REPORT

TO

HENROTH INVESTMENTS AS TRUSTEE FOR HENROTH DISCRETIONARY TRUST

ON

GEOTECHNICAL ASSESSMENT

FOR

PROPOSED MIXED USE DEVELOPMENT

AT

KIRRAWEE BRICK PIT SITE

566-594 PRINCES HIGHWAY KIRRAWEE

Date: October 2010

Ref:21714SLrpt4

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TABLE OF CONTENTS

1 INTRODUCTION

This geotechnical report has been prepared in support of an application for Concept Plan approval under part 3A of the Environmental Planning and Assessment Act at 566-594 Princes Highway Kirrawee, otherwise known as the former Kirrawee Brick Pit (Reference MP 10_0076). The application seeks approval for a mixed use development comprising residential, retail and commercial uses and building envelopes of between 5 and 15 storeys. The proposal also involves basement car parking and includes commuter parking, landscaping services and the provision of a major new public park. Specifically this report addresses the following issues as detailed in the Director General's Requirements (DGR's) issued by the Department of Planning on 24 August 2010.

1. Issue 10 Bullet point 4 *"Stability of the empty impoundment and potential for bank failure, particularly the influence on Flora Street"*
2. Issue 11, and more specifically the geotechnical issues associated with the proposal.
3. Appendix B, Item 11 – Geotechnical Report

This report has been commissioned by Mr Daniel Maurici of Henroth Investments.

The purpose of our assessment was to review existing geotechnical data available for the site and to provide our opinion on geotechnical issues likely to affect the proposed development and methods to address these geotechnical issues. Further specific geotechnical investigations and designs will be required as part of detailed design phases of the project.

2 SITE VISIT AND PREVIOUS REPORTS

As part of our assessment we have carried out a preliminary site visit to familiarise ourselves with the site and the geological and topographical conditions. We have also been provided with some previous geotechnical reports as summarised below.

- Geotechnical Assessment for Former Kirrawee Brick Pit, by URS, report reference 19892-024/R002 Final Report, dated April 2003. This report provides a general overview of the geotechnical conditions of the site (based on some limited subsurface investigations and visual inspection) and provides a discussion on geotechnical constraints to development with particular emphasis on filling or retention of the existing brick pit.

- Geotechnical Slope Risk Assessment along Flora Street, by URS, Project No. 43167325, dated 10 April 2006. This report attempts to identify and quantify the risk of instability of cut faces along the southern side of the brick pit, and provides recommendations on slope risk management measures.

- Supplementary Geotechnical Investigations, by URS, Project No. 43167393, dated 20 November 2006. This report provided the results of additional subsurface investigations over the northern portion of the site, including measurement of groundwater levels.

- Design Report: Design of Stabilisation Works along Section S6 at Flora Street Boundary, by URS, Project No. 43167449, dated 30 January 2007. This report provided a recommendation for a temporary soil nail retention system along a portion of the southern side of the brick pit face which was assessed to have a high risk of instability. We note that our site visit indicated that the stabilisation measures had been installed.

- Hydrogeological Data Report by C.M. Jewel & Associates Pty Ltd, Report Reference J1418.9R-rev0, dated October 2010.

- Dewatering Plan by C.M. Jewel & Associates Pty Ltd, Report Reference J1418.10R-rev0, dated October 2010.

- Long Term Groundwater Management Plan by C.M. Jewel & Associates Pty Ltd, Report Reference J1418.11R-rev0, dated October 2010.

- Groundwater Assessment by C.M. Jewel & Associates Pty Ltd, Report Reference J1418.13R-rev0, dated October 2010.

- Assessment of Groundwater, Quarry Pit Water and Sediment Contamination at the Kirrawee Brick Pit by C.M. Jewel & Associates Pty Ltd, Report Reference J1418.12L-rev0, dated 18 October 2010.

For our geotechnical assessment we have utilised the information obtained in these existing reports to supplement our own observations as a basis for our opinions on geotechnical issues affecting the proposed development. Relevant geotechnical data from these previous reports, including borehole logs and test pit logs, have been attached to this report as Appendix A.

3 SITE DESCRIPTION

The site is bounded by Princes Highway to the north, Flora Street to the south and Oak Road to the west and occupies an area of approximately 4.2 hectares. The general area has a gentle slope down to the east with a change in elevation from about RL105m at the south-western corner of the site to about 94m at the south-eastern corner. Further afield the topography to the north of Princes Highway slopes down to the north.

The site has a large open excavation which covers the majority of the southern side of the site. We understand that this excavation was a former brick pit which was in operation until about the late 1960's. Since that time the site has been dormant. The attached Figure 1 shows a survey plan of the site (as obtained from Woodhead).

The brick pit excavation is now water filled with the water level at an RL of about 91m. The sides of the brick pit excavation are quite steep in parts, particularly along the southern side. Further discussion of the brick pit sides is included in Section 4 of this report.

The northern side of the site is vacant apart from a small existing substation close to the Princes Highway. Remnants of previous structures are also evident over the northern side of the site with a number of old concrete slabs and footings. Natural bushland exists to the west of the brick pit excavation (between Oak Road and the brick pit) as well as toward the north-western corner.

To the east of the site is a number of existing warehouse buildings which abut or are very close to the subject site boundary.

4 PROPOSED DEVELOPMENT

As part of our geotechnical assessment we have been provided with a survey plan prepared by AWT Survey, Drawing Number 070807 (Sheets 1 to 4) dated 25 January 2008, Issue B. We have also been provided with architectural drawings by Woodhead. A full list of the architectural drawings provided are attached in Appendix B

From these drawings we understand that the following is proposed for the site.

1. Dewatering of the existing brick pit excavation.
2. Three basement car parking levels will be constructed. The lower two basement car parking levels (Basement B3 and Basement B2) will be used for residential car parking, while the upper carpark level will be used for a combination of retail, residential and commuter car parking.
3. The lowest Basement B3 will be located close to the central deepest portions of the existing brick pit and has been indicated to have a finished floor level at RL85.0m. Formation of this level will require excavation over most of the Basement B3 footprint (apart from the deeper section of the pit toward the south-western corner of B3). Excavation will be to typical depths of about 5m, however will extend to a maximum depth of about 12m toward the north western corner. Some filling will be required where the brick pit is at its deepest.
4. The Basement B2 will also be generally located within the area of the existing brick pit and has been indicated to have a finished floor level at RL88.0m. Basement B2 will extend beyond the existing pit batters, particularly along the northern and eastern sides. Maximum excavation depths of about 9m are expected, with excavation extending to about 8m from the eastern site boundary.
5. Basement B1 covers the majority of the site and has been indicated to have a finished floor levels ranging from RL91.0m to RL93.5m. Over the northern half of the site (away from the existing brick pit, excavation will typically range from about 5m to 8m below existing surface levels. However in the south-western corner excavation will extend into the existing pit bank and the trimmed height of the excavation will be to about 13m below existing surface levels.
6. The lower ground floor above the basement levels will include retail and commercial developments. A water feature and open space area will be constructed in the south-western corner of the site at about the lower ground

floor level and above the B1 car parking level. A further water feature is proposed centrally within the site.

7. Eight separate residential tower blocks (Block A to Block H inclusive) will be located above the ground floor level and these will range from five to fourteen storeys high.

We have not been provided with any indication of building loads, however we have assumed at least moderately high column loads will occur.

5 INFERRED SUBSURFACE CONDITIONS

5.1 Existing Brick Pit – Southern Portion of the Site

The existing brick pit covers the majority of the southern side of the site. At present the brick pit is water filled to a reduced level of about RL91m. Based on the survey plan by AWT referenced in Section 4 above it appears that the sediment bed at the base of the pit is irregular in level and ranges from about RL84m to RL88m, with slightly higher levels around the edges. Anecdotal evidence suggests that some fill may have been placed in the brick pit after completion of brick making activities, although the nature and depth of any such fill is unknown.

We expect that bulk excavation for the brick pit probably extended down to the top of the underlying sandstone bedrock, although excavation could have terminated within the siltstone which was the quarry product. Previous boreholes drilled across the northern portion of the site by URS as part of their November 2006 report (referenced above), indicated that sandstone bedrock was encountered at reduced levels in the order of RL83m (BH04) at the eastern end of the site, and RL88m (BH01) at the western end. The locations of the previous URS boreholes are shown on the attached Figure 1. The subsurface conditions exposed on the sides of the brick pit appear to be relatively similar to those encountered in these boreholes.

The southern side of the brick pit has slopes which typically range from about 3m high at the eastern end to 15m high at the western end. They generally expose extremely weathered and highly weathered shale with a capping of residual soils in the order of 1m to 1.5m thick. The cut faces are quite steep, typically ranging from 45º to near vertical. The crest of the cut face ranges from about 4m to 7m from the southern site boundary, but in at least one area is as close as 2m. Observations of the face indicates that failures have occurred over time and these have included wedge failures, toppling failures, erosion and undercutting, as well as unravelling of jointed and fragmented rock. There is a dominant joint set with a strike roughly NNW-SSE and another secondary joint set striking roughly ESE-WNW. The upper portion of one section of the southern face has been temporarily supported by a soil nail retention system. No other structural retention or support has been provided.

The western end of the brick pit has slopes typically in the order of 10m to 20m high which are at slopes of 25º to 45º, although there are isolated steeper sections. The slopes expose extremely and highly weathered shale with some areas covered by a mantle of clay soils washed/eroded from higher levels. Local erosion and small slump failures (particularly at the crest) are the dominant modes of failure along this section of the brick pit slope.

The northern side of the brick pit is largely covered by vegetation and therefore the exposed conditions are not apparent. However the slopes are in the order of 5m to 10m high. We expect the underlying conditions to be similar to those exposed on the other faces; namely extremely to highly weathered shales which have eroded over time to form flatter slopes.

The eastern end of the pit is also quite heavily vegetated and has flatter slopes which typically range from 10º to 15º. It is possible that this end of the pit was used for access into the pit and may have a greater thickness of fill below the existing water level.

5.2 Northern Portion of the Site

The northern portion of the site typically has an upper profile of fill, which appears to have the greatest thickness closest to the northern brick pit face, where it was assessed to be greater than 2.6m deep in one of the test pits presented in the URS report of April 2003. No fill was encountered toward the north-western corner of the site and generally only shallow depths were encountered along the majority of the northern boundary and eastern boundary. However some deeper fill was encountered close to the eastern side of the brick pit with fill depths greater than 2m thick in two of the test pits. The fill material typically comprises a clayey material, although occasionally it is more granular in nature. It often contains bricks and sometimes contains other inclusions such as clay pipes, gravel, ash, charcoal, metal fragments and plastic.

Below the fill are the natural medium plasticity residual clays which are typically of very stiff or hard strength. These residual clay soils seem to vary in thickness, and often contain bands or thin zones of extremely weathered shale or siltstone, which increase in frequency with depth. The residual clays overlie weathered shales and siltstones. The weathered shale or siltstone was recorded at the relatively shallow depth of only 0.6m in TP12, however the more recent boreholes by URS in 2006 indicate the weathered shale at a depth of nearly 8m in BH01 (toward the north-western corner of the site) and at about 3m in BH04 (toward the north-eastern corner of the site).

Groundwater levels have been recorded in some of the previous boreholes. The following table summarises the groundwater monitoring carried out to date. No further groundwater monitoring has been carried out.

The following groundwater observations indicate that there is a general groundwater flow gradient from west down to east, generally in line with the existing topography of the area.

Borehole Number	Approximate Surface RL (mAHD)	Depth to Water Level	Approximate Groundwater RL (mAHD)	Date of Most Recent Observation
GW1	99.6	6.1	93.5	4 Oct 06
GW2	96.3	4.5	91.8	27 Nov 01
GW3	93.5	2.5	91.0	4 Oct 06
BH01	98.9	5.1	93.8	27 Oct 06
BH04	96.0	4.6	91.4	27 Oct 06

6 SUITABILITY OF SITE FOR DEVELOPMENT

Based on our assessment of the site we consider that from a geotechnical perspective the site is suitable for the proposed development, provided the geotechnical issues (discussed further below) are properly evaluated, and addressed during planning and detailed design. The proposed development involves relatively standard building construction, completed on many sites within the Sydney area.

7 GEOTECHNICAL ISSUES

7.1 Dewatering of Brick Pit and Removal of Softened Material

The existing brick pit will need to be dewatered as part of the initial stages of construction work at the site. Disposal of the water within the brick pit will require the relevant authority approvals if it is to be discharged as stormwater. For further

specific advice on design of the dewatering, reference should be made to the Dewatering Plan prepared by C.M Jewel & Associates Pty Ltd, Report Reference J1418.10R-rev0.

Following dewatering, there will inevitably be soft and wet soil material (including organic material) in the base of the brick pit. It should be assumed that this material will not be suitable for re-use and will need to be removed and disposed of off site. Removal of the soft and wet material will probably need to extend down to the level of which undisturbed bedrock is encountered. At this stage the depth to the undisturbed bedrock is largely unknown. Therefore it would seem reasonable to make some assumptions based on the existing borehole data with confirmation being obtained during the later stages of dewatering, when some test pits may be able to be excavated within the base of the pit.

7.2 Stability of Brick Pit Cut Faces and Retention.

One of the critical issues for this site will be the stability of the existing brick pit cut faces, particularly along the southern (Flora Street) boundary. We consider that the following general approach will be required.

7.2.1 Southern Brick Pit Face

The southern brick pit face is quite close to Flora Street, and there is evidence that failures associated with erosion and rock defects have occurred over time. Some trimming of the existing southern pit face (particularly toward the western end) will be required to accommodate the basement levels. This face will need to be supported in both the short term and long term. We consider that a suitable method would be to utilise a soil nail and shotcrete retention system along the face. The system would more correctly be called pattern bolting with shotcrete and mesh. This system could be designed using permanent soil nails with a reinforced shotcrete

face, and would therefore be suitable as the final retention of this face. Alternatively a temporary soil nail retention system could be constructed and a concrete block or reinforced concrete wall could be built inside the soil nail wall. Backfill could then be placed between the temporary soil nail wall and the concrete walls. The soil nail wall retention system, is by no means the only retention system for this face, and other alternative options could be considered, (for example an anchored soldier pile wall with shotcrete infill panels constructed along the Flora Street boundary). However we believe that the soil nail wall provides a degree of flexibility in design and construction, which would be suitable to the site conditions and the potential for unknowns (particularly below the existing water levels). Prior to commencement of soil nailing, the face would need to be cleared of any obvious unstable overhangs, rock wedges vegetation and trees etc so that the soil nailing can be carried out safely.

In terms of stability of the southern brick pit face, it is possible and even likely that dewatering the pit may induce instability in the pit face walls as a result of groundwater pressures within joints in the rock. Slower rates of dewatering will reduce the risk of instability as a result of groundwater pressures. However stabilisation will still need to be provided even if the pit is dewatered slowly due to the inherent defects within the rock materials. We consider that at least some initial stabilisation of the southern pit face wall will need to be carried out prior to dewatering, and that the remainder will be carried out progressively as dewatering continues. One option will be to push fill material into the pit to create a berm along the southern face, such that access for construction plant to install suitable retention (such as the soil nails, anchors etc) can be achieved. The berm and the water level in the pit can be progressively lowered as excavation and/or stabilisation of the southern face extends downwards. Other methods may be applicable and could be investigated further during detailed design. Nevertheless whichever option is adopted there will be the need for the preparation of a detailed methodology.

Consideration will also need to be given to the potential for turbidity issues when constructing the berm.

