frequency as well as investigation technique.
- Changes in policy or interpretation of policy by statutory authorities.
- The actions of persons or contractors responding to commercial pressures.

If these occur, the company will be pleased to assist with investigation or advice to resolve any problems occurring.

SITE ANOMALIES

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, the company requests that it immediately be notified. Most problems are much more readily resolved when conditions are exposed that at some later stage, well after the event.

REPRODUCTION OF INFORMATION FOR CONTRACTUAL PURPOSES

Attention is drawn to the document *'Guidelines for the Provision of Geotechnical Information in Tender Documents'*, published by the Institution of Engineers, Australia. Where information obtained from this investigation is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Copyright in all documents (such as drawings, borehole or test pit logs, reports and specifications) provided by the Company shall remain the property of Jeffery and Katauskas Pty Ltd. Subject to the payment of all fees due, the Client alone shall have a licence to use the documents provided for the sole purpose of completing the project to which they relate. License to use the documents may be revoked without notice if the Client is in breach of any objection to make a payment to us.

REVIEW OF DESIGN

Where major civil or structural developments are proposed or where only a limited investigation has been completed or where the geotechnical conditions/ constraints are quite complex, it is prudent to have a joint design review which involves a senior geotechnical engineer.

SITE INSPECTION

The company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related.

Requirements could range from:

- i) a site visit to confirm that conditions exposed are no worse than those interpreted, to
- ii) a visit to assist the contractor or other site personnel in identifying various soil/rock types such as appropriate footing or pier founding depths, or
- iii) full time engineering presence on site.

SOIL		ROCK		DEFECTS AND INCLUSIONS	
	FILL		CONGLOMERATE		CLAY SEAM
	TOPSOIL		SANDSTONE		SHEARED OR CRUSHED SEAM
	CLAY (CL, CH)		SHALE		BRECCIATED OR SHATTERED SEAM/ZONE
	SILT (ML, MH)		SILTSTONE, MUDSTONE, CLAYSTONE		IRONSTONE GRAVEL
	SAND (SP, SW)		LIMESTONE		ORGANIC MATERIAL
	GRAVEL (GP, GW)		PHYLLITE, SCHIST		
	SANDY CLAY (CL, CH)		TUFF		CONCRETE
	SILTY CLAY (CL, CH)		GRANITE, GABBRO		BITUMINOUS CONCRETE, COAL
	CLAYEY SAND (SC)		DOLERITE, DIORITE		COLLUVIUM
	SILTY SAND (SM)		BASALT, ANDESITE		
	GRAVELLY CLAY (CL, CH)		QUARTZITE		
	CLAYEY GRAVEL (GC)				
	SANDY SILT (ML)				
	PEAT AND ORGANIC SOILS				



