Dear Sir/Madam,

Please find below a report on the geotechnical investigation carried out at 49 Myrna Road, Strathfield, New South Wales (herein referred to as the ‘site’).

1 Project Information

1.1 Introduction and Objective

Geo-Environmental Engineering Pty Ltd (GEE) was commissioned by Mahesh Katragadda to complete a geotechnical investigation of the site in relation to the proposed construction of a two level house with a single level basement.

GEE understands that the investigation was required to support a development application with Strathfield Council and to assist with the structural design of the development.

The report presents the factual results of the field investigations and provides interpretation and recommendations regarding the ground conditions at the site in accordance with client requirements and the agreed scope of work.
1.2 **PROPOSED DEVELOPMENT**

Plans of the proposed development are provided for reference in Appendix A and as previously mentioned it comprises new two level dwelling over a single level basement, with an in-ground swimming pool at the rear. The basement will be beneath the central part of the new dwelling and extend to within 1.5m of the northern and southern boundaries, and over 10m to the eastern and western boundaries. The finished floor level of the basement has not yet been finalised however, GEE estimates that excavation of between 3.0 – 3.5m will be required.

The depth of the pool is also not known, however, GEE anticipates that excavation of between 1.0m and 2.0m will be required. The pool excavation will be approximately 5.0m from the northern and southern boundaries and over 8.0m from the eastern and western boundaries. Of particular significance to the pool excavation is an existing Sydney Water sewer pipeline which passes within close proximity to the western end of the pool. According to the Sydney Water Dial-Before-You-Dig (DBYD) plan (Appendix B), the sewer comprises a 150mm diameter salt glazed ware pipe and it has an invert depth of approximately 1.4m. This sewer will require protection prior and during excavation works and consideration will need to be given to technical guidelines relating to building over, or adjacent, to pipe assets (reference 1).

1.3 **SCOPE OF WORK**

The scope of work undertaken by GEE, to satisfy the above objective, was as follows:

◊ Visual appraisal of the site conditions and locality,
◊ Review of published geological maps for the area,
◊ The drilling of boreholes and the performance of a Dynamic Cone Penetrometer (DCP) tests to assess the ground conditions,
◊ Collection of representative soil samples for the preliminary assessment of soil salinity and aggressivity, and
◊ Engineering assessment and reporting.
2 **SITE INFORMATION**

2.1 **SITE DESCRIPTION**

The site is located on the western side of Myrna Road and is legally described as Lot 49 in Deposited Plan 14613. The site covers an area of 626.8m² (by title) and is currently occupied by a single-storey brick cottage located in the central portion of the site. A detached garage at the north-western end is connected to Myrna road by a driveway that extends eastwards along the northern border. The remainder of the site is occupied by grass lawns, some paved areas, garden beds and small trees.

As previously mentioned, there exists a Sydney Water sewer pipeline which crosses the rear (western part) of the site and services the properties to the north (43, 45 and 47 Myrna Road). According to the Sydney Water Dial-Before-You-Dig (DBYD) plan ([Appendix B](#)), the sewer comprises a 150mm diameter salt glazed ware pipe and it has an invert depth of approximately 1.4m.

2.2 **TOPOGRAPHY**

The site is located on a gentle slope, with highest ground at the north-eastern corner sloping away at an average grade of approximately 5% to the south-west. According to the development plans ([Appendix A](#)), the site elevation falls from approximately 25.53m at the north-eastern corner to 23.21m, (AHD) at the south western corner.

2.3 **REGIONAL GEOLGY AND SOILS**

A review of the Sydney 1:100 000 Geological Series Sheet (reference 2) indicates that the site is underlain by the Bringelly Shale formation of the Wianamatta Group which typically comprises “...shale, carbonaceous claystone, laminit, fine to medium-grained lithic sandstone, rare coal”.

A review of the regional soils map (reference 3) indicates the site is located within the Blacktown Soil Landscape Group, recognised by gently undulating rises on the underlying shale formation. Local reliefs are up to 30m and slopes are usually less than 5% in gradient. Soils of the Blacktown Group typically comprise heavy clays that have been derived from the weathering process of shale bedrock, have low fertility and are often strongly acidic.
2.4 **Regional Hydrogeology**

The regional and permanent groundwater in the vicinity of the site, is expected to be confined or partly confined, discrete, water-bearing zones within the bedrock formation. However, intermittent ‘perched’ water seepage often occurs at the soil / bedrock interface following heavy and prolonged rainfall events.

Permanent groundwater associated with the Wianamatta group of Shale bedrock is characterised by high salinity (reference 4 and 5) and high ammonia concentrations (>10 mg/L, reference 6). In this regard, groundwater within the shale formation is not extracted for potable use and rarely extracted for commercial / industrial purposes. This is supported by a review of the NSW Water Information database (http://waterinfo.nsw.gov.au/gw/) for registered groundwater bores in the vicinity of the site. The search revealed that there are no bores within 500m of the site.

The rate of groundwater movement is likely to be low as a result of low relief, low altitude (approximately ~ 25m AHD) and the low permeability of the Shale (between $10^{-13}$ and $10^{-9}$ m/sec – reference 7). Groundwater flow is dominated by water movement through fractures (or joints), where stress has caused partial loss of cohesion in the rock and evidence of potential water bearing fractures is usually the presence of clay or iron-staining along face of the joints.

2.5 **Acid Sulfate Soil Risk**

Acid Sulfate Soil is naturally occurring sediments and soils containing iron sulfides (principally iron sulfide, iron disulfide or their precursors). Oxidation of these soils through exposure to the atmosphere or through lowering of groundwater levels results in the generation of sulfuric acid.

