

**GEOTECHNICAL INVESTIGATION,
NETBALL CENTRAL, SYDNEY OLYMPIC
PARK, NSW**

Netball NSW, C/- Crown Project Services Pty Ltd

GEOTLCOV24420AA-AC
20 January 2012

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Netball NSW
C/- Crown Project Services Pty Ltd
Level 15, 3 Spring Street,
Sydney, NSW 2000

Attention: Phoebe George

Dear Phoebe,

RE: Geotechnical Investigation, Netball Central, Sydney Olympic Park, NSW

Coffey Geotechnics Pty Ltd is pleased to present the results of our geotechnical investigation for the proposed Netball Central development at Sydney Olympic Park, NSW.

If you have any questions related to the report, or we can be of further assistance, please contact the undersigned on (02) 9911 1000.

For and on behalf of Coffey Geotechnics Pty Ltd



Peter Waddell

Principal Engineer

Distribution: Original held by Coffey Geotechnics Pty Ltd
Electronic copy to Crown Project Services Pty Ltd

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1 INTRODUCTION

This report presents the results of a geotechnical investigation carried out by Coffey Geotechnics Pty Ltd (Coffey) for the proposed construction of a new Netball Central Complex commissioned by Netball NSW. The investigation was carried out in general accordance with our fee proposal Ref: GEOTLCOV24420AA-AA, dated 14 October 2011, and subsequent revision Ref: GEOTLCOV24420AA-AB, dated 2 November 2011 with the exception of deflectometer testing later requested as an additional item.

Based on documentation received by Coffey, we understand that the proposed development will comprise construction of a four storey complex to house the following;

- A roofed structure containing a show court and five standard courts;
- A multi storey building with four storeys above show court level;
- A single level of basement carpark/loading dock which is expected to be at existing ground level on the southern boundary of the site.

The objectives of the geotechnical investigation were to assess subsurface conditions and provide comments and recommendations on:

- Geotechnical model of ground conditions;
- Soil reactivity and site classification in accordance with AS2870;
- Potential for soils aggressive to buried steel and concrete;
- Excavation conditions;
- Retention support options and retention design parameters;
- Suitable footing types, and foundation design parameters;
- Pavement design CBR;
- Earthquake site sub-soil class in accordance with AS1170.4-2007;
- The suitability of the site soils for use as compacted fill, and on fill construction procedures;
- Backfill and subfloor drainage requirements.

Additionally, a phase 1 contamination assessment was carried out concurrently with this investigation and is reported separately by Coffey Environments.

2 METHOD OF INVESTIGATION

2.1 Fieldwork

The fieldwork for the geotechnical and environmental investigation was conducted on 1 and 2 December 2011, and comprised the drilling of eight boreholes (BH1 to BH8) and excavation of eight test pits (TP1 to TP8). The borehole and test pit locations were measured from site features, and levels extrapolated from the survey drawings supplied by Crown Project Services.

The investigation locations are shown on the Investigation Location Plan attached as Figure 1.

All fieldwork was carried out under the full time observation of a Coffey Engineering Geologist, present throughout the drilling and test pitting operations to undertake geotechnical sampling and testing, record test results, and log the encountered ground conditions. Environmental sampling was also undertaken by the Coffey engineering geologist and a senior Coffey Environmental Scientist.

Boreholes were drilled using a Mobile Drill B80 truck mounted drilling rig and test pits excavated using a JCB 7.5 tonne backhoe. Each borehole was advanced using solid flight augers and a Tungsten Carbide (TC) drill bit to depths between 0.5m and 7.8m. A 600mm blade bucket was used to excavate test pits to depths between 3m and 3.6m. Standard Penetration Tests (SPT) were carried out in the boreholes at selected depth intervals to assess soil strength and obtain samples for logging purposes. Dynamic Cone Penetrometer (DCP) testing was undertaken at each test pit location to a depth of 3m or prior refusal.

Additionally, Falling Weight Deflectometer (FWD) testing was undertaken progressively at depths of 0.5m, 1m and 1.5m in the base of each test pit using a Zorn ZFG 2000 Light-Weight Deflectometer test unit with a 10kg drop load. FWD testing was not undertaken in TP6 where the test pit was terminated due to a suspected service being encountered.

Groundwater inflows and soil moisture observed during drilling and excavation in soil were recorded.

The borehole and test pit logs are attached as Appendix A together with our standard notes explaining logging terms and symbols.

On completion, boreholes were backfilled with cuttings and finished flush with the surrounding surface levels with a concrete plug. Test pits were backfilled with cuttings and tamped at the surface as much as practicable using the backhoe bucket. Test pits were later levelled and re-turfed at the request of Sydney Olympic Park Authority.

2.2 Laboratory Testing

Selected soil samples were submitted to our NATA accredited laboratory for the following tests;

- Four California Bearing Ratio (CBR) with Standard Compaction;
- Four Atterberg Limit Including Linear Shrinkage;
- Four Particle Size Distribution (PSD);
- Fifteen Moisture Content; and
- Four Soil Aggressivity Tests (pH, Sulphate and Chloride).

The laboratory test reports are attached as Appendix C.

3 RESULTS OF INVESTIGATION

3.1 Site Description

The site, identified as Lot 201 DP 1041756 is located on a roughly triangular parcel of land adjacent to the existing Sports Centre; near the corner of Shirley Strickland Avenue and Olympic Boulevard within Sydney Olympic Park, NSW.

The site has an area of roughly 9,000m² and comprises a mixture of an open grassed area to the north and hardstand car park to the south. A creek was observed beyond the car park along the southern boundary of the site orientated roughly east/west.

Ground elevations across the site vary significantly from approximately RL 12m AHD near the northern extent of the site to the crest of a south facing grassed slope from where the ground elevation reduces to approximately RL 7m AHD. The ground elevation at the southern boundary of the site, within the carpark is about RL 5m AHD.

3.2 Local Geology and Previous Information

The Sydney 1:100,000 Soil Landscape Map produced by the Soil Conservation Service of NSW indicates that the locality is underlain by the Blacktown Soil Landscape Group whose landscape is gently undulating rising on Wianamatta Group Shale and Hawkesbury Sandstone. Local topography is described as rising to a maximum of 30 m in the area. Broad, rounded crests and ridges with gently inclined slopes of less than 5 % gradient are common.

Soils are shallow to moderately deep (<100cm), with red and brown Podzolic soils in crests, upper slopes and well drained areas (150-300cm) and yellow Podzolic soils and Soloths on lower slopes and areas of poor drainage. The subsoil is considered to be moderately reactive and highly plastic with low fertility and poor drainage.

The landform in the Homebush Bay area has been significantly impacted by past industrial landuse and redevelopment for the Sydney Olympics. Review of the 1:100,000 Sydney Geological Series Sheet 9130 indicates that the foreshores of Homebush Bay and Parramatta River in the vicinity of Sydney Olympic Park are underlain by man-made fill overlying Quaternary-aged stream sediments.

The man-made fill is expected to comprise dredged estuarine sand and mud, demolition rubble, and industrial and household wastes.

The sediments are expected to comprise silty to peaty quartz sand, silt and clay that exhibits ferruginous (i.e. iron rich) and humic (i.e. organic) sedimentation in places. Shell layers are also common.

The fill is underlain by the Triassic Bringelly Shale Minchinbury Sandstone and Ashfield Shale of the Wianamatta Group comprising shale with some sandstone beds. Bringelly Shale is the uppermost unit and is described as carbonaceous claystone and laminite with fine to medium grained lithic sandstone. The Ashfield Shale is described as black to dark grey. An intermediate unit, Minchinbury Sandstone, described as fine to medium grained sandstone is situated between the Bringelly and Ashfield Shale units.

3.3 Subsurface Conditions Encountered

The results of the investigation indicate that the subsurface profile at the test locations comprises the following:

Table 1: Summary of Subsurface Conditions and Geotechnical Model

Unit	Material / Origin	Description	Depth to Top of Unit (m)	Range of Unit Thickness (m)	Range of Levels to Top of Unit (mRL AHD)
1	Fill	Variable; sandy gravel/sand/silty clay/sandy clay/gravelly clay.	0	0.4 to 6.3	5.1 to 12.5
2	Alluvium	Sandy / silty clay, typically low to high plasticity and firm to stiff, mottled dark grey and red-brown.	0.4 to 2.6	0.7 to 1	4.2 to 5.5
3	Residual Soil	Silty clay, typically high plasticity and stiff to very stiff, mottled pale grey and red brown.	0.4 to 6.3	0.5 to Unproven	3.5 to 7.9
4	Shale Bedrock	Extremely to moderately weathered, low to medium strength.	2.1 to 7.4	Unproven	2.4 to 4.7

The depths and layer thicknesses provided in Table 1 are based on the subsurface conditions at the borehole and test pit locations and may not represent all areas of the site.

Several cross sections have been developed across the based on interpretation of the borehole and test pit logs attached as Figure 2 and Figure 3. These indicate that there is a variable thickness of fill overlying relatively horizontal layers of alluvium and residual soil, overlying the shale bedrock. The Unit 1 fill increases in thicknesses from the southern car park boundary (0.4m) towards the northern extent of the investigation (6.3m).

Appendix A contains engineering borehole and test pit logs together with explanation sheets describing the terms and symbols used in the borehole log preparation.

3.4 Groundwater Conditions

Groundwater seepage was observed in BH6 at 3.3m and BH7 at 1.2m depth during drilling. The seepage observed in BH6 is likely to represent natural groundwater seepage through joints/defects in the shale bedrock. Seepage observed in BH7 is thought to represent perched water within the Unit 1 Fill.

We note that groundwater levels are expected to fluctuate seasonally and in response to extended rainfall, dry periods, or leaking/damaged services at or near the site.

3.5 Laboratory Test Results

Laboratory test reports of the Atterberg Limit, CBR, Particle Size Distribution (PSD), Moisture Content and Soil Aggressivity testing are presented in Appendix C and summarised below.

Table 1 Standard Compaction and CBR Testing

Sample Number	Standard Maximum Dry Density (t/m ³)	Standard Optimum Moisture Content (%)	CBR (%)
TP2 0.20 - 0.80m	1.98	11.5	6
TP4 0.20 - 0.60m	1.73	19	7
TP7 0.20 - 1.00m	1.76	15.5	2.5
TP8 0.20 -1.20m	1.76	19.5	6

Table 2 Atterberg Limit Testing

Sample Number	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)
BH2 0.50-0.95m	38	18	20	10.5
BH2 1.50-1.95m	61	23	38	16.5
BH3 0.50-0.95m	38	19	19	8.5
BH4 1.50-1.95m	69	23	46	14.5
BH7 4.50-4.95m	48	22	26	11
TP3 2.80-3.00m	61	24	37	11.5

Table 3 Natural Moisture Content Testing

Sample Number	Geotechnical Unit	Natural Moisture Content (%)
BH1 1.50-1.95m	Unit 3	25.6
BH2 0.50-0.95m	Unit 2	17.9
BH2 1.50-1.95m	Unit 3	25.2
BH3 0.50-0.95m	Unit 1	18.4
BH4 1.50-1.95m	Unit 3	21.8
BH6 0.50-0.95m	Unit 3	20.7
BH7 0.50-0.95m	Unit 1	14.5
BH7 1.50-1.95m	Unit 1	16.8
BH7 4.50-4.95m	Unit 1	34
BH7 7.20-7.60m	Unit 3	7.4
BH8 0.50-0.95m	Unit 1	14.8
BH8 3.00-3.45m	Unit 1	21.5
BH8 4.50-4.95m	Unit 1	26.1
TP2 2.60 - 2.80m	Unit 3	26.9
TP3 2.80 - 3.00m	Unit 2	24.2

Table 4 Summary of Soil Aggressivity Testing

Sample Number	Chloride (mg/kg)	pH	Sulphate (S) (mg/kg)	Moisture Content (%)
BH1 0.80 - 1.00m	780	5.5	98	19
BH3 1.00 - 1.20m	210	6.6	30	16
BH3 1.20 - 1.40m	230	6.1	<10	23

Sample Number	Chloride (mg/kg)	pH	Sulphate (S) (mg/kg)	Moisture Content (%)
BH7 3.00 - 3.45m	52	5.0	52	21
BH8 1.50 - 1.95m	65	8.2	44	15
TP2 1.20 - 1.40m	35	5.1	100	25
TP3 2.80 – 3.00m	85	5.3	39	20

The results of the Particle Size Distribution Testing indicate that the materials tested comprise sandy gravel with some silt and a trace of clay, which is consistent with our field description of the soils.

3.6 Deflectometer Test Results

Falling Weight Deflectometer (FWD) testing was undertaken progressively in the base of each test pit at depths of 0.5m, 1.0m and 1.5m using a Zorn ZFG 2000 Light-Weight Deflectometer test unit with a 10kg drop load, the test results are summarised below.

Table 5 Falling Weight Deflectometer Testing

Test Location	Test Depth (m)	Deflection (S) (mm)	E _{vd} Value (MN/m ²)
TP1	0.5	1.630	13.8
	1.0	1.950	11.5
	1.5	1.835	12.3
TP2	0.5	0.454	49.6
	1.0	1.086	20.7
	1.5	1.093	20.6
TP3	0.5	1.950	11.5
	1.0	2.615	8.6
	1.5	0.967	23.3
TP4	0.5	1.836	12.3

Test Location	Test Depth (m)	Deflection (S) (mm)	E _{vd} Value (MN/m ²)
	1.0	0.905	24.9
	1.5	1.808	12.4
TP5	0.5	1.831	12.3
	1.0	0.619	36.3
	1.5	1.975	11.4
TP7	0.5	1.596	14.1
	1.0	1.241	18.1
	1.5	0.967	23.3
TP8	0.5	1.241	18.1
	1.0	1.630	13.8
	1.5	1.596	14.1

4 DISCUSSION AND RECOMMENDATIONS

4.1 Proposed Development

We understand that the proposed development is to comprise the following;

- A roofed structure containing five standard courts;
- A multi storey building with four storeys above show court level;
- A single level of basement carpark/loading dock which is expected to be at existing ground level on the southern boundary of the site.

Sketch plans of the proposed development accompanying the brief indicate that the five court roofed structure will be oriented roughly north/south along the eastern boundary of the site with a proposed finished floor level of RL8.2m at the southern extent and RL10.9m at the northern proposed building extent.

Given the existing surface levels, it is expected that site preparation for this development will require a combination of excavation in the order of about 1m – 2m depth towards the northern extent of the proposed development and filling up to 2m to raise surface levels towards the southern extent in the area of existing pavement.

The multi storey building is understood to have a proposed finished floor level of about RL6.4m located in an area between the structure referred to above and an existing Sports Centre to the west. This development is likely to require excavations of up to 5m near the northern extent of the proposed building footprint with nominal filling near the southern existing car park boundary.

We understand that the proposed basement carpark/loading dock will be situated to the south of the proposed development possibly partially beneath the multi storey building and netball courts with a finished floor level close to existing ground surface level.

4.2 Building Foundation and Pavement Support Options

The results of the fieldwork indicate that the fill is variable in composition and compaction across the site. Unless records are available to confirm that this fill has been placed and compacted in accordance with an engineering specification, the fill should be classified as uncontrolled. Such fill is not considered suitable as a foundation for structures or subgrade for new pavements, unless excavated and re-compacted, if suitable or replaced with imported material.

To remove the risk of unacceptable bearing and settlement characteristics of uncontrolled fill, all fill should be stripped and recompacted or replaced beneath building areas and pavements (Option 1). Should this not be deemed practicable, for instance where the Unit 1 fill material extends significantly below proposed founding, subgrade or groundwater levels the following options could be considered:

2. Excavate only part of the uncontrolled fill and construct a compacted fill raft to act as a foundation for buildings and pavements.
3. Excavate only part of the uncontrolled fill, pile settlement sensitive structures and found lightly loaded floor slabs and pavements on a compacted fill raft.
4. Pile all structures and pavements.

A minimum raft thickness of say 2m may allow lightly loaded structures and pavements to perform satisfactorily, however, the risk of differential settlement of the remaining uncontrolled fill would need to be accepted.

For the proposed show court, Option 1 - excavation and recompaction of all fill should be practicable, given excavations will leave relatively little fill below bulk excavation level. Floor slabs and pavements should be able to be founded on the exposed subgrade, subject to assessment of the material exposed. Building loads may be able to be founded on strip, pad, or raft foundations. Alternatively, shale bedrock will be relatively shallow open and bored piles or continuous flight auger (CFA) piles should be practicable.

For the proposed five standard netball courts the depth of fill below bulk excavation level may preclude Option 1. Options 2 and 3 are likely to be feasible, provided structures and pavements founded on a compacted fill raft can tolerate some differential movement.

