PRELIMINARY GEOTECHNICAL INVESTIGATION

11-13 Percy Street, Auburn NSW

Fabcot Pty Ltd – July 2019

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PRELIMINARY GEOTECHNICAL INVESTIGATION

11–13 Percy Street,
Auburn, NSW 2144

PREPARED FOR

Fabcot Pty Ltd
1 Woolworths Way
Bella Vista, NSW 2153
Brookvale NSW 2100

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1. INTRODUCTION

Geo-Logix Pty Ltd (Geo-Logix) was commissioned by Fabcot Pty Ltd (Fabcot) to conduct a preliminary geotechnical investigation of the property located at 11-13 Percy Street, Auburn, NSW 2144 (Figure 1) for due diligence purposes.

1.1 Proposed Development

Geo-Logix understands Fabcot intends on acquisition of the site for redevelopment as a click and collect facility. Under the proposed development the western portion of the building would be constructed as slab on grade, and the eastern portion as suspended slab above the floodway area of the adjacent Haslams Creek.

1.2 Objectives and Scope of Work

The objective of the geotechnical investigation was to assess the subsurface soil strata in order to provide a preliminary understanding of site geology, provide preliminary recommendations on required earthworks, retention and foundation systems and provide preliminary soil parameters to assist with design of the proposed development.

To satisfy the above objective, Geo-Logix completed the following scope of work:

- Visual appraisal of the site conditions and locality;
- Review of the geological maps for the area;
- Completion of six borings using a truck mounted drilling rig equipped with solid stem augers;
- The performance of Standard Penetration Tests (SPTs) in each borehole at 1.0 mbg and every 1.5 mbg thereafter, to assess the relative density/consistency of the subsurface soils;
- Logging of fill and native soil by Geo-Logix staff in accordance with the Unified Soil Classification System (USCS);
- Collection of representative soil samples for selective geotechnical testing;
- Reinstatement of bore holes with cement grout capped with rapid-set concrete;
- Review of environmental borings and monitoring wells completed during the concurrent environmental investigation by Geo-Logix; and
- Provision of this report detailing the results of the above investigation and recommendations for design.

The field investigations were conducted in May and June 2019.

2. SITE INFORMATION

2.1 Site Identification

The investigation area comprises the following properties:

Street Address	Lot and Deposited Plan (DP)	Approximate Area (m^2)
11 Percy Street, Auburn, NSW 2144 13 Percy Street, Auburn, NSW 2144	Lot 1 DP 1183821 Lot 2 DP 1183821	32,500

2.2 Site Description

The following observations were made during site inspection and field works conducted by Geo-Logix in May and June 2019.

The subject site is located in a commercial/industrial area in Auburn NSW. The site comprises two rectangular shaped lots encompassing an area of approximately 3.25 Ha. The lots are bound by Percy Street to the northwest, Haslams Creek to the southeast and commercial/industrial on adjacent properties. Entry into the site is via two gates (North and South) from Percy Street.

At the time of the investigation Lot 1 was operating as Chameleon Touring Systems, a stage lighting and equipment supplier and Lot 2 as a Holden new vehicle accessories and auto detailing service centre. The Lot 1 building was located in the northwest portion of the site on the boundary with Percy Street. The building was constructed of metal cladding, a saw tooth roof and concrete floor slabs.

The Lot 2 building was located in the southeast portion of the site and was constructed to be level with Lot 1. The building was constructed of brick and metal cladding. The eastern portion of the building being constructed with a suspended concrete floor slab supported on concrete pillar. The undercroft area on lot 2 was paved with unbound gravel and used for vehicle parking. The northeast portion of Lot 2 comprised a car ramp and concrete and bitumen paved car parking.

Haslams Creek located on the south eastern site boundary was a concrete lined channel at the time of inspection.

Site cover outside building areas included approximately 15% asphalt in the eastern corner, used for car parking and 10% grass (in the southern corner and at the north western boundary with the remaining 75% being concrete pavements. The onsite pavements were generally in fair condition for their apparent age with little to no evidence of damage from differential settlements.

The site generally sloped downwards towards Haslams Creek in the east. Reference of Google Earth indicates the site is located at an elevation of 4–8 mAHD.

2.3 Regional Geology

Review of the NSW 1:100,000 Sydney Map (Geological Survey of NSW, 1983) indicates the western area of the site is underlain by Triassic age Ashfield shale of the Wianamatta Group comprising black to dark grey shale and laminate (Herbert, 1983). On the eastern portion of the site, surficial geology is mapped as Quaternary age alluvium comprised of silty to peaty quartz sand, silt, and clay with occasional ferruginous and humic cementation and common shell layers. The alluvium is expected to lie atop Ashfield shale.

2.4 Regional Hydrology

Regional groundwater is expected to follow the natural topography and generally flow northeast.

Reference to the NSW Natural Resource Atlas (NSW Government, 2019) indicates there are no registered groundwater bores within 500 m of the site.

2.5 Acid Sulfate Soils Risk

Review of the Prospect-Parramatta ASS Risk Map (Department of Land and Water Conservation 1997) indicates the site is in an area of disturbed terrain, and notes: disturbed terrain often occurs during reclamation of low lying swamps for urban development. Soil investigation are required to assess these areas for acid sulfate potential.

Review of the Auburn Local Environmental Plan (LEP) 2010 ASS map indicates the site may be underlain by actual or potential acid sulfate soils. The site is classified as Class 2; council consent is required for any works below the natural ground surface or works by which the water table is likely to be lowered. Copies of the DLWC ASS Risk map and Auburn LEP ASS map are presented as Attachment A.

3. METHOD OF INVESTIGATION

Preliminary geotechnical fieldwork, comprising the drilling of test bores BH104–BH106, was undertaken by Morgan Singleton-Fookes, an experienced geologist, between 28 May and 4 June 2019.

Prior to undertaking the borings each location was scanned for underground services and utilities by an independent utility locator and cross-checked with the results of a ‘Dial Before You Dig’ (DBYD) search.

Borings BH101–BH106, were completed using a canter truck mounted drill rig equipped with solid stem augers a “V” shaped hardened steel bit (V-bit) and a wing shaped tungsten-carbide bit (TC-bit). Standard Penetrometer Tests (SPTs) were completed in each boring utilising a donut hammer. SPTs were generally completed at 1.5 m intervals beginning at 1.0 mbg.

The borings were completed to SPT, V-bit or TC-bit refusal on weathered shale which occurred at depths of 5.0–8.7 mbg.

During drilling and excavation the encountered Fill material and natural soils were logged in accordance with the Unified Soil Classification System (USCS). Representative samples of soil were submitted to Macquarie Geotechnical Pty Ltd (Macquarie) and Eurofins Environmental Testing Australia Pty Ltd (Eurofins) for selective characterisation and chemical tests.

At the completion of works, the borings and excavations were reinstated with cement grout and capped with rapid set concrete in pavement areas.

The location of each boring and test pit was estimated using measurements from existing features (Figure 2). A copy of the boring logs and SPT results are provided in Attachment B.

4. INVESTIGATION RESULTS

4.1 Site Geology

Geo-Logix's understanding of the site geology is based on the regional geology map (Section 2.3), geotechnical soil borings and monitoring well borings from the concurrent environmental investigation (Attachment C).

The following is a summarised account of the site geology. For detailed descriptions of individual locations please refer to the attached borehole logs.

The site is located over a former alluvial channel system reclaimed for urban development in the 1940s–1960s. The alluvial environment appears to have resulted in isolated areas of competent residual clays, such as that found in boring BH101 surrounded by areas eroded and filled by weak alluvial clay and peat deposits. Only moderate filling associated with the land reclaiming and development, to a maximum depth of 1.8 mbg, was encountered at the site.

The underlying Ashfield shale bedrock was encountered at depths of 5.0–8.7 mbg as summarised in the following table:

Location	Date Completed	Depth to Rock (mbg)
BH101	30/05/2019	5.8
BH102	31/05/2019	5.0
BH103	31/05/2019	7.42
BH104	03/06/2019	8.65
BH105	04/06/2019	5.93
BH106	04/06/2019	6.5

4.2 Site Hydrogeology

Groundwater was encountered at depths between 0.8 and 5.7 mbg. In groundwater monitoring wells installed during the concurrent Environmental Due Diligence investigation, standing water levels in the environmental investigation wells were measured between 0.5 and 3.2 mbg (3 to 6 mAHD) with groundwater flow towards the northeast at a 0.019–0.027 gradient. A groundwater elevation map is presented as Figure 3.

4.3 Laboratory Results

Representative samples of soil were collected during the fieldwork and submitted to Macquarie and Eurofins for NATA accredited testing. Tests included:

- Atterberg Limit, Linear Shrinkage and Particle Size Distribution tests to confirm the USCS field classifications and assess the plasticity and reactivity of specific soil samples to assist with classification and description;
- Standard Maximum Dry Density (MDD), Optimum Moisture Content (OMC) and California Bearing Ratio (CBR) testing to assist with preliminary geotechnical design; and

- Aggressivity testing (electrical conductivity, sulphate, chloride and pH) to assess the exposure classification of the soil with respect to buried structural concrete and/or exposed steel.

The laboratory test results are presented in Attachment D. A summary of the results is provided in the following sections.

4.4 USCS Classification Testing

Representative samples were submitted to Macquarie and Eurofins for NATA accredited Atterberg Limit, Linear Shrinkage and/or Particle Size Distribution tests. The samples were selected to confirm the USCS field classification of fill and natural soils across the site. Linear Shrinkage tests were completed in order to calculate the free surface movement of the onsite soils for site classification in accordance with AS2870-2011. A summary of the results is provided in the following tables.

Atterberg Limits and Linear Shrinkage

Location/ Depth (m)	Sample Description	Liquid Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)
BH101/2.6-2.8	Silty Clay	67	21	14.5
BH103/2.0-2.2	Silty Clay trace of Sand and Gravel	32	15	8.0
BH103/4.5-4.7	Silty Clay	28	16	4.5

Particle Size Distribution

Location/ Depth (m)	Sample Description	Material Finer than 2.36mm (%)	Material Finer than 425µm (%)	Material Finer than 75µm (%)
BH103/0.5-0.7	Sandy Silty Clay trace of Gravel	85	68	53
BH103/2.0-2.2	Silty Clay trace of Sand and Gravel	99	93	85
BH105/2.5-2.7	Sandy Silty Clay trace of Gravel	97	97	53
BH106/5.9-6.1	Silty Clay and Gravel and Sand	74	67	53

Under the USCS material larger than 4.75 mm in size is considered Gravel, material between 4.75-75 µm in size is considered Sand and material finer than 75 µm in size is considered Silt or Clay. The Atterberg Limit test results indicate whether the fine grained component of the samples is classified as Silt or Clay as well as the reactivity of the material. The potential for surface movement based on the reactivity of the soil to changes in moisture is discussed in Section 5.6.

4.5 California Bearing Ratio (CBR) Laboratory Results

Two bulk samples were collected from locations BH103 and BH105 to obtain an understanding of the subgrade CBR values for use in preliminary geotechnical design. Each sample was representative of the subsurface material. These samples were submitted to Macquarie Geotechnical for NATA accredited testing of the CBR.

The CBR samples were remoulded in the laboratory and compacted to 98% maximum dry density (MDD) at optimum moisture content (OMC). Prior to testing, the samples were soaked for four days under a surcharge load of 4.5 kg. The soaked CBR values are provided in the following table.

Location/ Depth (m)	Laboratory Sample Description	SMDD (t/m3)	OMC (%)	CBR Value (%)	Swell After Soaking (%)
BH103/1.5-3.2	Gravelly Clay	1.93	12.0	5	0.2
BH105/0.5-2.0	Gravelly Clay	1.81	16.3	3.5	0.5

Pavement design based on these CBR results is discussed in Section 5.11.

4.6 Exposure Classification Tests

Samples from the soil profile in locations BH102, BH104 and BH106 were submitted to Eurofins for NATA accredited testing of pH, sulphate, chloride and electrical conductivity to determine the exposure classification (or aggressiveness/corrosiveness potential of the soil) with respect to buried steel and/or concrete. The samples were selected as representative soil samples in which foundations may be expected.

To determine the aggressiveness of the soil and water environment on concrete or steel, the chemical test results are compared to Tables 6.1 and 6.3 from Section 6 of the Australian Standard AS2159 – 2009. This section provides assessment criteria to assess the 'exposure classification' for a concrete or steel pile. The Standard has two classes of soil conditions:

- Type A – high permeability soils below groundwater; and
- Type B – low permeability soils and all soils above groundwater.

Based on the chemical testing results, the Standard provides a range of 'exposure classifications' from non-aggressive to very severe. For the range of chemical conditions in the soil surrounding the structure, the condition leading to the most severe aggressive conditions is adopted. A summary of the soil results is provided in the following table.

Location/ Depth (m)	Soil Condition	Electrical Conductivity (EC) (dS/m)	Soil Texture Factor	Extract Electrical Conductivity (Ec_e) (dS/m)	Electrical Resistivity (Ω·cm)	pH	Chloride (mg/kg)	Sulphate (mg/kg)
BH102/1.2-1.4	Type A	0.220	8.5	1.870	23,000	7.1	310	<25
BH102/3.8-4.0	Type A	0.570	8.5	4.845	8,800	6.1	1,100	260
BH102/4.8-5.0	Type A	0.550	8.5	4.675	9,000	6.8	860	270
BH104/1.0-1.2	Type B	0.260	8.5	2.21	20,000	8.3	100	110
BH104/4.1-4.3	Type B	0.410	8.5	3.485	12,000	6.9	770	<25
BH104/8.0-8.2	Type B	0.810	8.5	6.885	6,200	6.6	1,400	87
BH106/1.0-1.2	Type B	0.130	8.5	1.105	40,000	7.0	52	57
BH106/2.7-2.9	Type A	0.140	8.5	1.19	37,000	8.2	15	150
BH106/5.9-6.1	Type A	0.560	8.5	4.76	9,000	7.5	810	210

The potential aggressivity of an environment towards concrete and steel is dependent on the sulphate, chloride and pH levels of the soil. Soil aggressivity is discussed in Section 5.7. Site Salinity is discussed in Section 5.8.

5. DISCUSSION

5.1 Earthworks

The subject site should be prepared in accordance with AS 3798-2009 Section 6.1 and filled in accordance with AS 3798-2009 Section 6.2.

Initial Site Preparation

Initially surface features including pavements, fills and building foundations should be stripped from the site, in an area extending at least 1.5 m laterally beyond any planned structures or improvements.

Utilities should be located and rerouted as necessary and any abandoned pipes or utility conduits should be removed or filled with grout. Utility trench excavations must be cut to competent bearing soils and backfilled with properly compacted structural fill.

Existing Fill

Fill was encountered across the site to a maximum depth of 1.8 m. However, fill typically comprised a thin layer 0.1 m in thickness. While the potential for localised areas of fill containing deleterious material exists, Geo-Logix considers that onsite fill is generally suitable for re-use as structural subgrade beneath the proposed pavements and building structures.

Structural Filling

Where the above site preparation procedures create excavations below the proposed final grade, the excavations should be backfilled with properly compacted structural fill. Under no circumstances should topsoil or other organic-laden soils be placed as Fill beneath or within 1.5 horizontal metres of building, car park, or other structural areas.

Once final grade is reached in cut areas, and prior to fill placement in areas of the site that will receive new fill, the subgrade should be evaluated by a geotechnical engineer or their representative. Following subgrade evaluation the exposed subgrade should be test-rolled in accordance with AS 3798-2009.

Materials selected for use as Structural Fill should not contain organic matter, construction debris, deleterious materials or oversize material greater than 75 mm in nominal diameter. Fill materials should be granular material or be of low or medium plasticity. Clean onsite fill meeting the above criteria may be used as structural fill.

Fill materials should be placed in individual lifts of 300 mm or less loose measurement and compacted using a sheep's foot roller for cohesive soils and a smooth drum roller for cohesionless soils. Fill should be compacted to a minimum of 98% of standard compaction with a moisture content of ±2% of the optimum moisture content.

Test rolling and fill placement is recommended to be undertaken under Level 1 Supervision.

5.2 Excavations

Excavations of fill and onsite soils and weathered sandstone is generally expected to be achievable by an excavator of sufficient size. Excavation to depths below 2–3 m may require limited assistance of hammer or rock saw.

Groundwater management, batter and shoring of excavations and potential construction induced vibrations are discussed in the following sections.

5.3 Groundwater Inflow

During fieldworks, groundwater was not encountered. Though seepage may occur at the soil rock interface, particularly after heavy rains, significant groundwater inflow is not expected in onsite excavations. If bored concrete pier foundations are used, these should be dewatered by sump pump prior to the placement of concrete. Concrete pavements and ground slabs should be designed to allow for drainage of intermittent groundwater.

5.4 Temporary and Permanent Batter Slopes and Shoring

Excavations must be designed and constructed in a stable manner. The sides of the excavation should be shored or battered so as to maintain stability of both the excavation sides and bottom. Assuming that excavations are undertaken prior to any other construction works, and provided all surcharge loads, including plant and stockpiled material are kept well clear of the top of the batters, minimum batter slopes are recommended as 2H:1V for temporary batters and 4H:1V for permanent batters in unsaturated onsite fills and Sandy Clays above groundwater. For saturated soils below groundwater, shoring or batter support is expected to be required.

Permanent batters should be protected from erosion by vegetation or other measures and designed with adequate surface and subsurface drainage. For batters taller than 2 m, localised assessment of batter slopes is recommended.

The contractor is solely responsible for temporary excavation design and should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench depth, exceed those specified in local, state, and national safety regulations.