Land that may contain potential acid sulfate soils was mapped by the NSW Department of Land and Water Conservation (DLWC) and based on these maps local Councils produced their own acid sulfate soil maps to be used for planning purposes.

The DLWC ‘Botany Bay’ Acid Sulfate Soil Risk Map (reference 8), indicates that the site lies within an area with no known occurrences of acid sulphate soil and land activities within this area are “...not likely to be affected by acid sulphate soil materials”.

The Acid Sulfate Soils Map produced by Council (reference 9) indicates that the site lies within an area defined as “Class 5”. In accordance with Clause 6.1 of Strathfield City Council’s LEP (reference 10), a preliminary assessment of acid sulphate soil and
potentially a management plan, is required for “...works within 500m of adjacent Class 1, 2, 3 or 4 land that is below 5 metres Australian Height Datum and by which the watertable is likely to be lowered below 1 metre Australian Height Datum on adjacent Class 1, 2, 3 or 4 land”.

Firstly, the surface elevation is much greater than 5m AHD (at approximately 25m AHD). Secondly, the maximum depth of proposed excavation is expected to be 3.5m below the ground surface (bgs) which equates to a bulk excavation level which is significantly greater than 1m AHD. In this regard, there is no need for an acid sulphate soil assessment or management plan.
3 Method of Investigation

Fieldwork was completed on the 4th April 2017 by Joshua Long, a geotechnical engineer and comprised:

- The drilling and logging of three boreholes (BH1 to BH3) in accessible areas of the site to assess the soil conditions and depth to bedrock,
- The performance of DCP tests adjacent to each borehole to assess the consistency and/or relative density of the soil profile and to assist with determining the depth to bedrock, and
- The collection of representative soil samples for the preliminary assessment of soil salinity and aggressivity.

The boreholes were drilled using an 85mm diameter stainless steel hand auger, while the DCP tests were performed in accordance with Australian Standard Test Method AS1289.6.3.2-1997 (reference 11). Each borehole was advanced through topsoil / fill material and the natural soil profile before refusing on weathered shale bedrock at depths of 2.0m below ground surface (bgs) at BH1, 2.0 m bgs at BH2 and 1.35m bgs at BH3.

The DCP tests were terminated due to practical refusal at a similar depth to the boreholes which support the conclusion that bedrock had been encountered. The exception to this was borehole BH3 where the DCP extended to a slightly greater depth of 1.55m before refusing on weathered shale bedrock.

The location of the boreholes and DCP tests were estimated using measurements from existing features and is shown on Figure 1. A copy of the borehole logs, including DCP test results, is provided in Appendix C.
4 **INVESTIGATION RESULTS**

4.1 **SUBSURFACE CONDITIONS**

The site stratigraphy, as observed in the boreholes, typically comprised topsoil and/or fill material overlying natural silty clay soils, which in turn was underlain by weathered shale bedrock. Detailed descriptions of the subsurface conditions on site are provided in the borehole logs provided in **Appendix C**, while the soil profile is also summarised in **Table 1**.

**Table 1**: Summary of Subsurface Conditions

<table>
<thead>
<tr>
<th>Layer / Unit</th>
<th>Description</th>
<th>Depth to Base of Layer (m)(^1)</th>
<th>Consistency / Relative Density(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOPSOIL/FILL</td>
<td>Silty SAND: dark brown / dark grey, fine to medium grained, with a trace of clay</td>
<td>0.2 – 0.3</td>
<td>Loose</td>
</tr>
<tr>
<td>NATURAL SOIL</td>
<td>Silty CLAY: orange-brown becoming pale grey at depth, medium to high plasticity, moist with ironstone gravel</td>
<td>1.35 – 1.6</td>
<td>Firm becoming stiff to very stiff at depth</td>
</tr>
<tr>
<td></td>
<td>Silty CLAY: pale grey, medium to high plasticity, slightly moist with fragments of weathered shale</td>
<td>2.0</td>
<td>Very stiff to hard</td>
</tr>
<tr>
<td>BEDROCK</td>
<td>SHALE: pale grey, extremely to moderately weathered</td>
<td>&gt;2.0</td>
<td>Estimated extremely low to low strength</td>
</tr>
</tbody>
</table>

\(^1\) Estimated from DCP tests and borehole observations

4.1.1 **GROUNDWATER**

Permanent groundwater was not observed in the boreholes, however, minor water seepage was present at the base of the boreholes immediately following completion and during the short time (<30 minutes) that the boreholes remained open. The water encountered in the boreholes is considered to be perched water flowing at the soil/bedrock interface. Such water is recharged by rainfall events and therefore its presence is intermittent. Nonetheless, the water will need to be managed by the development, both in the short term during excavation works and the long term. Permanent groundwater is expected to be located at depth within the shale bedrock formation and is not expected to have any significant influence on the development.
4.2 **Laboratory Testing**

Samples of soil were collected from each borehole and submitted to Envirolab Services Pty Ltd (Envirolab) and for selective testing which included:

- Electrical Conductivity (EC) to provide a detailed assessment of the salinity potential of the soil profile, and
- Sulphate, Chloride, resistivity and pH to determine the exposure classification of the soil with respect to buried structural concrete and unprotected steel.

The laboratory test results are presented in Appendix D, while a summary of the results is provided in the following sub-sections.

4.2.1 **Soil Salinity Testing**

An assessment of soil salinity conditions has been undertaken with reference to guidance published by the Department Land and Water Conservation NSW (reference 12). In this regard, selected samples of natural soil and bedrock were submitted to Envirolab for NATA accredited testing of electrical conductivity (EC), which is the primary indicator of salinity.