As a guide for preliminary costing purposes, we expect that soil nails (rock bolts) would be spaced at a horizontal and vertical spacing of about 1.5m and would be equivalent to a length of about 0.7 to 1.0 times the height of the cut face. Prior to detailed design, the drilling of some cored boreholes within the Flora street car parking bays (i.e. just beyond the subject site boundary) would be advantageous to define subsurface conditions in more detail and enable some optimisation of stabilisation designs. If an anchored soldier pile wall option is being considered, one of the critical design issues will be the possibility of adversely inclined joints, so conservatively for preliminary design, the anchored soldier pile system would need to be designed on the basis of the horizontal load from a wedge of rock formed by a 45° plane inclined upwards from the bulk excavation level.

7.2.2 Eastern Brick Pit Face

It seems possible that the eastern brick pit face may be able to be suitably battered to enable construction of conventional retaining walls for Basement levels B1 and B2. Temporary batters within the residual soils and extremely weathered/highly weathered shale should be no steeper than 1 Vertical (V) in 1 Horizontal (H) for heights less than about 6m. For greater heights, or where the adjoining buildings are founded on shallow footings and overall stability is of concern, flatter batters will need to be adopted or a properly designed retention system installed along this side of the B1 and B2 basement excavation. Where batter slopes are adopted, all batter slopes should be inspected by an experienced geotechnical engineer at not greater than 1.5m height intervals or as directed on site by the geotechnical engineers. Construction of batter slopes will reduce access along this side of the site, and for this reason it may be desirable to construct insitu retention systems rather than temporary batter slopes. Careful attention to backfilling between temporary batter

slopes and the basement walls is also required to reduce the risk of post construction settlements. Soil nail wall techniques or anchored soldier pile wall techniques could be utilised to support this face.

7.2.3 Northern Brick Pit Face.

The northern brick pit face will be extended further to the north to incorporate both the Basement B1 and Basement B2 car parking levels. The proposed finished floor levels of these basements are such that at least partial dewatering of the pit will be required prior to complete excavation for these levels. Excavation for the B2 Basement Level will be to maximum depths of about 9m. There will be sufficient space for temporary batter slopes to be accommodated for the B2 excavations. Temporary batter slopes should not be steeper than 1V in 1H, however they may need to be flatter depending on the nature of the materials encountered. Further advice should be sought from the geotechnical engineers during detailed design.

Excavation for the B1 Basement level will extend reasonably close to the Princes Highway site boundary (about 3m to 12m away). The excavation depth will typically range from about 4m at the north-eastern corner to about 7m at the north-western corner. Based on this, temporary batter slopes would only be feasible toward the eastern end of this northern boundary with insitu retention systems required elsewhere.

Where insitu retention systems are required for either the B1 or B2 basement levels they may include anchored soldier pile walls or soil nail walls. Where such systems are adopted for the B2 excavation, anchors or soil nails may have an impact on the footing systems for nearby buildings, which will probably be piled down into the rock. Further consideration will need to be given to the most suitable methods of support.

7.2.4 Western Brick Pit Face

The current proposal is to extend the Basement B1 Level to about 30m from the Oak Road boundary, although it will be locally closer at the northern end, where it will be only about 6m from the existing boundary. The B1 level will primarily be within the existing brick pit excavation, apart from the residential car parking area in the north-western corner which will require excavation to about 7m to 8m deep and in the south-western corner. Apart from these areas, where insitu retention will be required, temporary batter slopes generally appear feasible. In the long term it appears that permanent batter slopes are proposed and these will slope down from the Oak Road level to the proposed water feature and open space area. The gradient of any permanent batter slopes will depend on the future use of the batter. However where permanent batters are proposed to be vegetated then permanent batter slopes of not greater than 1V in 2.5H are recommended. These permanent batters would need to be protected from erosion by suitable erosion protection measures, until vegetation is well established.

Some backfilling against the lower portions of the existing brick pit face will be required. Prior to backfilling, or as part of the backfilling process, it will be necessary to remove vegetation or softened surface materials from the pit face and to scale down any obvious overly steep portions of the face. The new fill will need to be 'keyed' in to the existing prepared pit face by excavating benches for suitable compaction. Consideration will need to be given to differential settlements between areas of deeper fill and areas of shallow fill (such as above the B1 car park level). These long term creep settlements are a function of the fill depth and the type of fill material used. As a guide a well compacted clayey fill would typically settle in the order of 0.5% of the fill depth per log cycle of time. Filling in the western end of the pit will only be able to commence once the base of the pit has been stripped of all wet and soft material and a suitable base to enable compaction of fill has been achieved. Reference should be made to Section 7.4 of this report for recommendations in regard to backfilling portions of the brick pit.

7.3 Seepage within the Basement Excavation

After dewatering of the brick pit, seepage will continue into the brick pit in the short and long term. Seepage is also expected into basement excavations which are excavated to below the surrounding groundwater level. From the data to date, it appears that the current groundwater level is about RL93.5m at the north western corner of the site and about RL91m at the south-eastern corner of the site. At this point it is largely unknown whether the groundwater table is being influenced by the water level in the brick pit or visa versa. It is clear however that during rainfall, runoff would end up in the open brick pit. Nevertheless we do not consider that dewatering the brick pit will have any significant impact on nearby areas due to the low permeability of the substrata.

The permeability of shale is generally very low and as a unit it is not considered to be an aquifer, rather it is an aquiclude (Ref Dupen 1992). We have carried out some preliminary hand calculations to assess the likely seepage volumes into the base of the brick pit after dewatering of the brick pit. We have assumed a horizontal permeability of the shale of 10^{-7} m/sec and a vertical permeability which is 100^{th} of the horizontal. Our calculations indicate a total inflow of 0.35 litres/sec for the whole pit (assuming a rough geometrical representation of the pit of about 210m x 80m square). We have also carried out a simple 2D computer model using the program SEEP/W for a typical pit cross section. For the same boundary conditions we derive an inflow of 0.24 litres/sec which is reasonably consistent with the hand calculations.

Even if we change some of the critical input parameters, such as increasing the permeability by an order of magnitude, the inflow only increases proportionately and becomes about 3 litres/sec which is still an almost insignificant amount compared to rainfall and run-off. These figures apply for the whole pit being open to a depth of

4m below the water table. If we increase the depth of dewatering the volume would be proportionately more, while If we partially backfill the pit the flows would be proportionately less.

The above preliminary analyses compare quite well with the detailed 3D groundwater modelling carried out by C.M. Jewel and Associates and presented in the various reports by C.M Jewel and Associates Pty Ltd. Reference should therefore be made to the C.M. Jewel reports referenced in Section 2 above for specific dewatering quantity and quality evaluation and analysis. The results of the detailed 3D modelling by C.M. Jewel should take precedent over our preliminary hand calculations and monitoring.

We expect that seepage into the brick pit after dewatering will be able to be controlled by conventional sump and pump systems. Detailed design will not be possible until the extent of soil and rock profile in the base of the brick pit is known, which will not be possible until commencement of construction. Nevertheless we consider that a suitable system would probably include the following;

- Placement of a free draining gravel blanket encompassing subsoil drains in the base of the existing brick pit. The gravel blanket would extend completely along the pit base at rock level (i.e. after excavation of the soft and wet soil) and then up the excavation or pit sides to connect to rear of wall retaining wall drainage. Geofabric would be required above the gravel drains to prevent clogging of the drains. Flushing points connected to the subsoil drains would likely be required.

- Connection of these drains to sumps with permanent failsafe pumps.

- Consideration must also be given to the potential for clogging of drainage with time. Further advice is provided in the Long Term Groundwater Management

Plan prepared by C.M. Jewel Report Reference J1418.11R-rev0, and the reader is directed to that report.

Subsoil drainage would also need to be provided below the Basement B1 level, but will likely only require a grid of subsoil drains connected to a failsafe pump for disposal.

Placement of fill above the gravel blanket will need to be carried out carefully so as to not damage the geofabric. A layer of sand may be required over the geofabric to protect it from damage during fill placement and compaction. Further specific advice on drainage will be required during the detailed design phases of the project.

It will be very difficult to predict the water quality which will come in to the pit in the long term. Water derived directly from the shale is commonly somewhat saline. However the seepage volumes noted above will be largely masked by the seepage which enters as a result of infiltration through surface soils into the drainage system and their diluting effect. Most basements in Sydney which have been excavated into the shale bedrock simply collect and discharge seepage to the stormwater system. This has been addressed further in the Long Term Groundwater Management Plan report prepared by C.M. Jewel Report Reference J1418.11R-rev0.

7.4 Backfilling Portions of the Brick Pit

Some backfilling of portions of the brick pit will be required after dewatering, removal of the soft and wet material in the base of the pit and placement of the drainage blanket. This will predominantly occur at the western end below the basement B1 Level. All filling should be placed as engineered fill. The residual soils and weathered rock excavated from other areas of the site will be suitable for re-use as an engineered fill. Some of the fill materials will also probably be suitable for re-

use provided any obviously deleterious, organic or other unsuitable material (such as particles greater than about 0.1m nominal size) are removed.

At this stage we recommend all earthworks associated with backfilling of the brick pit be carried out under Level 1 earthworks supervision in accordance with AS3798 - 2007 'Guidelines on Earthworks for Residential Developments'. Even with fill placed and compacted under level 1 supervision, some longer term settlements will occur. The extent of settlement will be a function of the fill thickness and material type used. Where settlements of the fill are to be reduced then the fill material should be compacted to between 98% and 102% of SMDD and within ± 2% of Standard Optimum Moisture Content. Further reduction in settlements will require the importation and use of a good quality granular material rather than the existing site-won clayey soils and weathered rock. Where fill is placed around the edges of the brick pit, then differential settlements will occur in the fill over time due to the differing fill thicknesses. This will need to be considered during design of structures in these areas (such as the water feature). The magnitude of predicted settlement is outside the scope of this assessment but should be considered further during detailed design stages of the project. A lower compaction and testing specification to that noted above may be acceptable for engineered fill where fill settlement is not critical.

7.5 Building Footings

Due to the nature of the proposed development, all new building footings should be uniformly founded on the underlying bedrock. Conventional footings systems such as pad/strip footings or bored piles will be suitable. At this stage there is only limited data on the weathered bedrock and further specific investigations for each building footprint will be required during the detailed design phase of the project.

It is quite possible that different rock founding stratums will be utilised for different buildings. In the base of the brick pit, we expect that better quality medium strength sandstone bedrock will probably be encountered at relatively shallow depths below the soft and wet material. This better quality bedrock may be suitable for bearing pressures of up to 3500kPa subject to additional proving. Elsewhere some of the more weathered bedrock (encountered at shallower depths) will be suitable for bearing pressures ranging from 600kPa to 1000kPa. It would be wise to found individual buildings on the same quality of rock to reduce the risk of differential settlements, or to provide articulation to accommodate such movements.

Some dewatering of bored piles will be required particularly if they extend below the current level of groundwater.

7.6 Basement Floor Slabs

Assuming a suitable drainage blanket is installed in the base of the brick pit as discussed in Section 7.3 above, then any fill material between the pit base and the subgrade level of basements would remain relatively dry. We consider that the site-won clayey soils and weathered rock material would be suitable for re-use as an engineered fill material to support the basement floor slabs and they should be compacted to between 98% and 102% of SMDD and to within ±2% of Standard Optimum Moisture Content. Further assessment will be required on suitable parameters for design of the basement slabs. However the clayey soils will have a relatively low soaked CBR and it may be more cost effective to utilise a select layer of good quality granular material as the subgrade immediately below the basement slab. A granular subbase layer would also be required.

7.7 Additional Geotechnical Investigations

Additional geotechnical investigations will be required during detailed design phases of the project to enhance the existing geotechnical data and refine designs. We expect that investigations will include;

- Boreholes for individual building areas to assess soil and rock parameters for retention and footings.

- Boreholes within the dewatered brick pit excavation to assess bearing pressures for footings.

- Boreholes along the Flora Street boundary and detailed geotechnical mapping of the southern cut face (adjacent to Flora Street) as a basis for further advice on stabilisation measures.

- Sampling and testing of soils for use as subgrade for pavements.

8 GENERAL COMMENTS

The recommendations presented in this report are of a preliminary nature and include issues to be addressed during the detailed design and construction phases of the project. In the event that any of these recommendations are not implemented, Jeffery and Katauskas Pty Ltd accept no responsibility whatsoever for the performance of the structure or other construction issues

The subsurface conditions 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.

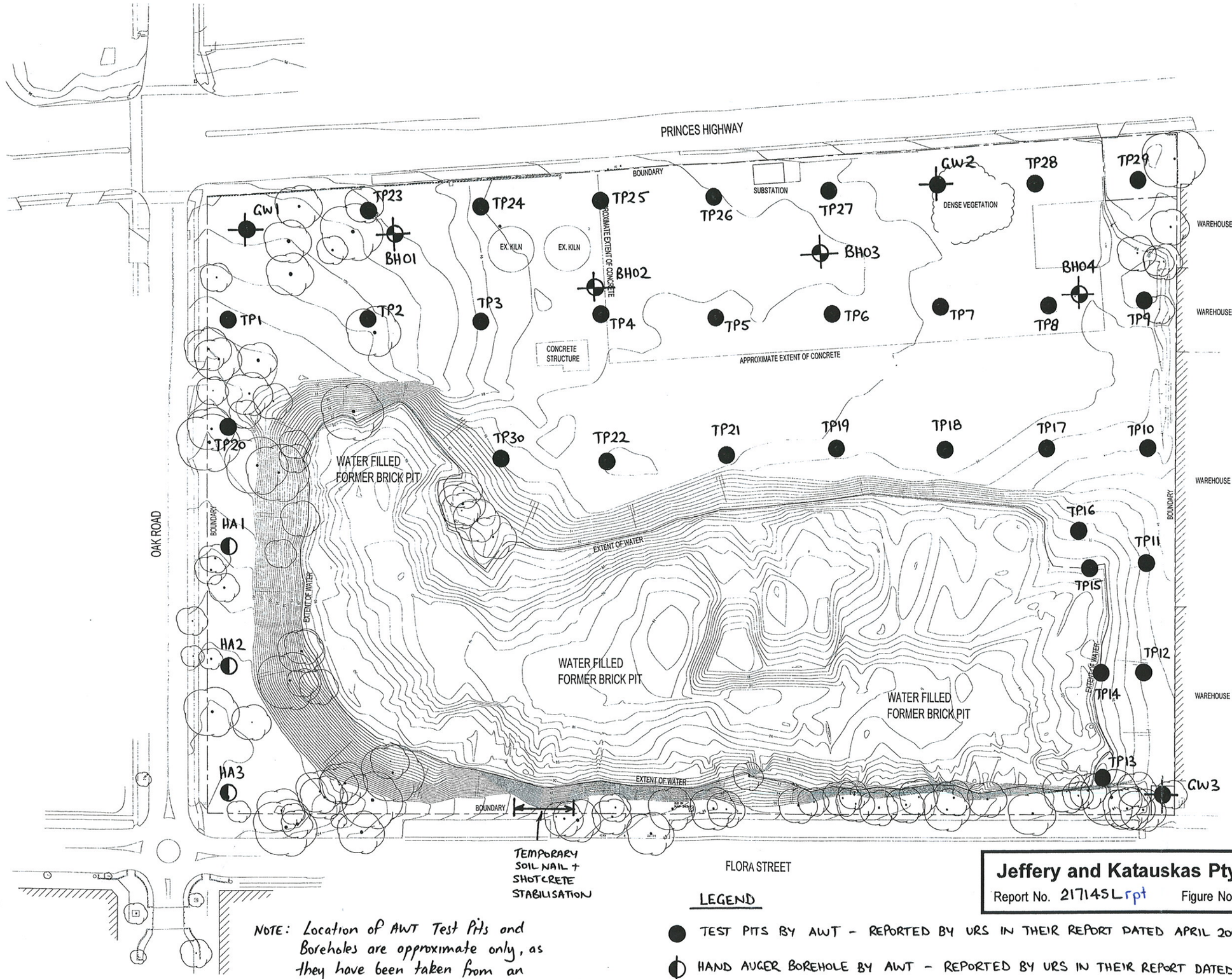
This report provides advice on geotechnical aspects for the proposed civil and structural design. As part of the documentation stage of this project, Contract Documents and Specifications may be prepared based on our report. However, there may be design features we are not aware of or have not commented 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.