4.3 Trafficability of Soils

Where there is a high proportion of clay fines or where the subgrade has been subject to the elements for a prolonged period of time the exposed subgrade may behave poorly, particularly when wet. A minimum 200mm thick working platform of road base may be needed to support construction plant. Where heavy plant such as piling rigs, or mobile cranes are to traffic the site, specific analysis of working platform requirements may be required to assess working platform thickness.

4.4 Excavation Conditions and Fill Compaction Requirements

From a geotechnical viewpoint, Unit 1 Fill should generally be suitable for re-use as Engineered Fill, provided unsuitable materials such as organics, waste or oversized particles are removed. For offsite disposal of site soils (if required), reference should be made to the phase 1 contamination assessment reported separately by Coffey Environments.

Excavations for the proposed roofed structure containing five standard courts along the eastern boundary of the site are expected up to approximately 2m depth and will likely encounter Unit 1 fill. Excavations associated with the Show Court and multi storey building are expected to encounter Unit 1 Fill, Unit 2 Alluvium and Unit 3 Residual Soil.

Groundwater seepage may occur in excavations, particularly from water perched within the Unit 1 fill. Such seepage is expected to be localised and should be able to be managed using sump and pump techniques.

Where the exposed soils are above the water table, they should be prepared as outlined below prior to placement of Engineered Fill:

- Where the exposed subgrade is more than 0.5m depth below the proposed structure or pavement formation, it should be proof rolled with at least 8 passes of a 10 tonne non-vibratory roller. Any soft or heaving areas detected by proof rolling should be excavated and replaced with Engineered Fill.
- Where the exposed subgrade is less than 0.5m below the proposed structure of pavement formation, the subgrade should be compacted to achieve the criteria in Section 4.1.6.

Should excavation of fill extend close to or below the water table, it may be necessary to construct a bridging layer to about 300mm above groundwater level. Bridging layers are typically constructed with rockfill (gravel and cobble sized material that can achieve mechanical interlock). It may also be necessary to use geotextiles below and/or above the bridging layer to assist construction of the fill and to avoid future loss of material into the voids of the bridging layer.

Once the bridging layer is placed it should be possible to compact suitable fill material in layers less than 200mm compacted thickness to achieve the criteria in section 4.1.6 for Engineered Fill.

Where Engineered Fill is required to form the foundation footings and at depths greater than 0.5m below pavement subgrade level, it should be compacted to a minimum of 98% Standard Maximum Dry Density (SMDD), and moisture conditioned to be within $\pm 2\%$ of Standard Optimum Moisture Content (SOMC). Within 0.5m of pavement subgrade level the fill should be compacted to a minimum of 100% SMDD.

The layer thickness should be appropriate to achieve uniform compaction throughout the layer for the compaction plant adopted.

4.5 Unsupported Excavations and Retention Systems

4.5.1 Unsupported Excavations

We recommend unsupported batter slopes for excavations above the water table in Unit 1 fill, Unit 2 alluvium and Unit 3 residual soils of 1.5H: 1V or flatter provided that surcharge loads are kept well clear of the crest of batters. Permanent batters in compacted fill and natural soils should be 2H:1V or flatter.

4.5.2 Retention Systems

If there is insufficient room to form temporary batters such or where excavations encounter groundwater a retention system will be required. We understand that the proposed Show Court and multi storey building is likely to require bulk excavation up to approximately 5m below the existing ground level and as such a permanent retention system will be required. Retention systems that could be considered include:

- Sheet Piled Walls;
- Contiguous Piled Wall; or
- Secant Pile if a tanked basement system is proposed.

The choice of wall type will be determined by project requirements for a sufficiently watertight, and/or stiff retention system.

Sheet piles should be able to be driven through the Unit 1 fill and Unit 2 / Unit 3 soils to provide temporary support for excavations. However, in the fill there will be a risk of obstructions being encountered. A cast insitu concrete wall would be required to provide a permanent retention system. Impact driving may be a practicable technique for driving sheet piles in this stratum, subject to noise and vibration considerations. Specialist advice should be sought from a piling contractor with experience in these ground conditions.

Contiguous pile wall systems are not “watertight” and are not generally suitable for use below the permanent water table. However these wall types can sometimes be used for excavations below observed groundwater if seepage rates are low. The results of the investigation suggest that inflow rates at this site may be sufficiently low for contiguous piled walls to be viable, If this wall type is adopted a water collection system and sump will be required to capture any inflows, together with approvals for water disposal from the relevant authorities during construction, and in the longer term if a waterproof permanent lining is not subsequently constructed.

For stability and to avoid differential settlement between piles/wall elements it is recommended that the selected wall type be socketed into the rock below bulk excavation levels to provide uniformity of foundation conditions and toe stability to the wall. Such wall founding could also be included as the permanent support system.

For basements the design should make allowance for the potential for hydrostatic pressures to develop in the fill and natural soils. Short term build up of hydrostatic pressures could occur during prolonged wet periods or due to broken services hence the possibility of hydrostatic pressures that could extend to the ground surface should be considered.

Surcharges due to equipment, stockpiles or other loadings behind the wall should also be considered in the design.

Additional lateral stability could be provided by anchors installed progressively as the excavation proceeds. Alternatively, top-down construction, or internal bracing, could be adopted as alternatives to the use of anchors.

4.5.3 Retaining Wall Design Parameters

The design of retaining walls for multi-anchored or braced walls is geotechnically complex. The relative stiffness of the wall and support system to that of the soil/rock will strongly influence the resulting earth

pressure magnitude and distribution. Earth pressure coefficients adopted for design will depend on the analytical tools utilised in the design, and whether numerical analysis methods used allow for stress re-adjustment to occur with wall movements.

It is recommended that detailed analysis be undertaken to develop a cost-effective retention support system. As a guide Table 6 below presents typical design parameters that can be adopted for retaining wall design.

Table 6: Design Parameters for Retaining Wall Design

Material	Bulk density γ (kN/m ³) *	c' (kPa)	Φ' (degrees)	Young's Modulus (MPa)
Unit 1 Fill	18	0	25	10
Unit 2 Alluvium	20	5	25	10
Unit 3 Residual Clay	20	5	28	15
Unit 4 Shale (Class IV/V)	23	20	30	100

*Use effective density γ' (where $\gamma' = \gamma - 10$ in kN/m³) for soil below water table when analysing fully tanked conditions.

Retaining wall analyses will need to consider surcharges, footing loads from adjacent structures, and hydrostatic pressure. Walls for tanked structures should be designed for full hydrostatic pressures plus potential localised flood levels if considered possible.

If drained walls are to be used then adequate drainage will need to be provided behind the walls, and a permanent water collection system will be required together with flushing points for drainage system periodic maintenance, alternatively a gravitational drain off may be considered. Nevertheless an allowance of potential water pressure build-up equivalent to one-third the wall height is considered to be prudent with such drainage measures installed.

4.5.4 Anchor Design

Anchor designs should be based on allowing effective anchorage to be developed by locating the bond length behind an 'active zone', determined by drawing a line at 45° from the base of the wall to intersect the ground surface behind the excavated face.

A working bond strength of 75kPa may be adopted for anchors into Class IV Shale with the provision that bond lengths are between 3m to 7m. Higher bond strengths may be available if anchors penetrate into better quality shale. However, cored boreholes would be required to assess the depth at which better quality shale exists.

Anchors should be proof loaded to at least 1.4 times their design working load.

4.6 Building Foundations

It is expected that bulk excavations associated with the proposed Netball Show Court and multi storey building will extend to a depth of approximately RL6.4m; such excavation is likely to expose a variable subgrade consisting of Unit 1 fill, Unit 2 Alluvium and Unit 3 Residual Soil. We recommend that the building be founded on shale bedrock. Bored piles are likely to be required, although in some locations the depth to rock may be relatively shallow and strip or pad footing may be practicable.

For the five standard netball courts a raft foundation may be practicable if a compacted fill raft is constructed or the building loads could be taken through a compacted raft (supporting pavements) and founded in the shale bedrock.

Where a raft of engineered fill is prepared and compacted in accordance with Section 4.2, an allowable bearing capacity of 100kPa may be achievable for the edge and internal beams of stiffened rafts.

For the design of piles Table 7 provides limit state design parameters for strip/pad footings or bored piles for building and retaining wall foundations.

Table 7: Recommended Design Parameters Strip/Pad Footings or Bored Piles

Geotechnical Unit	Ultimate End Bearing (kPa)	Ultimate shaft Adhesion (kPa)	Young's Modulus (MPa)
Unit 1 Fill and Unit 2 Alluvium	-	-	10
Unit 3 Residual Soil	-	50	15
Unit 4 Shale	3000	150	100

- For design we recommend a geotechnical strength reduction factor of 0.5 in soils and 0.7 in rock. Higher geotechnical strength reduction factors may be adopted if pile load testing is carried out. For detailed design the appropriate geotechnical strength reduction factors should be reassessed in accordance with AS2159-2009 and considering the level of pile testing.
- For shaft adhesion in uplift the parameters given in Table 7 should be multiplied by a factor of 0.7.
- The end bearing parameters assume the tip of the pile is underlain by the relevant material for at least 3 pile diameters. Where lower strength material occurs within three pile diameters of the tip the end bearing values should be downgraded.

If a working stress design approach is to be adopted, the maximum working stress may be assessed by dividing the ultimate values by a minimum factor of safety of 3 for pad/strip footings, and 2.5 for rock socketed piles. Regardless of the design method, foundation settlement should also be assessed. The use of such allowable bearing pressures would be expected to result in settlements of about of the footing width or diameter.

Higher end bearing and skin friction values may be available, but would require cored boreholes to further assess the rock quality.

During construction we recommend that foundation inspections be carried out by a geotechnical engineer or engineering geologist to confirm that a suitable foundation stratum has been reached and assess any further variability in subsurface conditions across the site.

4.7 Pavement Design

For design of pavements using existing Unit 1 fill we recommend a design CBR of 2.5% assuming the existing Unit 1 fill material meets the suitability criteria for re-use and can be recompacted in accordance with the specification in Section 4.4.

4.8 Soil Aggressivity

The results of the soil aggressivity testing were assessed in accordance with Australian Standard AS2159-1995 Piling – “Design and Installation”. Chemical test results indicated **non-aggressive** ground conditions to buried steel and concrete structural elements.

4.9 Earthquake Design

We recommend that the site be classified as Class C_e in accordance with the site sub-soil classes defined in AS1170.4 – 2007 Part 4, Earthquake Actions in Australia. A hazard factor of 0.08 is recommended.

5 LIMITATIONS

The geotechnical model and recommendations in this report are based on a limited number of boreholes. The engineering logs describe subsurface conditions only at the specific borehole locations. Ground conditions can vary over relatively close distances and a geotechnical engineer should be engaged at the construction stage to assess whether site conditions are consistent with design assumptions.

The attached document entitled “Important Information about your Coffey Report” presents additional information about the uses and limitations of this report.

For and on behalf of Coffey Geotechnics Pty Ltd



Peter Waddell

Principal Engineer

Important information about your **Coffey** Report

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

Your report is based on project specific criteria

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

Subsurface conditions can change

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

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by

earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

Your report will only give preliminary recommendations

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

Your report is prepared for specific purposes and persons

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

Important information about your **Coffey** Report

Interpretation by other design professionals

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

Data should not be separated from the report*

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way.

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

Geoenvironmental concerns are not at issue

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

Rely on Coffey for additional assistance

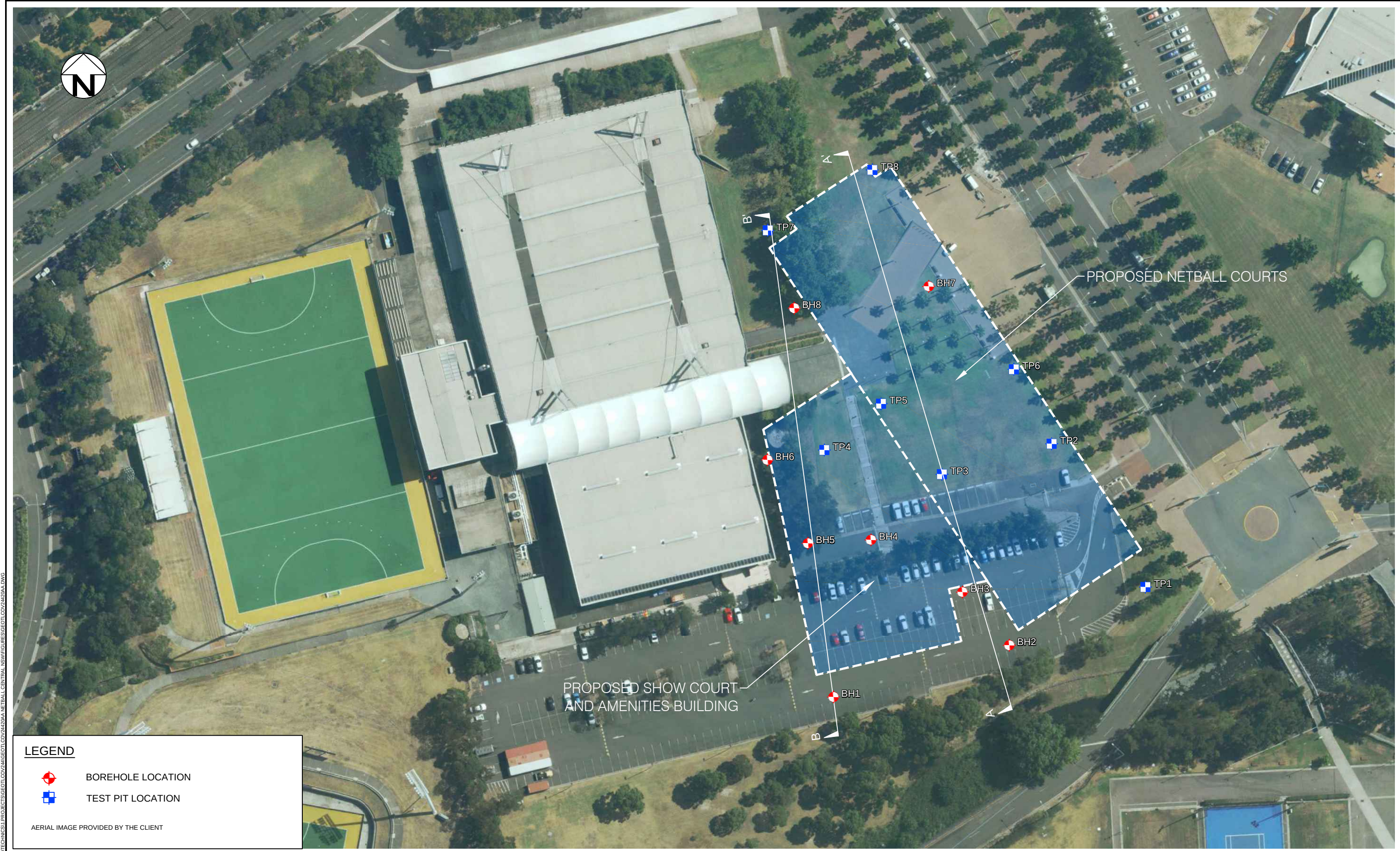
Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As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