The following earth pressure coefficients are recommended for use in design of temporary and permanent shoring and earth retaining structures:

Retained Material	Bulk Density (kN/m^3)	Earth Pressure Coefficients		
		At rest (K_0)	Active (K_a)	Passive (K_p)
Structural Fill	20	0.55	0.40	2.75
Native Clayey Sand/Sandy Clay	21	0.67	0.50	2.00

The 'at rest' earth pressure coefficient (K_0) is suitable for retaining structures where anchors or other methods restrain retaining wall movement or where significant movements cannot be tolerated (rigid wall). A uniform or trapezoidal earth pressure distribution should be adopted. It should be noted that shoring which is designed for this 'at rest' coefficient will still undergo some lateral movements.

The active earth pressure coefficient (K_a) is suitable for retaining structures allowing movement of the top such as cantilevered pile walls. For these structures the pressure acting on the wall can be estimated on the basis of a triangular earth pressure distribution.

The passive earth pressure coefficient (K_p) is suitable for the calculation of resisting forces at the toe of concrete, reinforced stone, or masonry walls.

Design of all retaining structures should be undertaken in accordance with AS4678-2002. Furthermore, the design of any retaining structures should make allowance for all applicable surcharge loadings including construction activities around the perimeter of the excavation, traffic loadings and adjacent buildings. Consideration should be given to the possibility of a hydrostatic pressure due to build-up of water behind the wall (e.g. from broken services), unless permanent subsurface drainage can be provided.

5.5 Construction Induced Vibrations

Onsite Fill and native soils may be readily excavated using excavators or backhoes. So long as neither percussive piling methods nor dynamic compaction are employed, construction induced vibrations are not expected to be an issue.

If percussive piling methods (e.g. driven piles) are used consideration must be given to possible construction induced ground vibration. Otherwise, construction induced ground vibration is unlikely to be an issue at the site.

If adopting a driven piles or similar, onsite guidance by a vibration specialist is recommended during the early part of excavation. This should include vibration characterisation trials which are used to define vibration levels for the selected equipment.

Peak Particle Velocity (PPV) is usually the adopted measure of ground vibration and the safe limits depend on the sensitivity of the adjoining structures and services. There are a number of Australian and overseas publications which provide vibration velocity guideline levels (or safe limits) including:

- Australian Standard AS2187.2–2006 Explosives – Storage and use – Use of explosives – Appendix J: Ground Vibrations and Airblast Overpressure;
- DIN 4150 – Part 3 – 1999. Effects if Vibration on Structures;
- Department of Environment and Conservation NSW, 2006. Assessing Vibration: a technical guideline;
- British Standard BS 7385–1:1990. Evaluation and measurement for vibration in buildings. Guide for measurement of vibrations and evaluation of their effects on buildings;
- British Standard BS 7385–2:1993. Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration.

The most appropriate guidelines levels for the works are provided in AS2187.2–2006, which refers to guideline values from BS7385–2 for the prevention of minor or cosmetic damage occurring in structures from ground vibration. Additionally, the guideline levels provided in DIN 4150 Part 3 is considered an appropriate source for guideline levels.

Ideally, safe limits should be determined by a specialist vibration consultant. However, as a preliminary guide, and considering the above guidelines and the type of adjoining structures present, Geo-Logix recommend a maximum PPV of 10 mm/sec (measured at the foundations of adjoining structures) to prevent cosmetic and structural damage.

Geo-Logix notes human discomfort levels caused by vibration are typically less than the levels that are likely to cause cosmetic or structural damage to structures. Therefore complaints may be lodged by neighbours before any cosmetic or structural damage occurs.

Vibration monitoring is not considered to be necessary so long as only non-percussive piling methods are used and no complaints are lodged.

5.6 Site Classification

Considering the depth of existing onsite fill, the appropriate geotechnical site classification is Class ‘P’ in accordance with AS2870-2011.

Based on Linear Shrinkage and Shrink Swell Index testing results, for structures with foundations in the onsite natural clay soils, the appropriate site classification is considered to be equivalent to Class ‘M’ with a characteristic free surface movement (ys) of 20–40 mm with changes in moisture (AS2870-2011).

Geo-Logix notes that this site classification has not included the effects of trees, poor site drainage, leaking plumbing, and exceptionally wet or dry moisture conditions. Dewatering of site areas may be expected to result in significant free surface movement.

5.7 Aggressivity/Exposure Classification

Based on the site location, geology and exposure classification test results, and in accordance with AS3600-2009 and AS2159-2009, steel and concrete structures in contact with soil may be designed based on non-aggressive, A2, exposure.

As the site is in a Class 2 ASS risk area, design for ASS conditions should be considered.

5.8 Salinity Risk

Soil salinity risk is based on extract electrical conductivity (EC_e). Based on laboratory testing of the selected samples the salinity of onsite soils increases with depth. Shallow soils are non-saline to slightly saline. Soils below 2–3 mbg are moderately saline. (Department of Land and Water Conservation NSW, 2002). While, urban salinity management best practices should be implemented, as significant excavation of deep soils is not anticipated, a salinity management plan is not considered warranted.

5.9 Earthquake Design and Preliminary Liquefaction Potential Analysis

Structural design for earthquake loads should be carried out in accordance with the relevant provisions in AS1170.4–2007. At this preliminary stage, based on the subsurface soil profile encountered during this investigation, and with reference to Tables 3.2 and 4.1 of AS1170.4, the site subsoil class is considered to be D_e (Shallow Soil) with a hazard factor (Z) of 0.08.

Weak onsite alluvial soils may be susceptible to liquefaction when saturated as indicated by preliminary liquefaction potential analysis completed using the Seed and Idriss “Simplified Procedure" for evaluating the liquefaction resistance of soils from SPT N-Values and soil fines content.

5.10 Foundations

Geo-Logix recommends that future structural footings be founded on a consistent medium to minimise any potential differential settlements. However, depending on the building loads and whether the structures are designed to be relatively flexible, this may not be significant.

Shallow Foundations

For isolated, lightly loaded structures, shallow footing in structural fill or native soil may be acceptable. Assuming settlement of approximately 25 mm, an allowable bearing capacity of 100 kPa may be used for design of such structures.

Due to the presence of weak alluvial soils onsite is important that where shallow footings are adopted, foundation subgrade surfaces be observed and tested by a geotechnical engineer using Dynamic Cone Penetrometer (DCP) testing equipment or other satisfactory methods prior to steel or concrete placement. Any unsatisfactory soil detected during this evaluation should be undercut as directed by the geotechnical engineer. Footing excavations should be protected from surface water run-off; if water is allowed to accumulate within a footing excavation and soften the bearing soils, the deficient soils should be removed from the excavation prior to concrete placement.

Due to the potential for liquefaction and for differential settlement from consolidation of onsite alluvial clays shallow foundations cannot be recommended for the proposed warehouse building or other moderately to heavily loaded structures.

Deep Foundations

Given the presence of weak alluvial soils across broad areas of the site, at this stage of design, deep foundations should be considered the preferred foundation type for the proposed warehouse building and similar moderate–heavy loadings.

Due to the presence of shallow groundwater, contamination in groundwater (as reported in Geo-Logix's concurrent environmental investigation), ASS and the potential for down-drag from alluvial clays, screw piles are considered to be the most appropriate deep foundation method. Advantages of screw pile foundations include ease of installation, lower susceptibility to down-drag from unconsolidated fill soils, absence of vibration during installation, and the ability to estimate achieved bearing pressure during installation through torque monitoring. Cast in place bored piers or continuous flight auger (CFA) piles may also be adopted. Casing and dewatering may be required for bored pier installation. Dewatering would need to consider disposal of contamination and ASS affected water.

If adopted, screw piles should be installed by an experienced contractor, and installation should be monitored by a geotechnical engineer. To ensure proper bearing capacity has been achieved, installation torque should be monitored utilising either a sheer pin indicator or pressure drop across the drive head. Torque to bearing capacity ratios are generally between 23 to 33 m^{-1} for small screw piles with narrow shafts, but should be obtained from the screw pile manufacturer.

As screw piles are a proprietary product, information on their design, installation and load carrying capacity should be obtained from the manufacturer or installer.

To ensure allowable end bearing pressure is fully available, piers should be embedded a minimum of two pier diameters into the bearing stratum. A minimum embedment depth of 3 mbg is recommended for all piles/piers. Embedment to shale bedrock at 5.0 to 8.7 mbg is expected to be required in areas of weak alluvial soil and should be anticipated. Shallower embedment in competent residual soil may be possible based on local inspection of the pile shaft.

Adhesion should be ignored for fill and for soil in the top metre below the ground surface due to desiccation cracking and the potential for disturbance during drilling. For piers founded in rock, adhesion should be ignored for the soils overlying rock. Adhesion for bedrock assumes a clean socket of roughness R2 or better.

In uplift conditions, in the top 0.5 m adhesion should be ignored due to desiccation cracking, from 0.5 to 1.5 mbg an uplift adhesion of 15 kPa should be considered due to swelling of expansive clays and below 1.5 m or the base of fill, 75% of the given adhesion value should be allowed, assuming a reduction due to cyclic softening.

Allowable bearing pressure and adhesion for deep foundations are summarised in the following table.

Bearing Stratum	Typical Founding Depth (mbg)	Allowable Bearing Pressure (kPa)	Allowable Adhesion (kPa)	Estimated Settlement
Competent Residual Clay (Based on local inspection)	Below 3.0	200	10	25 mm
Class V Shale	Below 5.0 to 8.7	700	20	1% of Pier Base

For piers, the bearing stratum should be verified prior to the placement of rebar or concrete. Pier borings should be filled on the same day as drilling. Pier borings should be dewatered immediately prior to placement of concrete. Dewatering for pier borings may be accomplished by sump pump.

All foundation systems should be designed and constructed in accordance with the recommendations contained in AS 2870-2011 and/or AS 2159-2009 by a suitably qualified and experienced structural engineer.

5.11 Ground Slabs and Pavements

Slab and pavement designs are based on the California Bearing Ratio (CBR) and modulus of the subgrade materials encountered after any excavation or re-grading has taken place. The principal aim of the subgrade preparation is to provide a uniform foundation over the entire slab/pavement formation which will not give rise to unevenness in the slab/pavement surface under the design loads. The final subgrade, following the earthworks recommended in Section 5.1, should comprise native soils, newly compacted structural fill or existing fill, provided the material performs satisfactorily under test-rolling as detailed in AS3798-2007.

Based on laboratory testing of the CBR and Geo-Logix's experience with similar soil and provided the final subgrade performs under test-rolling and is compacted to at least 98% standard compaction, design of pavements and slabs-on-grade may be based on a CBR of 3%.

In order to provide uniform support beneath any proposed floor slab-on-grade, Geo-Logix recommends that floor slabs be underlain by a minimum of 100 mm of free-draining (a maximum particle size of 19 mm with less than 5 percent material passing the 75 µm sieve), well graded gravel or crushed rock base course. Placement of slabs directly on soil or rock subgrade is not recommended.

Exterior slabs and pavements should be isolated from the building. These slabs should be reinforced to function as independent units. Movement of these slabs should not be transmitted to the building foundation or superstructure.

6. CONCLUSIONS AND RECOMMENDATIONS

Geo-Logix considers the site geotechnically suitable for the development of the proposed click and collect warehouse. Once concept plans are developed, additional geotechnical testing may be desired. The following should be addressed in future investigations:

- Acid sulfate soils risk – All onsite works disturbing natural soil or lowering groundwater will require consent from council due to ASS risk and an ASS investigation will be required to assess for the presence of ASS onsite; and
- Weak alluvial soils – Weak alluvial soils including peat were encountered at the site. Associated risks include differential settlement from consolidation and potential liquidation in the event of an earthquake. For this reason, deep foundations bearing on the underlying Ashfield shale rock have been recommended. To facilitate shallow foundations on pad footings, Electric friction Cone Penetrometer Testing (CPT) is recommended to assess the settlement and liquefaction potential of alluvial soils.

7. LIMITATIONS

This report should be read in full, and no executive summary, conclusion or other section of the report may be used or relied on in isolation, or taken as representative of the report as a whole. No responsibility is accepted by Geo-Logix, and any duty of care that may arise but for this statement is excluded, in relation to any use of any part of this report other than on this basis.

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This report is based on the available project information and the subsurface information obtained by Geo-Logix. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, Geo-Logix should be notified immediately to determine if there are consequences to the recommendations provided in this report. If Geo-Logix is not retained to perform these functions, Geo-Logix cannot be responsible for the impact of those conditions on the performance of the project.

Unless otherwise expressly stated, Geo-Logix has assumed that the information and data contained in previous reports carried out by others and reviewed in preparation of this report are completely accurate and has not sought independently to verify the accuracy of the information or data.

Where data from previous reports carried out by others has been incorporated into this report the data are reproduced in this report on the assumption that the data are accurate. Geo-Logix has not sought independently to verify the accuracy of this data and assumes no responsibility in respect of them.

Where laboratory tests have been carried out by others on Geo-Logix' behalf, the tests are reproduced in this report on the assumption that the tests are accurate. Geo-Logix has not sought independently to verify the accuracy of those tests and assumes no responsibility in respect of them.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area at the time of this report. No other warranties are implied or expressed.

This report has been prepared for the specific application to the proposed development as described in the report. After the plans and specifications for the project are more complete the geotechnical engineer should be provided with the opportunity to review the final design plans and specifications to assess whether our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations.

8. REFERENCES

Australian Standard (2004) AS1289.6.3.1-2004 Methods of testing soils for engineering purposes. Method 6.3.1: Soil strength and consolidation tests – Determination of the penetration resistance of a soil – Standard penetration test (SPT). Standard Australia.

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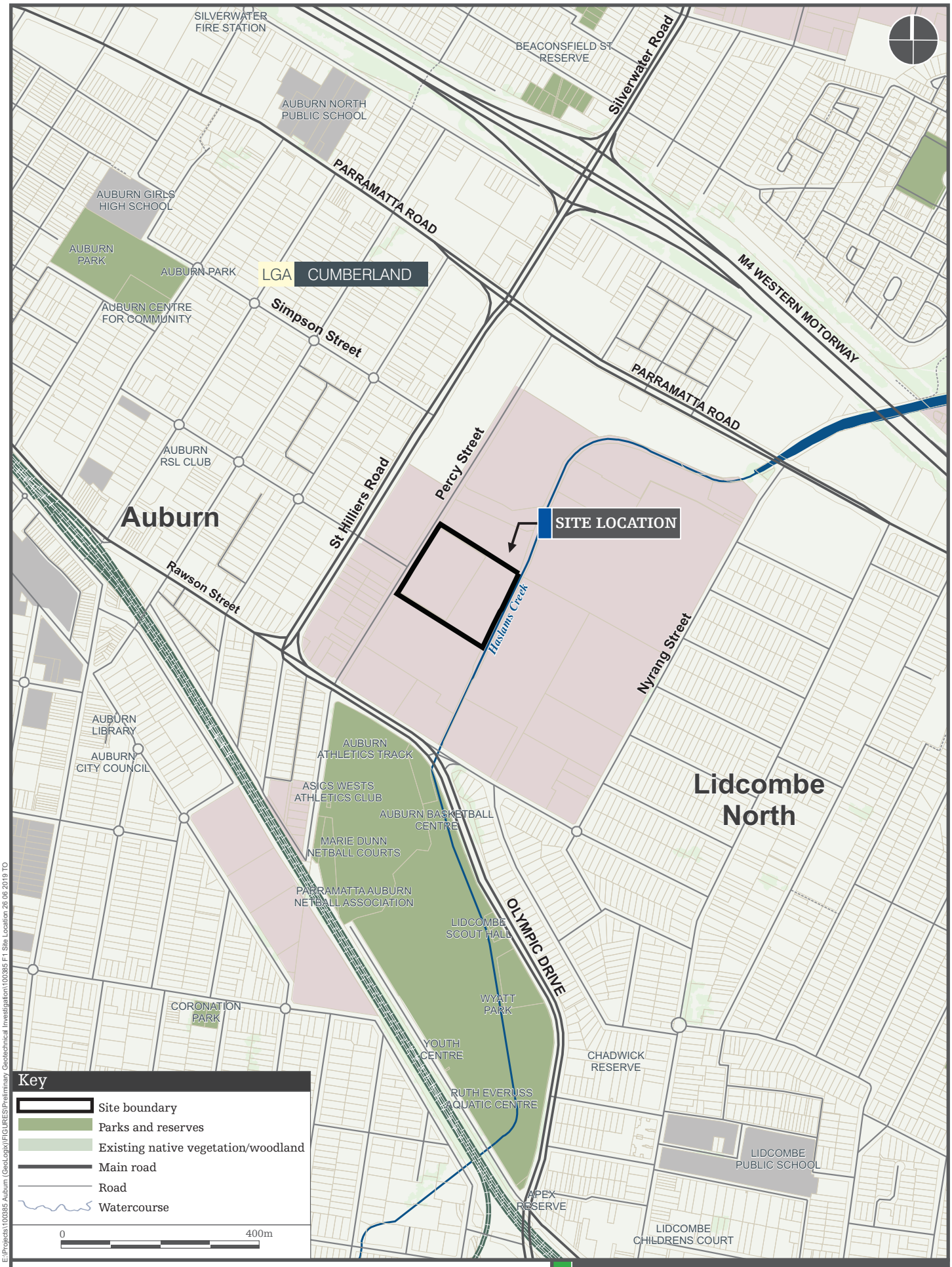
FIGURES



E:\Projects\100385 Auburn (GeoLogix)\FIGURES\Preliminary Geotechnical Investigation\100385-F1 Site Location 26 06 2019 TO

Geo-Logix
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SITE VICINITY MAP

Preliminary Geotechnical Investigation
11-13 Percy Street, Auburn NSW

Project No. 1901031

Figure 1

E:\Projects\1100985 Auburn (GeoLogix)\FIG\LIRES\Preliminary Geotechnical Investigation\100385 F2 Sample Location Map 26 06 2019.TO