UNIFIED SOIL CLASSIFICATION TABLE

Field Identification Procedures (Excluding particles larger than 75 μm and basing fractions on estimated weights)				Group Symbols	Typical Names	Information Required for Describing Soils	Laboratory Classification Criteria		
Coarse-grained soils More than half of material is larger than 75 μm sieve size (The 75 μm sieve size is about the smallest particle visible to naked eye)	Gravels More than half of coarse fraction is larger than 4 mm sieve size	Clean gravels (little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes	GW	Well graded gravels, gravel-sand mixtures, little or no fines	Give typical name; indicate approximate percentages of sand and gravel; maximum size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbols in parentheses For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics Example: <i>Silty sand</i> , gravelly; about 20% hard, angular gravel particles 12 mm maximum size; rounded and subangular sand grains coarse to fine, about 15% non-plastic fines with low dry strength; well compacted and moist in place; alluvial sand; (SM)	$C_u = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_c = \frac{D_{10}^2}{D_{30} \times D_{60}}$ Between 1 and 3 Not meeting all gradation requirements for GW		
			Predominantly one size or a range of sizes with some intermediate sizes missing	GP	Poorly graded gravels, gravel-sand mixtures, little or no fines				
		Gravels with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures see ML below)	GM	Silty gravels, poorly graded gravel-sand-silt mixtures			Atterberg limits below "A" line, or PI less than 4 Atterberg limits above "A" line, with PI greater than 7	
			Plastic fines (for identification procedures, see CL below)	GC	Clayey gravels, poorly graded gravel-sand-clay mixtures				Above "A" line with PI between 4 and 7 and borderline cases requiring use of dual symbols
	Sands More than half of coarse fraction is smaller than 4 mm sieve size	Clean sands (little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes	SW	Well graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_c = \frac{D_{10}^2}{D_{30} \times D_{60}}$ Between 1 and 3 Not meeting all gradation requirements for SW			
			Predominantly one size or a range of sizes with some intermediate sizes missing	SP	Poorly graded sands, gravelly sands, little or no fines		Atterberg limits below "A" line or PI less than 5 Atterberg limits below "A" line with PI greater than 7		
		Sands with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures, see ML below)	SM	Silty sands, poorly graded sand-silt mixtures			Above "A" line with PI between 4 and 7 and borderline cases requiring use of dual symbols	
			Plastic fines (for identification procedures, see CL below)	SC	Clayey sands, poorly graded sand-clay mixtures				
			Identification Procedures on Fraction Smaller than 380 μm Sieve Size						
			Fine-grained soils More than half of material is smaller than 75 μm sieve size (The 75 μm sieve size is about the smallest particle visible to naked eye)	Silt and clays liquid limit less than 50	Dry Strength (crushing characteristics)		Dilatancy (reaction to shaking)		Toughness (consistency near plastic limit)
None to slight	Quick to slow	None			ML				
Medium to high	None to very slow	Medium			CL				
Slight to medium	Slow	Slight			OL				
Silt and clays liquid limit greater than 50	Slight to medium	Slow to none		Slight to medium	MH				
	High to very high	None		High	CH				
	Medium to high	None to very slow		Slight to medium	OH				
Highly Organic Soils									
Readily identified by colour, odour, spongy feel and frequently by fibrous texture				Peat and other highly organic soils					

Determine percentages of gravel and sand from grain size curve
Depending on percentage of fines (fraction smaller than 75 μm sieve size) coarse grained soils are classified as follows:
Less than 5% GW, GP, SW, SP
More than 12% GM, GC, SM, SC
Borderline cases requiring use of dual symbols

Use grain size curve in identifying the fractions as given under field identification

Plasticity chart for laboratory classification of fine grained soils

NOTE: 1) Soils possessing characteristics of two groups are designated by combinations of group symbols (e.g. GW-GC, well graded gravel-sand mixture with clay fines).

2) Soils with liquid limits of the order of 35 to 50 may be visually classified as being of medium plasticity.