Responsibility

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

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

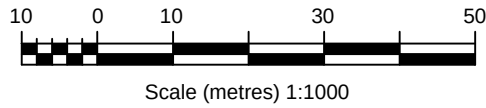
Figures



- LEGEND**
- BOREHOLE LOCATION
 - TEST PIT LOCATION

AERIAL IMAGE PROVIDED BY THE CLIENT

revision	description				drawn	approved	date

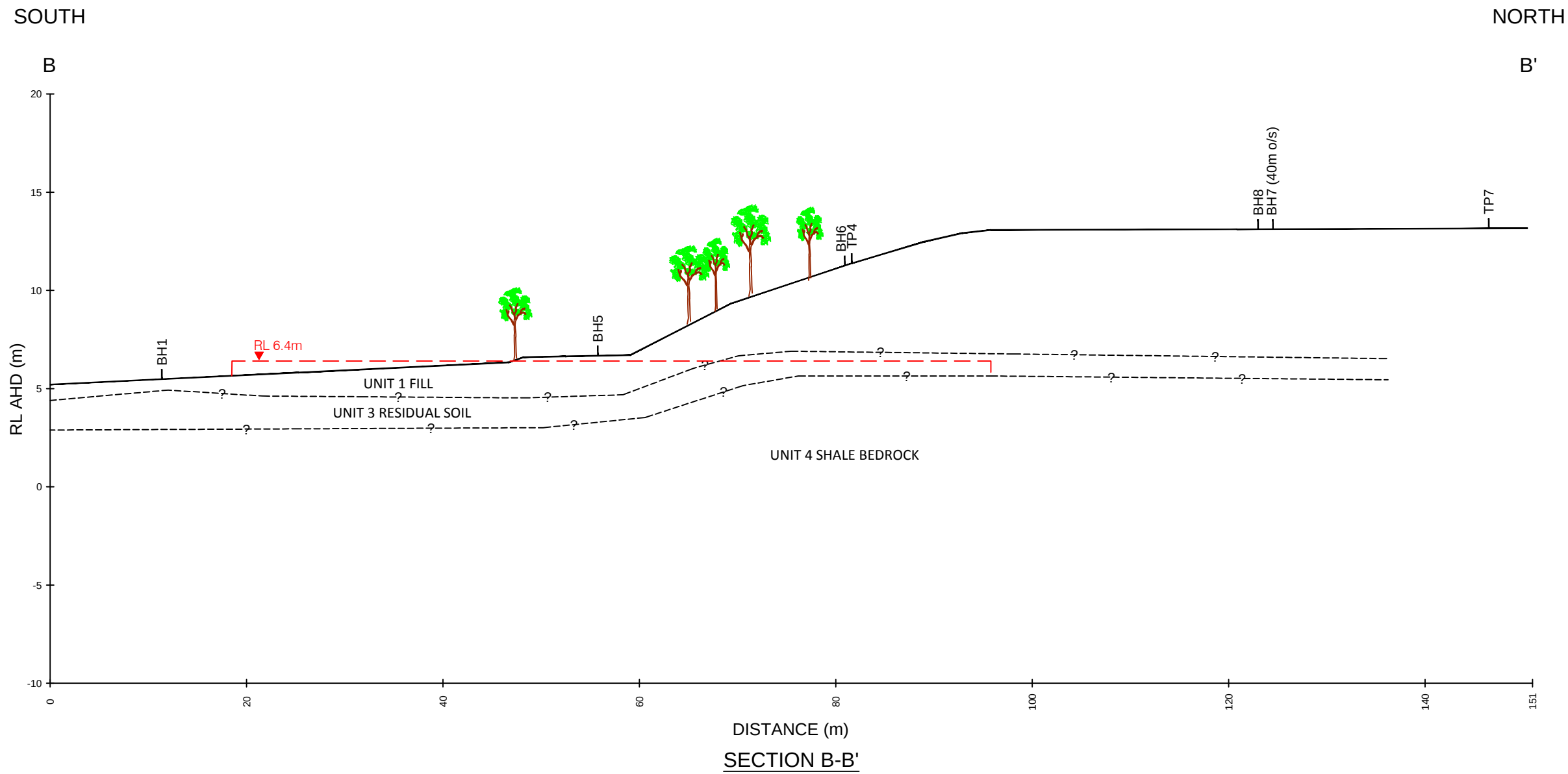


drawn	DB / MH
approved	PJW
date	16/01/12
scale	1:1000
original size	A3



client: NETBALL NSW, C/- CROWN PROJECT SERVICES PTY LTD	
project: GEOTECHNICAL INVESTIGATION PROPOSED NETBALL CENTRAL DEVELOPMENT	
title: INVESTIGATION LOCATION PLAN	
project no: GEOTLCOV24420AA	figure no: FIGURE 1

PLOT DATE: 16/01/2012 3:19:54 PM DWG FILE: I:\GEO\TECHNICAL\PROJECTS\GEOTLCOV24420AA\NETBALL CENTRAL\NEW\FIGURESGEOTLCOV24420AA.DWG



LEGEND

--- PROPOSED SHOW COURT AND AMENITIES BUILDING FINISHED LEVEL. (RL6.4m AHD)

revision	description	drawn	approved	date	501020 Horizontal Scale (metres) 1:500 2.50510 Vertical Scale (metres) 1:250	drawn	DB / MH	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client: NETBALL NSW, C/- CROWN PROJECT SERVICES PTY LTD	
						approved	PJW		project: GEOTECHNICAL INVESTIGATION PROPOSED NETBALL CENTRAL DEVELOPMENT	
						date	16/01/12		title: SECTION B-B'	
						scale	AS SHOWN		project no: GEOTLCOV24420AA	figure no: FIGURE 2
						original size	A3			

PLOT DATE: 16/01/2012 3:19:56 PM DWG FILE: I:\GEO\TECHNICAL\PROJECTS\GEOTLCOV24420AA\GEOTLCOV24420AA-NETBALL-CENTRAL-NEW\FIGURESGEOTLCOV24420AA.DWG

Appendix A

Engineering Borehole/Test Pit Logs and Explanation Sheets

Soil Description Explanation Sheet (1 of 2)

DEFINITION:

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

CLASSIFICATION SYMBOL & SOIL NAME

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

PARTICLE SIZE DESCRIPTIVE TERMS

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

MOISTURE CONDITION

Dry Looks and feels dry. Cohesive and cemented soils are hard, friable or powdery. Uncemented granular soils run freely through hands.

Moist Soil feels cool and darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.

Wet As for moist but with free water forming on hands when handled.

CONSISTENCY OF COHESIVE SOILS

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

DENSITY OF GRANULAR SOILS

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

MINOR COMPONENTS

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

SOIL STRUCTURE

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

GEOLOGICAL ORIGIN

WEATHERED IN PLACE SOILS

Extremely weathered material Structure and fabric of parent rock visible.

Residual soil Structure and fabric of parent rock not visible.

TRANSPORTED SOILS

Aeolian soil Deposited by wind.

Alluvial soil Deposited by streams and rivers.

Colluvial soil Deposited on slopes (transported downslope by gravity).

Fill Man made deposit. Fill may be significantly more variable between tested locations than naturally occurring soils.

Lacustrine soil Deposited by lakes.

Marine soil Deposited in ocean basins, bays, beaches and estuaries.

Soil Description Explanation Sheet (2 of 2)

SOIL CLASSIFICATION INCLUDING IDENTIFICATION AND DESCRIPTION

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 60 mm and basing fractions on estimated mass)					USC	PRIMARY NAME			
COARSE GRAINED SOILS More than 50% of materials less than 63 mm is larger than 0.075 mm	(A 0.075 mm particle is about the smallest particle visible to the naked eye)	GRAVELS More than half of coarse fraction is larger than 2.36 mm	CLEAN GRAVELS (Little or no fines)		Wide range in grain size and substantial amounts of all intermediate particle sizes.	GW	GRAVEL		
					Predominantly one size or a range of sizes with more intermediate sizes missing.	GP	GRAVEL		
			GRAVELS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below)		GM	SILTY GRAVEL		
				Plastic fines (for identification procedures see CL below)		GC	CLAYEY GRAVEL		
		SANDS More than half of coarse fraction is smaller than 2.36 mm	CLEAN SANDS (Little or no fines)		Wide range in grain sizes and substantial amounts of all intermediate sizes	SW	SAND		
					Predominantly one size or a range of sizes with some intermediate sizes missing.	SP	SAND		
			SANDS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).		SM	SILTY SAND		
				Plastic fines (for identification procedures see CL below).		SC	CLAYEY SAND		
		FINE GRAINED SOILS More than 50% of material less than 63 mm is smaller than 0.075 mm	(A 0.075 mm particle is about the smallest particle visible to the naked eye)	IDENTIFICATION PROCEDURES ON FRACTIONS <0.2 mm.					
				SILTS & CLAYS Liquid limit less than 50	DRY STRENGTH	DILATANCY	TOUGHNESS		
None to Low	Quick to slow				None	ML	SILT		
Medium to High	None				Medium	CL	CLAY		
Low to medium	Slow to very slow				Low	OL	ORGANIC SILT		
SILTS & CLAYS Liquid limit greater than 50	Low to medium			Slow to very slow	Low to medium	MH	SILT		
	High			None	High	CH	CLAY		
	Medium to High			None	Low to medium	OH	ORGANIC CLAY		
HIGHLY ORGANIC SOILS	Readily identified by colour, odour, spongy feel and frequently by fibrous texture.				Pt	PEAT			
• Low plasticity – Liquid Limit w_L less than 35%. • Medium plasticity – w_L between 35% and 50%. • High plasticity – w_L greater than 50%.									

• Low plasticity – Liquid Limit w_L less than 35%. • Medium plasticity – w_L between 35% and 50%. • High plasticity – w_L greater than 50%.

COMMON DEFECTS IN SOIL

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

Rock Description Explanation Sheet (1 of 2)

The descriptive terms used by Coffey are given below. They are broadly consistent with Australian Standard AS1726-1993.

DEFINITIONS: Rock substance, defect and mass are defined as follows:

Rock Substance In engineering terms rock substance is any naturally occurring aggregate of minerals and organic material which cannot be disintegrated or remoulded by hand in air or water. Other material is described using soil descriptive terms. Effectively homogenous material, may be isotropic or anisotropic.

Defect Discontinuity or break in the continuity of a substance or substances.

Mass Any body of material which is not effectively homogeneous. It can consist of two or more substances without defects, or one or more substances with one or more defects.

SUBSTANCE DESCRIPTIVE TERMS:

ROCK NAME Simple rock names are used rather than precise geological classification.

PARTICLE SIZE Grain size terms for sandstone are:
Coarse grained Mainly 0.6mm to 2mm
Medium grained Mainly 0.2mm to 0.6mm
Fine grained Mainly 0.06mm (just visible) to 0.2mm

FABRIC Terms for layering of penetrative fabric (eg. bedding, cleavage etc.) are:

Massive No layering or penetrative fabric.

Indistinct Layering or fabric just visible. Little effect on properties.

Distinct Layering or fabric is easily visible. Rock breaks more easily parallel to layering of fabric.

CLASSIFICATION OF WEATHERING PRODUCTS

Term	Abbreviation	Definition	Term	Abbreviation	Point Load Index, $I_s(50)$ (MPa)	Field Guide
Residual Soil	RS	Soil derived from the weathering of rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.	Very Low	VL	Less than 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with a knife; pieces up to 30mm thick can be broken by finger pressure.
Extremely Weathered Material	XW	Material is weathered to such an extent that it has soil properties, ie, it either disintegrates or can be remoulded in water. Original rock fabric still visible.	Low	L	0.1 to 0.3	Easily scored with a knife; indentations 1mm to 3mm show with firm bows of a pick point; has a dull sound under hammer. Pieces of core 150mm long by 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Highly Weathered Rock	HW	Rock strength is changed by weathering. The whole of the rock substance is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Some minerals are decomposed to clay minerals. Porosity may be increased by leaching or may be decreased due to the deposition of minerals in pores.	Medium	M	0.3 to 1.0	Readily scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
Moderately Weathered Rock	MW	The whole of the rock substance is discoloured, usually by iron staining or bleaching, to the extent that the colour of the fresh rock is no longer recognisable.	High	H	1 to 3	A piece of core 150mm long by 50mm can not be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Slightly Weathered Rock	SW	Rock substance affected by weathering to the extent that partial staining or partial discolouration of the rock substance (usually by limonite) has taken place. The colour and texture of the fresh rock is recognisable; strength properties are essentially those of the fresh rock substance.	Very High	VH	3 to 10	Hand specimen breaks after more than one blow of a pick; rock rings under hammer.
Fresh Rock	FR	Rock substance unaffected by weathering.	Extremely High	EH	More than 10	Specimen requires many blows with geological pick to break; rock rings under hammer.

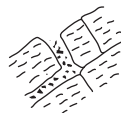
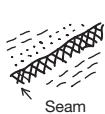
Notes on Weathering:

- AS1726 suggests the term "Distinctly Weathered" (DW) to cover the range of substance weathering conditions between XW and SW. For projects where it is not practical to delineate between HW and MW or it is judged that there is no advantage in making such a distinction. DW may be used with the definition given in AS1726.
- Where physical and chemical changes were caused by hot gasses and liquids associated with igneous rocks, the term "altered" may be substituted for "weathering" to give the abbreviations XA, HA, MA, SA and DA.

Notes on Rock Substance Strength:

- In anisotropic rocks the field guide to strength applies to the strength perpendicular to the anisotropy. High strength anisotropic rocks may break readily parallel to the planar anisotropy.
- The term "extremely low" is not used as a rock substance strength term. While the term is used in AS1726-1993, the field guide therein makes it clear that materials in that strength range are soils in engineering terms.
- The unconfined compressive strength for isotropic rocks (and anisotropic rocks which fall across the planar anisotropy) is typically 10 to 25 times the point load index $I_s(50)$. The ratio may vary for different rock types. Lower strength rocks often have lower ratios than higher strength rocks.

Rock Description Explanation Sheet (2 of 2)

COMMON DEFECTS IN ROCK MASSES		Diagram	Map Symbol	Graphic Log (Note 1)	DEFECT SHAPE	TERMS
Term	Definition				Planar	The defect does not vary in orientation
Parting	A surface or crack across which the rock has little or no tensile strength. Parallel or sub parallel to layering (eg bedding) or a planar anisotropy in the rock substance (eg, cleavage). May be open or closed.		20 Bedding 20 Cleavage	 (Note 2)	Curved	The defect has a gradual change in orientation
Joint	A surface or crack across which the rock has little or no tensile strength, but which is not parallel or sub parallel to layering or planar anisotropy in the rock substance. May be open or closed.		60	 (Note 2)	Undulating	The defect has a wavy surface
Sheared Zone (Note 3)	Zone of rock substance with roughly parallel near planar, curved or undulating boundaries cut by closely spaced joints, sheared surfaces or other defects. Some of the defects are usually curved and intersect to divide the mass into lenticular or wedge shaped blocks.		35		Stepped	The defect has one or more well defined steps
Sheared Surface (Note 3)	A near planar, curved or undulating surface which is usually smooth, polished or slickensided.		40		Irregular	The defect has many sharp changes of orientation
Crushed Seam (Note 3)	Seam with roughly parallel almost planar boundaries, composed of disoriented, usually angular fragments of the host rock substance which may be more weathered than the host rock. The seam has soil properties.		50		ROUGHNESS TERMS	
Infilled Seam	Seam of soil substance usually with distinct roughly parallel boundaries formed by the migration of soil into an open cavity or joint, infilled seams less than 1mm thick may be described as veneer or coating on joint surface.		65		Slickensided	Grooved or striated surface, usually polished
Extremely Weathered Seam	Seam of soil substance, often with gradational boundaries. Formad by weathering of the rock substance in place.		32		Polished	Shiny smooth surface
					Smooth	Smooth to touch. Few or no surface irregularities
					Rough	Many small surface irregularities (amplitude generally less than 1mm). Feels like fine to coarse sand paper.
					Very Rough	Many large surface irregularities (amplitude generally more than 1mm). Feels like, or coarser than very coarse sand paper.
					COATING TERMS	
					Clean	No visible coating
					Stained	No visible coating but surfaces are discoloured
					Veneer	A visible coating of soil or mineral, too thin to measure; may be patchy
					Coating	A visible coating up to 1mm thick. Thicker soil material is usually described using appropriate defect terms (eg, infilled seam). Thicker rock strength material is usually described as a vein.
					BLOCK SHAPE TERMS	
					Blocky	Approximately equidimensional
					Tabular	Thickness much less than length or width
					Columnar	Height much greater than cross section

Notes on Defects:

1. Usually borehole logs show the true dip of defects and face sketches and sections the apparent dip.
2. Partings and joints are not usually shown on the graphic log unless considered significant.
3. Sheared zones, sheared surfaces and crushed seams are faults in geological terms.