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SAMPLE LOCATION MAP

Preliminary Geotechnical Investigation
11-13 Percy Street, Auburn NSW

Project No. 1901031

Figure 2

Site Features

1. Former radioactive store
2. Decommissioned UST
3. Former dangerous goods shed
4. Former cooling towers
5. Wash bay
6. AST/fuel dispenser
7. Waste oil tank
8. Former AST
9. Air compressor pump
10. Wastewater tank/former lime dosing unit
11. substation
12. Decommissioned UST
13. former grease trap & cooling towers

Hall Street

Percy Street

Former rail line

Haslams Creek

MW111
4.059

MW106
3.477

MW104
3.339

MW107
4.743

4.108
GW04
MW105 (no well installed)

MW110
4.846

MW108
5.300

GW1
5.018

MW103
2.830

Former plastic raw materials silos

MW109
5.629

Undercroft parking

GW2
6.692

Retaining wall

MW102
3.170

Polyurethane drums/ spillage (in caged enclosure)

MW101
3.553

Percy Street

Key

- Site boundary
- Inferred groundwater flow direction
- Groundwater contour (mAHD)
- Groundwater monitoring well location
- 6.602 Groundwater elevation (mAHD)

0 50m

E:\Projects\1100385 Auburn (GeoLogix)\FIG\FIGURES\Preliminary Geotechnical Investigation\1100385 F3 Groundwater Elevation Map 10 07 2019 TO

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GROUNDWATER ELEVATION MAP

Preliminary Geotechnical Investigation
11-13 Percy Street, Auburn NSW

Project No. 1901031

Figure 3

ATTACHMENT A

Auburn Local Environmental Plan 2010

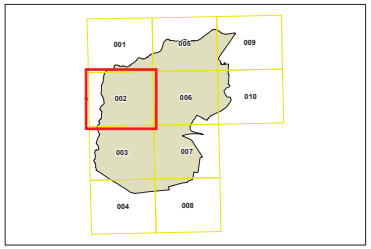
Acid Sulfate Soils Map - Sheet ASS_002

Acid Sulfate Soils

- 1 Class 1
- 2 Class 2
- 3 Class 3
- 4 Class 4
- 5 Class 5

Cadastre

Cadastre 25/05/2010 © Land and Property Information (LPI)



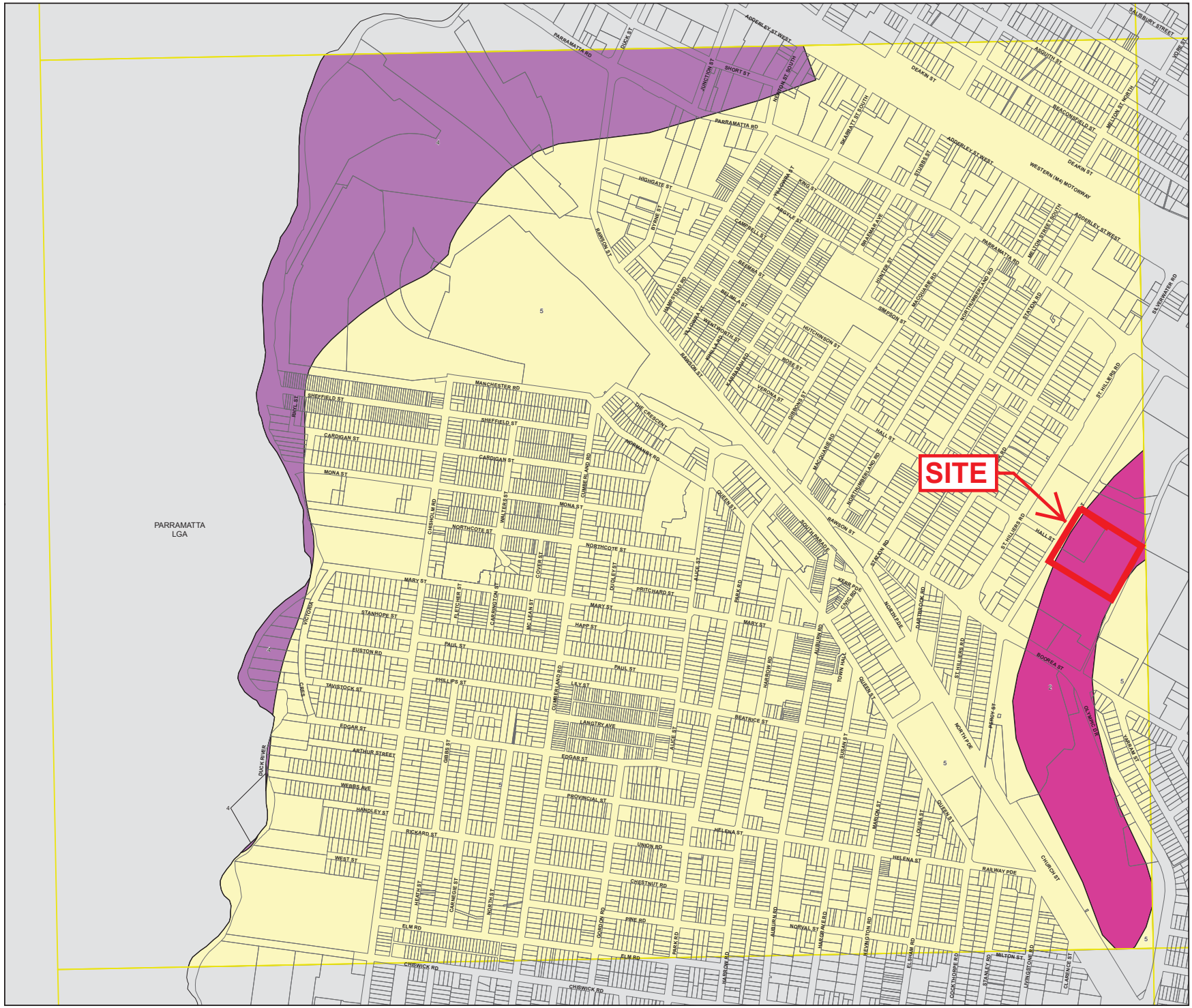
N

0 200 400 Metres

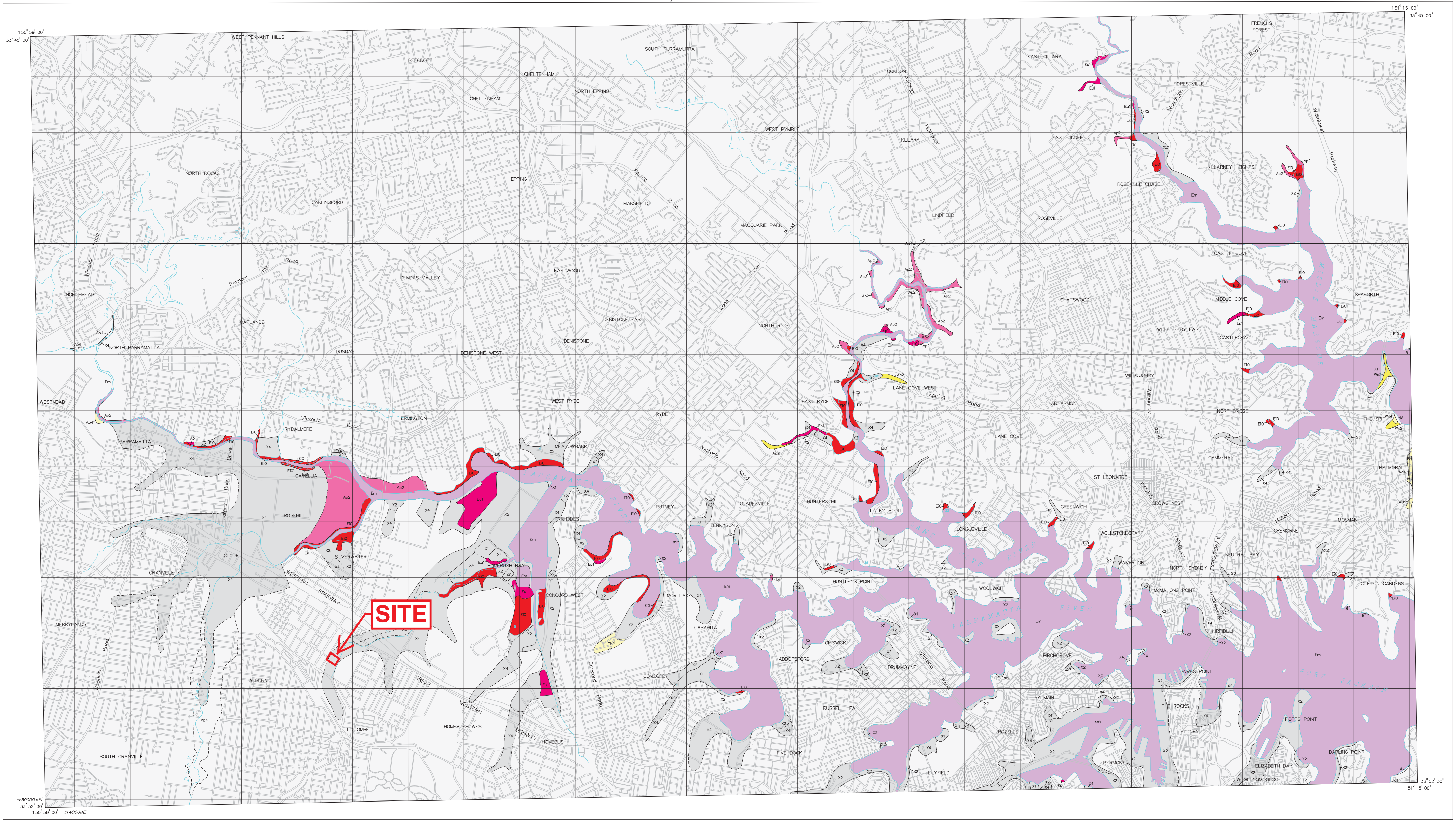
Scale:1:10,000 @ A3

Projection: GDA 1994
MGA Zone 56

Map identification number: 0200_COM_ASS_002_010_20120910



PROSPECT/PARRAMATTA RIVER



KEY

Map Class Description	Depth to Acid Sulfate Soil Materials		Environmental Risk	Typical Landform Types
HIGH PROBABILITY High probability of occurrence of acid sulfate soil materials within the soil profile. The environment of deposition has been suitable for the formation of acid sulfate soil materials. Acid sulfate soil materials are widespread or sporadic and may be buried by alluvium or windblown sediments.	Below water level	Bottom sediments.	Severe environmental risk if bottom sediments are disturbed by activities such as dredging.	Bottom sediments of lakes, lagoons, tidal creeks, rivers and estuaries.
		At or near the ground surface.	Severe environmental risk if acid sulfate soil materials are disturbed by activities such as shallow drainage, excavation or clearing.	Estuarine swamps, intertidal flats and supratidal flats.
		Within 1 metre of the ground surface.	Severe environmental risk if acid sulfate soil materials are disturbed by activities such as shallow drainage, excavation or clearing.	Low alluvial plains, estuarine sandplains, estuarine swamps, backswamps and supratidal flats.
		Between 1 and 3 metres below the ground surface.	Environmental risk if acid sulfate soil materials are disturbed by activities such as deep excavation for pipelines, dams or deep drains.	Alluvial plains, alluvial swamps, alluvial levees and sandplains.
		Greater than 3 metres below the ground surface.*	Environmental risk if acid sulfate soil materials are disturbed by activities such as deep excavations, –e.g., large structure foundations or deep dams.	Elevated levees and sandplains, alluvial plains and alluvial swamps in estuarine reaches of catchments.
LOW PROBABILITY Low probability of occurrence of acid sulfate soil materials within the soil profile. The environment of deposition has generally not been suitable for the formation of acid sulfate soil materials. Soil materials are often Pleistocene in age. Acid sulfate soil materials, if present, are sporadic and may be buried by alluvium or windblown sediments.	Below water level	Bottom sediments.	The majority of these landforms are not expected to contain acid sulfate soil materials. Therefore, land management is generally not affected by acid sulfate soils. However, highly localised occurrences may be found, especially near boundaries with environments with a high probability of occurrence. Disturbance of these soil materials will result in an environmental risk that will vary with elevation and depth of disturbance.	Elevated alluvial plains and levees dominated by fluvial sediments. Plains and dunes dominated by aeolian soils. Pleistocene plains. Lacustrine and alluvial bottom sediments.
		At or near the ground surface.		
		Within 1 metre of the ground surface.		
		Between 1 and 3 metres below the ground surface.		
		Greater than 3 metres below the ground surface.*		
NO KNOWN OCCURRENCE Acid sulfate soils are not known or expected to occur in these environments.		No known occurrences of acid sulfate soil materials.	Land management activities not likely to be affected by acid sulfate soil materials.	Bedrock slopes, elevated Pleistocene and Holocene dunes, and elevated alluvial plains.
DISTURBED TERRAIN		Disturbed terrain may include filled areas, which often occur during reclamation of low lying swamps for urban development. Other disturbed terrain includes areas which have been mined or dredged, or have undergone heavy ground disturbance through general urban development or construction of dams or levees. Soil investigations are required to assess these areas for acid sulfate potential.		

*Deep occurrences of acid sulfate soil materials not able to be confirmed by field inspection and sampling.

LAND & WATER CONSERVATION

A quality product prepared by G.I.S. OPERATIONS

SCALE 1:25000

metres 500 0 1 2 kilometres

G N

TRANSVERSE MERCATOR PROJECTION
Numbered grid lines are 1000 metre intervals of the Australian Map Grid, Zone 56.
Grid values are shown in full only at the south-west corner of the map.

Cadastral information based on the Digital Cadastral Data Base courtesy of the Surveyor Generals Department of N.S.W. Waterbody boundaries are dynamic and show slight differences between cadastral and topographic information.

THIS MAP IS TO BE USED AS A GENERAL GUIDE FOR REGIONAL AND LOCAL SCALE LAND USE PLANNING AND LAND MANAGEMENT ONLY AND NOT FOR THE ASSESSMENT OF SPECIFIC SITES WHICH CAN ONLY BE ASSESSED BY A SITE SPECIFIC SOIL INVESTIGATION. THIS MAP HAS BEEN PREPARED ON THE BASIS OF CURRENT INDICATORS WHICH MAY VARY AS THE PROCESS OF DETECTING THE OCCURRENCE OF ACID SULFATE SOILS IS FURTHER DEVELOPED. ACID SULFATE SOILS MAY OCCUR IN AREAS SPECIFICALLY IDENTIFIED ON THE MAP AS NO KNOWN OCCURRENCE.

THE STATE OF NEW SOUTH WALES, THE DEPT. OF LAND AND WATER CONSERVATION, ITS EMPLOYEES, OFFICERS, AGENTS OR SERVANTS ARE NOT RESPONSIBLE FOR THE RESULT OF ANY ACTIONS TAKEN ON THE BASIS OF THE INFORMATION CONTAINED ON THIS MAP OR FOR ANY ERRORS, OMISSIONS OR INACCURACIES CONTAINED ON THIS MAP. THE STATE OF NEW SOUTH WALES AND ITS EMPLOYEES, OFFICERS, AGENTS OR SERVANTS EXPRESSLY DISCLAIM ALL AND ANY LIABILITY AND RESPONSIBILITY TO ANY PERSON IN RESPECT OF ANYTHING AND OF THE CONSEQUENCES, OF ANYTHING DONE OR OMITTED TO BE DONE BY ANY SUCH PERSON IN RELIANCE, WHETHER WHOLLY OR PARTIALLY UPON THE INFORMATION CONTAINED ON THE MAP.

THIS MAP IS ONLY RELIABLE AT THE PUBLISHED SCALE OF 1:25000

MAP PREPARED BY C.L. MURPHY   REVIEWED BY C.L. MURPHY

MAP COMPILED BY G.I.S. OPERATIONS FROM DIGITISED FIELD INFORMATION AND DATA HELD IN THE DEPARTMENT OF LAND AND WATER CONSERVATION'S GEOGRAPHIC INFORMATION SYSTEM.

THIS MAP SHOULD BE USED IN CONJUNCTION WITH THE *GUIDELINES FOR THE USE OF ACID SULFATE SOIL RISK MAPS* S.D. NAYLOR et.al. (1995) DEPARTMENT OF LAND AND WATER CONSERVATION

THIS MAP IS PART OF A SERIES OF ACID SULFATE SOIL RISK MAPS ALONG THE ENTIRE NEW SOUTH WALES COAST. THE MAPPING HAS BEEN UNDERTAKEN BY A TEAM OF EXPERIENCED AND QUALIFIED SOIL SURVEYORS. THE MAPPING IS BASED ON THE ASSESSMENT OF GEOMORPHIC PROCESSES AND ENVIRONMENTS. ASSESSMENT METHODS INCLUDE, INTERPRETATION OF AERIAL PHOTOGRAPHY AND SATELLITE IMAGERY, EXTENSIVE FIELD WORK AND LABORATORY SOIL TESTING.

LANDFORM CODES

Landform Process Class	Landform Element		Elevation#
W.......Aeolian	b.......Backplain	t.......Levee Toe	0.......0–1 m
A.......Alluvial	k.......Backswamp	o.......Ox-bow	1.......1–2 m
B.......Beach	m.......Bottom Sediments	p.......Plain	2.......2–4 m
E.......Estuarine	n.......Channel	a.......Sandplain	4.......>4 m
L.......Lacustrine	d.......Dune	s.......Swamp	
S.......Swamp	r.......Interbarrier Swamp	y.......Splay	
	i.......Intertidal Flat	u.......Supratidal Flat	Additional Descriptive Codes
	g.......Lagoon	w.......Swale	(p).......Pleistocene
X.......Disturbed Terrain*	l.......Levee	c.......Tidal Creek	(s).......Acidic Scald

*Elevation levels given on the map refer to the elevation of the ground surface at the time of mapping. Depending on the nature of the disturbance, these elevation levels may or may not represent the original ground surface elevation.