LOG SYMBOLS

LOG COLUMN	SYMBOL	DEFINITION
Groundwater Record		Standing water level. Time delay following completion of drilling may be shown.
		Extent of borehole collapse shortly after drilling.
		Groundwater seepage into borehole or excavation noted during drilling or excavation.
Samples	ES	Soil sample taken over depth indicated, for environmental analysis.
	U50	Undisturbed 50mm diameter tube sample taken over depth indicated.
	DB	Bulk disturbed sample taken over depth indicated.
	DS	Small disturbed bag sample taken over depth indicated.
	ASB	Soil sample taken over depth indicated, for asbestos screening.
	ASS	Soil sample taken over depth indicated, for acid sulfate soil analysis.
	SAL	Soil sample taken over depth indicated, for salinity analysis.
Field Tests	N = 17 4, 7, 10	Standard Penetration Test (SPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration. 'R' as noted below.
	N _c = 5 7 3R	Solid Cone Penetration Test (SCPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration for 60 degree solid cone driven by SPT hammer. 'R' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	VNS = 25	Vane shear reading in kPa of Undrained Shear Strength.
	PID = 100	Photoionisation detector reading in ppm (Soil sample headspace test).
Moisture Condition (Cohesive Soils) (Cohesionless Soils)	MC > PL	Moisture content estimated to be greater than plastic limit.
	MC ≈ PL	Moisture content estimated to be approximately equal to plastic limit.
	MC < PL	Moisture content estimated to be less than plastic limit.
	D	DRY - runs freely through fingers.
	M	MOIST - does not run freely but no free water visible on soil surface.
	W	WET - free water visible on soil surface.
Strength (Consistency) Cohesive Soils	VS	VERY SOFT - Unconfined compressive strength less than 25kPa
	S	SOFT - Unconfined compressive strength 25-50kPa
	F	FIRM - Unconfined compressive strength 50-100kPa
	St	STIFF - Unconfined compressive strength 100-200kPa
	VSt	VERY STIFF - Unconfined compressive strength 200-400kPa
	H	HARD - Unconfined compressive strength greater than 400kPa
	()	Bracketed symbol indicates estimated consistency based on tactile examination or other tests.
Density Index/ Relative Density (Cohesionless Soils)	VL	Density Index (I _d) Range (%) SPT 'N' Value Range (Blows/300mm) Very Loose < 15 0-4
	L	Loose 15-35 4-10
	MD	Medium Dense 35-65 10-30
	D	Dense 65-85 30-50
	VD	Very Dense > 85 > 50
	()	Bracketed symbol indicates estimated density based on ease of drilling or other tests.
Hand Penetrometer Readings	300	Numbers indicate individual test results in kPa on representative undisturbed material unless noted otherwise.
	250	
Remarks	'V' bit	Hardened steel 'V' shaped bit.
	'TC' bit	Tungsten carbide wing bit.
	T ₆₀	Penetration of auger string in mm under static load of rig applied by drill head hydraulics without rotation of augers.



LOG SYMBOLS

ROCK MATERIAL WEATHERING CLASSIFICATION

TERM	SYMBOL	DEFINITION
Residual Soil	RS	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
Extremely weathered rock	XW	Rock is weathered to such an extent that it has "soil" properties, ie it either disintegrates or can be remoulded, in water.
Distinctly weathered rock	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by ironstaining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Slightly weathered rock	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh rock	FR	Rock shows no sign of decomposition or staining.

ROCK STRENGTH

Rock strength is defined by the Point Load Strength Index (Is 50) and refers to the strength of the rock substance in the direction normal to the bedding. The test procedure is described by the International Journal of Rock Mechanics, Mining, Science and Geomechanics. Abstract Volume 22, No 2, 1985.

TERM	SYMBOL	Is (50) MPa	FIELD GUIDE
Extremely Low:	EL	0.03	Easily remoulded by hand to a material with soil properties.
Very Low:	VL	0.1	May be crumbled in the hand. Sandstone is "sugary" and friable.
Low:	L	0.3	A piece of core 150mm long x 50mm dia. may be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.
Medium Strength:	M	1	A piece of core 150mm long x 50mm dia. can be broken by hand with difficulty. Readily scored with knife.
High:	H	3	A piece of core 150mm long x 50mm dia. core cannot be broken by hand, can be slightly scratched or scored with knife; rock rings under hammer.
Very High:	VH	10	A piece of core 150mm long x 50mm dia. may be broken with hand-held pick after more than one blow. Cannot be scratched with pen knife; rock rings under hammer.
Extremely High:	EH		A piece of core 150mm long x 50mm dia. is very difficult to break with hand-held hammer. Rings when struck with a hammer.

ABBREVIATIONS USED IN DEFECT DESCRIPTION

ABBREVIATION	DESCRIPTION	NOTES
Be	Bedding Plane Parting	Defect orientations measured relative to the normal to the long core axis (ie relative to horizontal for vertical holes)
CS	Clay Seam	
J	Joint	
P	Planar	
Un	Undulating	
S	Smooth	
R	Rough	
IS	Ironstained	
XWS	Extremely Weathered Seam	
Cr	Crushed Seam	
60t	Thickness of defect in millimetres	