The offsite disposal of soil will most likely require classification in accordance with the Department of Environment & Conservation (NSW) guidelines as inert, solid, industrial or hazardous waste. We can complete the necessary classification and testing if you wish to commission us. As testing requires about seven days to complete, allowance should be made for such testing in the construction program unless testing is completed prior to construction. If contamination is found to be present then substantial further testing and delays should be expected. We strongly recommend this issue be addressed prior to commencement of excavation on site.

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

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

LJ Speechley
Principal
For and on behalf of
JEFFERY AND KATAUSKAS PTY LTD.



NOTE: Location of AWT Test Pits and Boreholes are approximate only, as they have been taken from an unscaled plan.

LEGEND

- TEST PITS BY AWT - REPORTED BY URS IN THEIR REPORT DATED APRIL 2003
- HAND AUGER BOREHOLE BY AWT - REPORTED BY URS IN THEIR REPORT DATED APRIL 2003
- GROUNDWATER WELL BY AWT - REPORTED BY URS IN THEIR REPORT DATED APRIL 2003
- BOREHOLES BY URS REPORT DATED 20 NOVEMBER 2006

Jeffery and Katauskas Pty Ltd
Report No. 21714SLrpt Figure No. 1

PRELIMINARY

Key Plan

APPROX SCALE
0 50m

Issue	Rev.	Revision Description	Date
A	–	NOT YET ISSUED Changes Description Line 1 Changes Description Line 2	00.00.00

Development Management	RESTIFA & PARTNERS SUITE 1, GND 123 WALKER STREET NORTH SYDNEY 2060
Quantity Surveyor	RIDER LEVETT BUCKNALL L5, 41 MCLAREN STREET NORTH SYDNEY 2060
Structural	MACARTNEY ENGINEERING CONSULTANTS L13, 80 MOUNT STREET NORTH SYDNEY 2060
Civil & SW Engineering	NORTHROP LEVEL 1, GRAFTON BOND STORE, 60 HICKSON RD., SYDNEY NSW 2000
Service Engineers	WALLIS & SPRATT SUITE 504, 10-12 CLARKE STREET CROWS NEST 2065
Urban Designer	GMU DESIGN SUITE 1, 5 WONGALA CRES BEECROFT NSW 2119
Traffic Engineers	VARGA TRAFFIC PLANNING SUITE 6, 20 YOUNG ST. NEUTRAL BAY NSW 2089
BCA Consultant	MCKENZIE GROUP L6, 189 KENT STREET SYDNEY 2000
Landscape Architect	NS BOTANICA

Client
KIRRAWEE CENTRE PTY LTD

INVESTIGATION LOCATION PLAN

Architects
woodhead
343 Pacific Highway
North Sydney NSW 2060
T +612 9964 9500
F +612 9964 9683
ACN NO. 007 747 748
Architecture
Interiors
Planning
Graphics
Asia
Australia
Europe
work community lifestyle

Drawn	AK	Checked	PB
Design Verification	PB	Project Director Approval	
Drawing Coordinated	NC	Date Commenced	MARCH 08

Project Description
KIRRAWEE "BRICK PIT SITE" MIXED USE DEVELOPMENT

Project Number 07211202
Drawing Title
EXISTING LAYOUT
Scale

Drawing Number DA01
Issue ---

APPENDIX A

URS Non-cored Hole

BOREHOLE BH01

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone 02 8925 5500
Fax 02 8925 5555

Drilling Contractor: McDermott Drilling PTY LTD

Project Reference: Kirrawee Brick Pit Geotech Investigation
Project No.: 43167393

Client: Sydney Water Corporation
Location: Kirrawee

Logged By: J Donnelly
Checked By: SGR
Date Started: 09-10-06
Date Finished: 09-10-06

Bore Size: HW mm
Total Depth: 7.90 m
Casing Size: HW mm

Relative Level: 98.91 mRL
Coordinates: 6232576.00 mN
322021.70 mE
Permit No:

Drill Type: Solid flight Auger, TC bit
Drill Model: B40
Drill Fluid: None

SAMPLE TYPE	RUN (m)	FIELD SHEAR STRENGTH (kPa)	PENETROMETER BLOWS (N)	SAMPLING AND OTHER TESTING	GROUND WATER DATA AND COMMENTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION OF STRATA	MOISTURE CONDITION	USCS	CONSISTENCY/ DENSITY	GEOLOGICAL DESCRIPTION
						0		FILL: Silty CLAY, low to medium plasticity, orange/brown, dry to moist, firm, with some sub-rounded to sub-angular gravel and trace white sand	D/M		F	FILL
			N= 34	SPT 1-1.45m 10,14,20 N=34		1		Silty CLAY: medium plasticity, mottled red, orange/brown and grey, dry to moist, hard, with fine to coarse grained shale fragments, sub-angular to angular	D/M		H	RESIDUAL
			N= 33	SPT 2-2.45m 6,14,19 N=33		2						
			N>36	SPT 3-3.39m SPT 11,16,20 for 90mm, N>36		3		As above becoming grey with red and orange/brown mottles around claystone fragments				
			N>35	SPT 4-4.32m SPT 5,28,7 for 20mm N>35		4		As above with increasing ironstained shale				
			N>36	SPT 5-5.42m SPT 7,16,20 for 120mm N>36	SWL=5.12m 27/10/2006	5		Silty CLAY: as above, medium plasticity, grey with red and orange/brown mottles around shale fragments and lenses, dry to moist, hard	D/M		H	
			N=27	SPT 6-6.45m SPT 2,8,19 N=27		6		As above becoming low to medium plasticity, with red/purple and grey residual shale, moist, very stiff	M		VSt	RESIDUAL
			N>50	SPT 7-7.36m SPT 11,28,22 N>50		7		As above becoming hard, grey silty clay, with increasing extremely low strength to low strength, extremely weathered shale			H	
						8		End of augering at @ 7.9m, refer to cored log				

Remarks:

No TC-bit refusal
No V bit available, N>50 taken to approximate V bit refusal

URS Cored Borehole

BOREHOLE BH01

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone 02 8925 5500
Fax 02 8925 5555

Drilling Contractor: McDermott Drilling Pty Ltd

Project Reference: Kirrawee Brick Pit Geotech Investigation
Project No.: 43167393

Client: Sydney Water Corporation
Location: Kirrawee

Logged By: J Donnelly
Checked By: SGR
Date Started: 09-10-06
Date Finished: 09-10-06

Bore Size: HQ mm
Total Depth: 15.00 m
Casing Size: HW mm
Borehole Inclination and Bearing: 90° at 0

Relative Level: 98.91 mRL
Coordinates: 6232576.00 mN
322021.70 mE
Permit No:

Drill Type: Diamond core
Drill Model: B40
Drill Fluid: Water

METHOD	RUN	TESTING	WEATHERING	STRENGTH (EL VL L M H VH EH)	RQD (%) (25 50 75)	DEFECT SPACING (mm) (0-19 20-49 50-99 100-199 200-599 >599)	DEPTH (m)	DEFECT DESCRIPTION	GRAPHIC LOG	DESCRIPTION OF STRATA	GEOLOGICAL DESCRIPTION
Augering	7.9						7			Terminate augering at @ 7.9m, start coring	
Coring	100% CR		XW				8	7.90-7.95 Fz 0-90°, Ir, VR, R Clay 50mm JN 60° Wa, S, KL<1mm 7.97-8.28 4x BP 0-5°, Pl-Cu, S-Sr, R Clay 3-5mm JN 0-20° Ir, S, Clay 1mm JN 90° Wa, S, Clay 70mm 8.08-8.51 2x BP 0-10°, Pl-St, S-R, KL <1mm JN 0-30° St, R, KL<1mm JN 0-30° St, R, Rf & Clay 20mm 8.47-8.57 4x BP 0-5°, Pl-Ir, Sr-R, Rf & Clay 1-20mm 8.58-8.88 4x Dz 0-90°, Pl-Ir, Sr-R, Rf & Clay 280mm 8.86-9.6 6x BP 0-30°, Pl-St, S-R, Rf & Clay 1-30mm JN 30° Pl, S, Clay 2mm		Residual SHALE: Low strength, Extremely weathered, red/brown with some light grey, massive bedding, fractured, with some greyish purple ironstaining & black manganese laminations	Residual SHALE
	9.14						9			SHALE: Extremely Low to Low strength, Extremely weathered-Distinctly weathered with Extremely Low strength, Extremely weathered bands, grey, pale red and dark red/brown, thinly laminated, poorly developed bedding, fractured to highly fractured, stronger where ironstained	SHALE
			DW				10	9.70-9.77 Fz 0-90°, Pl-Ir, S-R, Rf 70mm 9.80-10.00 3x BP 0-5°, Pl-Wa, S-Sr, R Clay 1-3mm JN 90° Ir, Sr, Rf & Clay 30mm 10.06-10.28 BP 0-40°, Pl-Wa, S-Sr, Rf & Clay 1-5mm JN 70° Ir, Sr-R, Rf & Clay 60mm JN 70° Cu, S, Clay 40mm		As above becoming Medium strength with occasional Extremely Low strength, Extremely weathered bands, fractured	
								JN 90° Cu, S, Clay 10mm 10.63-11.28 BP 0-5°, Pl, S-Sr, KL & Sand Clay <1-5mm		RL88-31 SANDSTONE: Low-Medium strength, Extremely weathered-Distinctly weathered, red/ brown and dark red/orange, thinly laminated & wavy crossbedding, poorly to well developed bedding, fine to medium grained, fragmented to slightly fractured	SANDSTONE
	100% CR		XW				11	JN 60° Ir, R, Rf & Clay 30mm		As above becoming Low strength, Distinctly weathered	
			DW							SANDSTONE: Low-Medium strength, Distinctly weathered-Slightly weathered, light grey & dark grey	

A proportion of the bedding plane defects described are drilling induced fractures along incipient bedding

URS Cored Borehole — BOREHOLE BH01

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone 02 8925 5500
Fax 02 8925 5555

Project No.: 43167393

Project Reference: Kirrawee Brick Pit Geotech Investigation

METHOD	RUN	TESTING	WEATHERING	STRENGTH	RQD (%)	DEFECT SPACING (mm)	DEPTH (m)	DEFECT DESCRIPTION	GRAPHIC LOG	DESCRIPTION OF STRATA	GEOLOGICAL DESCRIPTION
Coring	100% CR	PL 12.16m D=0.06 A=0.44 PL 12.7m D=0.17 A=0.23 PL 14.85m D=0.85 A=0.31	SW	EL VL L M H VH EH	25 50 75	0-19 20-59 60-199 200-599 >600	12 13 14 15 16 17	12.02-12.36 4x BP 0-5°, Pl, Sr, KL <1mm 12.29-12.31 2x BP 0-5°, Pl-Wa, tight to S, Clay 15mm BP 5° Pl, Sr, Rf, Sand & Clay 25mm 12.69-12.87 4x BP 0-20° Pl-St, Sr, KL to Sand <1mm JN 90° Pl, Sr, Sand 2mm 12.93-13.12 Dz, Sr, Sand & Rf, 190mm JN 90° Pl, tight, feldspar infill visible 2mm BP 15° Pl, Sr, KL<1mm 13.58-13.75 2x BP 0-5° Pl, Sr, KL<1mm BP 15° Pl, Sr, KL<1mm 14.26-14.30 Dz, Pl-Wa, S, Clayey Sand & Rf 40mm 14.55-14.67 Dz, Pl-Ir, Sr, Clayey Sand & Rf 40mm 14.80-14.84 Dz, Pl, Sr, Sand & Rf 40mm		siltstone interbedding, thinly laminated with siderite, some crossbedding, well developed bedding, fractured to slightly fractured, occasional Extremely Low strength, Extremely weathered bands	SANDSTONE
										SANDSTONE: Extremely Low-Low strength, Extremely weathered -Distinctly weathered, light brown and orange, thinly laminated, poorly developed to massive bedding, medium grained, fragmented to fractured	SANDSTONE
										SANDSTONE: Medium strength, Slightly weathered, light greyish brown, thinly laminated, poorly to well developed bedding, fine to medium grained, slightly fractured, some crossbedding and local Low to Extremely Low strength bands	SANDSTONE
										End of borehole @ 15m	

URS Non-cored Hole

BOREHOLE BH02

URS Australia Pty Ltd
Level 9, 116 Miller St North Sydney NSW 2060
Phone 02 8925 5500
Fax 02 8925 5555

Drilling Contractor: McDermott Drilling PTY LTD

Project Reference: Kirrawee Brick Pit Geotech Investigation
Project No.: 43167393

Client: Sydney Water Corporation
Location: Kirrawee

Logged By: J Donnelly
Checked By: SGR
Date Started: 12-10-06
Date Finished: 12-10-06

Bore Size: HW mm
Total Depth: 6.40 m
Casing Size: HW mm

Relative Level: 97.15 mRL
Coordinates: 6232545.00 mN
322067.20 mE
Permit No:

Drill Type: Solid flight Auger, V bit, TC bit
Drill Model: B40
Drill Fluid: None

SAMPLE TYPE	RUN (m)	FIELD SHEAR STRENGTH (kPa)	PENETROMETER BLOWS (N)	SAMPLING AND OTHER TESTING	GROUND WATER DATA AND COMMENTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION OF STRATA	MOISTURE CONDITION	USCS	CONSISTENCY/ DENSITY	GEOLOGICAL DESCRIPTION
						0		FILL: Concrete, bricks, glass in matrix of Silty CLAY, low to medium plasticity, firm, dry to moist V-bit refusal at 0.1m in FILL Brick layer extending to 1m, with sand and crushed sandstone	D/M		F	FILL
X			N=34	SPT 1.7-2.15m 7,14,20 N=34		1		Becoming moist with depth				
X			N=44+R	SPT 3-3.35m 12,20,22 for 60mm N>42		2		Silty CLAY: low to medium plasticity, grey, orange/brown and pale to dark red, hard, moist with hard shale fragments			VSt-H	RESIDUAL
X			N=41	SPT 4-4.45m 9,22,19 N=41		3						
X			N=34	SPT 5-5.45m 7,20,14 N=34		4		Silty CLAY as above becoming medium plasticity, grey and dark pale red, very stiff to hard, moist, dark red shale fragments to lenses				
X			N=>50	SPT 6-6.45m 14,30,20 for 60mm N>50		5		Silty CLAY: low to medium plasticity, grey, moist, hard with red/orange shale lenses	M		H	RESIDUAL
						6		SHALE/CLAYSTONE: extremely low to very low strength, extremely weathered, dark brown/grey with red/orange fragments End of augering at 6.4m, refer to cored log				SHALE
						7						
						8						

Remarks:

V-bit refusal at 0.1m in FILL
No TC-bit refusal
No Groundwater encountered

URS Cored Borehole

BOREHOLE BH02

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone 02 8925 5500
Fax 02 8925 5555

Drilling Contractor: McDermott Drilling Pty Ltd

Project Reference: Kirrawee Brick Pit Geotech Investigation
Project No.: 43167393

Client: Sydney Water Corporation
Location: Kirrawee

Logged By: J Donnelly
Checked By: SGR
Date Started: 12-10-06
Date Finished: 12-10-06

Bore Size: HQ mm
Total Depth: 15.10 m
Casing Size: HW mm
Borehole Inclination and Bearing: 83° at 0

Relative Level: 97.15 mRL
Coordinates: 6232545.00 mN
322067.20 mE
Permit No:

Drill Type: Diamond core
Drill Model: B40
Drill Fluid: Water with polymer 'quick mud'