#Approximate AHD

LEGEND

LANDFORM BOUNDARY..........
APPROXIMATE LANDFORM BOUNDARY....
SOIL PROFILE DESCRIPTION SITE.......... 27
RIVER or CREEK..........
CADASTRE..........

KEY TO ADJOINING MAPS IN THIS SERIES

	HORNSBY/ MONA VALE 9130S1	
	PROSPECT/ PARRAMATTA RIVER 9130N3	SYDNEY HEADS 9130N2
LIVERPOOL 9030S2	BOTANY BAY 9130S3	BONDI 9130S2

ATTACHMENT B

Borehole Log

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Hole ID.	**BH101**
Project Number:	**1901031**
Hole Depth:	**5.80 m**
Sheet:	**1 of 1**

Project Name:	**Preliminary Geotechnical Investigation**
Location / Site:	**Auburn NSW**
Client:	**Fabcot Pty Ltd**
Contractor:	**Fico Group Pty Limited**
Method:	**Solid Flight Auger (Truck mounted)**

Date Started:	**30/05/2019**
Date Completed:	**30/05/2019**
Easting:	**N/A**
Northing:	**N/A**

Method	Water Level	Depth (mBGL)	Sample Type	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	Tests (SPT)	Observations / Comments
								Grass cover			
SFA		0.60			Natural	CL		**CLAY** - greyish orange (10YR 7/4), 85% clay, 15% sand, stiff.	dry		
		1	R	BH101/1.0-1.2		CL		**CLAY** - very pale orange (10YR 8/2), mottled dark yellowish orange (10YR 6/6), 100% clay, stiff.	dry damp	9,8,9 N=17	450mm recovery.
		2.60	R	BH101/2.6-2.8		CH		**CLAY** - very pale orange (10YR 8/2), mottled light brown (5YR 5/6), 100% clay, stiff, becoming very stiff with depth.	damp	6,6,7 N=13	450mm recovery.
		4	R	BH101/4.2-4.4						11,19,20 N=39	450mm recovery.
		5							moist	22,31,8/0	300mm recovery. Bouncing.
		6						**End of Hole at 5.800 m** Refusal.			

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
ASB Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer
Encountered Groundwater
Stabilised Groundwater

Additional Comments
Backfilled and compacted.
SPT Donut hammer.

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Morgan Singleton-Fookes** Date: **30/05/2019**
Checked By: **Morgan Singleton-Fookes** Date: **27/06/2019**

Borehole Log

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Hole ID.	**BH102**
Project Number:	**1901031**
Hole Depth:	**5.00 m**
Sheet:	**1 of 1**

Project Name:	**Preliminary Geotechnical Investigation**
Location / Site:	**Auburn NSW**
Client:	**Fabcot Pty Ltd**
Contractor:	**Fico Group Pty Limited**
Method:	**Solid Flight Auger (Truck mounted)**

Date Started:	**31/05/2019**
Date Completed:	**31/05/2019**
Easting:	**N/A**
Northing:	**N/A**

Method	Water Level	Depth (mBGL)	Sample Type	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	Tests (SPT)	Observations / Comments
SFA		0.03			Fill			**BITUMEN**.	dry		Slight bitumenous odour.
		0.30						**FILL** - dark yellowish brown (10YR 4/2), 90% sand, 10% gravel, poorly compacted.	damp		
		0.80			Natural	CL		**CLAY with Sand** - moderate brown (5YR 3/4), 70% clay, 25% sand, 5% gravel, firm, occasional rootlets.			
	▽	1	R	BH102/1.2-1.4		CL		**CLAY** - dark reddish brown (5YR 3/2), 85% clay, 10% sand, 5% gravel, soft, occasionally mottled dark yellowish orange (10YR 6/6) and moderate red (5R 4/6), rare rootlets. Rare very pale orange (10YR 8/2) mottles 1-1.6m.	damp to moist	1,1,2 N=3	450mm recovery.
		2.00									
		3	R	BH102/2.5-2.7		CL		**CLAY** - dark reddish brown (5YR 3/2), 90% clay, 10% sand, very soft.	wet	0,0,1 N=1	450mm recovery. Sunk under own weight 2.5-2.8m.
		3.80									
		4	R	BH102/3.8-4.0		CL		**CLAY with Sand / Gravel** - light brown (5YR 5/6), 40% clay, 30% sand, 30% gravel.	wet	1,3,4 N=7	400mm recovery. Very wet, gravels washed out.
		4.20				CL		**CLAY** - very pale orange (10YR 8/2), mottled dark yellowish orange (10YR 6/6), 95% clay, 5% sand, firm.	wet		
		5	D	BH102/4.8-5.0							
								End of Hole at 5.000 m Refusal. Rock at 5m.			

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
ASB Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer
▽ Encountered Groundwater
▼ Stabilised Groundwater

Additional Comments
Resurfaced with concrete.
SPT Donut hammer.

REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Morgan Singleton-Fookes** Date: **31/05/2019**
Checked By: **Morgan Singleton-Fookes** Date: **27/06/2019**

Borehole Log

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Hole ID.	**BH103**
Project Number:	**1901031**
Hole Depth:	**7.42 m**
Sheet:	**1 of 1**

Project Name:	**Preliminary Geotechnical Investigation**
Location / Site:	**Auburn NSW**
Client:	**Fabcot Pty Ltd**
Contractor:	**Fico Group Pty Limited**
Method:	**Solid Flight Auger (Truck mounted)**

Date Started:	**31/05/2019**
Date Completed:	**31/05/2019**
Easting:	**N/A**
Northing:	**N/A**

Method	Water Level	Depth (mBGL)	Sample Type	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	Tests (SPT)	Observations / Comments
CC		0.27						**CONCRETE HARDSTAND**.			
		0.40			Fill			**FILL** - moderate yellowish brown (10YR 5/4), 90% sand, 10% gravel.	dry		
	▽	0.80	R	BH103/0.5-0.7				**FILL** - moderate yellowish brown (10YR 5/4), 50% clay, 45% sand, 5% gravel.	damp		
		1.10						**FILL** - 20% clay, 65% sand, 15% gravel.	wet		
SFA						CL		**CLAY** - dark yellowish orange (10YR 6/6), mottled very pale orange (10YR 8/2), 85% clay, 15% sand, firm, rare rootlets.	moist	1,3,5 N=8	300mm recovery. Gravel washed out.
			R	BH103/2.0-2.2							
			B	BH103/1.3-3.5							
		2.60			Natural	CL		**CLAY** - dark yellowish orange (10YR 6/6), mottled very pale orange (10YR 8/2), 95% clay, 5% sand, firm, rare rootlets.	moist	4,5,7 N=12	450mm recovery.
		4.20				SC		**Clayey SAND** - strong brown (5YR 4/6), 35% clay, 65% sand, very fine grained sand.	moist	4,4,4 N=8	450mm recovery.
			R	BH103/4.5-4.7						3,2,3 N=5	450mm recovery.
		6.70				CL		**CLAY with Sand** - dark yellowish orange (10YR 6/6), mottled moderate red (5R 4/6), 70% clay, 20% sand, 10% gravel, stiff, rare very pale orange (10YR 8/2) mottles, occasional ironstone.	moist	9,12, 30/120	420mm recovery.
		7.35						**Ashfield SHALE**.			
								End of Hole at 7.420 m Refusal on Ashfield Shale.			

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
ASB Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer
▽ Encountered Groundwater
▼ Stabilised Groundwater

Additional Comments
Resurfaced with concrete.
SPT Donut hammer.

REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Morgan Singleton-Fookes** Date: **31/05/2019**
Checked By: **Morgan Singleton-Fookes** Date: **27/06/2019**

Borehole Log

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Hole ID.	**BH104**
Project Number:	**1901031**
Hole Depth:	**8.65 m**
Sheet:	**1 of 1**

Project Name:	**Preliminary Geotechnical Investigation**
Location / Site:	**Auburn NSW**
Client:	**Fabcot Pty Ltd**
Contractor:	**Fico Group Pty Limited**
Method:	**Solid Flight Auger (Truck mounted)**

Date Started:	**03/06/2019**
Date Completed:	**03/06/2019**
Easting:	**N/A**
Northing:	**N/A**

Method	Water Level	Depth (mBGL)	Sample Type	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	Tests (SPT)	Observations / Comments
CC		0.23						**CONCRETE HARDSTAND**.			
		0.70			Fill			**FILL** - dusky brown (5YR 2/2), 10% clay, 30% sand, 60% gravel.	damp		
		1	R	BH104/1.0-1.2		CL		**CLAY** - very pale orange (10YR 8/2) and moderate yellowish brown (10YR 5/4), mottled dark yellowish orange (10YR 6/6) and moderate red (5R 4/6), 80% clay, 15% sand, 5% gravel, soft. Sandy Gravel 1.2-1.25m.	damp to moist	2,1,2 N=3	450mm recovery.
		2.10				SC		**Clayey SAND** - moderate yellowish brown (10YR 5/4), 40% clay, 55% sand, 5% gravel, loose, rare dark yellowish orange (10YR 6/6) & greyish orange pink (5YR 7/2) mottling, weathered shale gravel.	moist		
		2.80	R	BH104/2.5-2.7						1,2,1 N=3	450mm recovery.
SFA		3			Natural	CL		**CLAY with Sand** - moderate yellowish brown (10YR 5/4), 80% clay, 20% sand, sticky.	moist to wet		
		4						Organic matter 3.8-4m, occasional rootlets.			Organic odour.
			R	BH104/4.1-4.3						1,1,2 N=3	450mm recovery.
		5									
		6						Organic matter 5.7-5.8m.		0,1,2 N=3	450mm recovery. Sunk under own weight 5.5-5.65m.
		6.60									
		7	D	BH104/6.7-6.9		CL		**CLAY with Sand & Gravel** - moderate yellowish brown (10YR 5/4), 60% clay, 20% sand, 20% gravel.	wet		
		7.10				SP		**Gravelly SAND with Clay** - dark yellowish orange (10YR 6/6) and very pale orange (10YR 8/2), mottled moderate red (5R 4/6), 10% clay, 75% sand, 15% gravel, medium dense, rare rootlets, ironstone, very fine grained sand.		11,8,10 N=18	450mm recovery.
		8	D	BH104/8.0-8.2							
		8.60								20/30	30mm recovery.
		9						**Ashfield SHALE**. **End of Hole at 8.650 m** Refusal on Ashfield Shale.			

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
ASB Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

Encountered Groundwater
Stabilised Groundwater

Additional Comments
Resurfaced with concrete.
SPT Donut hammer.

REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Morgan Singleton-Fookes** Date: **03/06/2019**
Checked By: **Morgan Singleton-Fookes** Date: **27/06/2019**

Borehole Log

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Hole ID.	**BH105**
Project Number:	**1901031**
Hole Depth:	**5.93 m**
Sheet:	**1 of 1**

Project Name:	**Preliminary Geotechnical Investigation**
Location / Site:	**Auburn NSW**
Client:	**Fabcot Pty Ltd**
Contractor:	**Fico Group Pty Limited**
Method:	**Solid Flight Auger (Truck mounted)**

Date Started:	**04/06/2019**
Date Completed:	**04/06/2019**
Easting:	**N/A**
Northing:	**N/A**

Method	Water Level	Depth (mBGL)	Sample Type	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	Tests (SPT)	Observations / Comments
CC		0.13						**CONCRETE HARDSTAND**.			
		0.30			Fill			**FILL** - dusky brown (5YR 2/2), 65% sand, 35% gravel, rare rootlets to 2m.	damp		
		1	D	BH105/0.8-1.0	Natural	SC		**Clayey SAND** - dark yellowish orange (10YR 6/6), mottled very pale orange (10YR 8/2), 15% clay, 85% sand, medium dense.			
			B	BH105/0.5-2.0						5,5,7 N=12	450mm recovery.
		2.00						**Sandy CLAY** - 55% clay, 45% sand, stiff, fine grained sand.			
SFA		3	R	BH105/2.5-2.7		CL				5,6,5 N=11	450mm recovery.
		4									Hard drilling at 3.9m.
										4,4,6 N=10	450mm recovery.
		4.80						**CLAY with Sand** - dark yellowish orange (10YR 6/6), 60% clay, 30% sand, 10% gravel, stiff.			
		5	R	BH105/5.0-5.2		CL					Hard drilling at 5.3m.
										9,17, 30/130	420mm recovery.
		6						**End of Hole at 5.930 m** Refusal.			

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
ASB Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer
Encountered Groundwater
Stabilised Groundwater

Additional Comments
Resurfaced with concrete.
SPT Donut hammer.

Log Drawn By:	Laurie White	Logged By:	**Morgan Singleton-Fookes** Date: **04/06/2019**
Contact:	laurie.white@reumad.com.au	Checked By:	**Ted Lilly** Date: **09/07/2019**

Borehole Log

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Hole ID.	**BH106**
Project Number:	**1901031**
Hole Depth:	**6.50 m**
Sheet:	**1 of 1**

Project Name:	**Preliminary Geotechnical Investigation**
Location / Site:	**Auburn NSW**
Client:	**Fabcot Pty Ltd**
Contractor:	**Fico Group Pty Limited**
Method:	**Solid Flight Auger (Truck mounted)**

Date Started:	**04/06/2019**
Date Completed:	**04/06/2019**
Easting:	**N/A**
Northing:	**N/A**

Method	Water Level	Depth (mBGL)	Sample Type	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	Tests (SPT)	Observations / Comments
CC		0.15						**CONCRETE SLAB**.			
		0.40			Fill			**FILL** - dusky brown (5YR 2/2), 65% sand, 35% gravel.	damp		
								FILL - dusky brown (5YR 2/2), 50% clay, 25% sand, 25% gravel, rare organic matter.	moist		
		1.30	R	BH106/1.0-1.2						2,4,6 N=10	450mm recovery.
					Natural	GP		**Clayey GRAVEL** - moderate yellowish brown (10YR 5/4), mottled very pale orange (10YR 8/2), 40% clay, 60% gravel, loose, rare moderate red (5R 4/6) mottling.			
		2.60									
SFA	▽		D	BH106/2.7-2.9		CL		**Sandy CLAY** - dark yellowish orange (10YR 6/6), mottled very pale orange (10YR 8/2), 55% clay, 45% sand, firm, very fine grained sand, rare ironstones.	moist to wet	3,5,6 N=11	450mm recovery.
										3,2,2 N=4	450mm recovery.
		5.90								3,6,6 N=12	450mm recovery.
		6.30	D	BH106/5.9-6.1		CL		**Sandy CLAY** - dark yellowish orange (10YR 6/6), 55% clay, 35% sand, 10% gravel.	wet		
						CL		**CLAY with Sand** - moderate yellowish brown (10YR 5/4), mottled very pale orange (10YR 8/2), 65% clay, 30% sand, 5% gravel, very hard, weathered shale.			
								End of Hole at 6.500 m TC-bit refusal.			

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
ASB Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

▽ Encountered Groundwater
▼ Stabilised Groundwater

Additional Comments
Resurfaced with concrete.
SPT Donut hammer.

REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Morgan Singleton-Fookes** Date: **04/06/2019**
Checked By: **Ted Lilly** Date: **09/07/2019**

ATTACHMENT C

Monitoring Well Log

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Hole ID.	**MW101**
Project Number:	**1901031**
Hole Depth:	**7.70 m**
Sheet:	**1 of 1**

Project Name:	**Environmental Due Diligence**
Location / Site:	**Auburn NSW**
Client:	**Fabcot Pty Ltd**
Contractor:	**Fico Group Pty Limited**
Method:	**Solid Flight Auger (Truck mounted)**

Date Started:	**30/05/2019**
Date Completed:	**30/05/2019**
Top of Casing: (mAHD)	**6.77**
Ground Level: (mAHD)	**6.85**
Easting:	**318810.89**
Northing:	**6252615.99**

Method	Depth (mBGL)	Sample Type	HC Odour	Sample ID	PID (ppm)	Material Type	USCS Symbol	Material Description	Moisture	Observations / Comments
								Grass cover		
SFA	0.60	D	Z	MW101/0.15-0.25	0.1	Natural	CL	**CLAY with Sand** - greyish orange (10YR 7/4), 85% clay, 15% sand, stiff to very stiff.	dry	
	2.80		Z		0.1		CL	**CLAY** - greyish orange (10YR 7/4), mottled dark yellowish orange (10YR 6/6) and very pale orange (10YR 8/2), 100% clay, stiff to very stiff. Mottled light brown (5YR 5/6) from 2.5-2.7m.	dry / damp	
	7.00		Z				CL	**CLAY** - dark yellowish orange (10YR 6/6), mottled very pale orange (10YR 8/2), 100% clay, firm. Very pale orange (10YR 8/2) slightly mottled dark yellowish orange (10YR 6/6) at 4m, very stiff. Hard lenses 5.2-5.5m. Firm 6.5-6.7m.	damp / moist	Seepage at 5.7m.
			Z				CL	**CLAY** - moderate reddish brown (10R 4/6), mottled dark yellowish orange (10YR 6/6), 95% clay, 5% sand, very stiff.	moist	
	8							**End of Hole at 7.700 m** Target depth.		

Well Details: Gatic; Grout; 3.70 Bentonite; 4.20; 4.70 Sand; Screen

Well Construction

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
ASB Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

Encountered Groundwater
Stabilised Groundwater

Additional Comments
Well developed 31/05/2019, bailed 15L dry.

REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Morgan Singleton-Fookes** Date: **30/05/2019**
Checked By: **Morgan Singleton-Fookes** Date: **21/06/2019**

GLLOG2019 1901031 AUBURN.GPJ GL.GDT 6/23/19 12:49:40 PM - drawn by laurie white at www.reumad.com.au

Monitoring Well Log

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Hole ID.	**MW102**
Project Number:	**1901031**
Hole Depth:	**5.20 m**
Sheet:	**1 of 1**

Project Name:	**Environmental Due Diligence**
Location / Site:	**Auburn NSW**
Client:	**Fabcot Pty Ltd**
Contractor:	**Fico Group Pty Limited**
Method:	**Solid Flight Auger (Truck mounted)**

Date Started:	**30/05/2019**
Date Completed:	**30/05/2019**
Top of Casing: (mAHD)	**5.84**
Ground Level: (mAHD)	**5.915**
Depth to Groundwater: (mBGL)	**2.9**
Easting:	**318835.11**
Northing:	**6252659.87**

Method	Water Level	Depth (mBGL)	Sample Type	HC Odour	Sample ID	PID (ppm)	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	Observations / Comments	Well Details	Well Construction
										Grass cover				
SFA	▼	0.40	D	Z	MW102/0.1-0.2	0.1	Natural	CL		**CLAY with Sand** - light brown (5YR 5/6), 80% clay, 20% sand, firm.	dry			Gatic
		0.60		Z				SC		**Gravelly SAND / CLAY** - moderate yellowish brown (10YR 5/4), 35% clay, 35% sand, 30% gravel, medium dense.	dry			
		1		Z		0.1		CL		**CLAY** - light brown (5YR 5/6), 80% clay, 20% sand, very stiff.	dry to damp			Grout
		1.50											1.40	
		2		Z				CL		**CLAY** - very pale orange (10YR 8/2), mottled dark yellowish orange (10YR 6/6), 100% clay, firm. Mottled moderate red (5R 4/6) 1.9-2.4m, rare ironstone.	damp		1.90	Bentonite
		3.00											2.20	
	▽	4		Z				SP		**SAND with Clay** - greyish orange pink (10R 8/2), mottled dark yellowish orange (10YR 6/6), 10% clay, 90% sand, very loose to loose, very fine grained sand.	moist wet	GW encountered at 3.4m, left for 15 minutes GWL at 2.9m.		Sand
		5.00		Z				CL		**CLAY with Sand** - greyish orange pink (10R 8/2), mottled dark yellowish orange (10YR 6/6), 70% clay, 30% sand, soft.	wet			Screen
		6								**End of Hole at 5.200 m** Target depth.				

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
ASB Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

▽ Encountered Groundwater
▼ Stabilised Groundwater

Additional Comments
Well developed 31/05/2019, bailed 18L.

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Morgan Singleton-Fookes** Date: **30/05/2019**
Checked By: **Morgan Singleton-Fookes** Date: **21/06/2019**

Monitoring Well Log

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Hole ID.	**MW103**
Project Number:	**1901031**
Hole Depth:	**4.00 m**
Sheet:	**1 of 1**

Project Name:	**Environmental Due Diligence**
Location / Site:	**Auburn NSW**
Client:	**Fabcot Pty Ltd**
Contractor:	**Fico Group Pty Limited**
Method:	**Solid Flight Auger (Truck mounted)**

Date Started:	**30/05/2019**
Date Completed:	**30/05/2019**
Top of Casing: (mAHD)	**4.53**
Ground Level: (mAHD)	**4.628**
Easting:	**318850.14**
Northing:	**6252700.96**

Method	Water Level	Depth (mBGL)	Sample Type	Sample ID	PID (ppm)	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	Observations / Comments	Well Details	Well Construction
SFA	▽	0.04							**BITUMEN**.	dry			Gatic
		0.15							**FILL** - black (N1), 15% clay, 75% sand, 10% gravel, medium compaction.	dry	Low bituminous odour 0.15-0.25m.		
		0.18							**BITUMEN**.				
			D	MW103/0.2-0.3	1.1	Fill			**FILL** - black (N1), 15% clay, 75% sand, 10% gravel, medium dense, dark reddish brown (5YR 3/2) at 0.5m.			0.30	
		0.60			0.5				**CLAY** - dark reddish brown (5YR 3/2), 85% clay, 10% sand, 5% gravel, soft.	damp		0.70	Bentonite
		1.00					CL		**CLAY** - pale yellowish brown (10YR 6/2), 100% clay, very soft.	damp		1.00	
		1.40					CL		**CLAY** - dark reddish brown (5YR 3/2), 85% clay, 10% sand, 5% gravel, soft.	damp			
		1.60											
	▽	2	D	MW103/1.6-1.8		Natural	SP		**SAND with Clay** - pale yellowish brown (10YR 6/2), 15% clay, 85% sand, very loose.	moist	Slight organic odour.		Sand
		3								wet			Screen
		4							**End of Hole at 4.000 m** Target depth.				

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
ASB Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer
▽ Encountered Groundwater
▼ Stabilised Groundwater

Additional Comments
Well developed 31/05/2019, bailed 10L dry.

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Morgan Singleton-Fookes** Date: **30/05/2019**
Checked By: **Morgan Singleton-Fookes** Date: **21/06/2019**

Monitoring Well Log

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Hole ID.	**MW104**
Project Number:	**1901031**
Hole Depth:	**4.00 m**
Sheet:	**1 of 1**

Project Name:	**Environmental Due Diligence**
Location / Site:	**Auburn NSW**
Client:	**Fabcot Pty Ltd**
Contractor:	**Fico Group Pty Limited**
Method:	**Solid Flight Auger (Truck mounted)**

Date Started:	**31/05/2019**
Date Completed:	**31/05/2019**
Top of Casing: (mAHD)	**4.37**
Ground Level: (mAHD)	**4.455**
Depth to Groundwater: (mBGL)	**1.3**
Easting:	**318869.35**
Northing:	**6252746.81**

Method	Depth (mBGL)	Sample Type	Sample ID	PID (ppm)	Material Type	USCS Symbol	Material Description	Moisture	Observations / Comments
SFA	0.03	D	MW104/0.2-0.3	0.1	Fill		**BITUMEN**.	dry	
	0.30			0.1			**FILL** - dark yellowish brown (10YR 4/2), 80% sand, 20% gravel, poorly compacted.		
						CL	**CLAY with Sand** - moderate brown (5YR 3/4), 60% clay, 25% sand, 5% gravel, firm, occasional roots.	damp	
	0.80				Natural	CL	**CLAY** - dark reddish brown (5YR 3/2), 85% clay, 10% sand, 15% gravel, soft, with occasional dark yellowish orange (10YR 6/6) mottled moderate red (5R 4/6), occasional rootlets. Rare rootlets from 1.2m.	damp to moist	
	2.00							wet	
						CL	**CLAY** - dark reddish brown (5YR 3/2), 90% clay, 10% sand, soft.	wet	
	3.70						**CLAY / SAND with Gravel** - light brown (5YR 5/6), 40% clay, 40% sand, 20% gravel, soft, loose.	wet	
							End of Hole at 4.000 m Target depth.		

Well Details: 0.40 Gatic; 0.80 Bentonite; 1.00 Sand; Screen

Well Construction: Gatic, Bentonite, Sand, Screen

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
ASB Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

Encountered Groundwater

Stabilised Groundwater

Additional Comments
Well developed 31/05/2019, bailed 10L dry, left to recharge, bailed 8L.

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Morgan Singleton-Fookes** Date: **31/05/2019**
Checked By: **Morgan Singleton-Fookes** Date: **21/06/2019**

Monitoring Well Log

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Hole ID.	**MW105**
Project Number:	**1901031**
Hole Depth:	**3.00 m**
Sheet:	**1 of 1**

Project Name:	**Environmental Due Diligence**
Location / Site:	**Auburn NSW**
Client:	**Fabcot Pty Ltd**
Contractor:	**Fico Group Pty Limited**
Method:	**Solid Flight Auger (Truck mounted)**

Date Started:	**31/05/2019**
Date Completed:	**31/05/2019**
Easting:	**N/A**
Northing:	**N/A**

Method	Water Level	Depth (mBGL)	Sample Type	Sample ID	PID (ppm)	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	Observations / Comments
SFA		0.04	D	MW105/0.2-0.3	0.4	Fill			**BITUMEN**.	dry	
		0.40							**FILL** - moderate yellowish brown (10YR 5/4), 90% sand, 10% gravel, medium compaction.		
					0.1		CL		**CLAY with Sand** - moderate brown (5YR 4/4), 60% clay, 30% sand, 10% gravel, firm.	damp	
		0.70									
	▽	1	D	MW105/0.8-1.0	0.1		PT		**PEAT** - moderate yellowish brown (10YR 5/4), very soft, organic matter, frequent rootlets.	moist to wet	Low organic odour.
		1.20				Natural					
		2					CL		**CLAY** - dark reddish brown (5YR 3/2), 80% clay, 15% sand, 5% gravel, soft, very fine grained sand.	wet	
									Mottled dark yellowish orange (10YR 6/6) at 1.8m, rare rootlets, rare ironstones.		
		2.50					CL		**CLAY** - very pale orange (10YR 8/2), mottled dark yellowish orange (10YR 6/6), 95% clay, 5% sand, stiff.	wet	
		3							Root at 2.7m.		
									Soft at 2.8m.		
									End of Hole at 3.000 m Target depth.		

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
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U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
ASB Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

▽ Encountered Groundwater
▼ Stabilised Groundwater

Additional Comments
No well installed. Resurfaced with concrete.

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Morgan Singleton-Fookes** Date: **31/05/2019**
Checked By: **Morgan Singleton-Fookes** Date: **21/06/2019**

Monitoring Well Log

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Hole ID.	**MW106**
Project Number:	**1901031**
Hole Depth:	**4.00 m**
Sheet:	**1 of 1**

Project Name:	**Environmental Due Diligence**	Date Started:	**03/06/2019**
Location / Site:	**Auburn NSW**	Date Completed:	**03/06/2019**
Client:	**Fabcot Pty Ltd**	Top of Casing: (mAHD)	**4.60**
Contractor:	**Fico Group Pty Limited**	Ground Level: (mAHD)	**4.695**
Method:	**Solid Flight Auger (Truck mounted)**	Easting:	**318833.69**
		Northing:	**6252775.32**

Method	Water Level	Depth (mBGL)	Sample Type	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	Observations / Comments	Well Details	Well Construction
CC		0.11						**CONCRETE HARDSTAND.**				Gatic
SFA		0.20						**FILL** - black (N1), 65% sand, 35% gravel, medium compaction.	dry	Bitumen fragments 0.2-0.25m.	0.30	
			D	MW106/0.4-0.6	Natural	CL		**CLAY with Sand** - dusky brown (5YR 2/2), 60% clay, 30% sand, 10% gravel, firm.	damp to moist	Low bituminous odour at 0.8m above clay layer.	0.70	Bentonite
		1.00	D	MW106/0.9-1.0								
	▽					CL		**CLAY** - moderate yellowish brown (10YR 5/4), 80% clay, 15% sand, 5% gravel, soft. Very fine sand lens 50mm thick at 1.8-1.85m.	moist	No odour from 1m. Seepage at 1.8m.	1.00	
		2.00				CL		**CLAY** - moderate yellowish brown (10YR 5/4), 90% clay, 5% sand, very soft.	wet			Sand
		3										Screen
		4						**End of Hole at 4.000 m** Target depth.				

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
ASB Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer
▽ Encountered Groundwater
▼ Stabilised Groundwater

Additional Comments
Well developed 03/06/2019, bailed 6L dry, left to recharge, bailed 5L dry.

REUMAD
Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By:	**Morgan Singleton-Fookes**	Date:	**03/06/2019**
Checked By:	**Morgan Singleton-Fookes**	Date:	**21/06/2019**

Monitoring Well Log

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Hole ID.	**MW107**
Project Number:	**1901031**
Hole Depth:	**4.00 m**
Sheet:	**1 of 1**

Project Name:	**Environmental Due Diligence**
Location / Site:	**Auburn NSW**
Client:	**Fabcot Pty Ltd**
Contractor:	**Fico Group Pty Limited**
Method:	**Solid Flight Auger (Truck mounted)**

Date Started:	**03/06/2019**
Date Completed:	**03/06/2019**
Top of Casing: (mAHD)	**7.17**
Ground Level: (mAHD)	**7.274**
Depth to Groundwater: (mBGL)	**2.6**
Easting:	**318773.78**
Northing:	**6252741.87**

Method	Depth (mBGL)	Sample Type	Sample ID	PID (ppm)	DUP / TRIP	Material Type	USCS Symbol	Material Description	Moisture	Observations / Comments
CC	0.32							**CONCRETE HARDSTAND**.		
SFA	0.40	D	MW107/0.5-0.7	0.1	DS1 TS1	Fill		**FILL** - black (N1), 80% sand, 20% gravel, medium compaction.	dry	Low bituminous odour.
								FILL - moderate brown (5YR 4/4), 75% clay, 15% sand, 10% gravel, firm.	dry to damp	Rare brick, ash.
	1.80					Natural	CL	**CLAY** - moderate yellowish brown (10YR 5/4), 85% clay, 15% sand, soft, rare rootlets, wood.	dry	
	2.30						CL	**CLAY** - dark yellowish orange (10YR 6/6), mottled very pale orange (10YR 8/2), 85% clay, 15% sand, soft.	dry	
	2.70						CL	**CLAY** - dark yellowish orange (10YR 6/6) and very pale orange (10YR 8/2) and moderate red (5R 4/6), mottled very pale orange (10YR 8/2), 85% clay, 15% sand, firm.	moist	
	3.20						SP	**SAND with Clay** - dark yellowish orange (10YR 6/6), 10% clay, 90% sand, loose, very fine grained sand.	moist to wet	GW encountered at 3.2m, left for 20 minutes GWL at 2.6m.
	4							**End of Hole at 4.000 m** Target depth.		

Well Details: 0.30 Gatic; 0.70 Bentonite; 1.00 Sand; Screen

Well Construction: Gatic, Bentonite, Sand, Screen

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
ASB Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

▽ Encountered Groundwater
▼ Stabilised Groundwater

Additional Comments
Well developed 03/06/2019, bailed 4L dry, left to recharge, bailed 2L dry.

REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Morgan Singleton-Fookes** Date: **03/06/2019**
Checked By: **Morgan Singleton-Fookes** Date: **21/06/2019**

GLLOG2019 1901031 AUBURN.GPJ GL.GDT 6/23/19 12:49:57 PM - drawn by laurie white at www.reumad.com.au

Monitoring Well Log

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Hole ID.	**MW108**
Project Number:	**1901031**
Hole Depth:	**4.00 m**
Sheet:	**1 of 1**

Project Name:	**Environmental Due Diligence**
Location / Site:	**Auburn NSW**
Client:	**Fabcot Pty Ltd**
Contractor:	**Fico Group Pty Limited**
Method:	**Solid Flight Auger (Truck mounted)**

Date Started:	**03/06/2019**
Date Completed:	**03/06/2019**
Top of Casing: (mAHD)	**7.07**
Ground Level: (mAHD)	**7.157**
Easting:	**318769.29**
Northing:	**6252718.23**

Method	Depth (mBGL)	Sample Type	Sample ID	PID (ppm)	Material Type	USCS Symbol	Material Description	Moisture	Observations / Comments
CC	0.23						**CONCRETE HARDSTAND**.		
SFA	0.40	D	MW108/0.3-0.4	1.7	Fill		**FILL** - dusky brown (5YR 2/2), 10% clay, 40% sand, 50% gravel, poorly compacted.	damp	
	0.80			0.6			**FILL** - moderate brown (5YR 4/4), 70% clay, 25% sand, 5% gravel, soft.	damp	
	1.40				Natural	CL	**CLAY with Sand** - moderate brown (5YR 3/4), mottled dark yellowish orange (10YR 6/6), 70% clay, 25% sand, 5% gravel, firm, rare ironstone.	damp	
	1.90	D	MW108/1.6-1.7			CL	**Sandy CLAY** - pale yellowish brown (10YR 6/2), 50% clay, 45% sand, 5% gravel, firm.	moist	
						SC	**Clayey SAND** - dark yellowish orange (10YR 6/6), mottled very pale orange (10YR 8/2), 15% clay, 85% sand, very loose, very fine grained sand.	wet	
							End of Hole at 4.000 m Target depth.		

Well Details: 0.30 Gatic; 0.70 Bentonite; 1.00 Sand; Screen

Well Construction: Gatic, Bentonite, Sand, Screen

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
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R Representative
C Continuous
J Jar
ASB Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

Encountered Groundwater
Stabilised Groundwater

Additional Comments
Well developed 03/06/2019, bailed 15L.

Log Drawn By:	Laurie White	Logged By:	**Morgan Singleton-Fookes** Date: **03/06/2019**
Contact:	laurie.white@reumad.com.au	Checked By:	**Morgan Singleton-Fookes** Date: **21/06/2019**

Monitoring Well Log

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Hole ID.	**MW109**
Project Number:	**1901031**
Hole Depth:	**4.00 m**
Sheet:	**1 of 1**

Project Name:	**Environmental Due Diligence**
Location / Site:	**Auburn NSW**
Client:	**Fabcot Pty Ltd**
Contractor:	**Fico Group Pty Limited**
Method:	**Solid Flight Auger (Truck mounted)**

Date Started:	**03/06/2019**
Date Completed:	**03/06/2019**
Top of Casing: (mAHD)	**6.96**
Ground Level: (mAHD)	**7.089**
Easting:	**318750.58**
Northing:	**6252681.31**

Method	Depth (mBGL)	Sample Type	Sample ID	PID (ppm)	Material Type	USCS Symbol	Material Description	Moisture	Observations / Comments
CC	0.25						**CONCRETE HARDSTAND**.		
SFA	0.70	D	MW109/1.2-1.4	0.9	Fill		**FILL** - dusky brown (5YR 2/2), 10% clay, 30% sand, 60% gravel, poorly compacted.	damp	Rare metal wire.
	1.50				Natural	CL	**CLAY** - dark yellowish brown (10YR 4/2), 80% clay, 15% sand, 5% gravel, soft.	moist	
						CL	**CLAY with Sand** - moderate yellowish brown (10YR 5/4), 80% clay, 20% sand, soft, sticky. Weathered shale gravel at 2.5m.	moist / wet	
	3.60					CL	**CLAY** - moderate brown (5YR 3/4), 95% clay, 5% sand, soft, frequent organic matter, rootlets, wood.	wet	Moderate organic odour.
							End of Hole at 4.000 m Target depth.		

