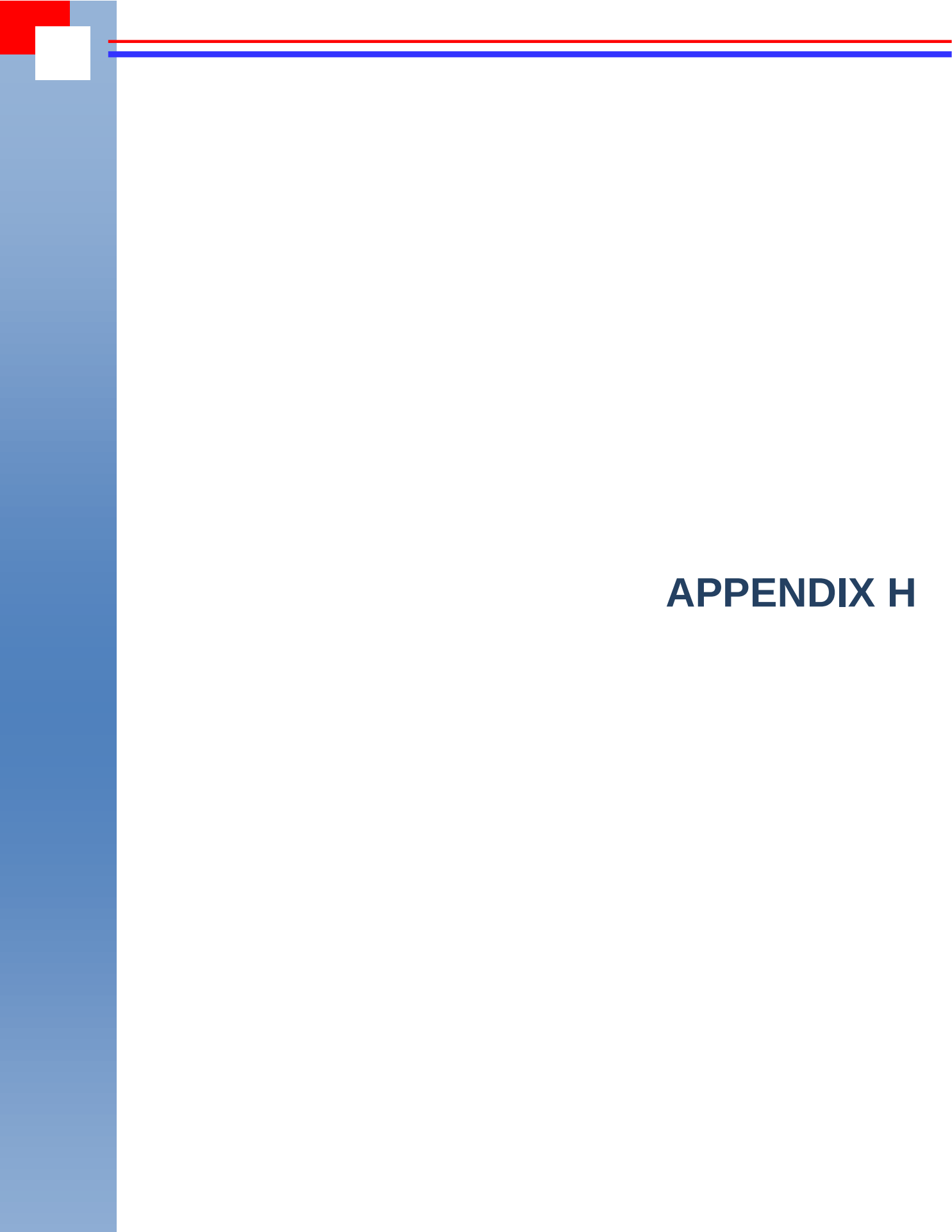




APPENDIX H



Geotechnical and Site Contamination

KML Joint Venture

Proposed Multi-storey Development

Brooks Parade, Sharp Street and Edgar Streets Belmont NSW

Geotechnical Report

Report No. RGS01385.1 - AA

30 August 2016

REGIONAL
GEOTECHNICAL SOLUTIONS





Manning-Great Lakes

Port Macquarie

Coffs Harbour

RGS01385.1 - AA

30 August 2016

KML Joint Venture
Suite 1
20 Smart Street
CHARLESTOWN NSW 2290

Attention: Tony Brown

Dear Tony

RE: Proposed Multi-storey Development – Belmont NSW

Geotechnical Report

Regional Geotechnical Solutions Pty Ltd (RGS) has completed geotechnical and Phase 1 site contamination assessments at the site of the proposed Belmont Multi-storey Development to be constructed on the block encompassed by Brooks Parade, Sharp Street and Edgar Streets Belmont NSW. This report presents the results of the investigations.