The raw EC results and the EC_e results\(^1\), are provided in Table 2 and reveal that the soil profile was typically non-saline.

<table>
<thead>
<tr>
<th>Location / Depth</th>
<th>Sample Description</th>
<th>EC (dS/m)</th>
<th>Multiplication Factor(^1)</th>
<th>EC_e (dS/m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BH1 / 0.4 – 0.5</td>
<td>Silty CLAY</td>
<td>0.091</td>
<td>6</td>
<td>0.546</td>
</tr>
<tr>
<td>BH2 / 0.4 – 0.5</td>
<td>Silty CLAY</td>
<td>0.046</td>
<td>6</td>
<td>0.276</td>
</tr>
<tr>
<td>BH2 / 0.9 – 1.0</td>
<td>Silty CLAY</td>
<td>0.200</td>
<td>6</td>
<td>1.200</td>
</tr>
<tr>
<td>BH2 / 1.4 – 1.5</td>
<td>Silty CLAY</td>
<td>0.180</td>
<td>6</td>
<td>1.080</td>
</tr>
<tr>
<td>BH2 / 1.9 – 2.0</td>
<td>Silty CLAY</td>
<td>0.330</td>
<td>6</td>
<td>1.980</td>
</tr>
<tr>
<td>BH3 / 0.4 – 0.5</td>
<td>Silty CLAY</td>
<td>0.130</td>
<td>6</td>
<td>0.780</td>
</tr>
</tbody>
</table>

4.2.2 **Aggressivity Testing**

Selected soil samples (comprising natural clay soil) were submitted to Envirolab for NATA accredited testing of pH, sulfate, chloride and resistivity to provide a preliminary

---

\(^1\) EC_e results are EC data multiplied by a conversion factor which depends upon the soil texture / type (reference 12)
assessment of the exposure classification (or aggressiveness/corrosiveness potential) of the soil with respect to future buried steel and/or concrete (e.g. footings).

To determine the aggressiveness of the soil and water environment on concrete or steel, the chemical test results are compared to Tables 6.4.2(C) and 6.5.2(C) from Section 6 of the Australian Standard AS 2159 (reference 13). This section provides assessment criteria to assess the ‘exposure classification’ for a concrete or steel pile. The Standard has two classes of soil conditions:

(A) high permeability soils below groundwater; and
(B) low permeability soils and all soils above groundwater.

For this site, all the soil samples are considered to be condition ‘B’. 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 Table 3.

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Location / Depth (m bgs)</th>
<th>Soil Condition</th>
<th>pH</th>
<th>Sulphate (SO₄) mg/kg</th>
<th>Chloride (Cl) mg/kg</th>
<th>Resistivity Ohm.cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>BH1 / 0.4 – 0.5</td>
<td>BH1 / 0.4 – 0.5</td>
<td>B</td>
<td>6.6</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>BH2 / 0.4 – 0.5</td>
<td>BH2 / 0.4 – 0.5</td>
<td>B</td>
<td>5.5</td>
<td>51</td>
<td>&lt;10</td>
<td>22,000</td>
</tr>
<tr>
<td>BH2 / 0.9 – 1.0</td>
<td>BH2 / 0.9 – 1.0</td>
<td>B</td>
<td>5.1</td>
<td>290</td>
<td>51</td>
<td>4,900</td>
</tr>
<tr>
<td>BH2 / 1.4 – 1.5</td>
<td>BH2 / 1.4 – 1.5</td>
<td>B</td>
<td>6.2</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>BH2 / 1.9 – 2.0</td>
<td>BH2 / 1.9 – 2.0</td>
<td>B</td>
<td>6.1</td>
<td>210</td>
<td>270</td>
<td>3,000</td>
</tr>
<tr>
<td>BH3 / 0.4 – 0.5</td>
<td>BH3 / 0.4 – 0.5</td>
<td>B</td>
<td>4.9</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

The aggressivity potential of an environment on concrete is dependent on the sulphate and pH levels of the soil. Based on the limited number of test results above and taking into account the ‘worst-case’ sample, the subsurface profile is mildly-aggressive towards concrete. According to Australian Standard AS 3600-2009 (reference 14), specifically Table 4.8.1, this equates to an exposure classification of ‘A2’. The corrosive potential of an environment on unprotected steel is typically dependent on pH, chloride, and resistivity levels of the soil. Based on the limited number of test results above and taking into account the ‘worst-case’ sample, the subsurface profile is considered to be non-aggressive / non-corrosive towards any unprotected steel.
5 DISCUSSION

5.1 SITE PREPARATION

Following demolition of the existing structures and prior to bulk excavation works, all topsoil with organic matter and any pavement materials, should be removed from the proposed building and pavement areas. Stripped topsoil should be stockpiled for re-use as landscape material, or disposed off-site.

Material removed from site will need to be managed in accordance with the provisions of current legislation and may include segregation by material type classification in accordance with NSW EPA (2014) Waste Classification Guidelines (reference 15) and disposal at facilities appropriately licensed to receive the particular materials. GEE notes that the natural soil and bedrock may be classified as Virgin Excavated Natural Material (VENM) and re-used on other sites rather than disposed at a landfill, although it must be proven to be free of contamination.

GEE notes that the natural silty clay soil profile is expected to be susceptible to loss of strength when wet. In this regard, it may be necessary to construct a working platform above the prepared sub-grade in areas of high construction vehicle traffic, comprising a minimum of 150 mm of gravel or recycled concrete.

5.2 EARTHWORKS

Based on the development plans provided in Appendix A, earthworks at the site will comprise excavation to a depth of between approximately 3.0 to 3.5m to facilitate the construction of the proposed basement, and between 1.0m and 2.0m depth to construct the pool. The excavation for the basement is expected to extend to within 1.5m of the northern and southern boundaries, and over 10m to the eastern and western boundaries.