Borehole No. **BH1**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTLCOV24420AA**

Client: **Netball NSW, C/- Crown Project Services Pty Ltd**

Date started: **1.12.2011**

Principal:

Date completed: **1.12.2011**

Project: **Proposed Netball Central Development**

Logged by: **DB + AA**

Borehole Location: **(See Figure 1)**

Checked by: **DS**

drill model and mounting:		Mobile Drill B80 Truck		Easting:		slope: -90°		R.L. Surface: 5.2									
hole diameter:		100 mm		Northing		bearing: N/A		datum: AHD									
drilling information				material substance													
method	penetration	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations				
ADT	1 2 3	N		E	5			CH	ASPHALT: 0.07m FILL: SAND: Fine to medium, pale brown, mottled pale grey, orange-brown, trace of clay and fine to medium, subangular sandstone gravel. CLAY: High plasticity, dark brown, mottled red-brown, trace of fine, subround ironstone gravel.	D M			PAVEMENT BASECOARSE				
				SPT 2,3,3 N*=6		1				<Wp	St	X	RESIDUAL SOIL				
				SPT 1,3,5 N*=8	4				1.20m - Clay becoming high plasticity, red-brown, mottled pale grey, with a trace of fine, subround ironstone gravel.			X					
				SPT 12,22,R N*=R	2	3			SHALE: Dark brown, mottled dark grey, highly weathered, low to very low strength.				BEDROCK				
						4			Borehole BH1 terminated at 3.45m								
					1	5											
					0	6											
					-1	7											
					-2	8											
method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT				support M mud C casing penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow				notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal				classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit				consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense	

Borehole No. **BH2**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTLCOV24420AA**

Client: **Netball NSW, C/- Crown Project Services Pty Ltd**

Date started: **1.12.2011**

Principal:

Date completed: **1.12.2011**

Project: **Proposed Netball Central Development**

Logged by: **DB + AA**

Borehole Location: **(See Figure 1)**

Checked by: **DS**

drill model and mounting:		Mobile Drill B80 Truck		Easting:		slope: -90°		R.L. Surface: 5.1					
hole diameter:		100 mm		Northing		bearing: N/A		datum: AHD					
drilling information				material substance									
method	penetration	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations
ADT	1 2 3	N		E	5				ASPHALT: 0.1m	D			PAVEMENT
				SPT 2,3,3 N*=6		1		CL	FILL: Gravelly SAND: Fine to medium, pale brown, mottled orange-brown, dark grey, fine to medium subangular sandstone and shale gravel.	>Wp	F		BASE COARSE
					4				Silty CLAY: Medium plasticity, dark grey, mottled dark brown, trace fine rootlets.				ALLUVIUM
				SPT 2,4,4 N*=8		2		CH	Silty CLAY: High plasticity, dark grey, mottled red-brown, pale grey, trace of fine subround ironstone gravel.	<Wp	St		RESIDUAL SOIL
					3				SHALE: Dark brown to pale grey, orange-brown, highly weathered, low strength.				BEDROCK
				SPT 14,14,10 N*=24	2								
						3							
						4			Borehole BH2 terminated at 3.45m				
						5							
						6							
						7							
						8							
method				support		notes, samples, tests				classification symbols and soil description		consistency/density index	
AS auger screwing*				M mud N nil		U ₅₀ undisturbed sample 50mm diameter				based on unified classification system		VS very soft	
AD auger drilling*				C casing		U ₆₃ undisturbed sample 63mm diameter						S soft	
RR roller/tricone						D disturbed sample						F firm	
W washbore						N standard penetration test (SPT)						St stiff	
CT cable tool						N* SPT - sample recovered						VSt very stiff	
HA hand auger						Nc SPT with solid cone						H hard	
DT diatube						V vane shear (kPa)						Fb friable	
B blank bit						P pressuremeter						VL very loose	
V V bit						Bs bulk sample						L loose	
T TC bit						E environmental sample						MD medium dense	
*bit shown by suffix e.g. ADT						R refusal						D dense	
												VD very dense	

Borehole No. **BH3**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTLCOV24420AA**

Client: **Netball NSW, C/- Crown Project Services Pty Ltd**

Date started: **1.12.2011**

Principal:

Date completed: **1.12.2011**

Project: **Proposed Netball Central Development**

Logged by: **DB + AA**

Borehole Location: **(See Figure 1)**

Checked by: **DS**

drill model and mounting:		Mobile Drill B80 Truck		Easting:		slope: -90°		R.L. Surface: 5.4											
hole diameter:		100 mm		Northing		bearing: N/A		datum: AHD											
drilling information				material substance															
method	penetration	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations						
ADT	1 2 3	N		E	5	1			ASPHALT: 0.07m FILL: SAND: Medium to coarse, pale brown, mottled orange-brown, with a trace of fine subangular sandstone gravel. FILL: Silty CLAY: Low plasticity, black, dark brown, mottled red-brown, pale grey, orange-brown, trace of fine to medium, subangular to subround shale gravel.	D M <Wp			PAVEMENT BASECOARSE						
		Not Observed		SPT 3,3,9 N*=12									FILL						
				D	4			CH	Silty CLAY: High plasticity, dark brown, mottled dark grey, trace of fine subround ironstone gravel.	F-St			ALLUVIUM						
				U ₅₀		2		CH	Silty CLAY: High plasticity, pale grey, mottled red-brown, trace of fine subangular ironstone gravel.	VSt			RESIDUAL SOIL						
					3				SHALE: Pale grey to orange-brown, highly weathered, low strength.				BEDROCK						
				SPT R N*=R	2														
Borehole BH3 terminated at 3.45m																			
					4														
					1														
					5														
					0														
					6														
					-1														
					7														
					-2														
					8														
method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT				support M mud C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow				notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal				classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit				consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense			

Borehole No. **BH4**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTLCOV24420AA**

Client: **Netball NSW, C/- Crown Project Services Pty Ltd**

Date started: **1.12.2011**

Principal:

Date completed: **1.12.2011**

Project: **Proposed Netball Central Development**

Logged by: **DB**

Borehole Location: **(See Figure 1)**

Checked by: **DS**

drill model and mounting:		Mobile Drill B80 Truck		Easting:		slope: -90°		R.L. Surface: 6.8											
hole diameter:		100 mm		Northing		bearing: N/A		datum: AHD											
drilling information				material substance															
method	penetration	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations						
ADT	1 2 3	N		E					ASPHALT: 0.05m FILL: Sandy GRAVEL: Fine to medium, subangular to angular, pale grey, mottled orange-brown sandstone. Fine to coarse sand. FILL: Sandy GRAVEL: Fine to coarse, subangular, pale grey, mottled orange-brown, red-brown, shale. Sand is fine to coarse.	D M-D			PAVEMENT BASECOARSE FILL						
		Not Observed		SPT 5,5,6 N*=11	6	1													
				SPT 3,3,3 N*=6	5	2		CH	CLAY: High plasticity, pale grey, mottled red-brown, with some fine to medium, round to subround ironstone gravel.	<Wp	F-VSt		RESIDUAL SOIL						
				SPT 5,8,16 N*=24	4	3			SHALE: Pale grey, with some orange brown iron stained bands, extremely weathered to highly weathered, low to very low strength.				BEDROCK						
					3	4			Borehole BH4 terminated at 3.45m										
					2	5													
					1	6													
					0	7													
					-1	8													
method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT				support M mud C casing penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow				notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal				classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit				consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense			

Borehole No. **BH5**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTLCOV24420AA**

Client: **Netball NSW, C/- Crown Project Services Pty Ltd**

Date started: **1.12.2011**

Principal:

Date completed: **1.12.2011**

Project: **Proposed Netball Central Development**

Logged by: **DB + AA**

Borehole Location: **(See Figure 1)**

Checked by: **DS**

drill model and mounting:		Mobile Drill B80 Truck		Easting:		slope: -90°		R.L. Surface:		6.7			
hole diameter:		100 mm		Northing		bearing: N/A		datum:		AHD			
drilling information				material substance									
method	penetration	support	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations	
ADT	1 2 3	N	E					ASPHALT: 0.07m FILL: Gravelly SAND: Fine to coarse, pale brown, fine to medium, subangular sandstone gravel.	D D-M			PAVEMENT BASECOARSE	
		Not Observed			6			Borehole BH5 terminated at 0.5m				Orange caution tape observed at 0.5m indicating potential service	
					1								
					5								
					2								
					4								
					3								
					3								
					4								
					2								
					5								
					1								
					6								
					0								
					7								
					-1								
					8								
method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT				support M mud N nil C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow		notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal				classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit		consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense	

Borehole No. **BH6**

Engineering Log - Borehole

Client: **Netball NSW, C/- Crown Project Services Pty Ltd**

Principal:

Project: ***Proposed Netball Central Development***

Borehole Location: **(See Figure 1)**

Sheet 1 of 1

Project No: **GEOTLCOV24420AA**

Date started: **1.12.2011**Date completed: **1.12.2011**

Logged by: **DB + AA**

Checked by: **DS**

drill model and mounting:										Mobile Drill B80 Truck										Easting:										slope: -90°										R.L. Surface: 6.8									
hole diameter:										100 mm										Northing										bearing: N/A										datum: AHD									
drilling information										material substance																																							
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer				structure and additional observations																															
	1	2	3											kPa	100	200	300		400																														
ADT			N		E	-6	1		CH	ASPHALT: 0.07m	D-M	F-VSt	x	x	PAVEMENT BASECOARSE																																		
					D					FILL: Clayey SAND: Fine to medium, pale brown, mottled dark brown, orange-brown, with some fine to medium, subangular sandstone gravel.																																							
					SPT 2,2,4 N*=6					FILL: SAND: Fine to medium, dark grey, with some fine to medium, subangular sandstone gravel.																																							
										Silty CLAY: High plasticity, pale grey, mottled red-brown, with a trace of fine, subangular ironstone gravel.																																							
					SPT 4,10,7 N*=17	2			SHALE: Pale grey, mottled orange-brown, extremely weathered to highly weathered, low to very low strength.					BEDROCK																																			
										Borehole BH6 terminated at 3.45m																																							

Borehole No. **BH7**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTLCOV24420AA**

Client: **Netball NSW, C/- Crown Project Services Pty Ltd**

Date started: **1.12.2011**

Principal:

Date completed: **1.12.2011**

Project: **Proposed Netball Central Development**

Logged by: **AA + DB**

Borehole Location: **(See Figure 1)**

Checked by: **DS**

drill model and mounting:		Mobile Drill B80 Truck		Easting:		slope: -90°		R.L. Surface: 11.1					
hole diameter:		100 mm		Northing		bearing: N/A		datum: AHD					
drilling information				material substance									
method	penetration	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations
ADT	1 2 3	N		E	11				Sandy SILT: Dark brown, with a trace of fine roots.	M			TOPSOIL
				D					FILL: SAND: Fine to medium, brown to pale brown, with a trace of fine to medium, subangular shale gravel.				FILL
				SPT 3,3,2 N*=5		1			FILL: Sandy Gravelly CLAY: Medium plasticity, pale grey, mottled orange-brown, red-brown, fine to medium sand and fine to coarse subangular shale gravel.				
					10				FILL: Sandy GRAVEL: Medium to coarse, subangular to angular, pale grey, mottled orange-brown shale, fine to medium sand, trace of clay.	W		x	
				SPT 2,2,2 N*=4		2							
					9				FILL: Silty CLAY: High plasticity, red-brown, mottled dark grey, pale grey and orange-brown, with some fine to medium, subangular to angular shale and ironstone gravel.	>Wp			
				SPT 2,5,5 N*=10		3						x	
					8				FILL: Silty CLAY: Medium to high plasticity, pale brown, mottled dark brown, orange-brown, with some black carbonaceous layers and flecks, trace of fine rootlets.	>Wp			
				SPT 3,6,6 N*=12		4						x	
					7								
					6								
					5								
					4			CH	Silty CLAY: High plasticity, pale grey, mottled red-brown, orange-brown, with a trace of fine to medium sub angular ironstone gravel.	<Wp	St-VSt		RESIDUAL SOIL
					3								
					2								
					1								
					0				SHALE: Pale grey to orange-brown, highly weathered, low strength.				BEDROCK
					8				Borehole BH7 terminated at 7.8m				

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud C casing penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Borehole No. **BH8**

Engineering Log - Borehole

Sheet 1 of 1
Project No: **GEOTLCOV24420AA**

Client: **Netball NSW, C/- Crown Project Services Pty Ltd**

Date started: **1.12.2011**

Principal:

Date completed: **1.12.2011**

Project: ***Proposed Netball Central Development***

Logged by: **DB**

Borehole Location: **(See Figure 1)**

Checked by: **DS**

drill model and mounting:						Mobile Drill B80 Truck		Easting:		slope: -90°		R.L. Surface:		5.8			
hole diameter:						100 mm		Northing		bearing: N/A		datum:		AHD			
drilling information							material substance										
method	penetration			support water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/density index	pocket penetrometer kPa	structure and additional observations			
	1	2	3														
ADT				N						FILL: Sandy SILT: Dark brown, mottled pale brown, with some fine rootlets. FILL: Sandy CLAY: Medium plasticity, pale brown, mottled pale grey, fine to medium sand, with some fine to coarse, subangular shale and sandstone gravel. 1.20m - Becoming silty, with some red brown mottling.	M >Wp					TOPSOIL FILL	
					E												
					SPT 2,6,4 N*=10	5	1						X				
					SPT 2,4,4 N*=8	4	2						X				
					SPT 6,5,5 N*=10	3	3			FILL: Silty CLAY: Low to medium plasticity, dark brown, mottled pale grey, red brown, with some fine to medium, angular to subangular sandstone and shale gravel.				X			
						2	4			FILL: Silty CLAY: High plasticity, pale grey, mottled red brown, orange brown, trace of fine to medium, subrounded to rounded gravel.	<Wp						
					SPT 2,13,5 N*=18	1	5						X				
										Borehole BH8 terminated at 4.95m							
						0	6										
						-1	7										
						-2	8										
method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT						support M mud C casing penetration 1 2 3 4 water 10/1/98 water level on date shown water inflow water outflow		notes, samples, tests U ₃₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal				classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit				consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense	

Engineering Log - Excavation

Excavation No. **TP1**

Sheet 1 of 1

Project No: **GEOTLCOV24420AA**

Client: **Netball NSW, C/- Crown Project Services Pty Ltd**

Date started: **2.12.2011**

Principal:

Date completed: **2.12.2011**

Project: ***Proposed Netball Central Development***

Logged by: **DB + AA**

Test pit location: **(See Figure 1)**

Checked by: **DS**

equipment type and model: JCB 75t Backhoe						Pit Orientation:		Easting: m		R.L. Surface: 5.8				
excavation dimensions: 2.1m long 1.1m wide								Northing: m		datum: AHD				
excavation information						material substance								
method	penetration			support	water	notes samples, tests, etc	depth RL metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa 100 200 300 400	structure and additional observations
	1	2	3											
BH				N	Not observed	E				Silty Clayey SAND: Fine to medium grained, dark grey mottled brown. FILL: Sandy Silty CLAY: Low plasticity, dark brown, mottled red-brown and orange-brown, dark grey, fine to medium sand with some fine to coarse subangular to subrounded shale/sandstone gravel, trace of ceramic material. FILL: CLAY: High plasticity, pale brown, mottled orange-brown, with a trace of fine to medium sand and fine to medium, subround gravel. FILL: Sandy CLAY: Medium to high plasticity, pale grey, mottled dark grey, orange-brown, fine to medium sand, with some fine to medium, subangular, sandstone/shale gravel and red brick fragments.	M <Wp 			

Sketch

TESTPIT GEOTLCOV24420AA.GPJ COFFEY.GDT 12.15.11

Form GEO 5.2 Issue 3 Rev.2

method		support	notes, samples, tests		classification symbols and soil description		consistency/density index	
N	natural exposure	S shoring	N nil	U ₅₀ undisturbed sample 50mm diameter	based on unified classification system	VS	very soft	
X	existing excavation		U ₆₃ undisturbed sample 63mm diameter	S		soft		
BH	backhoe bucket		D disturbed sample	F		firm		
B	bulldozer blade		V vane shear (kPa)	St		stiff		
R	ripper		Bs bulk sample	VSt		very stiff		
E	excavator		E environmental sample	H		hard		
			R refusal	Fb	friable			
				VL	very loose			
				L	loose			
				MD	medium dense			
				D	dense			
				VD	very dense			

Engineering Log - Excavation

Client: **Netball NSW, C/- Crown Project Services Pty Ltd**

Date started: **2.12.2011**

Principal:

Date completed: **2.12.2011**

Project: **Proposed Netball Central Development**

Logged by: **DB**

Test pit location: **(See Figure 1)**

Checked by: **DS**

equipment type and model: JCB 75t Backhoe Pit Orientation: Easting: m R.L. Surface: 7.9
excavation dimensions: 2.2m long 1.1m wide Northing: m datum: AHD

excavation information					material substance				
method	penetration	support	water	notes samples, tests, etc	depth RL metres	graphic log	classification symbol	material	structure and additional observations
BH	1 2 3	N							
				E	7.5			FILL: Silty SAND: Fine to medium, dark grey, mottled black, with some fine rootlets.	TOPSOIL
				D	0.5			FILL: Sandy Gravelly CLAY: Low plasticity, orange-brown, mottled pale grey, fine to coarse sand and fine to coarse, subangular shale, sandstone and bitumen gravel.	FILL
				E					
				Bs 0.2-0.8m	7.0				
					1.0				
				D	6.5			FILL: CLAY: Medium to high plasticity, pale brown, mottled pale grey, with some fine to coarse subangular shale/sandstone gravel.	
					1.5				
					2.0				
					2.5				
				E	5.0		CH	Silty CLAY: High plasticity, orange-brown, mottled pale grey, trace of fine to medium, subangular ironstone gravel.	RESIDUAL SOIL
					3.0				
					4.5			Test pit TP2 terminated at 3.1m	
					4.0				

Sketch

method	support	notes, samples, tests	classification symbols and soil description	consistency/density index
N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator	S shoring N nil penetration 1 2 3 4 no resistance ranging to refusal water water level on date shown water inflow water outflow	U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample V vane shear (kPa) Bs bulk sample E environmental sample R refusal	based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit	VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense

Engineering Log - Excavation

Client: **Netball NSW, C/- Crown Project Services Pty Ltd**

Date started: **2.12.2011**

Principal:

Date completed: **2.12.2011**

Project: **Proposed Netball Central Development**

Logged by: **DB**

Test pit location: **(See Figure 1)**

Checked by: **DS**

equipment type and model: JCB 75t Backhoe Pit Orientation: Easting: m R.L. Surface: 8.1
excavation dimensions: 2.9m long 1.1m wide Northing: m datum: AHD

excavation information					material substance				
method	penetration	support	water	notes samples, tests, etc	depth RL metres	graphic log	classification symbol	material	structure and additional observations
BH	1 2 3	N			8.0			FILL: Silty Clayey SAND: Fine to medium, dark grey, mottled black.	TOPSOIL
					7.5			FILL: Sandy Gravelly CLAY: Medium plasticity, pale brown, mottled orange-brown, red-brown and pale grey, fine to coarse sand and fine to coarse, subangular shale, with some subangular shale cobbles <120mm.	FILL
					7.0				
					6.5			FILL: CLAY: Medium plasticity, pale grey, mottled red-brown, orange-brown, with some fine to medium sand, trace of fine to medium, subangular shale/ironstone gravel.	
					6.0				
					5.5				
					5.0		CL	Sandy CLAY: Low plasticity, pale brown, mottled red-brown, trace of fine, subangular to subround quartz gravel.	ALLUVIUM
					4.5		CH	Silty CLAY: High plasticity, pale grey, mottled red-brown, with a trace of fine, subangular ironstone gravel.	RESIDUAL SOIL
					4.0			Test pit TP3 terminated at 3.6m	

Sketch

method	support	notes, samples, tests	classification symbols and soil description	consistency/density index
N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator	S shoring N nil penetration 1 2 3 4 no resistance ranging to refusal water water level on date shown water inflow water outflow	U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample V vane shear (kPa) Bs bulk sample E environmental sample R refusal	based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit	VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense

Engineering Log - Excavation

Excavation No. **TP4**

Sheet 1 of 1

Project No: **GEOTLCOV24420AA**

Client: **Netball NSW, C/- Crown Project Services Pty Ltd**

Date started: **2.12.2011**

Principal:

Date completed: **2.12.2011**Project: **Proposed Netball Central Development**

Logged by: **DB**

Test pit location: **(See Figure 1)**

Checked by: **DS**

equipment type and model:	JCB 75t Backhoe	Pit Orientation:	Easting:	m	R.L. Surface:	10.5
excavation dimensions:	2.5m long 1.1m wide		Northing:	m	datum:	AHD

excavation information							material substance								
method	penetration			support	water	notes samples, tests, etc	depth RL metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations	
	1	2	3												
BH				N						FILL: Silty SAND: Fine to medium, dark grey, mottled black, with some fine rootlets.	M			TOPSOIL	
					D					FILL: Sandy Gravelly CLAY: Medium to high plasticity, pale grey, mottled orange-brown and red-brown, fine to medium sand with fine to coarse, subangular to angular shale gravel.	<Wp			FILL	
				Not observed	Bs D	10.0	0.5								
							9.5	1.0			1.2m - Trace of wood fragments.				
							9.0	1.5							
						D					FILL: CLAY: High plasticity, orange-brown, mottled pale brown and pale grey, trace of fine to coarse, subangular sandstone and shale gravel.				
							8.5	2.0							
						8.0	2.5			FILL: Sandy GRAVEL: Medium to coarse, subangular, pale grey, fine to coarse sand with some sandstone cobbles (<100mm).					
									CH	Silty CLAY: High plasticity, red-brown, mottled pale grey and orange-brown, trace of fine, subangular to subround ironstone gravel.	<Wp	St	x	RESIDUAL SOIL	
					D	7.5	3.0			Test pit TP4 terminated at 3m					
						7.0	3.5								
						6.5	4.0								

Sketch

method		support	notes, samples, tests		classification symbols and soil description		consistency/density index		
N	natural exposure	S shoring	N nil	U ₅₀ undisturbed sample 50mm diameter	based on unified classification system	VS	very soft		
X	existing excavation			U ₆₃ undisturbed sample 63mm diameter		S	soft		
BH	backhoe bucket			D disturbed sample		F	firm		
B	bulldozer blade			V vane shear (kPa)		St	stiff		
R	ripper			Bs bulk sample	moisture	VSt	very stiff		
E	excavator			E environmental sample		D	dry		
				R refusal	M	moist	H	hard	
						W	wet	Fb	friable
						Wp	plastic limit	VL	very loose
						W _L	liquid limit	L	loose
								MD	medium dense
								D	dense
								VD	very dense

Excavation No. **TP5**

Engineering Log - Excavation

Sheet 1 of 1

Project No: **GEOTLCOV24420AA**

Client: **Netball NSW, C/- Crown Project Services Pty Ltd**

Date started: **2.12.2011**

Principal:

Date completed: **2.12.2011**

Project: ***Proposed Netball Central Development***

Logged by: **DB**

Test pit location: **(See Figure 1)**

Checked by: **DS**

excavation type and model: JC8 75t Backhoe						Pit Orientation:		Easting: m		R.L. Surface: 11.4				
excavation dimensions: 2.5m long 1m wide						Northing: m		datum: AHD						
excavation information						material substance								
method	penetration			support	water	notes samples, tests, etc	depth RL metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations
	1	2	3											
BH				N		E				FILL: Silty SAND: Fine to medium, dark grey, mottled black, with some fine rootlets.				TOPSOIL
						D	11.0	0.5		FILL: Sandy Gravelly CLAY: Medium to high plasticity, pale grey, mottled red-brown and orange-brown, fine to medium sand and fine to coarse, subangular shale gravel.				FILL
							10.5	1.0		FILL: CLAY: High plasticity, pale brown, mottled pale grey, trace of fine to coarse, subangular shale gravel and cobbles <100mm.				
						D	10.0	1.5		FILL: Silty CLAY: High plasticity, pale brown, mottled orange-brown, dark grey, trace of fine to medium, subangular ironstone and shale gravel.				
						E	9.5	2.0						
							9.0	2.5						
							8.5	3.0		FILL: Gravelly CLAY: Medium plasticity, pale grey, mottled red-brown, fine to coarse, subangular to angular shale gravel.				
							8.0	3.5		Test pit TP5 terminated at 3.2m				
							7.5	4.0						

Sketch

method		support	notes, samples, tests		classification symbols and soil description		consistency/density index	
N	natural exposure	S shoring	N nil	U ₅₀ undisturbed sample 50mm diameter	based on unified classification system	VS	very soft	
X	existing excavation			U ₆₃ undisturbed sample 63mm diameter		S	soft	
BH	backhoe bucket			D disturbed sample	moisture D dry M moist W wet Wp plastic limit W _L liquid limit	F	firm	
B	bulldozer blade			V vane shear (kPa)		St	stiff	
R	ripper			Bs bulk sample		VSt	very stiff	
E	excavator			E environmental sample		H	hard	
				R refusal		Fb	friable	
						VL	very loose	
						L	loose	
						MD	medium dense	
					D	dense		
						VD	very dense	

Excavation No. **TP6**

Engineering Log - Excavation

Sheet 1 of 1

Project No: **GEOTLCOV24420AA**

Client: **Netball NSW, C/- Crown Project Services Pty Ltd**

Date started: **2.12.2011**

Principal:

Date completed: **2.12.2011**

Project: **Proposed Netball Central Development**

Logged by: **DB + AA**

Test pit location: **(See Figure 1)**

Checked by: **DS**

equipment type and model: JCB 75t Backhoe Pit Orientation: Easting: m R.L. Surface: 9.5
excavation dimensions: 2.5m long 1.1m wide Northing: m datum: AHD

excavation information						material substance									
method	penetration			support	water	notes samples, tests, etc	depth		graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations
	1	2	3				RL	metres							
BH				N	Not observed		9.0	0.5			FILL: Silty SAND: Fine to medium, dark grey, mottled black, with some fine rootlets. FILL: Sandy Gravelly CLAY: Low to medium plasticity, pale grey, mottled dark grey, red-brown, fine to medium sand and fine to coarse, subangular shale gravel. Test pit TP6 terminated at 0.4m	M			TOPSOIL FILL
					Not observed		9.0	0.5							Stormwater pipe observed at 0.4m
							8.5	1.0							
							8.0	1.5							
							7.5	2.0							
							7.0	2.5							
							6.5	3.0							
							6.0	3.5							
							5.5	4.0							

Sketch

method	support	notes, samples, tests	classification symbols and soil description	consistency/density index
N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator	S shoring N nil penetration 1 2 3 4 no resistance ranging to refusal water water level on date shown water inflow water outflow	U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample V vane shear (kPa) Bs bulk sample E environmental sample R refusal	based on unified classification system moisture D dry M moist W wet W _p plastic limit W _L liquid limit	VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense

Excavation No. **TP7**

Engineering Log - Excavation

Sheet 1 of 1

Project No: **GEOTLCOV24420AA**

Client: **Netball NSW, C/- Crown Project Services Pty Ltd**

Date started: **2.12.2011**

Principal:

Date completed: **2.12.2011**

Project: **Proposed Netball Central Development**

Logged by: **DB + AA**

Test pit location: **(See Figure 1)**

Checked by: **DS**

equipment type and model: JCB 75t Backhoe Pit Orientation: Easting: m R.L. Surface: 12.5
excavation dimensions: 2.2m long 1.1m wide Northing: m datum: AHD

excavation information					material substance				
method	penetration	support	water	notes samples, tests, etc	depth RL metres	graphic log	classification symbol	material	structure and additional observations
BH	1 2 3	N							
				E				FILL: Silty Clayey SAND: Fine to medium, dark grey, mottled black with some fine rootlets.	TOPSOIL
				Bs	12.0 0.5			FILL: Sandy Clay: Medium plasticity, pale brown, mottled dark grey with some concrete fragments and boulders, house bricks, linen and metal fragments.	FILL
					11.5 1.0				
				E	11.0 1.5			FILL: Silty CLAY: Medium to high plasticity, red-brown, mottled pale brown and pale grey, with some fine to medium, subangular shale gravel and metal fragments.	
					10.5 2.0				
					10.0 2.5			FILL: CLAY: High plasticity, dark brown, mottled orange-brown, with some fine to medium, subangular to subround ironstone and shale gravel.	
				D	9.5 3.0				
					9.0 3.5			Test pit TP7 terminated at 3.1m	
					8.5 4.0				

Sketch

method	support	notes, samples, tests	classification symbols and soil description	consistency/density index
N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator	S shoring N nil penetration 1 2 3 4 no resistance ranging to refusal water water level on date shown water inflow water outflow	U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample V vane shear (kPa) Bs bulk sample E environmental sample R refusal	based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit	VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense

Excavation No. **TP8**

Engineering Log - Excavation

Sheet 1 of 1

Project No: **GEOTLCOV24420AA**

Client: **Netball NSW, C/- Crown Project Services Pty Ltd**

Date started: **2.12.2011**

Principal:

Date completed: **2.12.2011**

Project: **Proposed Netball Central Development**

Logged by: **AA + DB**

Test pit location: **(See Figure 1)**

Checked by: **DS**

equipment type and model: JCB 75t Backhoe Pit Orientation: Easting: m R.L. Surface: 11.3
excavation dimensions: 2.2m long 1.1m wide Northing: m datum: AHD

excavation information					material substance				
method	penetration	support	water	notes samples, tests, etc	depth RL metres	graphic log	classification symbol	material	structure and additional observations
BH	1 2 3	N		E	11.0			FILL: Silty SAND: Fine to medium, dark grey with some fine rootlets.	TOPSOIL
					0.5			FILL: Sandy GRAVEL: Fine to coarse, subangular to angular, pale grey, mottled orange-brown, fine to coarse sand, trace of clay.	FILL
				Bs + D (0.2-0.40m)	10.5			1m - Some high plasticity, red-brown clay layers <100mm.	
				Not observed	1.0				
					1.5				
					2.0				
				D E	9.0			FILL: Gravelly CLAY: High plasticity, orange-brown and pale grey, fine to medium subangular shale gravel.	
					2.5				
					3.0				
					3.5			Test pit TP8 terminated at 3m	
					4.0				

Sketch

method	support	notes, samples, tests	classification symbols and soil description	consistency/density index
N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator	S shoring N nil penetration 1 2 3 4 no resistance ranging to refusal water water level on date shown water inflow water outflow	U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample V vane shear (kPa) Bs bulk sample E environmental sample R refusal	based on unified classification system moisture D dry M moist W wet W _p plastic limit W _L liquid limit	VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense

Appendix B

Dynamic Cone Penetration (DCP) Test Results

AS1289 F3.2 - 1984 Dynamic Cone Penetrometer Test

Sheet **1** of **2**

Client **Netball NSW, c/- Crown Project Services Pty Ltd**

Office **LCOV**

Principal

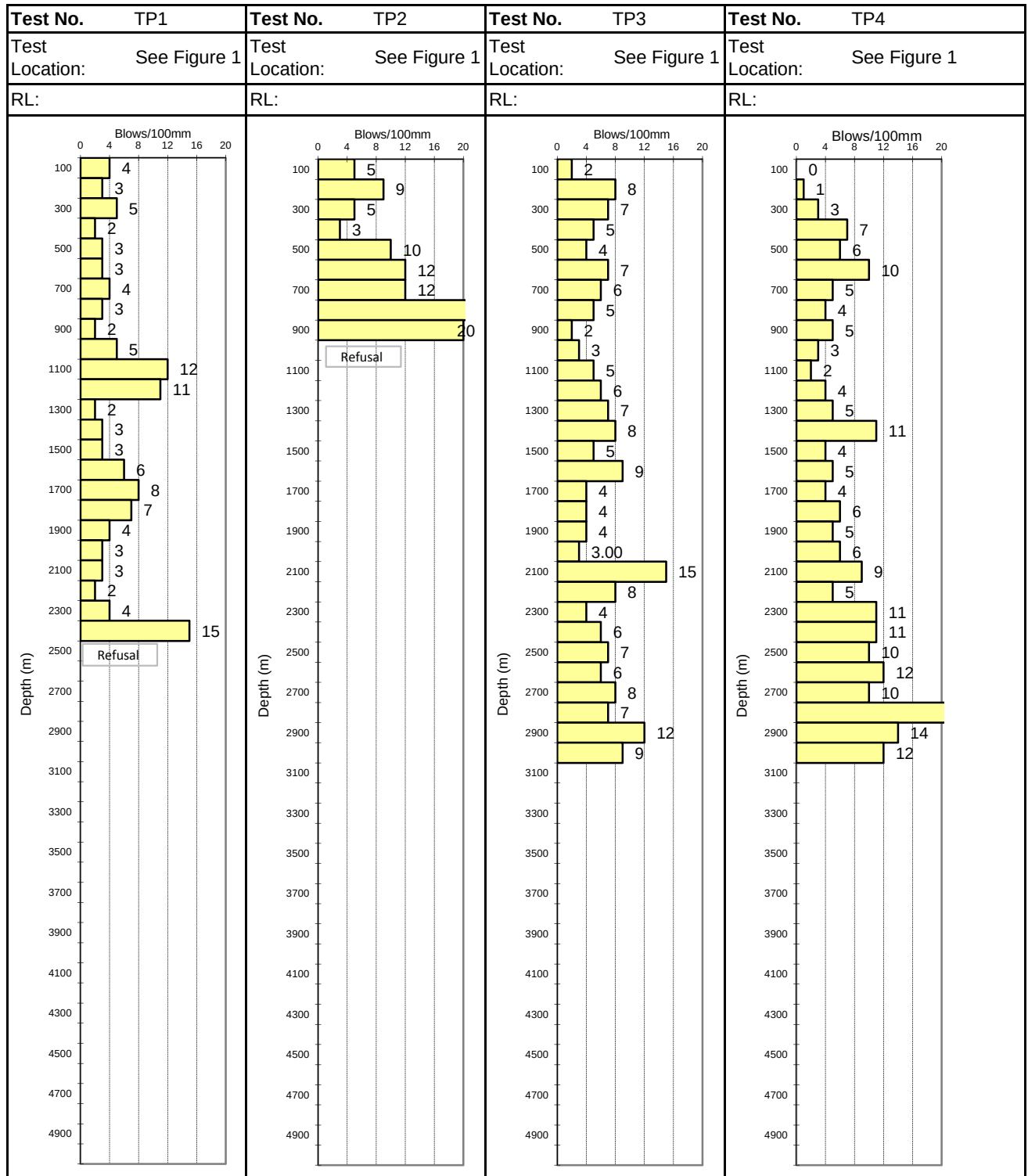
Date **12/1/2011**

Project **Proposed Netball Central Development**

By **DB + AA**

Location **See Figure 1**

Checked



AS1289 F3.2 - 1984 Dynamic Cone Penetrometer Test

Sheet **2** of **2**

Client **Netball NSW, c/- Crown Project Services Pty Ltd**

Office **LCOV**

Principal

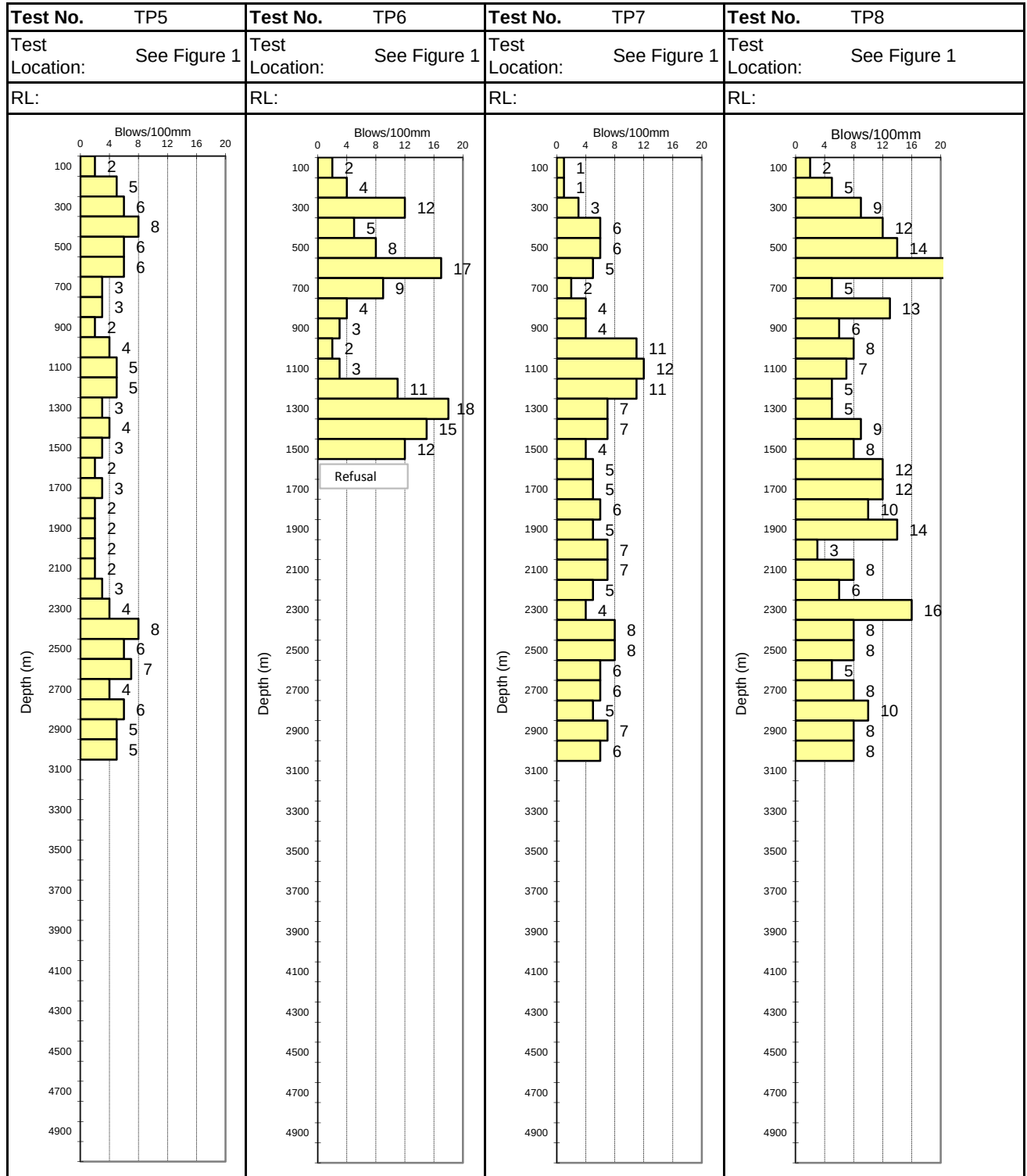
Date **12/1/2011**

Project **Proposed Netball Central Development**

By **DB + AA**

Location **See Figure 1**

Checked



Appendix C

Laboratory Test Results

Material Test Report

Report No: LCOV12S-00017-1

Issue No: 1

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:

Project No.: INFOLCOV00923AA

Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK

Lot No.: **TRN:**



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Approved Signatory: Garry Collins
(Specialised Testing Manager)

NATA Accredited Laboratory Number: 431
Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00017
Client Sample: TP3
Date Sampled: 02/12/2011
Source: Ex Job Site
Material: Subgrade
Specification: No Specification
Sampling Method: Submitted by client
Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT
Sample Location: TP3 (2.80 to 3.00 m)

Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	24.2	
Date Tested		3/01/2012	
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	11.5	
Mould Length (mm)		127.2	
Crumbling		No	
Curling		Yes	
Liquid Limit (%)	AS 1289.3.1.2	61	
Method		One Point	
Plastic Limit (%)	AS 1289.3.2.1	24	
Plasticity Index (%)	AS 1289.3.3.1	37	
Date Tested		19/01/2012	

Comments

N/A

Material Test Report

Report No: LCOV12S-00019-1

Issue No: 1

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:

Project No.: INFOLCOV00923AA

Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK

Lot No.: **TRN:**



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Approved Signatory: Garry Collins
(Specialised Testing Manager)

NATA Accredited Laboratory Number: 431
Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00019
Client Sample: BH7
Date Sampled: 02/12/2011
Source: Ex Job Site
Material: Subgrade
Specification: No Specification
Sampling Method: Submitted by client
Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT
Sample Location: BH7 (4.50 to 4.95 m)

Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	34.0	
Date Tested		3/01/2012	
Sample History	AS 1289.1.1		
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	11.0	
Mould Length (mm)		250.2	
Crumbling		No	
Curling		Yes	
Liquid Limit (%)	AS 1289.3.1.2	48	
Method		One Point	
Plastic Limit (%)	AS 1289.3.2.1	22	
Plasticity Index (%)	AS 1289.3.3.1	26	
Date Tested		19/01/2012	

Comments

N/A

Material Test Report

Report No: LCOV12S-00016-1

Issue No: 1

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:

Project No.: INFOLCOV00923AA

Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK

Lot No.: **TRN:**



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Approved Signatory: Garry Collins
(Specialised Testing Manager)

NATA Accredited Laboratory Number: 431
Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00016
Client Sample: BH4
Date Sampled: 02/12/2011
Source: Ex Job Site
Material: Subgrade
Specification: No Specification
Sampling Method: Submitted by client
Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT
Sample Location: BH4 (1.50 to 1.95 m)

Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	21.8	
Date Tested		3/01/2012	
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	14.5	
Mould Length (mm)		254.7	
Crumbling		No	
Curling		Yes	
Liquid Limit (%)	AS 1289.3.1.2	69	
Method		One Point	
Plastic Limit (%)	AS 1289.3.2.1	23	
Plasticity Index (%)	AS 1289.3.3.1	46	
Date Tested		19/01/2012	

Comments

N/A

Material Test Report

Report No: LCOV12S-00018-1

Issue No: 1

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:

Project No.: INFOLCOV00923AA

Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK

Lot No.: **TRN:**



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Approved Signatory: Garry Collins
(Specialised Testing Manager)

NATA Accredited Laboratory Number: 431
Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00018
Client Sample: BH3
Date Sampled: 02/12/2011
Source: Ex Job Site
Material: Subgrade
Specification: No Specification
Sampling Method: Submitted by client
Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT
Sample Location: BH3 (0.50 to 0.95 m)

Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	18.4	
Date Tested		3/01/2012	
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	8.5	
Mould Length (mm)		125.4	
Crumbling		No	
Curling		Yes	
Liquid Limit (%)	AS 1289.3.1.2	38	
Method		One Point	
Plastic Limit (%)	AS 1289.3.2.1	19	
Plasticity Index (%)	AS 1289.3.3.1	19	
Date Tested		19/01/2012	

Comments

N/A

Material Test Report

Report No: LCOV12S-00015-1

Issue No: 1

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:

Project No.: INFOLCOV00923AA

Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK

Lot No.: **TRN:**



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Approved Signatory: Garry Collins
(Specialised Testing Manager)

NATA Accredited Laboratory Number: 431
Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00015
Client Sample: BH2
Date Sampled: 02/12/2011
Source: Ex Job Site
Material: Subgrade
Specification: No Specification
Sampling Method: Submitted by client
Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT
Sample Location: BH2 (1.50 to 1.95 m)

Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	25.2	
Date Tested		20/01/2012	
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	16.5	
Mould Length (mm)		254.2	
Crumbling		Yes	
Curling		No	
Liquid Limit (%)	AS 1289.3.1.2	61	
Method		One Point	
Plastic Limit (%)	AS 1289.3.2.1	23	
Plasticity Index (%)	AS 1289.3.3.1	38	
Date Tested		19/01/2012	

Comments

N/A

Material Test Report

Report No: LCOV12S-00014-1

Issue No: 1

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:

Project No.: INFOLCOV00923AA

Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK

Lot No.: **TRN:**



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Approved Signatory: Garry Collins
(Specialised Testing Manager)

NATA Accredited Laboratory Number: 431
Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00014
Client Sample: BH2
Date Sampled: 02/12/2011
Source: Ex Job Site
Material: Subgrade
Specification: No Specification
Sampling Method: Submitted by client
Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT
Sample Location: BH2 (0.50 to 0.95 m)

Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	17.9	
Date Tested		3/01/2012	
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	10.5	
Mould Length (mm)		127.4	
Crumbling		No	
Curling		Yes	
Liquid Limit (%)	AS 1289.3.1.2	38	
Method		One Point	
Plastic Limit (%)	AS 1289.3.2.1	18	
Plasticity Index (%)	AS 1289.3.3.1	20	
Date Tested		19/01/2012	

Comments

N/A

Report No: CBR:LCOV12S-00013

Issue No: 1

California Bearing Ratio Test Report

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:

Project No.: INFOLCOV00923AA

Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK

Lot No.: **TRN:**



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Approved Signatory: Garry Collins
(Specialised Testing Manager)
NATA Accredited Laboratory Number: 431
Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00013

Date Sampled: 2/01/2012

Date Submitted: 13/12/2011

Date Tested: 17/01/2012

Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT

Sample Location: TP8 (0.20 to 1.20 m)

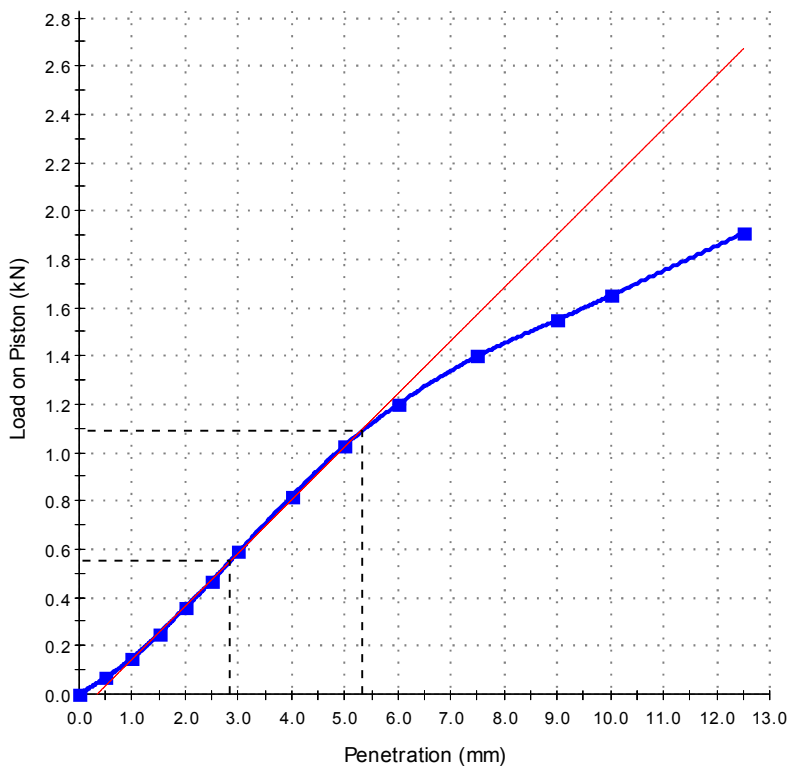
Sampling Method: Submitted by client

Material: Subgrade

Source: Ex Job Site

Specification: No Specification

Load vs Penetration



Test Results

AS 1289.6.1.1

CBR At 5.0mm (%): **6**

Maximum Dry Density (t/m³): 1.76

Optimum Moisture Content (%): 19.3

Dry Density before Soaking (t/m³): 1.76

Density Ratio before Soaking (%): 100

Moisture Content before Soaking (%): 19.3

Moisture Ratio before Soaking (%): 100

Dry Density after Soaking (t/m³): 1.76

Density Ratio after Soaking (%): 100

Moisture Content of Top 30mm (%): 22.0

Moisture Content of Remaining Depth (%): 17.2

Compactive Effort: Standard

Surcharge Mass (kg): 4.50

Period of Soaking (Days): 4

Oversize Material: Excluded

Oversize Material (%): 21.9

Comments

Report No: CBR:LCOV12S-00012

Issue No: 1

California Bearing Ratio Test Report

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:
Project No.: INFOLCOV00923AA
Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK
Lot No.: **TRN:**



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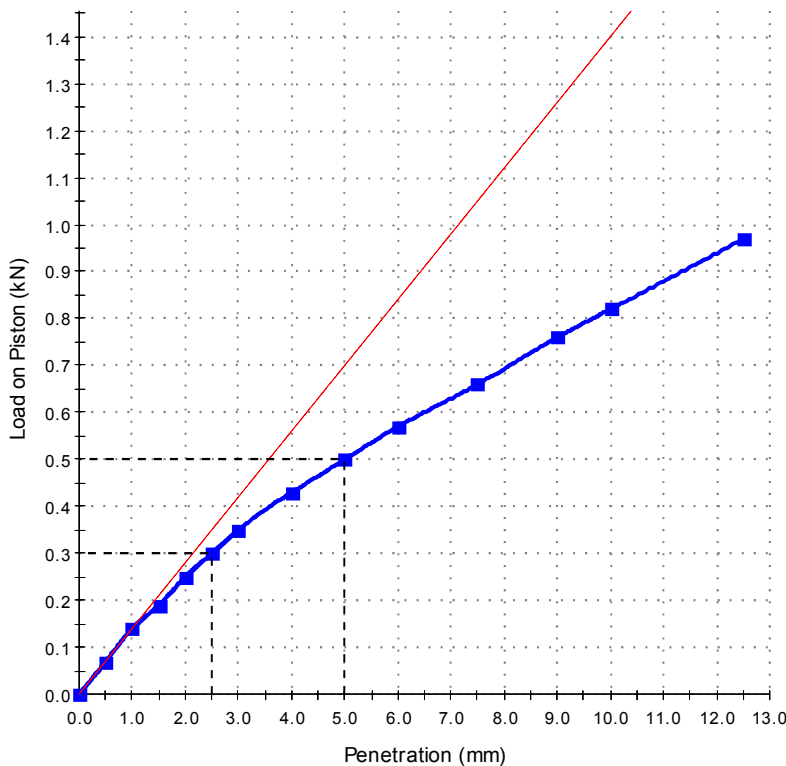
Garry Collins

Approved Signatory: Garry Collins
(Specialised Testing Manager)
NATA Accredited Laboratory Number: 431
Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00012	Sampling Method: Submitted by client
Date Sampled: 2/01/2012	Material: Subgrade
Date Submitted: 13/12/2011	Source: Ex Job Site
Date Tested: 17/01/2012	Specification: No Specification
Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT	
Sample Location: TP7 (0.20 to 1.00 m)	

Load vs Penetration



Test Results

AS 1289.6.1.1

CBR At 5.0mm (%):	2.5
Maximum Dry Density (t/m³):	1.76
Optimum Moisture Content (%):	15.6
Dry Density before Soaking (t/m³):	1.76
Density Ratio before Soaking (%):	100
Moisture Content before Soaking (%):	15.6
Moisture Ratio before Soaking (%):	100
Dry Density after Soaking (t/m³):	1.72
Density Ratio after Soaking (%):	98
Swell (%):	2.5
Moisture Content of Top 30mm (%):	25.6
Moisture Content of Remaining Depth (%):	18.6
Compactive Effort:	Standard
Surcharge Mass (kg):	4.50
Period of Soaking (Days):	4
Oversize Material:	Excluded
Oversize Material (%):	14.4

Comments

Report No: CBR:LCOV12S-00011

Issue No: 1

California Bearing Ratio Test Report

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:

Project No.: INFOLCOV00923AA

Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK

Lot No.: **TRN:**



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Garry Collins

Approved Signatory: Garry Collins
(Specialised Testing Manager)
NATA Accredited Laboratory Number: 431
Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00011

Date Sampled: 2/12/2011

Date Submitted: 13/12/2011

Date Tested: 17/01/2012

Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT

Sample Location: TP4 (0.20 to 0.60 m)