METHOD	RUN	TESTING	WEATHERING	STRENGTH (EL, VL, L, M, H, VH, EH)	RQD (%) (25, 50, 75)	DEFECT SPACING (mm) (0-19, 20-59, 60-199, 200-599, 600-)	DEPTH (m)	DEFECT DESCRIPTION	GRAPHIC LOG	DESCRIPTION OF STRATA	GEOLOGICAL DESCRIPTION
Augering	6.4						6			Terminate augering at @ 6.4m, start coring	
Coring	7.8 100% CR		XW DW XW DW XW DW				7	JN 10-50° St, S, Clay 1mm, Rf 20mm 6.56-6.89 2x BP 0° Pl, S-Sr, Rf & Clay 1-7mm 6.77-6.84 3x BP 0° Pl, Sr, KL<1mm 7.00-7.11 4x BP 0-10° Pl, Sr, Clay 5mm 7.12 BP 20° Pl-St, Sr, Rf & Clay 10mm JN 80° Pl, S-Sr, KL<1mm 7.19-8.00 2x BP 0-5° Pl, S-Sr, KL<1mm JN 30° Pl-St, S-Sr, R Clay 10mm 7.37-8.00 6x BP 0-10° Pl, S-Sr, R, Rf & Clay 1-10mm 7.67-7.74 Cz,Pl, Sr-R, Rf & Clay 70mm 7.80-7.87 3x Drill breaks JN 80° Pl, S, KL<1mm 8.00-9.00 2x BP 0° Pl, S-Sr, Rf & Clay 10mm 8.00-8.14 3x BP 0° Pl, S, KL<1mm JN 75° Pl, S, KL<1mm JN 80° Pl, S, KL<1mm 8.39-8.65 7x DI fractures-discing 0° Pl, S, KL<1mm 8.77-8.87 6x DI fractures-discing 0° Pl, S, KL<1mm JN 80° Pl-Wa, S, KL<1mm 8.96-9.30 11x DI fractures 0° Pl, S, KL<1mm 9.31-9.96 3x BP 0-10° Pl-Ir, S-Sr, Rf & Clay 5-40mm JN 65° Pl, S, KL<1mm JN 65° Pl, S, KL<1mm JN 75° Ir, Sr, KL<1mm 9.53-9.68 5° DI fractures 0-5°, Pl, S, KL <1mm 9.74-9.81 Fz 0-90°, Ir, Sr, R Clay 70mm JN 0-20° Pl-St, Sr, Rf 12mm 9.89-9.91 2° DI fractures 0-5°, Pl, S, KL <1mm 10.00-10.48 Fz 0-90°, Ir, Sr-R, Rf 480mm BP 0° Pl, S, R Clay 20mm 10.70-11.00 4° DI fractures 0-5°, Pl-Wa, S, KL <1mm		SHALE: Extremely Low-Very Low strength, Extremely weathered-Distinctly weathered dark brownish grey, thinly laminated, poorly developed to massive bedding, fractured, occasional siltstone laminations SHALE: Very Low-Low strength, Distinctly weathered, dark grey, thinly laminated, poorly developed bedding, fragmented to fractured SILTSTONE: Low strength, Distinctly weathered, light to mid grey, poorly developed to massive bedding, slightly fractured, grading into Sandstone with depth	SHALE SHALE
	8.5 100% CR						8				
	9 100% CR						9				
							10				

Remarks: A proportion of the bedding plane defects described are drilling induced fractures along incipient bedding

URS Cored Borehole

BOREHOLE BH02

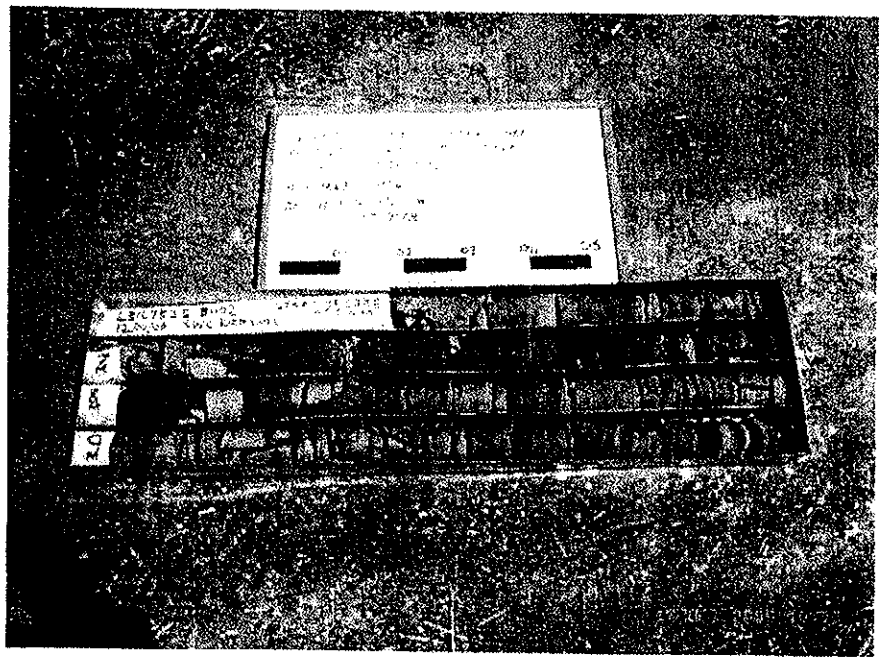
URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone 02 8925 5500
Fax 02 8925 5555

Project No.: 43167393

Project Reference: Kirrawee Brick Pit Geotech Investigation

METHOD	RUN	TESTING	WEATHERING	STRENGTH (EL, VL, L, M, H, VH, EH)	RQD (%) (25, 50, 75)	DEFECT SPACING (mm) (0-10, 10-29, 30-59, 60-199, 200-599, >600)	DEPTH (m)	DEFECT DESCRIPTION	GRAPHIC LOG	DESCRIPTION OF STRATA	GEOLOGICAL DESCRIPTION
Coring	12 100% CR		XW				11	11.00-11.41 4° DI fractures 0-5°, Pl, S, KL <1mm			SANDSTONE
			DW					BP 0° Pl, Sr, R Clay 15mm		RL 85.35	
								JN 25° Pl, Sr, KL<1mm			
								11.72-11.83 Cz, Ir, S-Sr, Rf 120mm			
							12	BP 10° Pl, S-Sr, R Clay 1mm		SANDSTONE: Low-Medium strength, Distinctly weathered, grey, thinly laminated , poorly to well developed bedding, fine to medium grained, fractured to slightly fractured, with occasional Extremely Low, Extremely weathered bands, increasing grain size with depth	SANDSTONE
								12.00-12.16 7° DI fractures 0-10°, Pl,-Wa S-Sr, KL <1mm			
								12.48-13.00 2° DI fractures 0-7°, Pl, S-Sr, KL <1mm			
			RS								
			DW				13	13.00-14.00 4° DI fractures 0-5°, Pl, S-Sr, KL <1mm			
								13.11- 13.15 Dz 0°,Pl, Sr, R Sand 40mm		SANDSTONE: Low-Medium strength, Distinctly weathered-Slightly weathered, light grey, laminated to thinly laminated, massive bedding , medium grained, fractured to slightly fractured	SANDSTONE
								13.32-13.35 Dz 5°, Pl, Sr, R Sand 30mm			
	100% CR	PL 13.8m D=0.11 A=0.30									
		PL 14.1m D=0.54 A=1.69	SW				14	14.10-14.48 4° BP 0-5°, Pl-Wa, S-Sr, KL <1mm		SANDSTONE as above becoming Medium to High strength	
			DW					14.48-14.69 4° BP 0°, Wa, S-Sr, KL <1mm			
	15.1	PL 14.82m D=2.60 A=3.19	SW				15	BP 0° Pl, S-Sr, R Sand 2mm		SANDSTONE as above becoming High to Very High strength, Slightly weathered	
										End of borehole @ 15.1m	
							16				

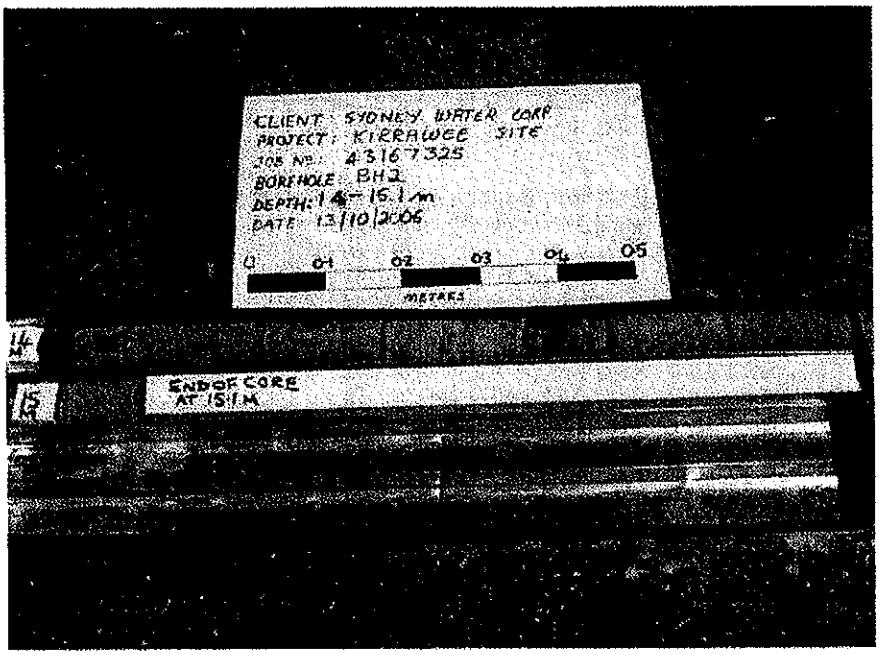
Appendix B
Boreholes Logs, Core Photos and Well Construction Details



BH2: 6.4 – 10.0 m

BH2: 10.0 14.0 m

Appendix B
Boreholes Logs, Core Photos and Well Construction Details



BH2: 14.0 15.1 m

URS Non-cored Hole

BOREHOLE BH03

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone 02 8925 5500
Fax 02 8925 5555

Drilling Contractor: McDermott Drilling PTY LTD

Project Reference: Kirrawee Brick Pit Geotech Investigation
Project No.: 43167393

Client: Sydney Water Corporation
Location: Kirrawee

Logged By: A. Hitchon
Checked By: SGR
Date Started: 11-10-06
Date Finished: 11-10-06

Bore Size: HW mm
Total Depth: 4.00 m
Casing Size: HW mm

Relative Level: 97.11 mRL
Coordinates: 6232553.40 mN
322128.60 mE
Permit No:

Drill Type: Solid flight Auger, V-bit,TC bit
Drill Model: B40
Drill Fluid: None

SAMPLE TYPE	RUN (m)	FIELD SHEAR STRENGTH (kPa)	PENETROMETER BLOWS (N)	SAMPLING AND OTHER TESTING	GROUND WATER DATA AND COMMENTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION OF STRATA	MOISTURE CONDITION	USCS	CONSISTENCY/ DENSITY	GEOLOGICAL DESCRIPTION
						0		FILL: Clayey SILT, low plasticity, brown/grey, orange brown, dry, firm, with gravel to 60mm				FILL
								As above becoming hard, possible concrete, bricks	D		F-H	
								FILL: Sandy CLAY, low plasticity, orange/brown, dry to moist, stiff to very stiff, trace brick fragments, silty in parts	D/M		St-VSt	
			N=17	SPT 1-1.45m 5,8,9 N=17		1						
								FILL: CLAY low plasticity, orange/brown, dry to moist, very stiff, with trace silt	D/M		VSt	
								Silty CLAY: low plasticity, grey, red/brown, dry to moist, very stiff to hard	D/M		VSt-H	RESIDUAL
			N=R	SPT 2-2.45m 23+refusal for 130mm N=R		2						
								CLAY: low plasticity, grey with abundant extemely weathered shale fragments, dry, hard	D		H	
						3		Becoming silty				
			N=>32	SPT 3.5-3.95m 10,24,28 N>32				Residual SHALE: extremely to very low strength, extremely weathered, light grey, trace siltstone layers			H	SHALE
						4		End of augering at 4m, refer to cored log				

Remarks:

V- bit refusal in Fill at 0.4m & in Silty Clay at 2.2m
No Groundwater encountered
No TC-bit refusal

URS Cored Borehole

BOREHOLE BH03

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone 02 8925 5500
Fax 02 8925 5555

Drilling Contractor: McDermott Drilling Pty Ltd

Project Reference: Kirrawee Brick Pit Geotech Investigation
Project No.: 43167393

Client: Sydney Water Corporation
Location: Kirrawee

Logged By: A. Hitchon
Checked By: SGR
Date Started: 11-10-06
Date Finished: 11-10-06

Bore Size: HQ mm
Total Depth: 15.40 m
Casing Size: HW mm
Borehole Inclination and Bearing: 90° at 0

Relative Level: 97.11 mRL
Coordinates: 6232553.40 mN
322128.60 mE
Permit No:

Drill Type: Diamond core
Drill Model: B40
Drill Fluid: Water with polymer 'quick mud'

METHOD	RUN	TESTING	WEATHERING	STRENGTH (EL VL L M H VH EH)	RQD (%) (25 50 75)	DEFECT SPACING (mm) (0-19 20-59 60-199 200-599 600)	DEPTH (m)	DEFECT DESCRIPTION	GRAPHIC LOG	DESCRIPTION OF STRATA	GEOLOGICAL DESCRIPTION
Augering	4						3				
										Terminate augering at @ 4.0m, start coring	
Coring	100% CR 6.3		DW				4	4.07- 4.12x BP 5° Pl, S, KL<1mm 4.14-4.43 2x BP 10° Pl-Ir, Sr, KL<1mm		SHALE: Extremely Low to Very Low strength, Extremely weathered to Distinctly weathered, dark grey, poorly developed bedding	SHALE
								4.80-4.94 2x BP 15° Pl-Ir, S-Sr, KL<1mm			
			XW				5				
			DW					JN 90-95° Pl, S, KL<1mm DI fracture BP 10-20° Pl, Sr, KL<1mm JN 50° Ir, Sr, KL<1mm & BP 20° Pl, Sr, KL<1mm 5.35 -5.72 3x BP 15° Pl, Sr, KL<1mm BP 15° Pl, Sr, Rf JN 50° Pl-Ir, Sr, KL<1mm 5.83-5.94 2x BP 15° Pl, S, KL<1mm JN 75° Ir, Sr, KL<1mm BP 20° Ir, Sr,KL<1mm			
							6			SHALE: Very Low- Low strength, Extremely weathered-Distinctly weathered, dark brown and grey/brown, thinly laminated, poorly to well developed bedding, fractured to highly fractured, with occasional Extremely Low strength, Extremely weathered bands	SHALE
			XW					6.22-6.25 2x BP 15° Pl-Ir, Sr, KL<1mm		CLAY: high plasticity, grey to dark grey with some rock fragments	CH
			DW					JN 55° Pl, S, KL<1mm 6.60-6.66 2x BP 20° Pl-Ir, Sr, KL<1mm JN 40° Pl, S, KL<1mm		SHALE: Very Low- Low strength, Extremely weathered-Distinctly weathered, grey, poorly developed fabric, fractured to highly fractured, with occasional Very Low strength, Extremely weathered bands	SHALE
							7	7.05-7.15 CZ 5° Ir, R, Rf, 100mm			
								7.37-7.90 2x BP 0° Pl, S-Sr, KL<1mm BP 10° Ir, Sr-R, Rf 7.50-7.60 2x BP 10° Pl-Ir, S-Sr, KL<1mm JN 75° Pl, Sr, KL<1mm			