Of particular significance for the pool excavation is a Sydney Water sewer pipeline that passes within close proximity to the southern end of the proposed pool. In this regard discussions with Sydney Water are recommended with approval needed for any realignment work.

5.2.1 EXCAVATION

Based on the fieldwork undertaken as part of this investigation, the excavation will encounter minor surface fill and topsoil material across the site, overlying firm to stiff clay becoming very stiff with depth before encountering weathered shale bedrock at a depths of between approximately 1.6m and 2.0m. GEE notes that the strength of the shale bedrock has not been assessed as part of this geotechnical investigation, however,
based on local knowledge it is likely to be initially extremely low to low strength, becoming at least low to medium strength with depth. To confirm the strength of the bedrock within the depth of proposed excavation would require more detailed investigations (preferably following demolition of the existing dwelling) including the coring and strength testing of the bedrock formation.

The majority of the excavation, through the fill/soil profile and into very low to low strength rock, is expected to be readily excavated using standard equipment such as excavators, although the use of an impact hammer may be required if medium strength or better rock, combined with unfavourable rock-defect geometry, is encountered. Should an impact hammer be required then the effects of vibration should be considered and are discussed further in Section 5.2.3.

5.2.2 GROUNDWATER INFLOW

Permanent groundwater was not encountered during the drilling of the boreholes however some minor seepage was observed near the soil/brock interface during the short time that the boreholes remained open. In general, seepage can be expected to occur over time at the soil / bedrock interface, ironstone gravel bands and through natural joints and fractures within the underlying bedrock formation. Such seepage should be manageable during the earthworks phase by pumping from a sump at the base of the excavation. In the long term conventional techniques such as strip drains behind the basement walls and ag-lines will need to be incorporated into the design of the basement.

5.2.3 CONSTRUCTION / EXCAVATION INDUCED VIBRATION

When using a hydraulic hammer, vibrations will be transmitted through the ground and potentially impact on adjoining structures. Where possible, the use of other techniques not involving impact (e.g. rock saws), should be adopted as they would reduce or possibly eliminate risks of damage due to vibrations.

The structures on the adjacent properties are sensitive to vibrations above certain threshold levels (regarding potential for cracking). Given that the proposed basement excavation will extend to within close proximity of the boundaries and adjoining development, close controls by the excavation contractor over the rock excavation are necessary, and are recommended, so that excessive vibration effects are not generated.

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 is a number of Australian and overseas publications which provide vibration velocity guideline levels (or safe limits) including:
The most appropriate guidelines levels for the proposed excavation work 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, with consultation with Sydney Water also recommended. However, as a preliminary and conservative guide, and considering the above guidelines and the type of nearby structures (including Sydney Water assets), GEE recommend that excavation methods should be adopted which limit ground vibrations at the adjoining developments to not more than 5mm/sec, and vibration monitoring will be required to verify that this is achieved.

As a guide, the PPV limits of 5mm/sec are expected to be achievable if rock breaker equipment or other excavation methods are restricted as indicated in Table 4.
Table 4: Recommendations for Rock Hammer Equipment

<table>
<thead>
<tr>
<th>Distance from adjoining structure (m)</th>
<th>Maximum Peak Particle Velocity 5mm/sec</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Equipment</td>
</tr>
<tr>
<td>1.0 to 2.0</td>
<td>Hand operated jackhammer only</td>
</tr>
<tr>
<td>2.0 to 5.0</td>
<td>300 kg rock hammer</td>
</tr>
<tr>
<td>5.0 to 10.0</td>
<td>300 kg rock hammer or 600 kg rock hammer</td>
</tr>
</tbody>
</table>

GEE 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. In this regard, consideration may be given to adopting more stringent vibration limits recommended for human amenity or, as a minimum, ensuring that vibration monitoring is undertaken as reassurance to confirm that vibrations are within safe limits. Acceptable vibration limits for human comfort caused by construction and excavation equipment are provided in DEC (2006) (reference 19). Specifically maximum acceleration limits as specified in Table 2.2 of the guideline should be adopted.

Finally, at all times, the excavation equipment should be operated by experienced personnel, according to the manufactures instructions, and in a manner consistent with minimising vibration effects. Measures which may be used to minimise vibration include:

- Progressive breakage from open excavated faces,
- Selective breakage along open joints, where present,
- Use of rock hammers in short bursts to prevent generation of resonant frequencies,
- Orientation of the rock hammer pick away from property boundaries and into the existing open excavation,
- Commencement of excavation as far away from other structures as possible, and
- The use of a rock sawing or grinder adjacent to the site boundaries. GEE notes that this equipment also reduces the possibility of overbreak and loosening of the rock mass.
5.2.4 **EXCAVATION SUPPORT**

The topsoil / fill layer, natural soil and the upper portion of the shale formation (typically extremely low to very low strength shale) may be temporarily battered to no steeper than 1.5 Horizontal to 1 Vertical. This batter slope assumes that the ground surface beyond the crest is horizontal and there are no surcharge loads within a distance of the crest equal to the vertical height of the cut.

Where this batter slope cannot be safely adopted, either temporary shoring or the early construction of permanent walls designed to shore up the soil profile and adjoining structures/services, will be required. Options for shoring include the use of evenly spaced bored piles and should be designed by a suitably experienced structural engineer in accordance with AS 4678-2002 *Earth Retaining Structures* (reference 22) and consider both the short and long term configurations. Should the shoring walls be cantilevered or supported by a single row of anchors and some wall movements can be tolerated (flexible wall), the pressure acting on the wall can be estimated on the basis of a triangular earth pressure distribution.