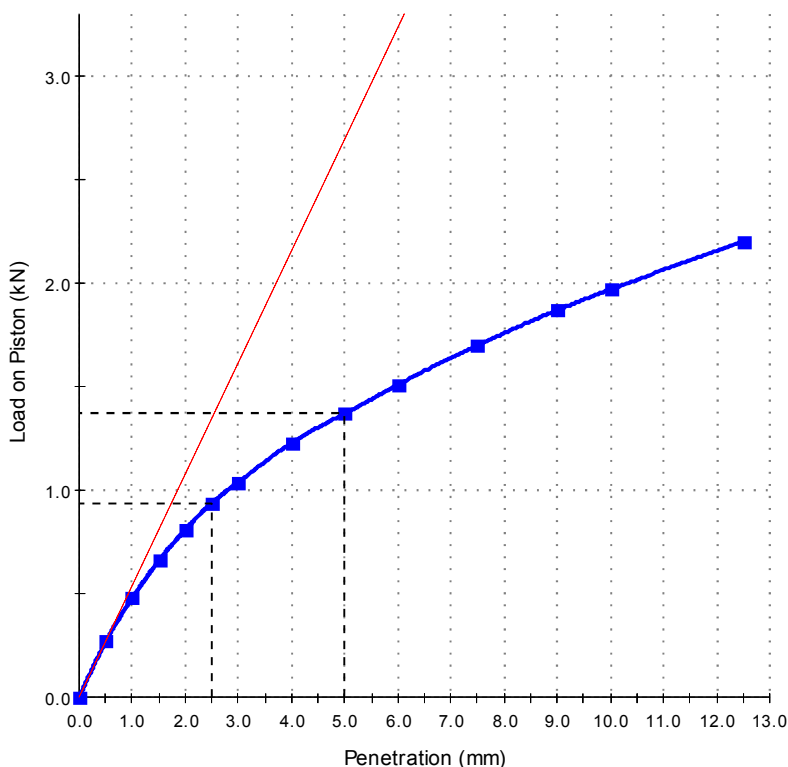
Sampling Method: Submitted by client

Material: Subgrade

Source: Ex Job Site

Specification: No Specification

Load vs Penetration



Test Results

AS 1289.6.1.1

CBR At 2.5mm (%):	7
Maximum Dry Density (t/m³):	1.73
Optimum Moisture Content (%):	18.9
Dry Density before Soaking (t/m³):	1.73
Density Ratio before Soaking (%):	100
Moisture Content before Soaking (%):	18.7
Moisture Ratio before Soaking (%):	99
Dry Density after Soaking (t/m³):	1.72
Density Ratio after Soaking (%):	99
Swell (%):	0.5
Moisture Content of Top 30mm (%):	23.2
Moisture Content of Remaining Depth (%):	18.7
Compactive Effort:	Standard
Surcharge Mass (kg):	4.50
Period of Soaking (Days):	4
Oversize Material:	Excluded
Oversize Material (%):	5.6

Comments

Report No: CBR:LCOV12S-00010

Issue No: 1

California Bearing Ratio Test Report

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:

Project No.: INFOLCOV00923AA

Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK

Lot No.: **TRN:**



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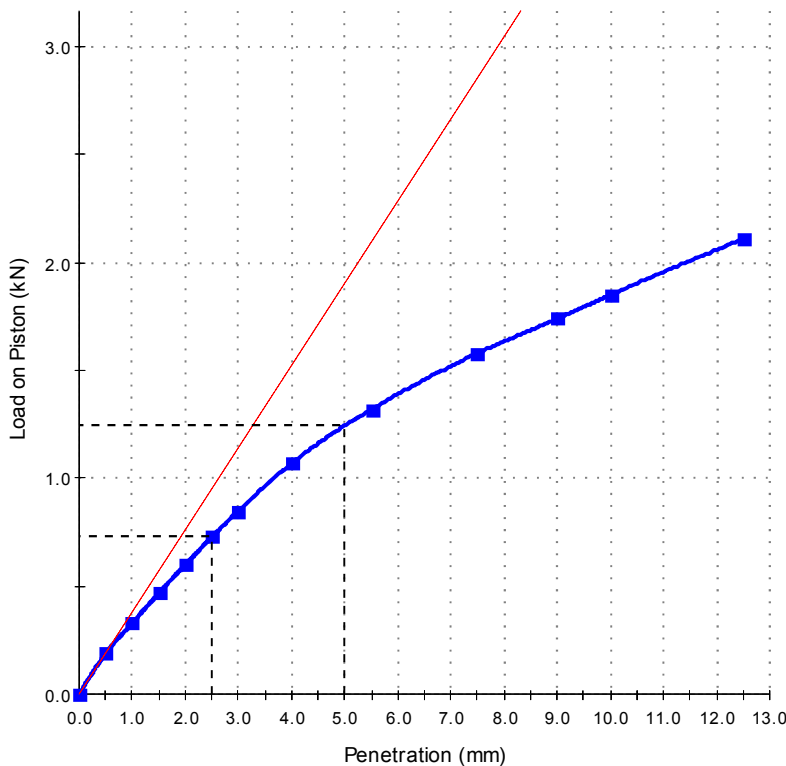
Garry Collins

Approved Signatory: Garry Collins
(Specialised Testing Manager)
NATA Accredited Laboratory Number: 431
Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00010	Sampling Method: Submitted by client
Date Sampled: 2/12/2011	Material: Subgrade
Date Submitted: 13/12/2011	Source: Ex Job Site
Date Tested: 17/01/2012	Specification: No Specification
Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT	
Sample Location: TP2 (0.20 to 0.80 m)	

Load vs Penetration



Test Results

AS 1289.6.1.1

CBR At 5.0mm (%):	6
Maximum Dry Density (t/m ³):	1.98
Optimum Moisture Content (%):	11.7
Dry Density before Soaking (t/m ³):	1.98
Density Ratio before Soaking (%):	100
Moisture Content before Soaking (%):	11.6
Moisture Ratio before Soaking (%):	99
Dry Density after Soaking (t/m ³):	1.97
Density Ratio after Soaking (%):	99
Swell (%):	1.0
Moisture Content of Top 30mm (%):	16.8
Moisture Content of Remaining Depth (%):	12.7
Compactive Effort:	Standard
Surcharge Mass (kg):	4.50
Period of Soaking (Days):	4
Oversize Material:	Excluded
Oversize Material (%):	3.5

Comments

PARTICLE SIZE DISTRIBUTION

Client: **COFFEY GEOTECHNICS PTY LTD. (GEOTLCOV24420AA)**

Job No: **INFOLCOV00923AA**

Principal:

Laboratory: **Lane Cove West**

Project: **PROPOSED NETBALL CENTRAL DEVELOPMENT**

Report Date: **21-Dec-11**

Location: **SYDNEY OLYMPIC PARK**

Test report No: **IOLT 5232**

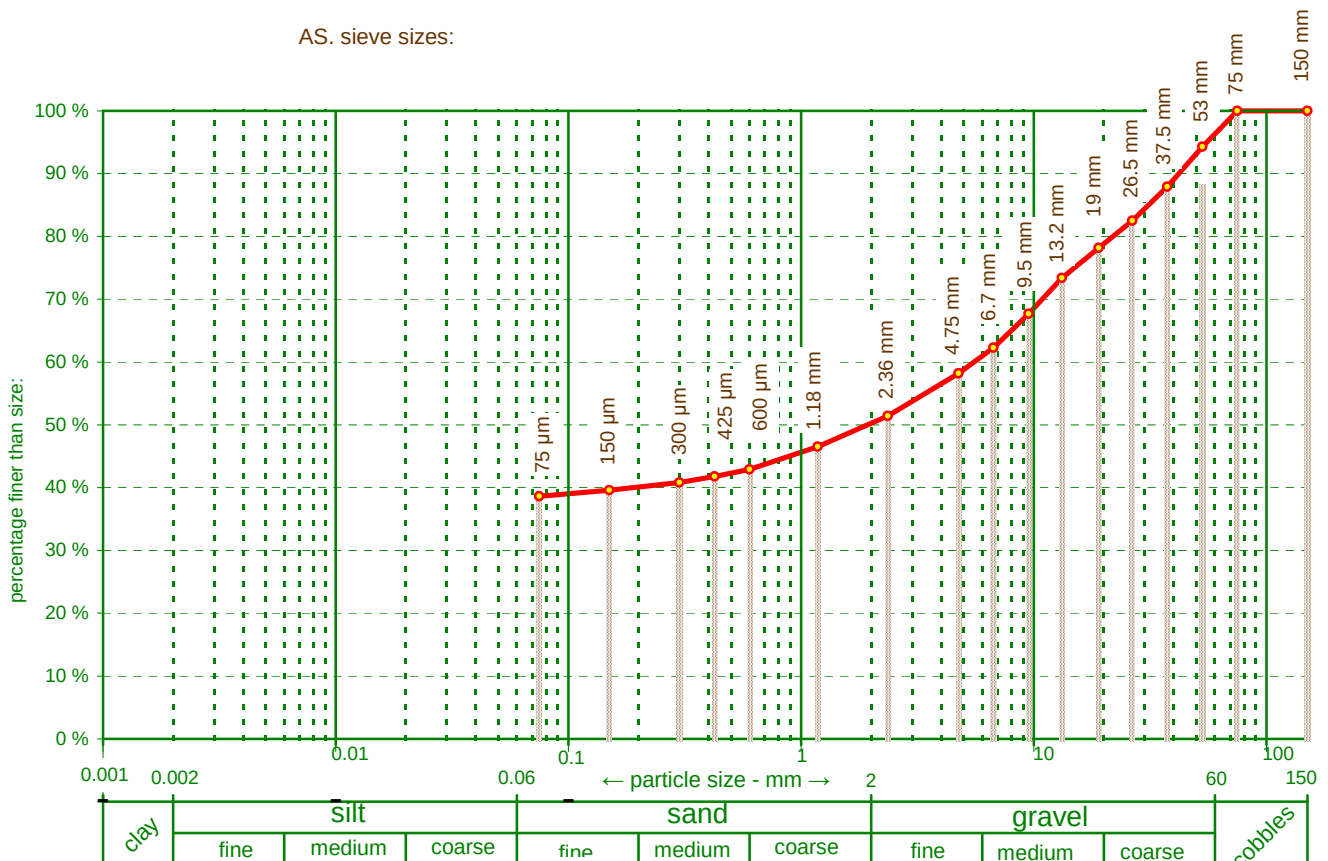
Test procedure: **AS1289.3.6.1:3.6.3**

Depth: **0.20 to 1.20m**

Sample No: **LCOV12S - 00013**

Sample Identification: **TP8**

AS. sieve sizes:



Sieve Analysis		Hydrometer Analysis		ATTERBERG LIMITS		Procedures
Sieve Size mm	% Passing	Particle Size µm	% Passing			
75	100			Liquid Limit	%	AS1289 3.1.1
53	94			Plastic Limit	%	AS1289 3.2.1
37.5	88			Plasticity Index		AS1289 3.3.1
26.5	83			Linear Shrinkage	%	AS1289 3.4.1
19	78			Mould Length	mm	
13.2	73			Crumbling &/or Curling		
9.5	68			Sample History	Oven Dried ☐ Air Dried ☐	
6.7	62			Sample Preparation	Dry Sieved ☐ Wet Sieved ☐	
4.75	58			NOTES: Loss of mass in pretreatment: No pretreatment. Dispersion method: Sodium hexametaphosphate and Sodium carbonate Type of hydrometer: ASTM Soil Particle density: N/A Moisture Content (as received) 17.3% N.D. = not determined N.O.= not obtainable		
2.36	51					
1.18	47					
600 µm	43					
425 µm	42					
300 µm	41					
150 µm	40					
75 µm	39					

Page 1 of 1

F:\INFO\01. Laboratory\01 - INFOLCOV Jobs\INFOLCOV 00923AA - SYDNEY OLYMPIC PARK\TP8 (0.2 to 1.2 m) GRADING REPORT.xls\Report



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NATA Accredited Laboratory No. 431

Approved Signatory:

Garry Collins

Associate/Laboratory Manager

Date:

20 January 12

PARTICLE SIZE DISTRIBUTION

Client: **COFFEY GEOTECHNICS PTY LTD. (GEOTLCOV24420AA)**

Job No: **INFOLCOV00923AA**

Principal:

Laboratory: **Lane Cove West**

Project: **PROPOSED NETBALL CENTRAL DEVELOPMENT**

Report Date: **20-Jan-12**

Location: **SYDNEY OLYMPIC PARK**

Test report No: **IOLT 5233**

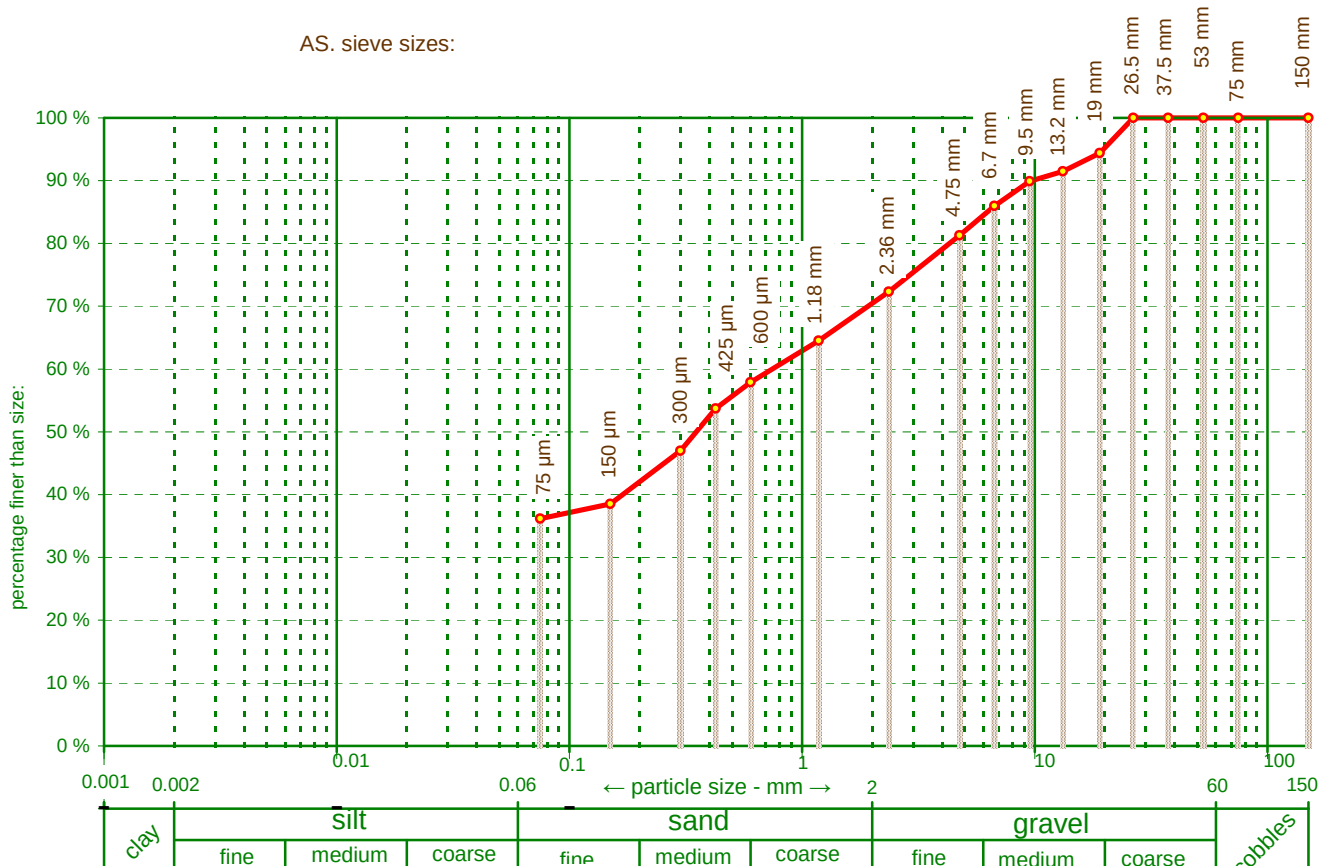
Test procedure: **AS1289.3.6.1:3.6.3**

Depth: **0.50 to 0.95 m**

Sample No: **LCOV12S - 00030**

Sample Identification: **BH4**

AS. sieve sizes:



Sieve Analysis		Hydrometer Analysis		ATTERBERG LIMITS		Procedures
Sieve Size mm	% Passing	Particle Size µm	% Passing			
75	100			Liquid Limit	%	AS1289 3.1.1
53	100			Plastic Limit	%	AS1289 3.2.1
37.5	100			Plasticity Index		AS1289 3.3.1
26.5	100			Linear Shrinkage	%	AS1289 3.4.1
19	94			Mould Length	mm	
13.2	92			Crumbling &/or Curling		
9.5	90			Sample History	Oven Dried ☐ Air Dried ☐	
6.7	86			Sample Preparation	Dry Sieved ☐ Wet Sieved ☐	
4.75	81			NOTES: Loss of mass in pretreatment: No pretreatment. Dispersion method: Sodium hexametaphosphate and Sodium carbonate Type of hydrometer: ASTM Soil Particle density: N/A Moisture Content (as received) 11.5% N.D. = not determined N.O.= not obtainable		
2.36	72					
1.18	65					
600 µm	58					
425 µm	54					
300 µm	47					
150 µm	39					
75 µm	36					

Page 1 of 1

F:\INFO\01. Laboratory\01 - INFOLCOV Jobs\INFOLCOV 00923AA - SYDNEY OLYMPIC PARK\BH4 (0.5 to 0.95 m) GRADING REPORT.xls\Report



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NATA Accredited Laboratory No. 431

Approved Signatory:

Garry Collins

Associate/Laboratory Manager

Date:

20 January 12

Material Test Report

Report No: LCOV12S-00029-1

Issue No: 1

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:

Project No.: INFOLCOV00923AA

Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK

Lot No.: **TRN:**



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Approved Signatory: Garry Collins

(Specialised Testing Manager)

NATA Accredited Laboratory Number: 431

Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00029
Client Sample: TP2
Date Sampled: 02/12/2011
Source: Ex Job Site
Material: Subgrade
Specification: No Specification
Sampling Method: Submitted by client
Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT
Sample Location: TP2 (2.60 to 2.80 m)

Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	26.9	
Date Tested		28/12/2011	

Comments

N/A

Material Test Report

Report No: LCOV12S-00025-1

Issue No: 1

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:

Project No.: INFOLCOV00923AA

Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK

Lot No.: **TRN:**



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Approved Signatory: Garry Collins

(Specialised Testing Manager)

NATA Accredited Laboratory Number: 431

Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00025
Client Sample: BH8
Date Sampled: 02/12/2011
Source: Ex Job Site
Material: Subgrade
Specification: No Specification
Sampling Method: Submitted by client
Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT
Sample Location: BH8 (4.50 to 4.95 m)

Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	26.1	
Date Tested		28/12/2011	

Comments

N/A

Material Test Report

Report No: LCOV12S-00024-1

Issue No: 1

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:

Project No.: INFOLCOV00923AA

Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK

Lot No.: **TRN:**



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Approved Signatory: Garry Collins

(Specialised Testing Manager)

NATA Accredited Laboratory Number: 431

Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00024
Client Sample: BH8
Date Sampled: 02/12/2011
Source: Ex Job Site
Material: Subgrade
Specification: No Specification
Sampling Method: Submitted by client
Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT
Sample Location: BH8 (3.00 to 3.45 m)

Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	21.5	
Date Tested		28/12/2011	

Comments

N/A

Material Test Report

Report No: LCOV12S-00023-1

Issue No: 1

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:

Project No.: INFOLCOV00923AA

Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK

Lot No.: **TRN:**



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NATA Accredited Laboratory Number: 431
Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00023
Client Sample: BH8
Date Sampled: 02/12/2011
Source: Ex Job Site
Material: Subgrade
Specification: No Specification
Sampling Method: Submitted by client
Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT
Sample Location: BH8 (0.50 to 0.95 m)

Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	14.8	
Date Tested		28/12/2011	

Comments

N/A

Material Test Report

Report No: LCOV12S-00022-1

Issue No: 1

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:

Project No.: INFOLCOV00923AA

Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK

Lot No.: **TRN:**



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Approved Signatory: Garry Collins
(Specialised Testing Manager)

NATA Accredited Laboratory Number: 431
Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00022
Client Sample: BH7
Date Sampled: 02/12/2011
Source: Ex Job Site
Material: Subgrade
Specification: No Specification
Sampling Method: Submitted by client
Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT
Sample Location: BH7 (7.20 to 7.60 m)

Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	7.4	
Date Tested		28/12/2011	

Comments

N/A

Material Test Report

Report No: LCOV12S-00021-1

Issue No: 1

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:

Project No.: INFOLCOV00923AA

Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK

Lot No.: **TRN:**



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Approved Signatory: Garry Collins
(Specialised Testing Manager)

NATA Accredited Laboratory Number: 431
Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00021
Client Sample: BH7
Date Sampled: 02/12/2011
Source: Ex Job Site
Material: Subgrade
Specification: No Specification
Sampling Method: Submitted by client
Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT
Sample Location: BH7 (1.50 to 1.95 m)

Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	16.8	
Date Tested		28/12/2011	

Comments

N/A

Material Test Report

Report No: LCOV12S-00020-1

Issue No: 1

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:

Project No.: INFOLCOV00923AA

Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK

Lot No.: **TRN:**



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NATA Accredited Laboratory Number: 431

Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00020
Client Sample: BH7
Date Sampled: 02/12/2011
Source: Ex Job Site
Material: Subgrade
Specification: No Specification
Sampling Method: Submitted by client
Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT
Sample Location: BH7 (0.50 to 0.95 m)

Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	14.5	
Date Tested		28/12/2011	

Comments

N/A

Material Test Report

Report No: LCOV12S-00028-1

Issue No: 1

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:

Project No.: INFOLCOV00923AA

Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK

Lot No.: **TRN:**



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Approved Signatory: Garry Collins
(Specialised Testing Manager)

NATA Accredited Laboratory Number: 431
Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00028
Client Sample: BH6
Date Sampled: 02/12/2011
Source: Ex Job Site
Material: Subgrade
Specification: No Specification
Sampling Method: Submitted by client
Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT
Sample Location: BH6 (0.50 to 0.95 m)

Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	20.7	
Date Tested		28/12/2011	

Comments

N/A

Material Test Report

Report No: LCOV12S-00027-1

Issue No: 1

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:

Project No.: INFOLCOV00923AA

Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK

Lot No.: **TRN:**



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Approved Signatory: Garry Collins
(Specialised Testing Manager)

NATA Accredited Laboratory Number: 431
Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00027
Client Sample: BH1
Date Sampled: 02/12/2011
Source: Ex Job Site
Material: Subgrade
Specification: No Specification
Sampling Method: Submitted by client
Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT
Sample Location: BH1 (1.50 to 1.95 m)

Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	25.6	
Date Tested		28/12/2011	

Comments

N/A

Report No: MDD:LCOV12S-00013

Issue No: 1

Maximum Dry Density Report

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:
Project No.: INFOLCOV00923AA
Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK
Lot No.: **TRN:**



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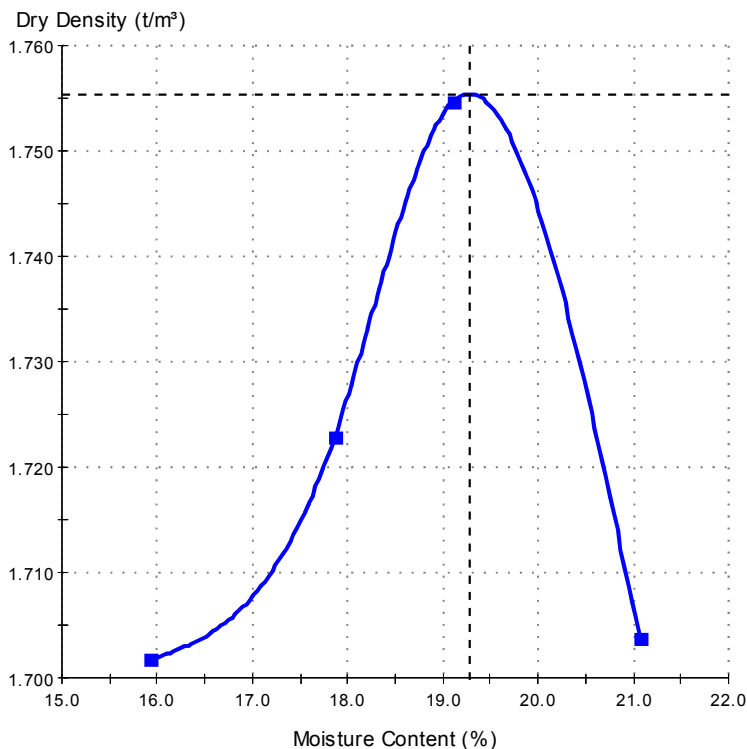
Approved Signatory: Garry Collins
(Specialised Testing Manager)
NATA Accredited Laboratory Number:431
Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00013
Date Sampled: 2/01/2012
Date Submitted: 13/12/2011
Date Tested: 5/01/2012
Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT
Sample Location: TP8 (0.20 to 1.20 m)

Sampling Method: Submitted by client
Material: Subgrade
Source: Ex Job Site
Specification: No Specification

Dry Density - Moisture Content Relationship



Test Results

AS 1289.5.1.1

Standard MDD (t/m³): 1.76
Standard OMC (%): 19.5
Retained Sieve 19.0mm (%): 22

Comments

Report No: MDD:LCOV12S-00012

Issue No: 1

Maximum Dry Density Report

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:

Project No.: INFOLCOV00923AA

Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK

Lot No.: **TRN:**



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Garry Collins

Approved Signatory: Garry Collins
(Specialised Testing Manager)

NATA Accredited Laboratory Number:431
Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00012

Sampling Method: Submitted by client

Date Sampled: 2/01/2012

Material: Subgrade

Date Submitted: 13/12/2011

Source: Ex Job Site

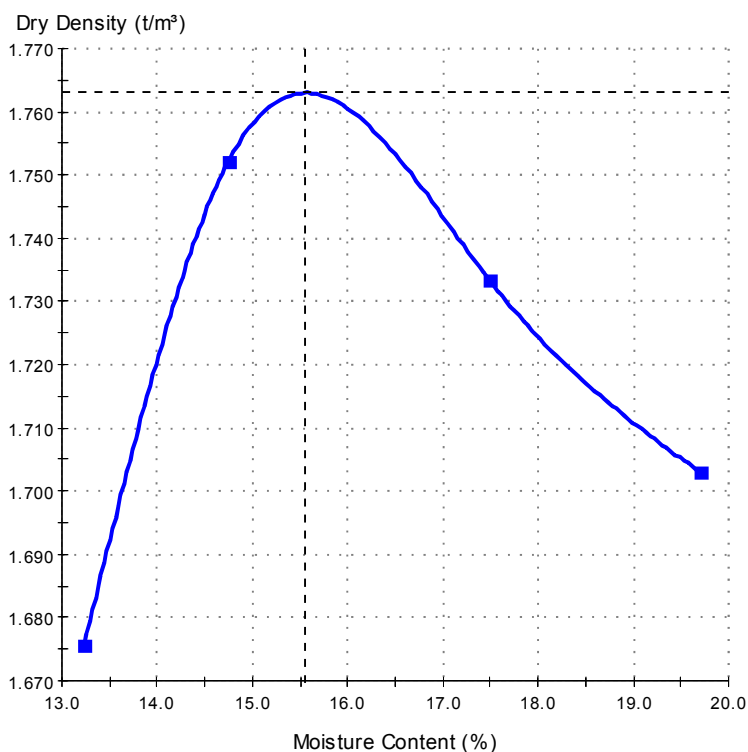
Date Tested: 5/01/2012

Specification: No Specification

Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT

Sample Location: TP7 (0.20 to 1.00 m)

Dry Density - Moisture Content Relationship



Test Results

AS 1289.5.1.1

Standard MDD (t/m³): **1.76**

Standard OMC (%): **15.5**

Retained Sieve 19.0mm (%): 14

Comments

Report No: MDD:LCOV12S-00011

Issue No: 1

Maximum Dry Density Report

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:

Project No.: INFOLCOV00923AA

Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK

Lot No.: **TRN:**



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Approved Signatory: Garry Collins
(Specialised Testing Manager)
NATA Accredited Laboratory Number: 431
Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00011

Date Sampled: 2/12/2011

Date Submitted: 13/12/2011

Date Tested: 5/01/2012

Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT

Sample Location: TP4 (0.20 to 0.60 m)

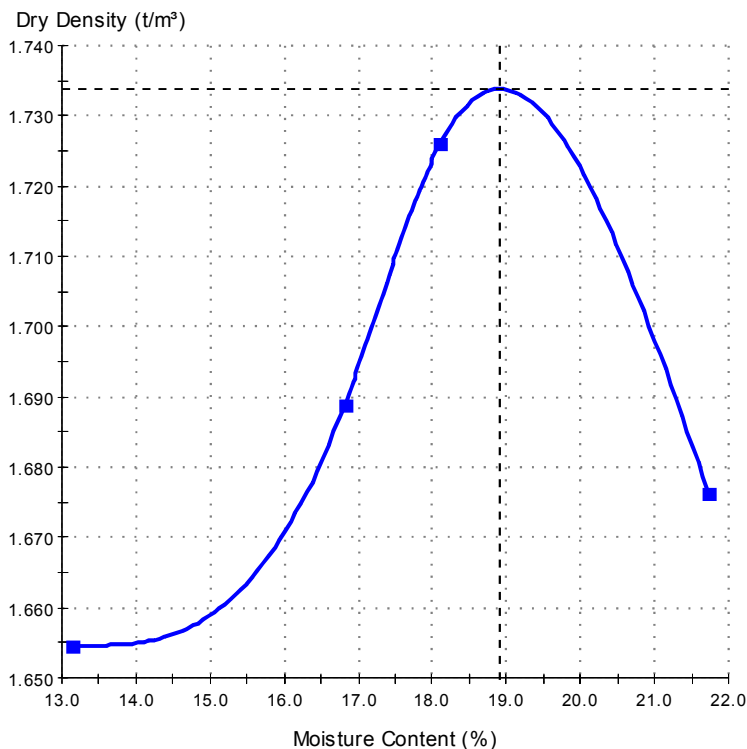
Sampling Method: Submitted by client

Material: Subgrade

Source: Ex Job Site

Specification: No Specification

Dry Density - Moisture Content Relationship



Test Results

AS 1289.5.1.1

Standard MDD (t/m³): **1.73**

Standard OMC (%): **19.0**

Retained Sieve 19.0mm (%): 6

Comments

Report No: MDD:LCOV12S-00010

Issue No: 1

Maximum Dry Density Report

Client: Coffey Geotechnics Pty Ltd
P.O. Box 125
North Ryde NSW 1670

Principal:

Project No.: INFOLCOV00923AA

Project Name: GEOTLCOV24420AA - SYDNEY OLYMPIC PARK

Lot No.: **TRN:**



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Approved Signatory: Garry Collins

(Specialised Testing Manager)

NATA Accredited Laboratory Number: 431

Date of Issue: 20/01/2012

Sample Details

Sample ID: LCOV12S-00010

Sampling Method: Submitted by client

Date Sampled: 2/12/2011

Material: Subgrade

Date Submitted: 13/12/2011

Source: Ex Job Site

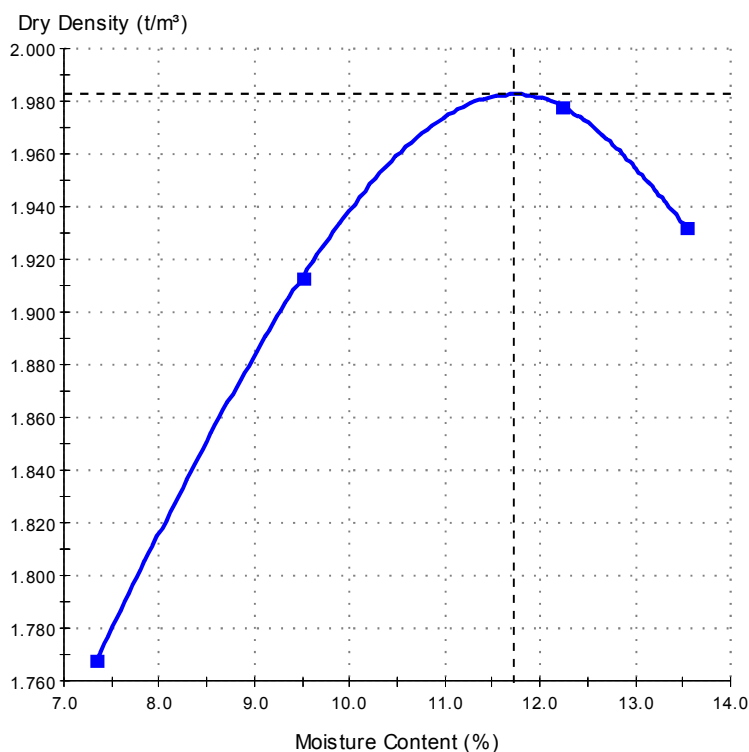
Date Tested: 5/01/2012

Specification: No Specification

Project Location: PROPOSED NETBALL CENTRAL DEVELOPMENT

Sample Location: TP2 (0.20 to 0.80 m)

Dry Density - Moisture Content Relationship



Test Results

AS 1289.5.1.1

Standard MDD (t/m³): **1.98**

Standard OMC (%): **11.5**

Retained Sieve 19.0mm (%): 4

Comments