Well Details: 0.30 Gatic; 0.70 Bentonite; 1.00 Sand; Screen

Well Construction: Gatic, Bentonite, Sand, Screen

Abbreviations

Hydrocarbon Odour
H High
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Sample Type
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U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
ASB Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

Encountered Groundwater
Stabilised Groundwater

Additional Comments
Well developed 04/06/2019, bailed 5L dry, left to recharge, bailed 5L dry.

REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Morgan Singleton-Fookes** Date: **03/06/2019**
Checked By: **Morgan Singleton-Fookes** Date: **21/06/2019**

Monitoring Well Log

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Hole ID.	**MW110**
Project Number:	**1901031**
Hole Depth:	**4.50 m**
Sheet:	**1 of 1**

Project Name:	**Environmental Due Diligence**
Location / Site:	**Auburn NSW**
Client:	**Fabcot Pty Ltd**
Contractor:	**Fico Group Pty Limited**
Method:	**Solid Flight Auger (Truck mounted)**

Date Started:	**03/06/2019**
Date Completed:	**03/06/2019**
Top of Casing: (mAHD)	**7.23**
Ground Level: (mAHD)	**7.337**
Depth to Groundwater: (mBGL)	**2.8**
Easting:	**318744.15**
Northing:	**6252725.55**

Method	Depth (mBGL)	Sample Type	Sample ID	PID (ppm)	Material Type	USCS Symbol	Material Description	Moisture	Observations / Comments
CC	0.13						**CONCRETE HARDSTAND**.		
	0.20	D	MW110/0.2-0.3	1.4			**FILL** - dusky brown (5YR 2/2), 30% sand, 70% gravel.	dry	
SFA	0.60			0.8	Natural	CL	**CLAY with Sand** - light brown (5YR 5/6), 60% clay, 30% sand, 10% gravel, firm, rare rootlets.	damp	
	1.10					CL	**Sandy CLAY** - greyish orange (10YR 7/4), 55% clay, 45% sand, soft, very fine grained sand.	damp	
	1.60					CL	**CLAY** - pale yellowish brown (10YR 6/2), 95% clay, 5% sand, stiff.	damp	
	2.00					CL	**CLAY with Sand** - moderate red (5R 4/6), mottled very pale orange (10YR 8/2), 75% clay, 25% sand, stiff, rare rootlets.	damp	
	2.60					CL	**CLAY with Sand** - dark yellowish orange (10YR 6/6), mottled moderate red (5R 4/6) and very pale orange (10YR 8/2), 75% clay, 25% sand, firm.	moist	Low organic odour.
	3.50					CL	**CLAY with Sand** - dark yellowish orange (10YR 6/6), mottled very pale orange (10YR 8/2), 65% clay, 30% sand, 15% gravel, soft, becoming softer with depth, ironstone at 2.8m.	moist	
	4					SP	**SAND with Clay** - dark yellowish orange (10YR 6/6), 10% clay, 90% sand, very loose, very fine grained sand.	moist / wet	GW encountered at 3.7m, left for 20 minutes GWL at 2.8m.
	5						**End of Hole at 4.500 m** Target depth.		

Well Details: 0.80 – 1.30 Bentonite; 1.50 Sand; Screen

Well Construction: Gatic; Bentonite; Sand; Screen

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
ASB Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

Encountered Groundwater
Stabilised Groundwater

Additional Comments
Well developed 03/06/2019, bailed 13L.

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Morgan Singleton-Fookes** Date: **03/06/2019**
Checked By: **Morgan Singleton-Fookes** Date: **21/06/2019**

Monitoring Well Log

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Hole ID.	**MW111**
Project Number:	**1901031**
Hole Depth:	**5.00 m**
Sheet:	**1 of 1**

Project Name:	**Environmental Due Diligence**
Location / Site:	**Auburn NSW**
Client:	**Fabcot Pty Ltd**
Contractor:	**Fico Group Pty Limited**
Method:	**Solid Flight Auger (Truck mounted)**

Date Started:	**04/06/2019**
Date Completed:	**04/06/2019**
Top of Casing: (mAHD)	**5.85**
Ground Level: (mAHD)	**5.954**
Depth to Groundwater: (mBGL)	**3.1**
Easting:	**318781.01**
Northing:	**6252806.81**

Method	Water Level	Depth (mBGL)	Sample Type	Sample ID	PID (ppm)	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	Observations / Comments
CC		0.14							**CONCRETE HARDSTAND**.		
		0.30	D	MW111/0.2-0.3	0.6	Fill			**FILL** - dusky brown (5YR 2/2), 65% sand, 35% gravel.	damp	
							CL		**CLAY with Sand** - 80% clay, 20% sand, firm.	damp	
		0.70									
		1					CL		**Sandy CLAY** - dark yellowish orange (10YR 6/6), mottled very pale orange (10YR 8/2), 60% clay, 40% sand, soft, very fine grained sand.	damp	
		1.20									
							SC		**Clayey SAND** - dark yellowish orange (10YR 6/6), mottled very pale orange (10YR 8/2), 20% clay, 80% sand, loose.	damp	
		1.70									
SFA		2				Natural	CL		**CLAY with Sand** - moderate brown (5YR 3/4), 80% clay, 20% sand, soft, occasional rootlets / organic matter. Hard lens 2.3-2.4m.	moist	
	▼	3									
	▽	3.70							**PEATY** - dark yellowish orange (10YR 6/6).	wet	GW encountered at 3.7m, left for 20 minutes GWL at 3.1m. Low organic odour.
		4					CL		**CLAY with Sand** - moderate brown (5YR 3/4), 80% clay, 20% sand, soft. Sandy lens 4.5-4.7m.	wet	
		4.10									
		4.80					CL		**CLAY with Sand** - moderate brown (5YR 3/4), 80% clay, 20% sand, soft.	wet	
		5							**End of Hole at 5.000 m** Target depth.		

Well Details: 1.20, 1.70, 2.00

Well Construction: Gatic, Bentonite, Sand, Screen

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
ASB Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

▽ Encountered Groundwater
▼ Stabilised Groundwater

Additional Comments
Well developed 04/06/2019, bailed 20L.

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Morgan Singleton-Fookes** Date: **04/06/2019**
Checked By: **Morgan Singleton-Fookes** Date: **21/06/2019**

ATTACHMENT D

SOIL CLASSIFICATION REPORT

Client	Geo-Logix Pty Ltd	**Source**	BH101 2.6-2.8m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Silty CLAY
Project	Auburn	**Report No**	S49034-PI
Job No	S19289	**Lab No**	S49034

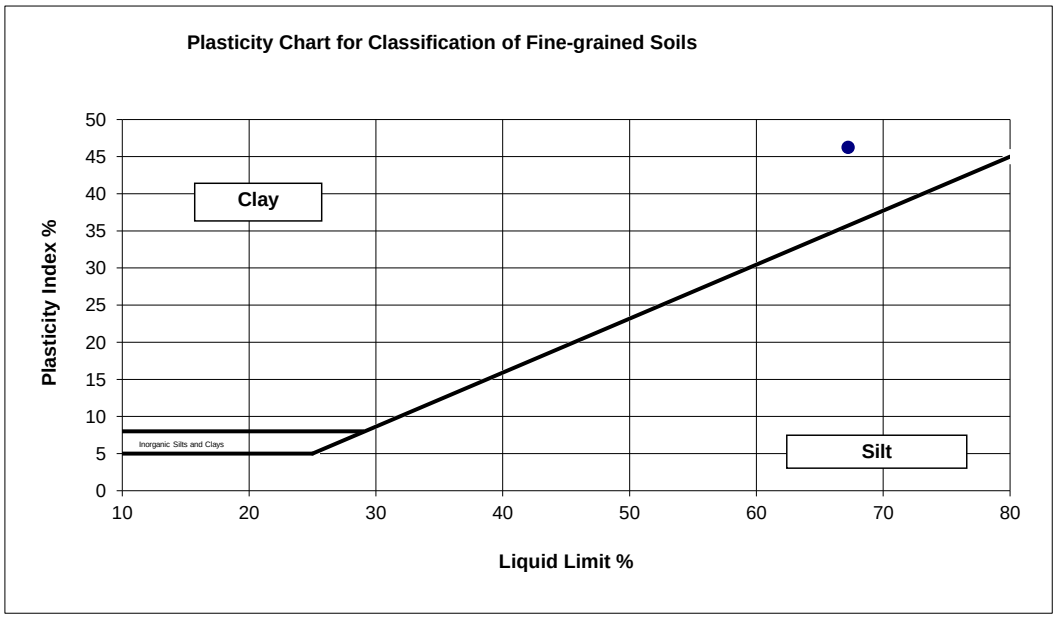
Test Procedure:

- ☐ AS1289 2.1.1 Soil moisture content tests (Oven drying method)
- ☐ AS1289 3.1.1 Soil classification tests - Determination of the liquid limit of a soil - Four point casagrande method
- ☑ AS1289 3.1.2 Soil classification tests - Determination of the liquid limit if a soil - One point Casagrande method (subsidiary method)
- ☑ AS1289 3.2.1 Soil classification tests - Determination of the plastic limit of a soil - Standard method
- ☑ AS1289 3.3.1 Soil classification tests - Calculation of the plasticity Index of a soil
- ☑ AS1289 3.4.1 Soil classification tests - Determination of the linear shrinkage of a soil - Standard method

Sampling: Sampled by Client **Date Sampled:** Unknown

Preparation: Prepared in accordance with the test method

Liquid Limit (%)	67	**Linear Shrinkage (%)**	14.5
Plastic Limit (%)	21	**Plasticity Index**	46



Soil Preparation Method: Dry Sieved
Soil History: Oven Dried
Soil Condition: Linear

Notes

Accredited for compliance with ISO/IEC 17025 - Testing.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. This document shall not be reproduced, except in full.

NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

28/06/2019

Date:

Macquarie Geotechnical
U7/8 10 Bradford Street
Alexandria NSW 2015

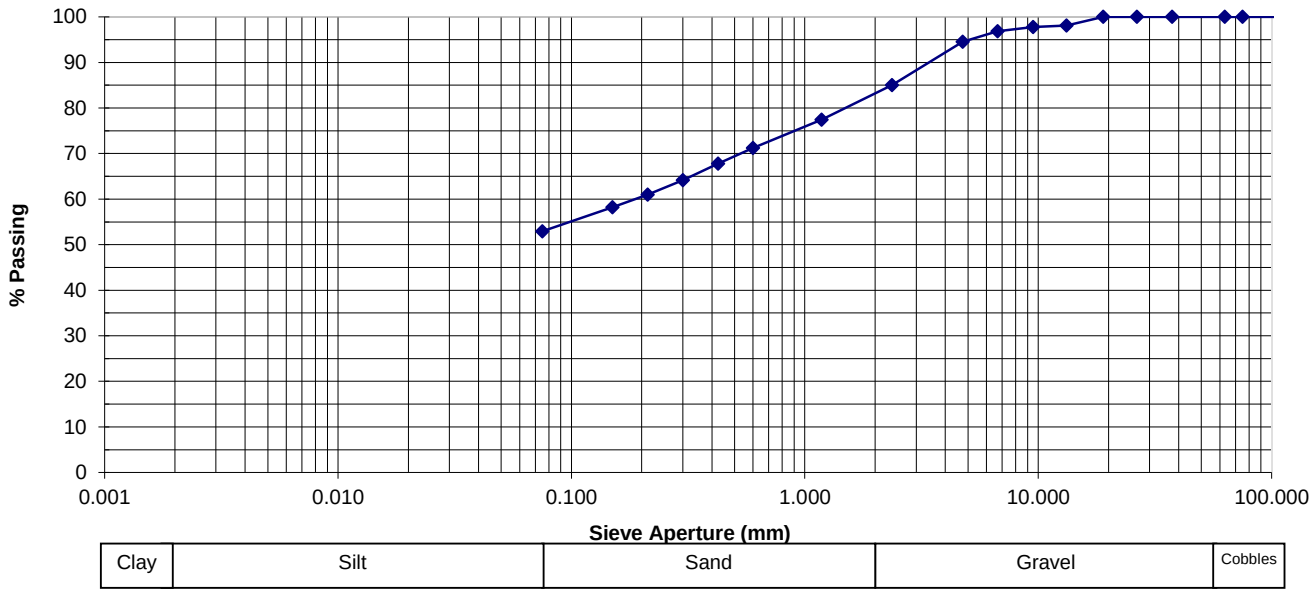
PARTICLE SIZE DISTRIBUTION REPORT

Client:	Geo-Logix Pty Ltd	**Source:**	BH103 0.5-0.7m
Address:	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description:**	Sandy Silty CLAY trace of Gravel
Project:	Auburn	**Report No.:**	S49035-PSD
Job No.:	S19289	**Lab No.:**	S49035

Test Procedure: ☑ AS1289.3.6.1 Soil classification tests - Determination of the particle size distribution of a soil - Standard method of analysis by sieving

Sampling: Sampled by Client | Date Sampled: Unknown

Preparation: Prepared in accordance with the test method



Sieve Apperture: (mm)	% Passing	Specification (..) Envelope	Sieve Aperture: (mm)	% Passing	Specification (..) Envelope
200	100		4.75	95	
75	100		2.36	85	
63	100		1.18	77	
37.5	100		0.600	71	
26.5	100		0.425	68	
19	100		0.300	64	
13.2	98		0.212	61	
9.5	98		0.150	58	
6.7	97		0.075	53	

NATA

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

27/06/2019

Date:

MACQUARIE GEOTECH

Macquarie Geotechnical
U7/8 10 Bradford Street
Alexandria NSW 2015

DRY DENSITY / OPTIMUM MOISTURE CONTENT REPORT

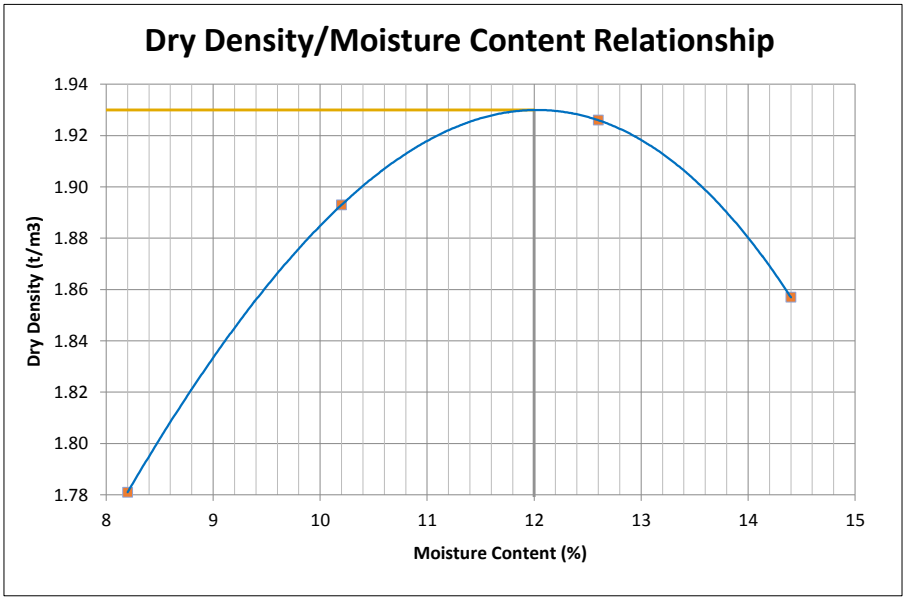
Client	Geo-Logix Pty Ltd	**Source**	BH103 1.5-3.2m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Gravelly CLAY
Project	Auburn	**Report No**	S49036-MDD
Job No	S19289-1	**Sample No**	S49036

Test Procedure:

☑ AS1289.5.1.1 Dry Density / Moisture Content Relationship - Standard Compaction

☑ AS1289.2.1.1 Moisture Content - Oven Drying Method (Standard Method)

Sampling:	Sampled by Client	**Date Sampled:**	Unknown
Preparation:	Prepared in accordance with the test method		



Maximum Dry Density (t/m^3)	1.930
Optimum Moisture Content (%)	12.0
Oversize Retained on 19mm sieve (%)	0.0
Oversize Retained on 37.5mm sieve (%)	0.0
Curing Time	100 hrs
Liquid Limit Determination	Technician Assessment

NATA

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

26/06/2019

Date:

MACQUARIE GEOTECH

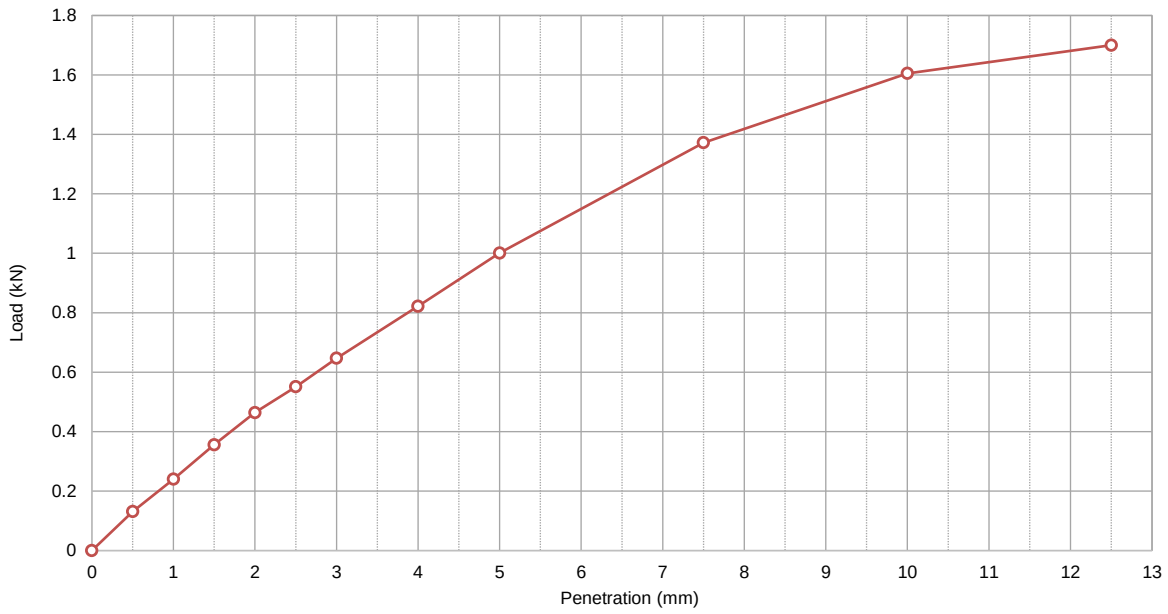
Macquarie Geotechnical
U7/8 10 Bradford Street
Alexandria NSW 2015

CALIFORNIA BEARING RATIO REPORT

Client	Geo-Logix Pty Ltd	**Source**	BH103 1.5-3.2m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Gravelly CLAY
Project	Auburn	**Report No.**	S49036-CBR
Job No.	S19289	**Sample No.**	S49036

Test Procedure:	☑ AS 1289.6.1.1	☐ RMS T117	California Bearing Ratio
	☑ AS 1289.5.1.1	☐ RMS T111	Dry Density / Moisture Content Relationship - Standard Compaction
	☐ AS 1289.5.2.1	☐ RMS T112	Dry Density / Moisture Content Relationship - Modified Compaction
	☑ AS 1289.2.1.1	☐ RMS T120	Moisture Content - Oven Drying Method (Standard Method)

Sampling:	Sampled by Client	**Date Sampled:**	Unknown
Preparation:	Prepared in accordance with the test method		



Preparation & Specification		Density & Moisture	Achieved	Target
Retained on 19.0mm Sieve (%)	0	Lab Moisture Ratio - LMR (%)	96.0	100.0
Method of Establishing Plasticity Level	Technician Assessment	Lab Density Ratio - LDR (%)	98.5	98.0
Sample Curing Time (hrs)	54 hrs	Dry Density - At Compaction (t/m³)	1.90	1.89
Compaction Hammer Used	Standard	Dry Density - After Soaking (t/m³)	1.90	
Surcharge Mass Applied (kg)	4.5	Specimen Swell (%)	0.2	
Period of Soaking (Days)	4	Moisture Content - At Compaction (%)	11.5	
Maximum Dry Density - MDD (t/m³)	1.93	Moisture Content - Top 30mm (%)	14.2	
Optimum Moisture Content - OMC (%)	12.0	Moisture Content - Remainder (%)	13.6	

Material CBR Value (%): **5** **at a penetration of** **5.0** **mm**

Notes:

NATA

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

2/07/2019

Chris Lloyd Date:

MACQUARIE GEOTECH

Macquarie Geotechnical
U7/8 10 Bradford Street
Alexandria NSW 2015

SOIL CLASSIFICATION REPORT

Client	Geo-Logix Pty Ltd	**Source**	BH103 2.0-2.2m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Silty CLAY trace of Sand and Gravel
Project	Auburn	**Report No**	S49037-PI
Job No	S19289	**Lab No**	S49037

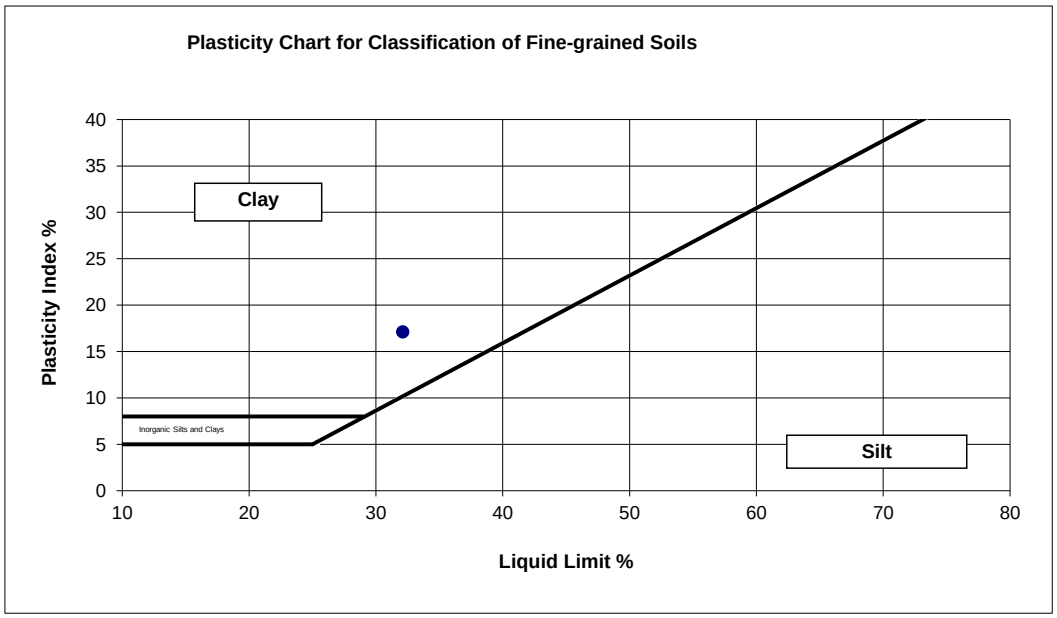
Test Procedure:

- ☐ AS1289 2.1.1 Soil moisture content tests (Oven drying method)
- ☐ AS1289 3.1.1 Soil classification tests - Determination of the liquid limit of a soil - Four point casagrande method
- ☑ AS1289 3.1.2 Soil classification tests - Determination of the liquid limit if a soil - One point Casagrande method (subsidiary method)
- ☑ AS1289 3.2.1 Soil classification tests - Determination of the plastic limit of a soil - Standard method
- ☑ AS1289 3.3.1 Soil classification tests - Calculation of the plasticity Index of a soil
- ☑ AS1289 3.4.1 Soil classification tests - Determination of the linear shrinkage of a soil - Standard method

Sampling: Sampled by Client **Date Sampled:** Unknown

Preparation: Prepared in accordance with the test method

Liquid Limit (%)	32	**Linear Shrinkage (%)**	8.0
Plastic Limit (%)	15	**Plasticity Index**	17



Soil Preparation Method: Dry Sieved
Soil History: Oven Dried
Soil Condition: Linear

Notes

Accredited for compliance with ISO/IEC 17025 - Testing.

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

28/06/2019

Date:

Macquarie Geotechnical
U7/8 10 Bradford Street
Alexandria NSW 2015

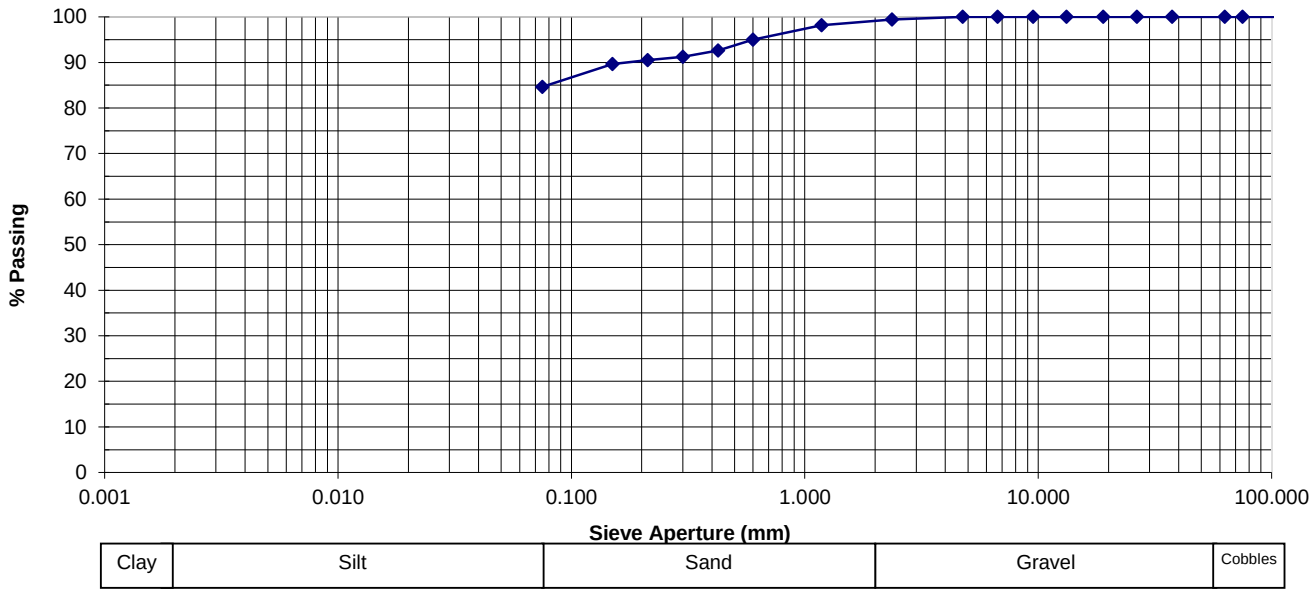
PARTICLE SIZE DISTRIBUTION REPORT

Client:	Geo-Logix Pty Ltd	**Source:**	BH103 2.0-2.2m
Address:	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description:**	Silty CLAY trace of Sand and Gravel
Project:	Auburn	**Report No.:**	S49037-PSD
Job No.:	S19289	**Lab No.:**	S49037

Test Procedure: ☑ AS1289.3.6.1 Soil classification tests - Determination of the particle size distribution of a soil - Standard method of analysis by sieving

Sampling: Sampled by Client | Date Sampled: Unknown

Preparation: Prepared in accordance with the test method



Sieve Apperture: (mm)	% Passing	Specification (..) Envelope	Sieve Aperture: (mm)	% Passing	Specification (..) Envelope
200	100		4.75	100	
75	100		2.36	99	
63	100		1.18	98	
37.5	100		0.600	95	
26.5	100		0.425	93	
19	100		0.300	91	
13.2	100		0.212	90	
9.5	100		0.150	90	
6.7	100		0.075	85	

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

27/06/2019

Date:

MACQUARIE GEOTECH

Macquarie Geotechnical
U7/8 10 Bradford Street
Alexandria NSW 2015

SOIL CLASSIFICATION REPORT

Client	Geo-Logix Pty Ltd	**Source**	BH103 4.5-4.7m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Silty CLAY
Project	Auburn	**Report No**	S49038-PI
Job No	S19289	**Lab No**	S49038

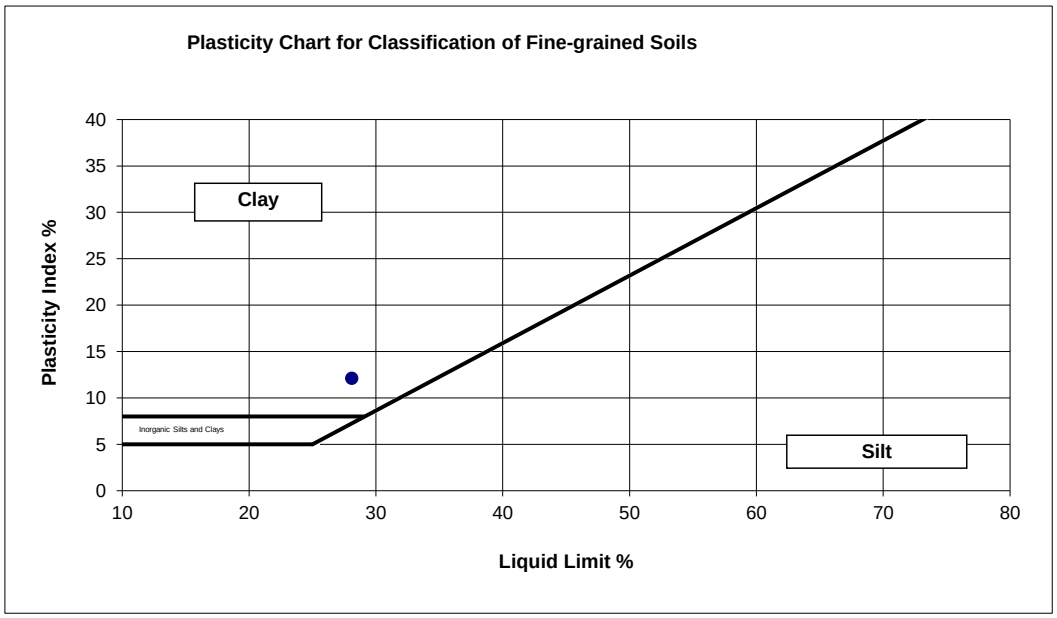
Test Procedure:

- ☐ AS1289 2.1.1 Soil moisture content tests (Oven drying method)
- ☐ AS1289 3.1.1 Soil classification tests - Determination of the liquid limit of a soil - Four point casagrande method
- ☑ AS1289 3.1.2 Soil classification tests - Determination of the liquid limit if a soil - One point Casagrande method (subsidiary method)
- ☑ AS1289 3.2.1 Soil classification tests - Determination of the plastic limit of a soil - Standard method
- ☑ AS1289 3.3.1 Soil classification tests - Calculation of the plasticity Index of a soil
- ☑ AS1289 3.4.1 Soil classification tests - Determination of the linear shrinkage of a soil - Standard method

Sampling: Sampled by Client **Date Sampled:** Unknown

Preparation: Prepared in accordance with the test method

Liquid Limit (%)	28	**Linear Shrinkage (%)**	4.5
Plastic Limit (%)	16	**Plasticity Index**	12



Soil Preparation Method: Dry Sieved
Soil History: Oven Dried
Soil Condition: Linear

Notes

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28/06/2019

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DRY DENSITY / OPTIMUM MOISTURE CONTENT REPORT

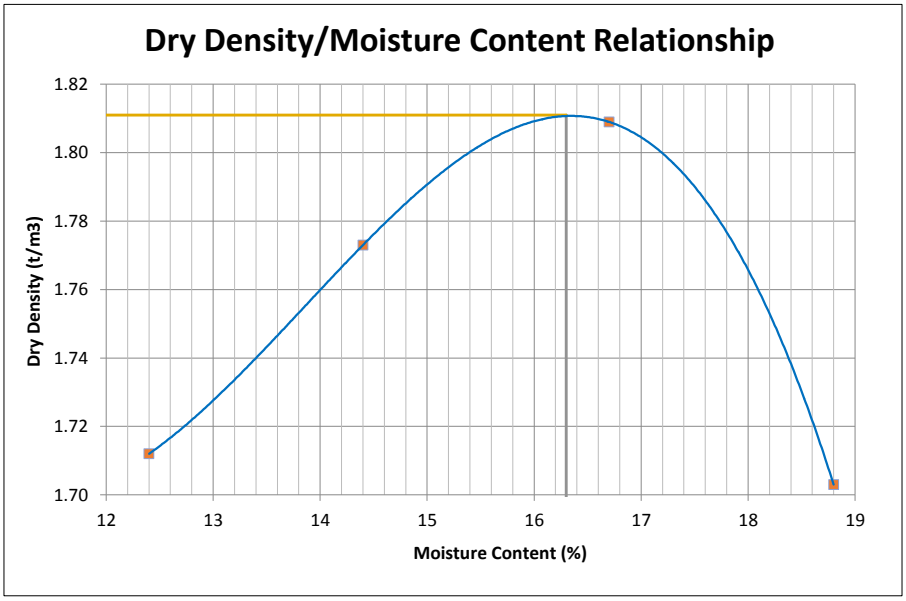
Client	Geo-Logix Pty Ltd	**Source**	BH105 0.5-2.0m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Gravelly CLAY
Project	Auburn	**Report No**	S49039-MDD
Job No	S19289-1	**Sample No**	S49039

Test Procedure:

☑ AS1289.5.1.1 Dry Density / Moisture Content Relationship - Standard Compaction

☑ AS1289.2.1.1 Moisture Content - Oven Drying Method (Standard Method)

Sampling:	Sampled by Client	**Date Sampled:**	Unknown
Preparation:	Prepared in accordance with the test method		



Maximum Dry Density (t/m^3)	1.811
Optimum Moisture Content (%)	16.3
Oversize Retained on 19mm sieve (%)	15.2
Oversize Retained on 37.5mm sieve (%)	5.1
Curing Time	102 hrs
Liquid Limit Determination	Technician Assessment

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

26/06/2019

Date:

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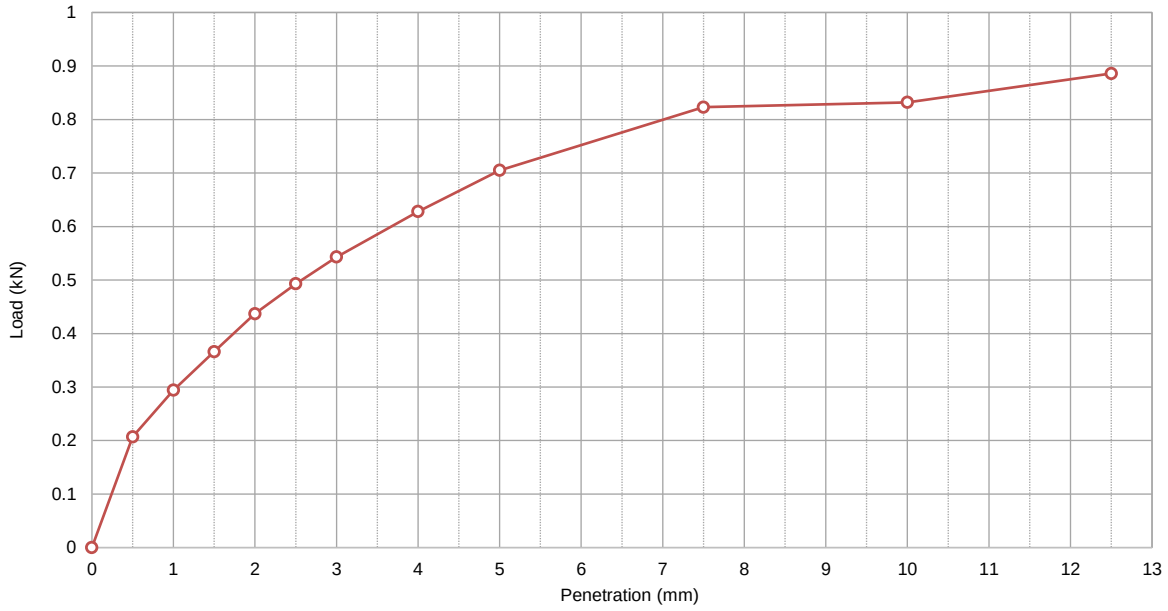
Alexandria NSW 2015

CALIFORNIA BEARING RATIO REPORT

Client	Geo-Logix Pty Ltd	**Source**	BH105 0.5-2.0m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Gravelly CLAY
Project	Auburn	**Report No.**	S49039-CBR
Job No.	S19289	**Sample No.**	S49039

Test Procedure:				
☑	AS 1289.6.1.1	☐	RMS T117	California Bearing Ratio
☑	AS 1289.5.1.1	☐	RMS T111	Dry Density / Moisture Content Relationship - Standard Compaction
☐	AS 1289.5.2.1	☐	RMS T112	Dry Density / Moisture Content Relationship - Modified Compaction
☑	AS 1289.2.1.1	☐	RMS T120	Moisture Content - Oven Drying Method (Standard Method)

Sampling:	Sampled by Client	**Date Sampled:**	Unknown
Preparation:	Prepared in accordance with the test method		



Preparation & Specification		**Density & Moisture**	**Achieved**	**Target**
Retained on 19.0mm Sieve (%)	15	Lab Moisture Ratio - LMR (%)	98.0	100.0
Method of Establishing Plasticity Level	Technician Assessment	Lab Density Ratio - LDR (%)	98.5	98.0
Sample Curing Time (hrs)	53 hrs	Dry Density - At Compaction (t/m³)	1.78	1.77
Compaction Hammer Used	Standard	Dry Density - After Soaking (t/m³)	1.77	
Surcharge Mass Applied (kg)	4.5	Specimen Swell (%)	0.5	
Period of Soaking (Days)	4	Moisture Content - At Compaction (%)	15.9	
Maximum Dry Density - MDD (t/m³)	1.81	Moisture Content - Top 30mm (%)	20.0	
Optimum Moisture Content - OMC (%)	16.3	Moisture Content - Remainder (%)	18.4	

Material CBR Value (%): **3.5** **at a penetration of** **2.5** **mm**

Notes:

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

2/07/2019

Chris Lloyd Date:

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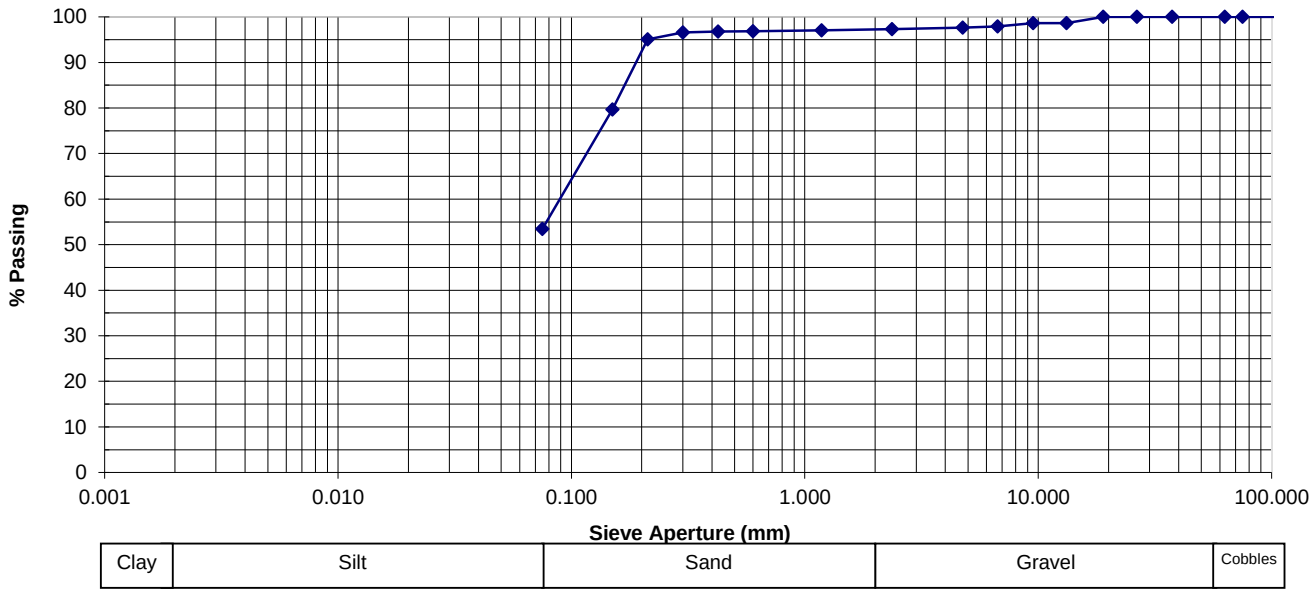
PARTICLE SIZE DISTRIBUTION REPORT

Client:	Geo-Logix Pty Ltd	**Source:**	BH105 2.5-2.7m
Address:	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description:**	Sandy Silty CLAY trace of Gravel
Project:	Auburn	**Report No.:**	S49040-PSD
Job No.:	S19289	**Lab No.:**	S49040

Test Procedure: ☑ AS1289.3.6.1 Soil classification tests - Determination of the particle size distribution of a soil - Standard method of analysis by sieving

Sampling: Sampled by Client | Date Sampled: Unknown

Preparation: Prepared in accordance with the test method



Sieve Apperture: (mm)	% Passing	Specification (..) Envelope	Sieve Aperture: (mm)	% Passing	Specification (..) Envelope
200	100		4.75	98	
75	100		2.36	97	
63	100		1.18	97	
37.5	100		0.600	97	
26.5	100		0.425	97	
19	100		0.300	97	
13.2	99		0.212	95	
9.5	99		0.150	80	
6.7	98		0.075	53	

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

27/06/2019

Date:

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Alexandria NSW 2015

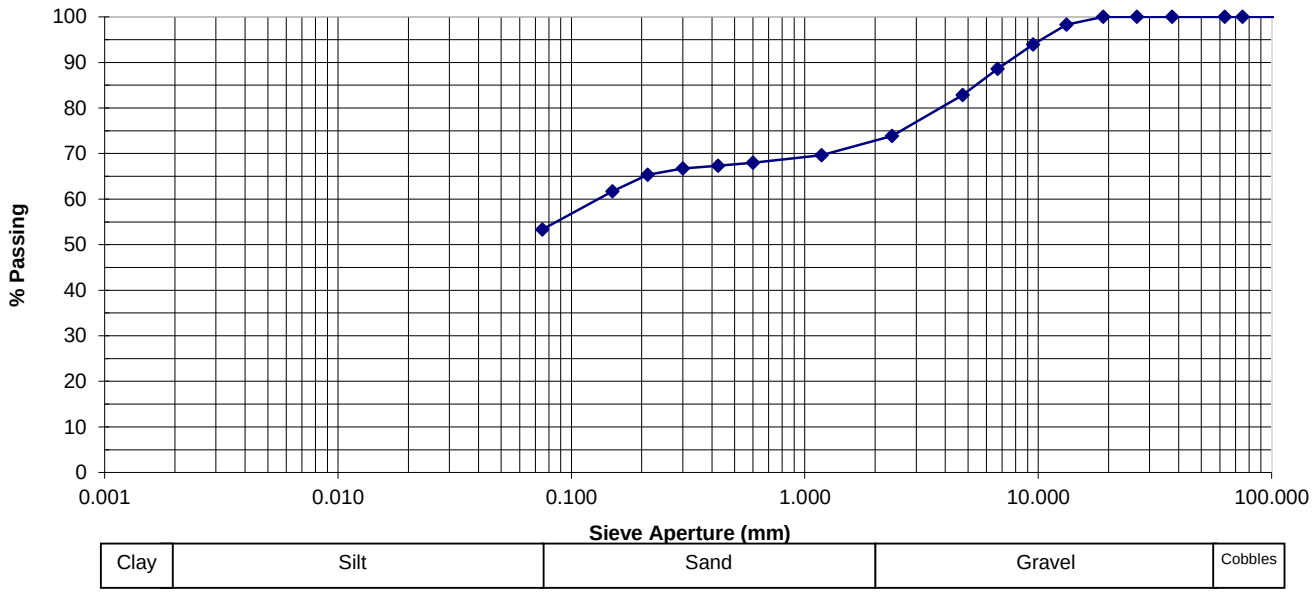
PARTICLE SIZE DISTRIBUTION REPORT

Client:	Geo-Logix Pty Ltd	**Source:**	BH106 5.9-6.1m
Address:	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description:**	Silty CLAY with Gravel and Sand
Project:	Auburn	**Report No.:**	S49041-PSD
Job No.:	S19289	**Lab No.:**	S49041

Test Procedure: ☑ AS1289.3.6.1 Soil classification tests - Determination of the particle size distribution of a soil - Standard method of analysis by sieving

Sampling: Sampled by Client | Date Sampled: Unknown

Preparation: Prepared in accordance with the test method



Sieve Apperture: (mm)	% Passing	Specification (..) Envelope	Sieve Aperture: (mm)	% Passing	Specification (..) Envelope
200	100		4.75	83	
75	100		2.36	74	
63	100		1.18	70	
37.5	100		0.600	68	
26.5	100		0.425	67	
19	100		0.300	67	
13.2	98		0.212	65	
9.5	94		0.150	62	
6.7	89		0.075	53	

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27/06/2019

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Geo-Logix P/L
Bld Q2 Level 3, 2309/4 Daydream St
Warriewood
NSW 2102

NATA Accredited
Accreditation Number 1261
Site Number 18217

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The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention: **Ben Pearce**

Report **659313-S**
Project name AUBURN
Project ID 1901031
Received Date Jun 05, 2019

Client Sample ID			[G01]**BH102/1.2-1.4**	**BH102/3.8-4.0**	**BH102/4.8-5.0**	**BH104/1.0-1.2**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Jn04067**	**S19-Jn04069**	**S19-Jn04070**	**S19-Jn04074**
Date Sampled			**May 31, 2019**	**May 31, 2019**	**May 31, 2019**	**Jun 03, 2019**
Test/Reference	LOR	Unit				
Chloride	10	mg/kg	310	1100	860	100
Conductivity (1:5 aqueous extract at 25°C as rec.)	5	uS/cm	220	570	550	260
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	7.1	6.1	6.8	8.3
Resistivity*	0.5	ohm.m	230	88	90	200
Sulphate (as SO4)	10	mg/kg	< 25	260	270	110
% Moisture	1	%	26	26	20	18

Client Sample ID			[G01]**BH104/4.1-4.3**	**BH104/8.0-8.2**	**BH106/1.0-1.2**	**BH106/2.7-2.9**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Jn04076**	**S19-Jn04078**	**S19-Jn04082**	**S19-Jn04083**
Date Sampled			**Jun 03, 2019**	**Jun 03, 2019**	**Jun 04, 2019**	**Jun 04, 2019**
Test/Reference	LOR	Unit				
Chloride	10	mg/kg	770	1400	52	15
Conductivity (1:5 aqueous extract at 25°C as rec.)	5	uS/cm	410	810	130	140
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	6.9	6.6	7.0	8.2
Resistivity*	0.5	ohm.m	120	62	400	370
Sulphate (as SO4)	10	mg/kg	< 25	87	57	150
% Moisture	1	%	25	25	21	16

Client Sample ID			**BH106/5.9-6.1**
Sample Matrix			**Soil**
Eurofins | mgt Sample No.			**S19-Jn04084**
Date Sampled			**Jun 04, 2019**
Test/Reference	LOR	Unit	
Chloride	10	mg/kg	810
Conductivity (1:5 aqueous extract at 25°C as rec.)	5	uS/cm	560
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	7.5
Resistivity*	0.5	ohm.m	90
Sulphate (as SO4)	10	mg/kg	210
% Moisture	1	%	20

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chloride	Sydney	Jun 10, 2019	28 Day
- Method: E045 /E047 Chloride			
Conductivity (1:5 aqueous extract at 25°C as rec.)	Sydney	Jun 10, 2019	7 Day
- Method: LTM-INO-4030 Conductivity			
pH (1:5 Aqueous extract at 25°C as rec.)	Sydney	Jun 10, 2019	7 Day
- Method: LTM-GEN-7090 pH in soil by ISE			
Sulphate (as SO4)	Sydney	Jun 10, 2019	28 Day
- Method: E045 Anions by Ion Chromatography			
% Moisture	Sydney	Jun 07, 2019	14 Day
- Method: LTM-GEN-7080 Moisture			

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NATA # 1261 Site # 18217

Brisbane
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NATA # 1261 Site # 20794

Perth
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Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Company Name: Geo-Logix P/L
Address: Bld Q2 Level 3, 2309/4 Daydream St
Warriewood
NSW 2102

Project Name: AUBURN
Project ID: 1901031

Order No.:
Report #: 659313
Phone: 02 9979 1722
Fax: 02 9979 1222

Received: Jun 5, 2019 4:07 PM
Due: Jun 18, 2019
Priority: 7 Day
Contact Name: Ben Pearce

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						HOLD	Aggressivity Soil Set	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	BH101/1.0-1.2	May 30, 2019		Soil	S19-Jn04064	X		
2	BH101/2.6-2.8	May 30, 2019		Soil	S19-Jn04065	X		
3	BH101/4.2-4.4	May 30, 2019		Soil	S19-Jn04066	X		
4	BH102/1.2-1.4	May 31, 2019		Soil	S19-Jn04067		X	X
5	BH102/2.5-2.7	May 31, 2019		Soil	S19-Jn04068	X		
6	BH102/3.8-4.0	May 31, 2019		Soil	S19-Jn04069		X	X
7	BH102/4.8-5.0	May 31, 2019		Soil	S19-Jn04070		X	X
8	BH103/0.5-0.7	May 31, 2019		Soil	S19-Jn04071	X		
9	BH103/2.0-2.2	May 31, 2019		Soil	S19-Jn04072	X		

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Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
10	BH103/4.5-4.7	May 31, 2019		Soil	S19-Jn04073	X		
11	BH104/1.0-1.2	Jun 03, 2019		Soil	S19-Jn04074		X	X
12	BH104/2.5-2.7	Jun 03, 2019		Soil	S19-Jn04075	X		
13	BH104/4.1-4.3	Jun 03, 2019		Soil	S19-Jn04076		X	X
14	BH104/6.7-6.9	Jun 03, 2019		Soil	S19-Jn04077	X		
15	BH104/8.0-8.2	Jun 03, 2019		Soil	S19-Jn04078		X	X
16	BH105/0.8-1.0	Jun 04, 2019		Soil	S19-Jn04079	X		
17	BH105/2.5-2.7	Jun 04, 2019		Soil	S19-Jn04080	X		
18	BH105/5.0-5.2	Jun 04, 2019		Soil	S19-Jn04081	X		
19	BH106/1.0-1.2	Jun 04, 2019		Soil	S19-Jn04082		X	X
20	BH106/2.7-2.9	Jun 04, 2019		Soil	S19-Jn04083		X	X
21	BH106/5.9-6.1	Jun 04, 2019		Soil	S19-Jn04084		X	X

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Sample Detail	HOLD	Aggressivity Soil Set	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271			
Sydney Laboratory - NATA Site # 18217	X	X	X
Brisbane Laboratory - NATA Site # 20794			
Perth Laboratory - NATA Site # 23736			
Test Counts	12	9	9

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure, April 2011 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.2 2018
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.2 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank									
Chloride			mg/kg	< 10			10	Pass	
Conductivity (1:5 aqueous extract at 25°C as rec.)			uS/cm	< 5			5	Pass	
Sulphate (as SO4)			mg/kg	< 10			10	Pass	
LCS - % Recovery									
Chloride			%	91			70-130	Pass	
Conductivity (1:5 aqueous extract at 25°C as rec.)			%	91			70-130	Pass	
Resistivity*			%	91			70-130	Pass	
Sulphate (as SO4)			%	91			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
				Result 1					
Chloride	S19-Jn04067	CP	%	107			70-130	Pass	
Sulphate (as SO4)	S19-Jn04067	CP	%	107			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
Chloride	S19-Jn04067	CP	mg/kg	310	310	<1	30%	Pass	
Conductivity (1:5 aqueous extract at 25°C as rec.)	S19-Jn04067	CP	uS/cm	220	200	6.0	30%	Pass	
pH (1:5 Aqueous extract at 25°C as rec.)	S19-Jn14269	NCP	pH Units	7.3	7.4	Pass	30%	Pass	
Resistivity*	S19-Jn04067	CP	ohm.m	230	240	6.0	30%	Pass	
Sulphate (as SO4)	S19-Jn04067	CP	mg/kg	< 25	< 25	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S19-Jn04070	CP	%	20	20	1.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
G01	The LORs have been raised due to matrix interference

Authorised By

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Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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