When internal props, such as the ground floor slab, restrain retaining wall movement, or where significant movements cannot be tolerated (rigid wall), an ‘at-rest’ earth pressure coefficient (Ko) should be adopted with either a uniform or trapezoidal pressure distribution. It should be noted that shoring which is designed for this ‘at rest’ coefficient may still undergo some lateral movements, depending on the final configuration of the wall and construction sequence.

The design of any retaining structures should make allowance for all applicable surcharge loadings including construction activities around the perimeter of the excavation 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.

Finally, computer aided analysis may be carried out to assess potential ground movements based on different wall designs and construction sequence, so as to control deflections to within tolerable limits. It is also considered prudent to carry out surveys before and after installation to measure the actual movement of the wall or soil.

Geotechnical parameters for the soil and bedrock profile encountered at the site are provided in **Table 5**.
Table 5: Geotechnical Design Parameters – Retaining Walls

<table>
<thead>
<tr>
<th>Units</th>
<th>Depth to Top of Layer (m)</th>
<th>Unit Weight (kN/m³)</th>
<th>Active Lateral Earth Pressure (Ka)</th>
<th>Lateral Earth Pressure at Rest (Ko)</th>
<th>Passive Lateral Earth Pressure (Kp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Profile and EL strength BEDROCK</td>
<td>0.0</td>
<td>18</td>
<td>0.35</td>
<td>0.50</td>
<td>--</td>
</tr>
<tr>
<td>BEDROCK: VL to L strength (or better)</td>
<td>1.6 – 2.0</td>
<td>22</td>
<td>0.2</td>
<td>0.40</td>
<td>3.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Units</th>
<th>Depth to Top of Layer (m)</th>
<th>Modulus of Elasticity ($E_s$) (MPa)</th>
<th>Poisson Ratio ($\gamma'$)</th>
<th>Effective Cohesion ($c'$) (kPa)</th>
<th>Angle of Internal Friction ($\varphi'$) (degree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Profile and EL strength BEDROCK</td>
<td>0.0</td>
<td>20</td>
<td>0.35</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>BEDROCK: VL to L strength (or better)</td>
<td>1.6 – 2.0</td>
<td>50</td>
<td>0.3</td>
<td>25</td>
<td>28</td>
</tr>
</tbody>
</table>

5.2.5 **Salinity Risk**

The testing carried out on the soil profile (refer to Section 4.2.1) indicate non-saline soil conditions. In this regard, GEE considers that a site specific management plan is not required.

5.3 **Foundations**

Based on the development plans, only the central portion of the dwelling will be situated over the basement level. Following excavation of the basement, the bulk excavation level will comprise shale bedrock and is assessed as being capable of providing an allowable bearing capacity of 700kPa (Pells et al reference 24). For consistency and to minimise any differential settlement, it is recommended that footings for the remainder of the dwelling also be founded within the shale stratum.

With respect to the proposed pool shale bedrock is also expected to be encountered by the excavation of the deep end of the pool, or will be within close proximity to the base of the excavation. In this regard, all the pool footings should extend to the shale formation.
By founding the pool and the dwelling within the shale formation, GEE expects that the requirements of Sydney Water will also be met (reference 1). Sydney Water requires that when building over, adjacent to, or under Sydney Water pipe assets, the work must not obstruct full and free access to the assets, cause physical damage to the assets, or weaken the assets leading to future damage. By protecting the Sydney Water asset from additional loads, and potential damage, the proposed development is also protected at some future time, should repairs to the asset be required.

In this regard, it is important that foundations for the new development be extended below the 'Zone of Influence' (ZOI) of the adjacent sewer pipeline. The ZOI is defined by Sydney Water as a “...notional envelope within which an external vertical load would exert stress on the pipe (Figure 1). The zone is defined by the lines from the bottom projection of the pipe extending upwards at an angle of 45° to the ground surface”.

Finally, footing systems should be designed by a suitably qualified and experienced structural engineer and GEE recommends that inspection by a geotechnical engineer is undertaken during the piering stage to confirm that the design founding conditions have been achieved.

5.3.1 Aggressivity / Exposure Classification

Based on the limited exposure classification test results (Section 4.2.2), and in accordance with AS 2159-2009 (reference 13), the subsurface concrete structures (e.g. footings) should be designed based on mildly-aggressive soil conditions for concrete. According to Australian Standard AS 3600-2009 (reference 14), the equivalent exposure classification is ‘A2’. With respect to unprotected steel, the silty clay soil profile is considered to be non-corrosive.
6 CONCLUSION

GEE considers that sufficient information has been gained to be confident of the subsurface conditions across the site, to assist with design and construction of the proposed development at 49 Myrna Road, Strathfield.

Based on the results of the preliminary investigation, the proposed development is considered feasible. Additionally, GEE concludes that the existing rock formation is capable of withstanding the proposed loads to be imposed, and standard shoring works (provided they are designed by a structural engineer), will ensure the stability of the excavation and provide protection and support of adjoining properties.

The geotechnical issues associated with the proposed development have been addressed by the investigation and are discussed in this report. If, during construction, any conditions are encountered that vary significantly from those described or inferred in the above report, it is a condition of the report that we be advised so that those conditions, and the conclusions discussed in the report, can be reviewed and alternative recommendations assessed, if appropriate.

GEE will be pleased to assist with any further advice or geotechnical services required in regard to the proposed development.
7 **GENERAL LIMITATIONS**

Soil and rock formations are variable. The logs or other information presented as part of this report indicate the approximate subsurface conditions only at the specific test locations. Boundaries between zones on the logs or stratigraphic sections are often not distinct, but rather are transitional and have been interpreted.