Remarks: A proportion of the bedding plane defects described are drilling induced fractures along incipient bedding

URS Cored Borehole

BOREHOLE BH03

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone 02 8925 5500
Fax 02 8925 5555

Project No.: 43167393

Project Reference: Kirrawee Brick Pit Geotech Investigation

METHOD	RUN	TESTING	WEATHERING	STRENGTH	RQD (%)	DEFECT SPACING (mm)	DEPTH (m)	DEFECT DESCRIPTION	GRAPHIC LOG	DESCRIPTION OF STRATA	GEOLOGICAL DESCRIPTION
Coring	100% CR 9.37 100% CR 12.35	PL11.1m D=0.42 A=1.59 PL13.2m D=2.25 A=3.88	SW DW SW	EL VL L M H VH EH	25 50 75	0-19 20-49 60-199 200-599 >600	8 9 10 11 12 13	JN 50° Pl, S, KL<1mm BP 15° Pl, S,KL<1mm BP 20° Pl, S,KL<1mm JN 45-50° Ir, Sr, KL<1mm 8.38-8.53 2x BP 5-10° Pl, S, KL<1mm JN 30° Pl, S, Rf 110mm JN 60° Pl, Sr, Rf to previous JN JN 85-90° Pl, S, KL<1mm BP 10° Pl-Wa, S, KL<1mm JN 60° Pl, S, KL<1mm 9.05-9.63 5x BP 10° Pl-Ir, S-Sr, KL<1mm JN 30° St, Sr-R, KL<1mm 9.17-9.94 5x BP 5° Plr, S, KL<1mm 9.47-9.59 Dz, R Clay 120mm 9.75-9.85 Cz 5°, Ir, R, 100mm JN 50° Pl, Sr, Rf 10.04-10.12 5x BP 5° Pl, S-Sr, KL<1mm JN 30° Pl, S-Sr, KL<1mm JN 50° Pl, S-Sr, R Clay 20mm 10.24-10.36 6x BP 5° Pl-Ir, Sr, KL<1mm 10.36-10.39 Dz, R Clay 30mm 10.40-10.49 4x BP 5° Pl-Ir, S-Sr, KL<1mm 10.62-10.63 Dz, R Clay 10mm JN 55° Pl, S, Rf 30mm JN 50° Pl, S, KL<1mm 3x BP 0° Pl, S, KL<1mm 11.27-11.30 BP 5-10° Pl-Ir, S-Sr, KL<1mm BP 10° Pl, S-Sr, KL<1mm JN 30° Pl-Wa, S-Sr, KL<1mm BP 15° Pl, S, KL<1mm JN 25° Pl-Ir, Sr, KL<1mm JN 80° Ir-St , Sr, KL<1mm BP 10° Ir, Sr-R, KL<1mm 12.10-12.19 Cz 20°, Ir, R,90mm BP 15° Pl-Ir, Sr, KL<1mm 12.62-12.67 Dz, R Clay 50mm BP 15° Pl-Ir, Sr, drillers break JN 15° Pl, S, KL<1mm JN 10-15° Ir, Sr, KL<1mm BP 5° Ir, Sr-R, KL<1mm BP 25° Ir, R, KL<1mm BP 10° Plr, S, KL<1mm BP 5° Pl- Ir, Sr, KL<1mm		SHALE: Very Low- Low strength, Distinctly weathered-Slightly weathered, dark grey, brown, poorly developed fabric, fractured to highly fractured, with trace rock clay seams SHALE: Medium strength, Slightly weathered, dark grey, slightly fractured SHALE as above becoming Medium to High strength RL83.91 m SANDSTONE: High strength, Slightly weathered, light grey, yellow/brown, with shale interbeds, fine to medium grained, fractured to slightly fractured	SHALE SHALE SANDSTONE

SYDNEY_CORE J:\JOBS\43167393\5000TE~1\LOGS\KIRRAW~1.GPJ URS1.GDT 30/10/05

URS Cored Borehole

BOREHOLE BH03

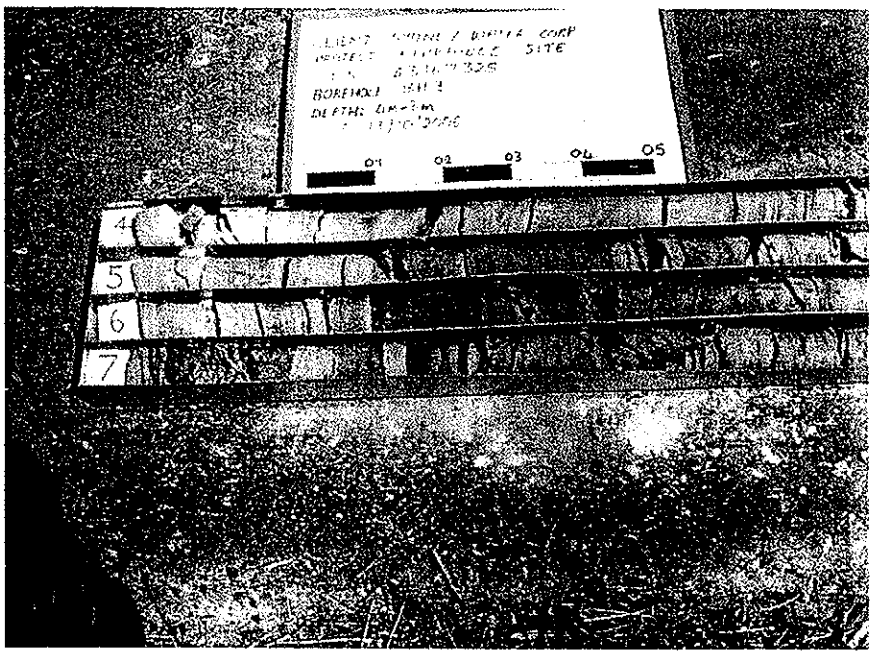
URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone 02 8925 5500
Fax 02 8925 5555

Project No.: 43167393

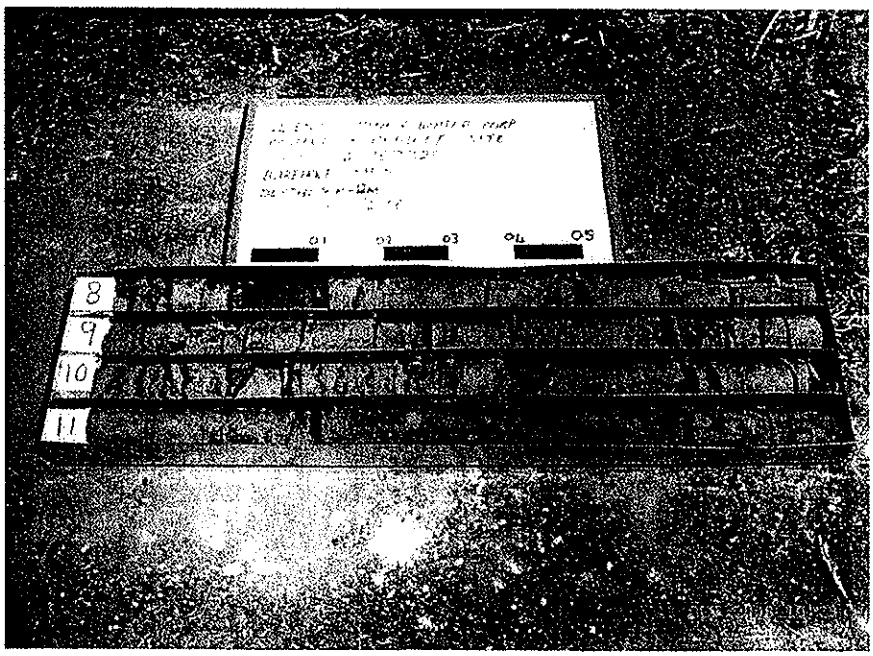
Project Reference: Kirrawee Brick Pit Geotech Investigation

METHOD / RUN	TESTING	WEATHERING	STRENGTH	RQD (%)	DEFECT SPACING (mm)	DEPTH (m)	DEFECT DESCRIPTION	GRAPHIC LOG	DESCRIPTION OF STRATA	GEOLOGICAL DESCRIPTION
Coring 100% CR 15.4	PL 14.32m D=2.51 A=1.22 PL 14.8m D=2.30 A=2.97	SW	EL VL L M H VH EH	25 50 75	0-19 20-59 60-199 200-599 600-	14 15 16 17 18 19	BP 5° Pl- Ir, Sr, KL<1mm DI fracture BP 5° Pl- Ir, Sr, KL<1mm 14.34-14.47 BP 10° Pl-Wa, S-Sr, KL<1mm BP 0° Pl, S,KL<1mm 15.00-15.08 3x DI fractures 5° Pl-Ir, Sr, KL<1mm		As above with shale interbeds, grey SANDSTONE: High strength, Slightly weathered, yellow/ brown, massive bedding, fine to medium grained, with trace bedding, slightly fractured End of borehole @ 15.4m	SANDSTONE

Appendix B
Boreholes Logs, Core Photos and Well Construction Details

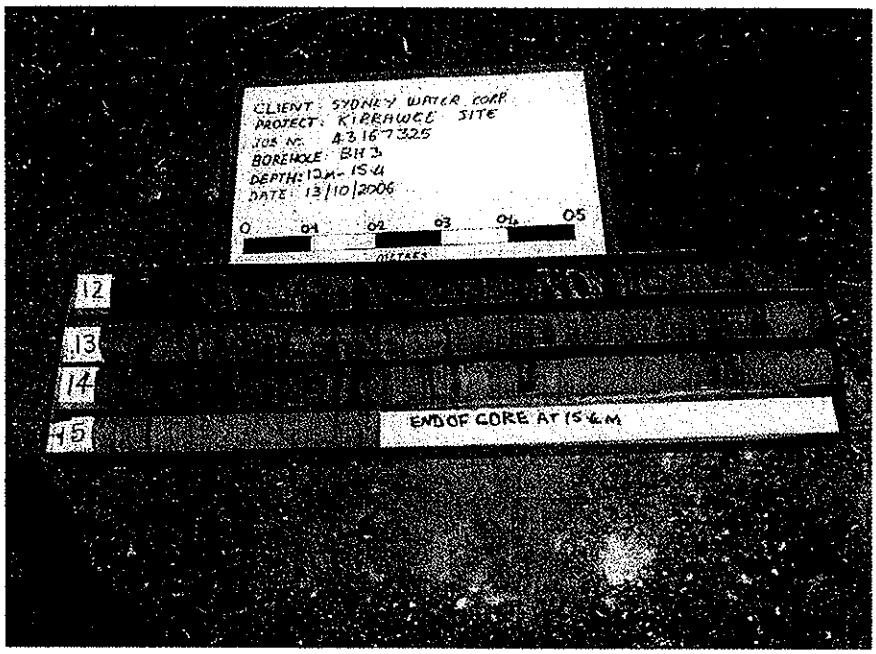


BH3: 4.0 – 8.0 m



BH3: 8.0 – 12.0 m

Appendix B
Boreholes Logs, Core Photos and Well Construction Details



BH3: 12.0 – 15.4 m

URS Non-cored Hole

BOREHOLE BH04

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone 02 8925 5500
Fax 02 8925 5555

Drilling Contractor: McDermott Drilling PTY LTD

Project Reference: Kirrawee Brick Pit Geotech Investigation
Project No.: 43167393

Client: Sydney Water Corporation
Location: Kirrawee

Logged By: J Donnelly
Checked By: SGR
Date Started: 10-10-06
Date Finished: 10-10-06

Bore Size: HW mm
Total Depth: 3.40 m
Casing Size: HW mm

Relative Level: 96.02 mRL
Coordinates: 6232628.30 mN
322191.70 mE
Permit No:

Drill Type: Solid flight Auger, Concrete corer, V-bit, TC bit
Drill Model: B40
Drill Fluid: None

SAMPLE TYPE	RUN (m)	FIELD SHEAR STRENGTH (kPa)	PENETROMETER BLOWS (N)	SAMPLING AND OTHER TESTING	GROUND WATER DATA AND COMMENTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION OF STRATA	MOISTURE CONDITION	USCS	CONSISTENCY/ DENSITY	GEOLOGICAL DESCRIPTION
						0		Concrete slab cover with topsoil				FILL
								FILL: Silty CLAY, low to medium plasticity, light brown with orange/brown flecks, dry to moist, with some black staining				
			N=10	SPT 1-1.45m 2,5,5 N=10		1			D/M		St	FILL
						2		FILL: Silty CLAY, with gravel, light brown, low to medium plasticity, dry to moist, gravel angular to sub-angular, some sandstone pieces and black staining FILL as above with trace gravel, brick fragments and black staining	D/M		H	FILL
								Silty CLAY: low to medium plasticity, grey and light brown, dry to moist, hard with shale fragments increasing with depth	D/M		H	RESIDUAL
			N=>50	SPT 3-3.4m 15,29,21 for 90mm N>50		3		SHALE: extremely low to very low strength, extremely weathered, brown/grey			H	SHALE
					SWL=4.56m 27/10/2006	4		End of augering at 3.4m, refer to cored log				

Remarks:
V bit Refusal at 1.7m in Fill
No TC-bit refusal

URS Cored Borehole

BOREHOLE BH04

URS Australia Pty Ltd
Level 3, 116 Miller St North Sydney NSW 2060
Phone 02 8925 5500
Fax 02 8925 5555

Drilling Contractor: McDermott Drilling Pty Ltd

Project Reference: Kirrawee Brick Pit Geotech Investigation
Project No.: 43167393

Client: Sydney Water Corporation
Location: Kirrawee

Logged By: J Donnelly
Checked By: SGR
Date Started: 10-10-06
Date Finished: 10-10-06

Bore Size: HQ mm
Total Depth: 15.00 m
Casing Size: HW mm
Borehole Inclination and Bearing: 90° at 0

Relative Level: 96.02 mRL
Coordinates: 6232528.30 mN
322191.70 mE
Permit No:

Drill Type: Diamond core
Drill Model: B40
Drill Fluid: Water with polymer 'quick mud'

METHOD	RUN	TESTING	WEATHERING	STRENGTH (EL VL L M H VH EH)	RQD (%) (25 50 75)	DEFECT SPACING (mm) (0-19 20-59 60-99 100-199 200-599 600)	DEPTH (m)	DEFECT DESCRIPTION	GRAPHIC LOG	DESCRIPTION OF STRATA	GEOLOGICAL DESCRIPTION
Augering	3.4						3			Terminate augering at @ 3.4m, start coring	
Coring			XW					BP 0° Pl, S-Sr, Clay 10mm BP 0° Pl, S-Sr, Clay 10mm BP 0-5° Pl-Wa, S, Rf & Clay 3mm BP 0-5° Pl-St, S, Rf & Clay 1mm		SHALE: Very Low- Low strength, Extremely weathered-Distinctly weathered, dark brown and grey/brown, thinly laminated, poorly to well developed, fractured to highly fractured, with occasional Extremely Low strength, Extremely weathered bands	SHALE
			DW				4	3.84-3.87 2x BP 0-10°, Pl-St, S, KL <1mm JN 40° Pl-St, Sr, Rf 2mm BP 0-5° Pl-St, S, KL <1mm 4.04-4.05 2x BP 0° Pl, S, KL <1mm 4.17-4.26 2x BP 15° Pl, S-Sr, KL with iron veneer <1mm			
			XW					BP 10° Pl, Sr-R, KL with iron veneer<1mm BP 0° Pl-St, Sr, KL<1mm JN 60-90° Ir, Sr, Rf to 30mm & iron veneer <1mm 4.41-4.54 3x BP 5° Pl, Sr, KL with iron veneer <1mm, open to partially open JN 60° Pl, S-Sr, KL with iron veneer <1mm 4.70-4.81 2x BP 0-10° Pl-St, S, KL<1mm JN 40-90° Ir, S-Sr, KL<1mm, partially tight JN 0-40° Wa, S, KL with iron veneer <1mm 5.00-5.05 2x BP 0° Pl-St, S-Sr, KL<1mm JN 45° Pl, S, KL <1mm, 5.11-5.20 2x BP 0-10° Pl, S, KL with iron veneer <1mm JN 70° Pl-Cu, Sr Rf & Clay with ironstaining 5mm BP 5° Pl, Sr, KL with iron veneer 1mm BP 0-30° Pl, Sr, Rf 5mm JN 0-40° Wa, S, KL with iron veneer <1mm 5.53-5.59 4x BP 0-10° Pl, S, KL with iron veneer <1mm 5.53-6.24 12x BP 0-15° Pl-Wa S, KL <1mm		As above with some ironstaining in bedding planes and joints	
			DW				5				