The geotechnical and site contamination assessments are presented in separate reports. This report presents the results of the geotechnical assessment. The site contamination assessment is presented in report number RGS01385.1-AB.

If you have any questions regarding this project, or require any further assistance with this or any other project, please do not hesitate to contact the undersigned.

For and on behalf of

Regional Geotechnical Solutions Pty Ltd

A handwritten signature in black ink, appearing to read 'S Morton', is written over a horizontal line.

Steven Morton

Principal



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Appendix A Results of Field Investigations

Appendix B Laboratory Test Results

Appendix C Preliminary Acid Sulfate Soil Management Plan



1 INTRODUCTION

This report presents the results of the geotechnical investigations and assessment undertaken by Regional Geotechnical Solutions Pty Ltd (RGS) for the proposed new Multi-storey Development to be constructed on the block encompassed by Brooks Parade, Sharp Street and Edgar Streets Belmont NSW. The proposed development is comprised of three, six storey towers and one, eight storey tower with basement parking level parking, surface level parking and landscaped gardens. The towers will be comprised of commercial premises and one, two and three bedroom residential apartments.

The development site is generally level and is situated on the northeastern shore of Lake Macquarie at Belmont, in an area underlain by interbedded sands and estuarine sediments with a high groundwater table.

Taking into account the proposed development details and the likely geotechnical conditions at the site the purpose of the investigation was to obtain an understanding of geotechnical issues at the site and provide comments and recommendations on:

- Site earthworks including site preparation and excavation conditions
- Options for retention and parameters for design of retaining walls
- Foundation conditions including alternative footing types and founding materials, bearing capacities and expected settlements;
- Assessment of "site sub-soil classification" for earthquake design to AS1170.4 - 2007.
- Durability requirements (soil aggressively) for buried structural elements;
- Groundwater conditions including requirements for dewatering
- Pavement thickness design, material requirements and construction recommendations;
- Preliminary acid sulfate soils (ASS) assessment.

2 PROPOSED DEVELOPMENT

The development will cover the majority of the block encompassed by Brooks Parade, Sharp Street, Edgar Street and Maude Street Belmont. The existing developments located at the north-eastern, north-western and south-western corners of the block do not form part of the proposed development. The development will require the demolition of the remaining structures within the site area, which predominantly comprise single storey residential structures with some commercial development fronting Brooks Parade. A concrete lined drainage channel crosses the northern end of the site.

The development will comprise the construction of three, six storey towers and one, eight storey tower. The towers will be comprised of commercial premises and one, two and three bedroom residential apartments. A single level basement car parking level will occupy the majority of the site on the southern side of the drainage channel. A number of smaller structures, driveways and an on grade car parking located over the basement in the south eastern portion of the site is also proposed.



3 FIELD WORK

Fieldwork for the investigation was undertaken in April 2012 and comprised a site walkover assessment and intrusive investigations. The site walkover included observation and mapping of relevant surface features.

Intrusive investigations included:

- The drilling of eight boreholes using a drill rig;
- The excavation of one hand dug test pit; and
- Dynamic Cone Penetration (DCP) testing at ten locations
- In situ permeability testing at four locations;
- Installation of four standpipe monitoring wells to allow extraction of groundwater samples.

The fieldwork was undertaken in the full time presence of a Senior Geotechnical Engineer from RGS. Engineering logs are presented in Appendix A. The approximate locations, obtained by taped measurements from existing site boundaries, are presented on Figure 1.

4 LABORATORY TESTING

Samples collected during the fieldwork were sent to NATA registered laboratories for testing.

The following geotechnical testing was undertaken:

- One Californian Bearing Ratio (CBR) to assess pavement subgrade design values;
- Sixteen point load strength index tests on recovered rock core;
- Four aggressivity tests to assess durability requirements for buried concrete and steel elements;
- Twenty one acid sulfate soils screening tests; and
- Eight acid sulfate soils CRS test suites.

The results of the testing are presented in Appendix B and discussed in the relevant sections of the report.

5 SITE CONDITIONS

5.1 Surface conditions

The site is located within a coastal environment on the eastern shore of Lake Macquarie approximately 2 km from the coast. The Google earth image below illustrates the site setting and site features.

The site is generally level and located within a low lying Aeolian sand plain at the base of a broad depression within the surrounding gently undulating topography. Beyond the site residual hill-slopes rise gradually to the north and south, and costal dune systems are situated to the east.