The precision with which subsurface conditions are indicated depends largely on the frequency and method of sampling, and on the uniformity of subsurface conditions. The spacing of test sites also usually reflects budget and schedule constraints. Groundwater conditions described in this report refer only to those observed at the place and under circumstances noted in the report. The conditions may vary seasonally or as a consequence of construction activities on the site or adjacent sites.

Where ground conditions encountered at the site differ significantly from those anticipated in the report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that GEE be notified of any variations and be provided with an opportunity to review the recommendations of this report. Recognition of changed soil and rock conditions requires experience and it is recommended that a suitably experienced geotechnical engineer be engaged to visit the site with sufficient frequency to detect if conditions have changed significantly.

The comments given in this report are intended only for the guidance of the design engineer, or for other purposes specifically noted in the report. The number of boreholes or test excavations necessary to determine all relevant underground conditions which may affect construction costs, techniques and equipment choice, scheduling, and sequence of operations would normally be greater than has been carried out for design purposes. Contractors should therefore rely on their own additional investigations, as well as their own interpretations of the borehole data in this report, as to how subsurface conditions may affect their work.
If you have any questions about the content of this letter, please do not hesitate to contact the undersigned.

Yours sincerely

Stephen McCormack
Principal

REFERENCES


APPENDIX A

Proposed Development Plans (5 Sheets)
APPENDIX B

Sydney Water Dial Before You Dig (1 Sheet)
APPENDIX C

Borehole Logs (4 Sheets)
### Geotechnical Investigation

**Location / Site:** 49 Myrna Road, Strathfield NSW

**Project Name:** Geotechnical Investigation

**Client:** Mahesh Katragadda

**Drilling Company:** GEE

**Drill Method:** Hand Auger

**Equipment:** Manual

**Date Started:** 04-APR-17

**Date Completed:** 04-APR-17

### Material Description

- **TOPSOIL/FILL:** Silty Sand, dark brown / dark grey, fine to medium grained, with a trace of clay.
- **Silty CLAY:** orange-brown / brown, with fine to medium ironstone gravel.
  - becoming pale grey / red-brown from 0.8m.
  - becoming predominantly pale grey from 1.4m.
- **Silty CLAY:** pale grey, with fragments of weathered shale.

**Practical hand auger refusal at 2.00m**

Caused by weathered shale

**Additional Comments:**

- DCP practical refusal at 1.6m
- Residual soil profile from 1.6m
- **BH1**
  - / 0.40-0.50m
  - / 0.90-1.00m
  - / 1.40-1.50m
  - / 1.90-2.00m

**Moisture:**
- Surface: Grass
- **Samples / Tests**
  - ID No.
  - DCP
  - Observations / Comments
  - BH1 / 0.40-0.50m
  - BH1 / 0.90-1.00m
  - BH1 / 1.40-1.50m
  - BH1 / 1.90-2.00m

**Logged By:** Joshua Long  
**Date:** 04-Apr-17

**Checked By:** Stephen McCormack  
**Date:** 04-APR-17
<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Material Description</th>
<th>Consistency / Density</th>
<th>Moisture</th>
<th>ID No.</th>
<th>DCP (blows/100mm)</th>
<th>Observations / Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Surface: driveway</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.4</td>
<td>TOPSOIL/FILL- Silty Sand, dark brown / dark grey, fine to medium grained, with a trace of clay.</td>
<td>loose</td>
<td>moist</td>
<td>5</td>
<td>10, 15</td>
<td></td>
</tr>
<tr>
<td>0.7</td>
<td>Silty CLAY- orange-brown / brown, with fine to medium ironstone gravel.</td>
<td>soft to firm</td>
<td>moist</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>becoming pale grey / red-brown from 0.7m.</td>
<td>firm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4</td>
<td>becoming predominantly pale grey from 1.0m.</td>
<td>stiff</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>Silty CLAY- pale grey, with fragments of weathered shale.</td>
<td>very stiff to hard</td>
<td>slightly moist</td>
<td></td>
<td></td>
<td>Residual soil profile from 1.6m</td>
</tr>
<tr>
<td>2.0</td>
<td>Practical hand auger refusal at 2.00m</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Slight water seepage at base of borehole</td>
</tr>
<tr>
<td>2.0</td>
<td><em>Caused by weathered shale</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Drilling Company:** GEE  
**Drill Method:** Hand Auger  
**Equipment:** Manual

---

**Date Completed:** 04-APR-17  
**Northing:** unknown  
**Easting:** unknown  
**Ground Level:** unknown (approx)
**Hand Auger SM**

### TOPSOIL/FILL - Silty Sand, dark brown / dark grey, fine to medium grained, with a trace of clay.

- Silty CLAY - orange-brown / brown, with fine to medium ironstone gravel.
  - Becoming pale grey / red-brown from 0.7m.
  - Becoming predominantly pale grey from 1.2m.