URS Cored Borehole

BOREHOLE BH04

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Phone 02 8925 5500
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Project No.: 43167393

Project Reference: Kirrawee Brick Pit Geotech Investigation

METHOD	RUN	TESTING	WEATHERING	DEPTH (m)	DEFECT DESCRIPTION	DESCRIPTION OF STRATA	GEOLOGICAL DESCRIPTION
	100% CR			6		SHALE as above	
	6.35		XW		6.24-6.28 Cz 0-90°, Ir, S-R, Rf 40mm BP 0° Pl-Wa, Sr-R, KL <1mm	SHALE: Extremely Low strength, Extremely weathered, grey and dark grey, thinly laminated, poorly developed, fragmented to fractured with ironstaining in bedding planes	SHALE
			RS				
					Core Loss 6.52-6.84m	Core loss 6.52-6.84m	
Coring			XW		6.84-7.05 Fz 0-90°, Ir,S-R, with Rf & Clay 210mm	SHALE as above	SHALE
				7	JN 30° Pl, S, Rf 5mm 7.14-7.31 BP 0° Pl, Sr-R, Rf & Clay 1-3mm BP 0° Pl, Sr-R, Rf & Clay 50mm		
					7.33-7.45 3x BP 0-3° Pl-Wa, S-Sr, KL <1mm BP 3° Pl-Wa, Sr-R, Rf & Clay 10mm BP 0° Pl, Sr, Rf & Clay 5mm BP 3° Pl-Wa, tight, KL <1mm 7.74-7.88 3xBP 0° Pl, Sr-R, Rf & Clay 3-10mm 7.93-7.97 Cz 0-90°, Ir, S-R, Rf 40mm	SHALE: Very Low- Low strength, Extremely weathered-Distinctly weathered, dark grey, thinly laminated, well developed bedding, fractured with some Extremely Low strength, Extremely W bands	
			DW	8	7.98-8.00 2x BP 10° Pl, S, KL<1mm 8.00-8.03 Fz 0-90°, Ir, S-R, Rf 30mm		
			SW		8.06-8.10 Cz 0-90°, Ir, R, Rf 40mm 8.16-8.23 3x BP 0° Pl, S, KL <1mm 8.23-9.6 8x BP 0-3° Pl, S-Sr, KL<1mm some with iron veneer 8.26 - 8.45 2x BP 15° Pl, S, KL<1mm 8.78-9.13 3x DI fractures 0° Pl-St, S, KL <1mm	SHALE: Medium strength, Slightly weathered, dark grey, thinly laminated, well developed bedding, fracturing along bedding planes, with occasional siltstone bands	
	81% CR			9			
	9.25				9.25-9.35 2x Drillers breaks Pl-Ir, Sr, KL <1mm 9.45-9.6 2x BP 0° Pl, S-Sr, KL <1mm JN 80° Pl, Sr, KL<1mm		

Strength scale: EL, VL, L, M, H, VH, EH. RQD (%): 25, 50, 75. Defect spacing (mm): 0-10, 20-40, 50-99, 100-199, 200-599, >600.

Remarks: A proportion of the bedding plane defects described are drilling induced fractures along incipient bedding

URS Cored Borehole

BOREHOLE BH04

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Project No.: 43167393

Project Reference: Kirrawee Brick Pit Geotech Investigation

METHOD	RUN	TESTING	WEATHERING	STRENGTH (EL VL L M H VH EH)	RQD (%) (25 50 75)	DEFECT SPACING (mm) (<20 20-60 60-200 200-600 >600)	DEPTH (m)	DEFECT DESCRIPTION	GRAPHIC LOG	DESCRIPTION OF STRATA	GEOLOGICAL DESCRIPTION
Coring	100% CR 12.25		DW SW DW				10 11 12 13	9.66-9.83 4x DI fractures Pl, S-Sr, KL<1mm BP 0° Pl, S, KL <1mm 9.89-10.02 3x DI fractures Pl, S-Sr, KL<1mm 10.19-10.57 4x DI fractures Pl, S, KL<1mm BP 0° Pl-Ir, S, Rf 4mm 10.7-10.89 3x DI fractures Pl, S, KL<1mm 10.79-10.84 Fz 0° Pl, Sr, Rf 50mm JN 60° Cu, Sr, KL<1mm 10.89-11.74 5x DI fractures 0° Pl-Ir, S, KL <1mm 11.23-11.74 3x DI fractures Pl-Ir, S, KL<1mm 12-12.47 4x BP 0° Pl, S-Sr, KL <1mm 12.25-12.75 6x DI fractures 0-7° Pl, S-Sr, KL <1mm JN 80° Cu, tight, KL<1mm 12.52-12.57 Fz 0-90° Pl-Ir, Sr-R, Rf 50mm 12.65-12.95 BP 0-3° Pl, Sr-R, KL <1mm BP 0-7° Pl-Ir, Sr, Rf 7mm BP 0° Pl, Sr-R, R Clay 10mm JN 90° Pl-Wa, R, KL<1mm JN 0° Pl, Sr-R, R Clay & Rf 30mm		SHALE as above: Medium strength, Slightly weathered, dark grey, thinly laminated, well developed bedding, fracturing along bedding planes, with occasional siltstone bands SILTSTONE: Medium to High strength, Distinctly weathered, light brown and grey, thinly laminated, poorly developed bedding, fractured to slightly fractured As above beginning to grade into Sandstone, becoming Medium to High Strength RL 83.27m SANDSTONE: Medium to High strength, Distinctly weathered-Slightly weathered, light grey/brown to light brown, faintly bedded, fine to medium grained, slightly fractured to fractured, with poorly developed siderite cross bedding and lamination & occasional laminite bands and trace carbonaceous wisps	SHALE SILTSTONE SANDSTONE

URS Cored Borehole

BOREHOLE BH04

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Project No.: 43167393

Project Reference: Kirrawee Brick Pit Geotech Investigation

METHOD	RUN	TESTING	WEATHERING	STRENGTH	RQD (%)	DEFECT SPACING (mm)	DEPTH (m)	DEFECT DESCRIPTION	GRAPHIC LOG	DESCRIPTION OF STRATA	GEOLOGICAL DESCRIPTION
Coring	100% CR	PL 14.33m D=2.30 A=1.82	SW	EL VL L M H VH EH	25 50 75	0.19 60 60-99 100-199 200-599 >600	14 15 16	13.26-13.3 2x BP 5° Pl, Sr, R & R Clay 2-3mm 14.15-14.78 4x BP 0-5° Pl-Wa, S-Sr, KL <1mm BP 0° Pl, S-Sr, Clay 4mm		SANDSTONE as above: Medium to High strength, Distinctly weathered-Slightly weathered, light grey/brown to light brown, fine to medium grained, slightly fractured to fractured, with poorly developed sideritic cross bedding and laminations & occasional laminite bands and trace carbonaceous wisps End of borehole @ 15m	SANDSTONE

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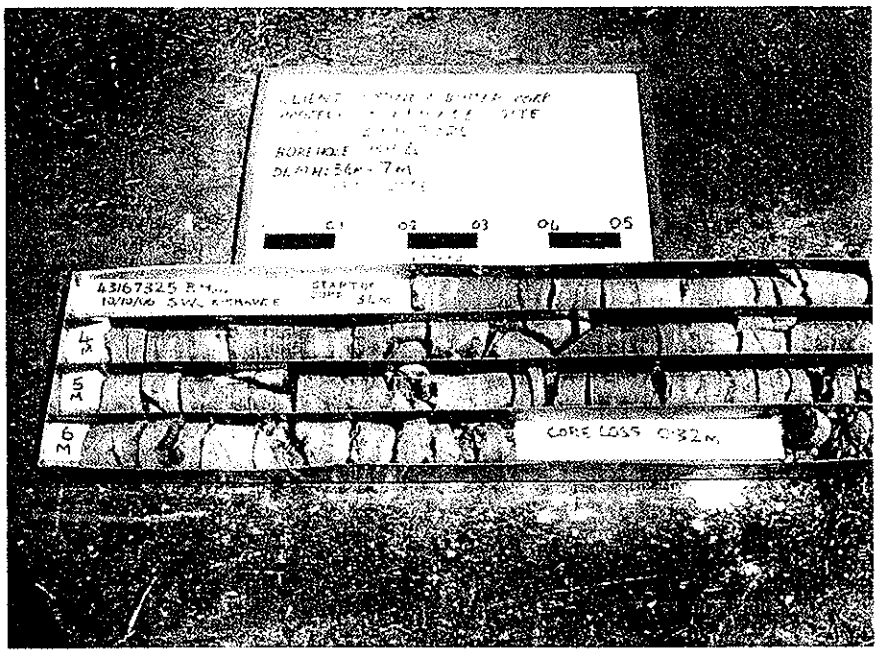
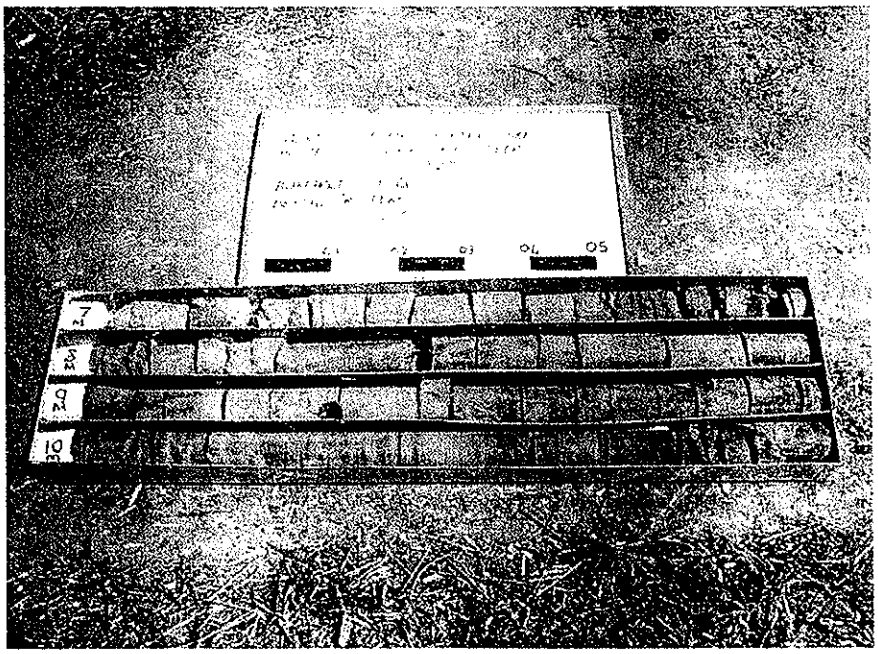
Appendix B
Boreholes Logs, Core Photos and Well Construction Details

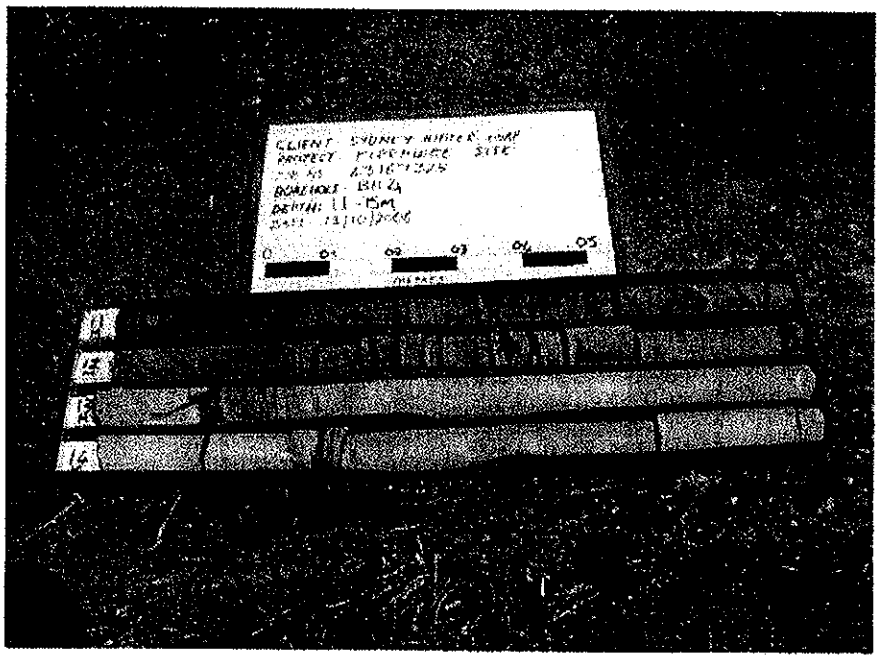


BH4: 3.4 – 7.0 m



BH4: 7.0 – 11.0 m

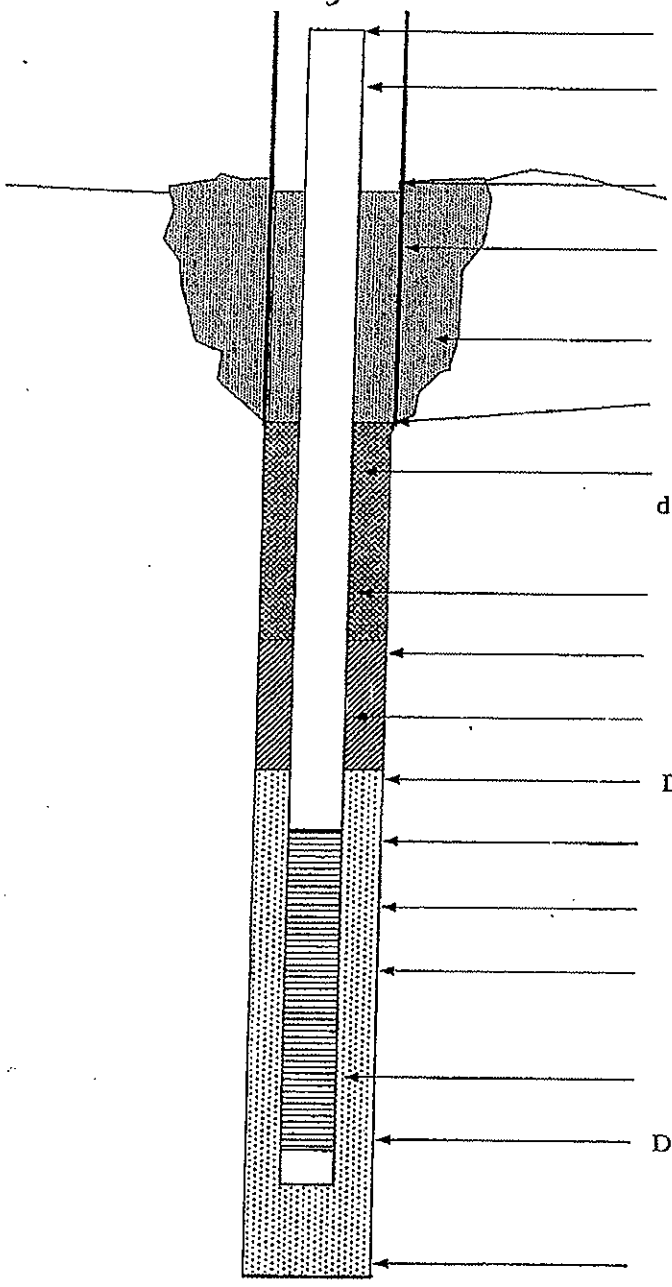
Appendix B
Boreholes Logs, Core Photos and Well Construction Details