**Practical hand auger refusal at 1.35m**
- Caused by weathered shale

**DCP refusal at 1.55m (bouncing)**
- Inferred to have been caused by weathered shale

---

**Table: Material Description**

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Material Description</th>
<th>Consistency / Density</th>
<th>Moisture</th>
<th>ID No.</th>
<th>DCP (blows/100mm)</th>
<th>Observations / Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>Surface: garden bed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>TOPSOIL/FILL - Silty Sand, dark brown / dark grey, fine to medium grained, with a trace of clay.</td>
<td>loose</td>
<td>moist</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>Silty CLAY - orange-brown / brown, with fine to medium ironstone gravel.</td>
<td>firm</td>
<td>very moist</td>
<td>BH3 / 0.40-0.50m</td>
<td>BH3 / 0.90-1.00m</td>
<td>BH3 / 1.25-1.35m</td>
</tr>
<tr>
<td>1.35</td>
<td>Practical hand auger refusal at 1.35m Caused by weathered shale</td>
<td>very stiff to hard</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DCP refusal at 1.55m (bouncing) inferred to have been caused by weathered shale</td>
</tr>
</tbody>
</table>

---

**Additional Comments**

**Moisture**
- D: Dry
- Dp: Damp
- SM: Slightly Moist
- M: Moist
- VM: Very Moist
- V: Very Wet
- W: Wet
- Sd: Saturated
APPENDIX D

Laboratory Results (10 Sheets)
CERTIFICATE OF ANALYSIS

Client:
Geo-Environmental Engineering
82 Bridge St
Lane Cove
NSW 2066

Attention: Stephen McCormack, Josh Long

Sample log in details:
Your Reference: G17039STR
No. of samples: 11 soils
Date samples received / completed instructions received 04/04/17 / 05/04/17

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

Report Details:
Date results requested by: / Issue Date: 12/04/17 / 11/04/17
Date of Preliminary Report: Not Issued
NATA accreditation number 2901. This document shall not be reproduced except in full.
Accredited for compliance with ISO/IEC 17025 - Testing
Tests not covered by NATA are denoted with *. 

Results Approved By:

David Springett
General Manager
<table>
<thead>
<tr>
<th>Misc Inorg - Soil</th>
<th>Our Reference:</th>
<th>UNITS 164740-1</th>
<th>164740-5</th>
<th>164740-6</th>
<th>164740-7</th>
<th>164740-8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your Reference</td>
<td>---------------</td>
<td>-------------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------</td>
<td>-------------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>Depth</td>
<td>0.4-0.5</td>
<td>0.4-0.5</td>
<td>0.9-1.0</td>
<td>1.4-1.5</td>
<td>1.9-2.0</td>
<td></td>
</tr>
<tr>
<td>Type of sample</td>
<td>Soil</td>
<td>Soil</td>
<td>Soil</td>
<td>Soil</td>
<td>Soil</td>
<td></td>
</tr>
</tbody>
</table>

| Date prepared   | 06/04/2017       | 06/04/2017 | 06/04/2017| 06/04/2017| 06/04/2017|
| Date analysed   | 06/04/2017       | 06/04/2017 | 06/04/2017| 06/04/2017| 06/04/2017|
| pH 1:5 soil:water| 6.6             | 5.5         | 5.1       | 6.2       | 6.1       |
| Electrical Conductivity 1:5 soil:water | 91              | 46          | 200       | 180       | 330       |
| Chloride, Cl 1:5 soil:water | [NA]           | <10         | 51        | [NA]      | 270       |
| Sulphate, SO4 1:5 soil:water | mg/kg | [NA] | 290 | [NA] | 210 |
| Resistivity in soil* | ohmm | 220 | 49 | [NA] | 30 |

<table>
<thead>
<tr>
<th>Misc Inorg - Soil</th>
<th>Our Reference:</th>
<th>UNITS 164740-9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your Reference</td>
<td>---------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Depth</td>
<td>0.4-0.5</td>
<td></td>
</tr>
<tr>
<td>Date Sampled</td>
<td>4/04/2017</td>
<td></td>
</tr>
<tr>
<td>Type of sample</td>
<td>Soil</td>
<td></td>
</tr>
</tbody>
</table>

<p>| Date prepared   | 06/04/2017       |
| Date analysed   | 06/04/2017       |
| pH 1:5 soil:water| 4.9             |
| Electrical Conductivity 1:5 soil:water | 130 |</p>
<table>
<thead>
<tr>
<th>Method ID</th>
<th>Methodology Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inorg-001</td>
<td>pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.</td>
</tr>
<tr>
<td>Inorg-002</td>
<td>Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment &amp; Lyons.</td>
</tr>
<tr>
<td>Inorg-081</td>
<td>Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Alternatively determined by colourimetry/turbidity using Discrete Analyzer.</td>
</tr>
<tr>
<td>Inorg-002</td>
<td>Conductivity and Salinity - measured using a conductivity cell at 25oC in accordance with APHA 22nd ED 2510 and Rayment &amp; Lyons. Resistivity is calculated from Conductivity.</td>
</tr>
<tr>
<td>QUALITY CONTROL</td>
<td>UNITS</td>
</tr>
<tr>
<td>----------------</td>
<td>-------</td>
</tr>
<tr>
<td>Misc Inorg - Soil</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Date prepared</td>
<td>-</td>
</tr>
<tr>
<td>Date analysed</td>
<td>-</td>
</tr>
<tr>
<td>pH 1:5 soil:water</td>
<td>pHUnits</td>
</tr>
<tr>
<td>Electrical Conductivity 1:5 soil:water</td>
<td>µS/cm</td>
</tr>
<tr>
<td>Chloride, CI 1:5 soil:water</td>
<td>mg/kg</td>
</tr>
<tr>
<td>Sulphate, SO4 1:5 soil:water</td>
<td>mg/kg</td>
</tr>
<tr>
<td>Resistivity in soil*</td>
<td>ohmm</td>
</tr>
</tbody>
</table>
### Report Comments:

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INS</td>
<td>Insufficient sample for this test</td>
</tr>
<tr>
<td>NR</td>
<td>Test not required</td>
</tr>
<tr>
<td>&lt;</td>
<td>Less than</td>
</tr>
<tr>
<td>&gt;</td>
<td>Greater than</td>
</tr>
<tr>
<td>PQL</td>
<td>Practical Quantitation Limit</td>
</tr>
<tr>
<td>RPD</td>
<td>Relative Percent Difference</td>
</tr>
<tr>
<td>NT</td>
<td>Not tested</td>
</tr>
<tr>
<td>NA</td>
<td>Test not required</td>
</tr>
<tr>
<td>LCS</td>
<td>Laboratory Control Sample</td>
</tr>
</tbody>
</table>