BH4: 11.0 – 15.0 m

MONITORING BORE CONSTRUCTION RECORD

Project Name	KIRRAWEE BRICK PIT	Bore ID	BH1
Location	6232576.00N 322021.7mE	Project No	43167393
Installed By	Mc Dermott Drilling	Date Installed	9/10/06
Inspected By	J Donnelly	Method of Installation	



Elevation of top of riser	99.61
Height of riser above ground	Monument 0.7m
Ground Elevation	98.91m AHD
Internal diameter and type of surface casing	50
Type of surface seal	
Depth of surface seal	
Internal and external diameters, and type of riser pipe	
Type of backfill	Spoil + Grout Mix to Surface
Depth to top of seal	9m
Type of seal	Bentonite
Depth to top of filter pack	11.5m
Depth to top of screen	12.2m
Type of filter pack	2mm Sand
Diameter and type of screen	Slotted, 50mm.
Screen slot size	40 micron
Depth to bottom of screen	15.2m
Type of backfill	
Depth to bottom of hole	15.2m
Diameter drilled	HQ (125mm)

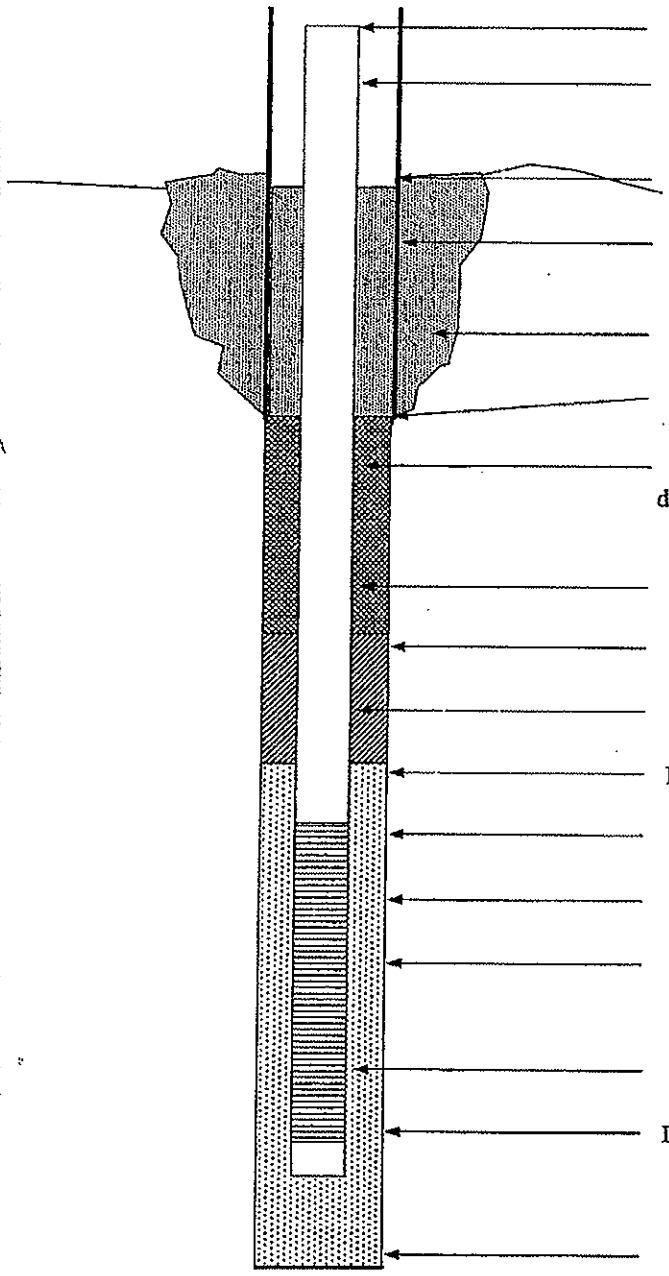
Comments: Cap at base + top

Prepared By: JD

Checked By: SR

MONITORING BORE CONSTRUCTION RECORD

Project Name	KIRRAWEE BRICK PIT	Bore ID	BH04
Location	6232528·30N, 322191·70E	Project No	43167393
Installed By	McDermott Drilling	Date Installed	11/10/06
Inspected By	A. Hitchman	Method of Installation	



Elevation of top of riser _____

Height of riser above ground Monument

Ground Elevation 96.02 m AHD

Internal diameter and type of surface casing 50mm

Type of surface seal _____

Depth of surface seal _____

Internal and external diameters, and type of riser pipe _____

Type of backfill Grout & spoil to surface

Depth to top of seal _____

Type of seal Bentonite

Depth to top of filter pack 11.5m

Depth to top of screen 12m

Type of filter pack Sand (2mm grade)

Diameter and type of screen 50mm, slotted

Screen slot size 40 micro

Depth to bottom of screen 15m

Type of backfill _____

Depth to bottom of hole 15m

Diameter drilled _____

Comments: cap at top & base

Prepared By: JD

Checked By: SR

Test Pit Excavation Logs

Project and location	Date
Kirrawee Brick Pit	**25/05/1999**
Site Number	Excavation Equipment
TP1	**Bobcat mounted excavator**
Test Depth: 1.5m	

Sample Depths	Depth Profile	Description
Surface (0.1)		Silty Clay: dark brown moist silty clay with some ironstone gravel
0.15		
		Clay: stiff orange brown clay with some silt and ironstone gravel
0.5		
0.7		
		Clay: very stiff grey mottled red brown clay
1		
1.5	1.5	
		Test Pit Discontinued @ 1.5 m depth
		Target depth reached
Comments		No free groundwater observed

Project and location	Date
Kirrawee Brick Pit	**25/05/1999**
Site Number	Excavation Equipment
TP2	**Bobcat mounted excavator**
Test Depth: 1.2m	

Sample Depths	Depth Profile	Description
Surface (0.1)		Gravelly Clay: orange brown gravelly clay with some ironstone gravel
0.2		
		Clay: stiff orange brown clay with some gravel
0.5		
0.8		
		Clay: very stiff to hard grey mottled red brown clay becoming very hard @ approximately 0.9m
1		
1.2	1.2	
		Test Pit Discontinued @ 1.2 m depth
		Target depth reached
Comments		No free groundwater observed

Test Pit Excavation Logs

Project and location **Kirrawee Brick Pit**	Date **25/05/1999**
Site Number **TP3**	Excavation Equipment **Bobcat mounted excavator**
Test Depth: 1.2m	

Sample Depths		Depth Profile	Description
Surface (0.1)			Gravelly Clay: orange brown gravelly clay with some ironstone gravel
	0.3		
0.5			Clay: very stiff to hard orange brown clay with some ironstone gravel
	0.6		
			Clay: very stiff to hard red brown mottled grey clay with some ironstone gravel becoming very hard @ approximately 0.9m
1			
			large ironstone cobbles @ approximately 1.10m
1.2	1.2		
			Test Pit Discontinued @ 1.2 m depth
			Target depth reached
Comments			No free groundwater observed

Project and location **Kirrawee Brick Pit**	Date **25/05/1999**
Site Number **TP4**	Excavation Equipment **Bobcat mounted excavator**
Test Depth: 1.2m	

Sample Depths		Depth Profile	Description
Surface (0.1)			Fill: dark brown silty sand with some crushed bricks
	0.3		
0.5			Fill+D23: coal ash and gravel
	0.6		
			Clay: very stiff to hard red brown mottled grey clay with some ironstone gravel
1			
1.2	1.2		
			Test Pit Discontinued @ 1.2 m depth
			Target Depth Reached
Comments			No free groundwater observed

0.6

Test Pit Excavation Logs

Project and location	Date
Kirrawee Brick Pit	**25/05/1999**
Site Number	Excavation Equipment
TP5	**Bobcat mounted excavator**
Test Depth: 2.0m	

Sample Depths		Depth Profile	Description
Surface (0.1)			Fill: dark brown silty gravelly sand
	0.3		
0.5			Fill: grey black ash, gravel and charcoal
	0.6		
			Fill: coarse sand and clay with some ash, gravel, crushed bricks and broken clay pipes
1			
2	2.0		
			Test Pit Discontinued @ 2.0m depth Refusal in brick rubble
Comments			No free groundwater observed

Project and location	Date
Kirrawee Brick Pit	**25/05/1999**
Site Number	Excavation Equipment
TP6	**Bobcat mounted excavator**
Test Depth: 1.5 m	

ple Depths		Depth Profile	Description
rface (0.1)			Fill: dark brown silty gravelly sand
	0.2		
0.5			Fill: light brown silty gravelly sand with some ash, gravel, crushed concrete and broken bricks
	0.6		
			Clay: stiff to very stiff yellow brown clay
1*			
			becoming grey mottled red brown clay @ approximately 1.10m
	1.4		
1.5	1.5		Siltstone: extremely low to very low strength grey siltstone
			Test Pit Discontinued @ 1.5 m depth Target depth reached
Comments			No free groundwater observed *Denotes duplicate sample Z1 collected

— 1.4 Siltstone

Test Pit Excavation Logs

Project and location	Date
Kirrawee Brick Pit	**25/05/1999**
Site Number	Excavation Equipment
TP7	**Bobcat mounted excavator**
Test Depth: 1.4m	

Sample Depths		Depth Profile	Description
Surface (0.1)	0.15		Fill: dark brown silty gravelly sand
0.5	0.45		Fill: dark brown silty clay with some gravel, crushed bricks and charcoal
1			Clay: very stiff yellow grey clay
			becoming grey mottled red brown clay @ approximately 1.0m
1.4	1.4		
			Test Pit Discontinued @ 1.4 m depth Target depth reached
Comments			No free groundwater observed

Project and location	Date
Kirrawee Brick Pit	**25/05/1999**
Site Number	Excavation Equipment
TP8	**Bobcat mounted excavator**
Test Depth: 1.5m	

Sample Depths		Depth Profile	Description
Surface (0.1)	0.2		Fill: dark brown gravelly sand with some clay
0.5	0.6		Fill: dark brown silty sand with some ash and gravel
	0.7		Fill: stiff orange brown clay
1	1.0		Clay: firm orange brown clay with some gravel
1.4	1.4		Clay: very stiff to hard grey mottled red brown clay
	1.45		Siltstone: extremely low to very low strength grey siltstone.
			Test Pit Discontinued @ 1.45 m depth Target depth reached
Comments			No free groundwater observed

— 1.4m Siltstone

Test Pit Excavation Logs

Project and location		Date
Kirrawee Brick Pit		**25/05/1999**
Site Number		Excavation Equipment
TP9		**Bobcat mounted excavator**
Test Depth: 1.6m		
Sample Depths	**Depth Profile**	**Description**
Surface (0.1)		Fill: dark brown sandy silt with some gravel and charcoal fragments
0.5		
0.6		
1		Clay: very stiff orange brown clay
1.2		
		Clay: very stiff to hard grey mottled orange brown clay with some ironstone gravel.
1.6	1.6	
		Test Pit Discontinued @ 1.6 m depth Target depth reached
Comments		No free groundwater observed

Project and location		Date
Kirrawee Brick Pit		**25/05/1999**
Site Number		Excavation Equipment
TP10		**Bobcat mounted excavator**
Test Depth: 1.2m		
Sample Depths	**Depth Profile**	**Description**
ce (0.1)		Clay: stiff to very stiff orange brown clay with some ironstone gravel
0.3		
0.5		Clay: very stiff grey mottled red brown clay with some ironstone gravel
1		
1.2		
		Test Pit Discontinued @ 1.2 m depth Target depth reached
Comments		No free groundwater observed

Test Pit Excavation Logs

Project and location	Date
Kirrawee Brick Pit	**25/05/1999**
Site Number	Excavation Equipment
TP11	**Bobcat mounted excavator**
Test Depth: 1.4m	

Sample Depths		Depth Profile	Description
Surface (0.1)			Fill: grey brown silty sand with some gravel bricks noted at approx 0.2m
	0.25		
0.5			Clay: very stiff grey mottled orange brown clay with some ironstone and shale gravel
1			
	1.3		
1.4	1.4		Shale: extremely low to very low strength grey shale with some ironstone
			Test Pit Discontinued @ 1.4 m depth Target depth reached
Comments			No free groundwater observed

1.3m shale

Project and location	Date
Kirrawee Brick Pit	**25/05/1999**
Site Number	Excavation Equipment
TP12	**Bobcat mounted excavator**
Test Depth: 0.75m	

Sample Depths		Depth Profile	Description
Surface (0.1)			Fill: grey brown sandy gravel
	0.16		
			Clay: very stiff grey mottled red brown clay with some shale gravel
0.5	0.6		
			Siltstone: extremely low to very low strength highly weathered grey shale
	0.75		
			Test Pit Discontinued @ 0.75 m depth Refusal in bedrock
Comments			No free groundwater observed

0.6m Siltstone

Test Pit Excavation Logs

Project and location **Kirrawee Brick Pit**	Date **25/06/1999**
Site Number **TP13**	Excavation Equipment **Bobcat mounted excavator**
Test Depth: 2.0m	

Sample Depths	Depth Profile	Description
Surface (0.1)		Fill+DS4: dark brown silty sand with some broken pipes, bricks and gravel
0.5		
1.5		
2		
		Test Pit Discontinued @ 2.0 m depth Target depth reached
Comments		Groundwater observed at approximately 1.4m associated with adjacent brick pit water level

Project and location **Kirrawee Brick Pit**	Date **25/06/1999**
Site Number **TP14**	Excavation Equipment **Bobcat mounted excavator**
Test Depth: 1.7 m	

mple Depths	Depth Profile	Description
face (0.1)		Fill: grey brown clay with some broken pipes, bricks, metal fragments and plastic
0.5		
1.2		Fill: red brown coarse sand and gravel with broken bricks
1.7	1.7	
		Test Pit Discontinued @ 1.7 m depth Refusal in rubble
Comments		No free groundwater observed

Test Pit Excavation Logs

Project and location **Kirrawee Brick Pit**	Date **25/05/1999**
Site Number **TP15**	Excavation Equipment **Bobcat mounted excavator**
Test Depth: 2.0 m	

Sample Depths	Depth Profile	Description
Surface (0.1)		Fill: grey brown clay with some coarse sand, gravel, bricks and broken pipes
0.5		
0.8		
1		Fill: coarse grey brown silty sand with some gravel and clay pipes
2	2	
		Test Pit Discontinued @ 2.0 m depth Target depth reached
Comments		No free groundwater observed

Project and location **Kirrawee Brick Pit**	Date **25/05/1999**
Site Number **TP16**	Excavation Equipment **Bobcat mounted excavator**
Test Depth: 1.4 m	

Sample Depths	Depth Profile	Description
Surface (0.1)		Fill: coarse red brown sand with some gravel and broken bricks
0.20		
		Fill: grey brown silty clay and coarse sand with some gravel and broken bricks
0.5		
0.8		
1		Fill: coarse grey brown silty sand with some gravel and broken bricks
1.4		
		Test Pit Discontinued @ 1.4 m depth Refusal in brick rubble
Comments		No free groundwater observed

Test Pit Excavation Logs

Project and location			Date
Kirrawee Brick Pit			**25/05/1999**
Site Number			Excavation Equipment
TP17			**Bobcat mounted excavator**
Test Depth: 0.75 m			
Sample Depths		**Depth Profile**	**Description**
Surface (0.1)	0.20		Fill: dark grey brown silty sand with some gravel
0.5			Clay: stiff to very stiff grey mottled orange brown clay
0.7	0.7		
	0.75		Siltstone: extremely low to very low strength highly weathered siltstone
			Test Pit Discontinued @ 0.75 m depth Refusal in low strength siltstone
Comments			No free groundwater observed