---

Envirolab Reference: 164740  
Revision No: R 00  
Page 5 of 6
**Quality Control Definitions**

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

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

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

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

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

**Laboratory Acceptance Criteria**

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

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

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

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.
# CHAIN OF CUSTODY - Client

## ENVIROLAB SERVICES

**Client:** Geo-Environmental Engineering Pty Ltd  
**Project Mgr:** McCormack  
**Sampler:** J. Long  
**Address:** 82 Bridge Street, Lane Cove NSW 2066  
**Email:** stephen@geoenvironmental.com.au  
**Email:** josh@geoenvironmental.com.au  
**Phone:** 0431 480 980

---

### ENVIRONLAB SERVICES

12 Ashley St, Chatswood, NSW, 2067  
**Phone:** 02 9910 6200  
**Fax:** 02 9910 6201  
**E-mail:** ahie@envirolabservices.com.au  
**Contact:** Aileen Hie

---

### Sample Information

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Client Sample ID</th>
<th>Date sampled</th>
<th>Type of sample</th>
<th>EC</th>
<th>pH</th>
<th>Chloride</th>
<th>Sulfate</th>
<th>Sedivity</th>
<th>Resistivity</th>
<th>Combination 3</th>
<th>8 metals</th>
<th>CEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BH1 / 0.4 - 0.5</td>
<td>04-04-17</td>
<td>Bag</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>BH1 / 0.9 - 1.0</td>
<td>04-04-17</td>
<td>Bag</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>BH1 / 1.4 - 1.5</td>
<td>04-04-17</td>
<td>Bag</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>BH1 / 1.9 - 2.0</td>
<td>04-04-17</td>
<td>Bag</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>BH2 / 0.4 - 0.5</td>
<td>04-04-17</td>
<td>Bag</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>BH2 / 0.9 - 1.0</td>
<td>04-04-17</td>
<td>Bag</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>BH2 / 1.4 - 1.5</td>
<td>04-04-17</td>
<td>Bag</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>BH2 / 1.9 - 2.0</td>
<td>04-04-17</td>
<td>Bag</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>BH3 / 0.4 - 0.5</td>
<td>04-04-17</td>
<td>Bag</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>BH3 / 0.9 - 1.0</td>
<td>04-04-17</td>
<td>Bag</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>BH3 / 1.25 - 1.35</td>
<td>04-04-17</td>
<td>Bag</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

### Tests Required

Provide as much information about the sample as you can

---

**Relinquished (company):** Geo-Environmental Engineering  
**Received by (company):** ENVIROLAB SERVICES  
**Print Name:** J. Long  
**Date & Time:** 04-Apr-17

---

**Samples Received:** Cool or Ambient (circle one)  
**Temperature Received at:** (if applicable)  
**Transported by:** Hand delivered / courier
Sorry about that, it should be identifiable as BH2 / 1.4 – 1.5 will contain pale grey silty clay, BH2 / 1.9 – 2.0 will also contain pale grey silty clay but there should be chips of weathered shale inside it that you can snap with your fingers. The deeper sample (1.9 – 2.0m) was taken close to the soil / bedrock interface. The soil profiles within BH1 and BH2 were the same so you may be able to compare them (ie BH1 / 1.4 – 1.5 should appear the same as BH2 / 1.4 – 1.5 and BH1 / 1.9 – 2.0 should appear the same as BH2 / 1.9 – 2.0).

Please let me know if you cannot tell them apart and I can amend the COC to test the full profile of borehole BH1 samples instead.

Regards

Joshua Long
Geotechnical Engineer
Geo-Environmental Engineering
82 Bridge Street
Lane Cove NSW 2066
T 02 8964 6045
M 0439 339 264
www.geoenvironmental.com.au

Hi Josh,
Received 2 bags of BH2 1.4-1.5, not BH2 1.9-2.0, can you please check

Regards,

Simon Song | Customer Service | Envirolab Services Pty Ltd

*Great Science, Great Service.*
From: Joshua Long <josh@geoenvironmental.com.au>
Sent: Wednesday, 5 April 2017 8:23 AM
To: Simon Song
Subject: RE: Strathfield G17039STR COC

I believe it's the one at the top of the photo you have sent me.

Regards

Joshua Long
Geotechnical Engineer
Geo-Environmental Engineering
82 Bridge Street
Lane Cove NSW 2066
T 02 8964 6045
M 0439 339 264
www.geoenvironmental.com.au

From: Simon Song [mailto:SSong@envirolab.com.au]
Sent: Tuesday, April 4, 2017 4:46 PM
To: Joshua Long <josh@geoenvironmental.com.au>; Aileen Hie <AHie@envirolab.com.au>; Aileen Hie <AHie@envirolab.com.au>
Subject: RE: Strathfield G17039STR COC

Hi Josh,
Received 2 bags of BH2 1.4-1.5, not BH2 1.9-2.0, can you please check

Regards,

Simon Song | Customer Service | Envirolab Services Pty Ltd

Great Science, Great Service.

12 Ashley Street Chatswood NSW 2067
T 612 9910 6200 F 612 9910 6201
E ssong@envirolab.com.au | W www.envirolab.com.au

Please note that all samples submitted to the Envirolab Group laboratories will be analysed under the Envirolab Group Terms and Conditions. The Terms and Conditions are accessible by clicking this link.