— 0.7 Substone

Project and location			Date
Kirrawee Brick Pit			**25/05/1999**
Site Number			Excavation Equipment
TP18			**Bobcat mounted excavator**
Test Depth: 1.6 m			
Sample Depths		**Depth Profile**	**Description**
Surface (0.1)	0.1		Silty clay: very soft to soft grey brown silty clay with some gravel
	0.4		Clay: stiff to very stiff orange brown clay
0.5			Clay: very stiff to hard grey mottled orange brown clay
			some red brown mottling @ 1.2m
	1.4		
	1.6		Siltstone: extremely low to very low strength highly weathered siltstone
			Test Pit Discontinued @ 1.6 m depth Refusal in low strength siltstone
Comments			No free groundwater observed

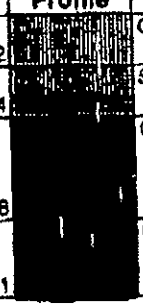
1.4m Substone

Test Pit Excavation Logs

Project and location	Date
Kirrawee Brick Pit	**26/06/1999**
Site Number	Excavation Equipment
TP19	**Bobcat mounted excavator**
Test Depth: 1.7 m	

Sample Depths	Depth Profile	Description
Surface (0.1)		Fill: dark brown coarse silty sand with crushed bricks, gravel and clay pipes
0.5		
1.5		
1.7		Test Pit Discontinued @ 1.7 m depth Refusal in brick rubble
Comments		No free groundwater observed

Project and location	Date
Kirrawee Brick Pit	**26/05/1999**
Site Number	Excavation Equipment
TP20	**Bobcat mounted excavator**
Test Depth: 1.1 m	

Sample Depths	Depth Profile	Description
ce (0.1)*		Clayey Silt: dark brown clayey silt
0.2		Silty clay: very stiff yellow brown silty clay with some gravel
0.4		Clay: very stiff to hard red brown clay with some ironstone gravel
0.5		
0.8		Clay: hard grey mottled red brown clay with some ironstone gravel
1.1	1.1	Test Pit Discontinued @ 1.1 m depth Target depth reached
Comments		No free groundwater observed *Denotes duplicate sample Z2 collected

Test Pit Excavation Logs

Project and location	Date
Kirrawee Brick Pit	26/08/1999
Site Number	Excavation Equipment
TP21	Bobcat mounted excavator
Test Depth: 2.1 m	

Sample Depths	Depth Profile	Description
Surface (0.1)		Fill: grey brown mottled orange clay with some sand and ironstone gravel
0.6		
1		
1.2		Fill: dark brown silty clay with some sand, gravel and broken bricks
1.8		Fill: dark brown silty clay with grey/black shale gravel/cobbles
2		
2.1		
		Test Pit Discontinued @ 2.1 m depth Target depth reached
Comments		No free groundwater observed

Project and location	Date
Kirrawee Brick Pit	26/08/1999
Site Number	Excavation Equipment
TP22	Bobcat mounted excavator
Test Depth: 2.6 m	

Sample Depths	Depth Profile	Description
Surface (0.1)		Fill: dark brown silty clay with gravel particles, and some shale cobbles
0.3		Fill: orange brown clay with gravel particles, some sand and shale gravel
0.6		
1.1		
1.2		Fill: dark brown silty clay with some sand, gravel and charcoal fragments
1.8		Fill: dark brown silty clay with grey/black shale gravel/cobbles
2.6		
		Test Pit Discontinued @ 2.6 m depth Target depth reached
Comments		No free groundwater observed

Test Pit Excavation Logs

Project and location **Kirrawee Brick Pit**		Date **26/06/1999**
Site Number **TP23**		Excavation Equipment **Bobcat mounted excavator**
Test Depth: 1.2 m		
Sample Depths	**Depth Profile**	**Description**
Surface (0.1) 0.2		Silty Clay: dark brown silty clay with some organic matter and sand
0.5* 0.6		Silty Clay: Stiff orange brown silty clay with some ironstone fgravel
1 1.2		Clay: very stiff to hard red brown mottled grey clay with some ironstone and siltstone gravel
		Test Pit Discontinued @ 1.2 m depth Target depth reached
Comments		No free groundwater observed *Denotes duplicate sample Z3 collected

Project and location **Kirrawee Brick Pit**		Date **26/06/1999**
Site Number **TP24**		Excavation Equipment **Bobcat mounted excavator**
Test Depth: 1.6 m		
Sample Depths	**Depth Profile**	**Description**
Surface (0.1) 0.15		Fill: dark brown clayey coarse sand
0.5 0.6		Fill: grey brown silty sand with some gravel and broken bricks
1 1.6		Clay: very stiff grey clay mottled red/brown with ironstone gravel
		Test Pit Discontinued @ 1.6 m depth Target depth reached
Comments		No free groundwater observed

Test Pit Excavation Logs

Project and location **Kirrawee Brick Pit**		Date **26/05/1999**
Site Number **TP26**		Excavation Equipment **Bobcat mounted excavator**
Test Depth: 1.5 m		
Sample Depths	**Depth Profile**	**Description**
Surface (0.1) 0.1		Fill: dark brown silty sand and coal gravel
0.5		Clay: very stiff to hard grey mottled red brown clay with ironstone gravel
1		becoming increasingly grey with less ironstone @ 1m
1.5		
		Test Pit Discontinued @ 1.5 m depth Target depth reached
Comments		No free groundwater observed

Project and location **Kirrawee Brick Pit**		Date **26/05/1999**
Site Number **TP26**		Excavation Equipment **Bobcat mounted excavator**
Test Depth: 1.2 m		
Sample Depths	**Depth Profile**	**Description**
Surface (0.1) 0.2		Fill: dark brown silty sand with roots, cobbles and brick
0.5* 0.6		Clay: stiff orange brown clay with ironstone gravel
1		Clay: Stiff grey mottled red brown clay with ironstone gravel
1.2		
		Test Pit Discontinued @ 1.2 m depth Target depth reached
Comments		No free groundwater observed *Denotes duplicate sample Z4 collected

Test Pit Excavation Logs

Project and location **Kirrawee Brick Pit**		Date **26/05/1999**
Site Number **TP27**		Excavation Equipment **Bobcat mounted excavator**
Test Depth: 1.7 m		
Sample Depths	**Depth Profile**	**Description**
Surface (0.1)		Fill: dark brown silty sand with bricks, roots, cobbles, metal, pipe and crushed concrete
0.6 0.6		Clay: stiff to very stiff orange brown clay
1.3 1.3		Clay: hard grey mottled red brown clay with ironstone gravel
1.7		
		Test Pit Discontinued @ 1.7 m depth Target depth reached
Comments		No free groundwater observed

Project and location **Kirrawee Brick Pit**		Date **26/05/1999**
Site Number **TP26**		Excavation Equipment **Bobcat mounted excavator**
Test Depth: 1.0 m		
Sample Depths	**Depth Profile**	**Description**
Surface (0.1) 0.1		Fill: brown silty sand with crushed bricks and roots
0.5		Fill: coarse red brown sand with crushed red bricks
1		
		Test Pit Discontinued @ 1.0 m depth Refusal in brick layer
Comments		No free groundwater observed Site observations found ground levels to east are reduced by approximately 1.6m

Test Pit Excavation Logs

Project and location **Kirrawee Brick Pit**			Date **26/05/1999**
Site Number **TP29**			Excavation Equipment **Bobcat mounted excavator**
Test Depth: 1.8 m			
Sample Depths		**Depth Profile**	**Description**
Surface (0.1)			Fill: grey brown silty clay with bricks, bitumen, timber, crushed concrete and sand
0.6	0.5		
	0.8		Clay: very stiff to hard yellow brown clay
1			Clay: hard grey mottled red brown clay
1.7	1.8		
			Test Pit Discontinued @ 1.8 m depth Target depth reached
Comments			No free groundwater observed

Project and location **Kirrawee Brick Pit**			Date **26/05/1999**
Site Number **TP30**			Excavation Equipment **Bobcat mounted excavator**
Test Depth: 1.7 m			
Sample Depths		**Depth Profile**	**Description**
Surface (0.1)	0.1		Fill: soft dark brown sandy clay with roots
0.5			Fill: Hard grey clay mottled red/brown with broken terracotta pipe and some mudstone rubble
1			
1.7	1.7		
			Test Pit Discontinued @ 1.7 m depth Target depth reached
Comments			No free groundwater observed

Test Bore Excavation Logs

Project and location Kirrawee Brick Pit	Date 28.5.99
Site Number GW1	Excavation Equipment Truck Mounted Drill Rig 110mm SFA
Borehole Depth: 15 m	Well Type Standard Piezometer

Well Details		Soil Description			
Description	Depth	Sample	Depth	Profile	Description
Casing	0	GW1/0.0 GW1/0.5 GW1/1.0 GW1/2.0	0.1 0.6 1.4		Clayey Loam: dark brown moderately pedal clayey loam with some roots present. Clay: orange brown plastic clay with some ironstone gravel and charcoal fragments Clay: mottled red/ white/ yellow very stiff to hard clay with some ironstone gravel Siltstone: extremely low to very low strength, highly weathered grey siltstone with shale lenses becoming less weathered @ 3m hard layer of siltstone @ 3-4m some interbedding of silt and clay noted @ approximately 4m
Screened	16		12.0 16.0		Sandstone: extremely weathered, very low to low strength orange brown sandstone
					Test Bore discontinued at 16m depth Standing Water Level = 6.42 m depth

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Test Bore Excavation Logs

Project and location Kirrawee Brick Pit	Date 26.6.99
Site Number GW2	Excavation Equipment Truck Mounted Drill Rig 110mm SFA
Borehole Depth: 15 m	Well Type Standard Piezometer

Well Details		Soil Description			
Description	Depth	Sample	Depth	Profile	Description
Casing	9	GW2/0.0 GW2/0.5 GW2/1.0 GW2/2.0	0.2 1.1 2.2		Fill: dark brown sandy loam with minor gravel fragments, some root matter and ashy material Fill: light brown clay and sand filling with crushed bricks and rubbke fragments Clay: firm to stiff light grey/ red brown clay with some ironstone gravel
Screened	15		12.0 15.0		Siltstone: extremely weathered, low to very strength grey siltstone interbedded with some grey clay layers Sandstone: extremely weathered, very low to low strength orange brown sandstone
					Test Bore discontinued at 15m depth Standing Water Level = 4.42 m depth

Test Bore Excavation Logs

Project and location Kinyswae Brick Pit	Date 26.6.99
Site Number GW3	Excavation Equipment Truck Mounted Drill Rig 110mm SFA
Borehole Depth: 9 m	Well Type Standard Piezometer

Well Details		Soil Description			
Description	Depth	Sample	Depth	Profile	Description
Casing	3	GW3/0.0* GW3/0.5 GW3/1.0 GW3/2.0	0.1		Fill: dark brown/ black coarse sand with minor roots and organic matter
			2.2		Clay:stiff to very stiff grey mottled orange brown clay, slightly moist
			4.5		Siltstone: extremely weathered, low to very strength grey siltstone interbedded with some grey clay layers
	9				Shale: extremely weathered black shale with some minor clay content

Test Bore discontinued at 9m depth.
*Denotes duplicate sample ZA collected
Standing Water Level = 3.05 m depth
Groundwater encountered at 7.0 m depth during drilling

Test Bore Excavation Logs

Project and location **Kirrawee Brick Pit**		Date **25/05/1999**
Site Number **HA1**		Excavation Equipment **Hand auger**
Test Depth: 0.55m		
Sample Depths	**Depth Profile**	**Description**
Surface (0.1) 0.05		Sandy Loam: dark brown slightly moist sandy loam with roots present
0.5 0.55		Sandy Clay: yellow, moderately pedal, slightly moist, dense sandy loam with minor gravel fragments
		Test Pit Discontinued @ 0.55 m depth Refusal in sandy clay
Comments		No free groundwater observed

Project and location **Kirrawee Brick Pit**		Date **25/05/1999**
Site Number **HA2**		Excavation Equipment **Hand auger**
Test Depth: 0.7m		
Sample Depths	**Depth Profile**	**Description**
Surface (0.1) 0.05		Gravelly Sand: dark brown, loose gravelly sand with roots present
0.5 0.5		Gravelly Clay: orange to red gravelly clay with abundant ironstone gravel
0.7 0.70		Clay: red very stiff plastic clay with minor gravel
		Test Pit Discontinued @ 0.7 m depth Refusal in clay
Comments		No free groundwater observed

Test Bore Excavation Logs

Project and location Kirrawee Brick Pit		Date 26/05/1999
Site Number HA3		Excavation Equipment Hand auger
Test Depth: 0.5m		
Sample Depths	**Depth Profile**	**Description**
Surface (0.1) 0.05		Clayey Gravelly Loam: light brown, loose clayey gravelly loam with abundant gravel
0.5 0.5		Gravelly Clay: orange to red stiff gravelly clay, ironstone gravel
		Test Pit Discontinued @ 0.5 m depth Refusal in gravelly clay
Comments		No free groundwater observed

APPENDIX B

APPENDIX B – LIST OF ARCHITECTURAL DRAWINGS

- Cover Sheet – View from Oak Road, Drawing Number 0001, dated 15 October 2010.
- View from Princes Highway, Drawing Number 0002, dated 15 October 2010.
- Site Photos, Drawing Number 015, dated 15 October 2010.
- Site Photos, Drawing Number 016, dated 15 October 2010
- Context Plan, Drawing Number 0020, dated 15 October 2010.
- Site Context and Analysis, Drawing Number 0021, dated 15 October 2010.
- Existing Site Conditions, Drawing Number 0030, dated 15 October 2010.
- Typical Top Level Residential Floor Plan, Drawing Number 0100, dated 15 October 2010.
- Typical Residential Floor Plan, Drawing Number 0110, dated 15 October 2010.
- Upper Ground Floor Plan, Drawing Number 0120, dated 15 October 2010.
- Lower Ground Floor Plan, Drawing Number 0130, dated 15 October 2010.
- Basement 1 Plan, Drawing Number 0140, dated 15 October 2010.
- Basement 2 Plan, Drawing Number 0150, dated 15 October 2010.
- Basement 3 Plan, Drawing Number 0160, dated 15 October 2010.
- Floor Plans Building A to C, Drawing Number 0180, dated 15 October 2010.
- Floor Plans Building D, E, F, G, and H, Drawing Number 0181, dated 15 October 2010.
- Sections East West, Drawing Number 0300, dated 15 October 2010.
- Sections North South, Drawing Number 0301, dated 15 October 2010.
- Site Sections, Drawing Number 0302, dated 15 October 2010.
- Sun Study – Winter, Drawing Number 0400, dated 15 October 2010.
- Sun Study – Summer, Drawing Number 0401, dated 15 October 2010.
- Sun Study – Public Areas, Drawing Number 0402, dated 15 October 2010.
- Elevations North and East, Drawing Number 0500, dated 29 September 2010.
- Elevations South and West, Drawing Number 0501, dated 29 September 2010.
- Elevations Coloured, Drawing Number 0502, dated 15 October 2010.
- Elevations Coloured, Drawing Number 0503, dated 15 October 2010
- Staging - Lower Ground Level Stage 1, Drawing Number 0600, dated 15 October 2010.
- Staging – Upper Ground Stage 1, Drawing Number 0602, dated 15 October 2010.
- Staging – Upper Ground Stage 2, Drawing Number 0603, dated 15 October 2010.
- Staging – Upper Ground Stage 3, Drawing Number 0604, dated 15 October 2010.