Diagram 1: Site Setting and Features



Lake Macquarie is located approximately 50m to the west of the site beyond Brooks Parade and a park reserve. The mean tide level of the lake is approximately 1 to 1.5m below site level.

A concrete lined stormwater drain flows from east to west flowing drain through the northern end of the site. The channel divides the site and separates the proposed northernmost tower from the other three proposed towers and basement car parking level on the main site area.

Existing structures generally comprise single storey houses of timber construction. Three commercial buildings of brick and timber construction occupy the central portion of the Brooks Parade frontage. The existing developments are surrounded by yards comprising grassed lawns, border gardens, with localised concrete pavements and numerous scattered trees and shrubs.

A pump station is located to the north of the stormwater drain at the north-western corner of the site. A recently constructed five storey residential complex with basement car park is located at the corner of Brooks Parade and Maude Street. A similar development is located to the south of the site. The remainder of the site is surrounded by one and two storey residential development. A single level precast panel shopping centre is located to the south east on the opposite side of Edgar Street.

5.2 Subsurface conditions

The 1:250,000 Geology sheet for Sydney indicates the site is underlain by Quaternary alluvial deposits comprising sand, silts clays and gravel. To the north and south of the site the underlying geology comprise the Newcastle Coal Measures comprising shale, sandstone, conglomerate, chert, tuff and coal seams.



In summary the boreholes encountered a subsurface profile generally comprising:

Unit 1 - Topsoil / Fill: Predominantly sand, encountered in all boreholes to depths of between 0.1m to 0.7m; overlying,

Unit 2 - Alluvial / Aeolian Sand: Comprising very loose to loose sand and gravelly sand, encountered below the topsoil and fill in all boreholes.

Unit 3 - Alluvial Clay: Gravelly clay and sandy clay, medium to high plasticity varying from firm to very stiff, encountered below the alluvial sands. A layer of peat approximately 0.6m thick was encountered in in BH3 from a depth of 1.8m.

Unit 4 - Residual Clay: Clay and silty clay of medium to high plasticity, very stiff to hard strength, encountered below the alluvial clays on all boreholes. The residual clays graded into extremely weathered siltstone.

Unit 5 - Weathered Siltstone: The siltstone was extremely weathered (hard residual clay) generally improving with depth to highly to moderately weathered and very low to low strength siltstone. The siltstone was interbedded with sandstone in BH2, BH6, BH7 and BH8 near the siltstone / sandstone interface.

Unit 6 - Weathered Sandstone: The sandstone was generally moderately weathered and low to medium strength improving with depth to slightly weathered to fresh and of medium to high strength.

Further details of the profile encountered are provided in the engineering logs which are presented in Appendix A together with photographs of the rock core.

Sections of up to 0.4m of no core recovery were encountered within some of the cored portions of the boreholes. These sections are likely to represent clay seams in the weathered rock profile. The core contained defects which included predominately partings, joints, clay seams shear zones.

The depth to the base of each of the different materials is summarised in Table 2.

Table 1: Summary of Subsurface Conditions

Unit	Material Description	Depth Encountered (m)							
		BH1	BH2	BH3	BH4	BH5	BH6	BH7	BH8
	Surface cover	grass	grass	grass	grass	grass	grass	Concrete 130mm	Concrete 130mm
1	Topsoil / Fill	0 - 0.3	0 - 0.3	0 - 0.1	0 - 0.15	0 - 0.3	0 - 0.2	0 - 0.4	0 - 0.7
2	Aeolian / Alluvial Sand	0.3 - 2.6	0.3 - 2.6	0.1 - 2.4 ⁽¹⁾	0.15 - 2.5	0.3 - 2.5	0.2 - 2.8	0.4 - 2.8	0.7 - 2.6
3	Alluvial Clay	2.6 - 4.0	2.6 - 4.0	2.4 - 3.5	2.5 - 3.1	2.5 - 4.0	2.8 - 4.0	2.8 - 4.4	2.6 - 4.5
4	Residual Clay	4.0 - 8.6	4.0 - 6.8	3.5 - 8.2	3.1 - 8.5	4.0 - 8.5	4.0 - 9.0	4.4 - 10	4.5 - 10
5	Extremely weathered Siltstone	8.6 - 11.75	6.8 - 11.5	8.2 - 11.9	8.5 - 12.5	8.5 - 12.5	9.0 - 13.7	10 - 13.58	10 - 12.85
6	Moderately weathered to fresh Sandstone	11.75 - ≥13.2	11.5 - ≥12.9	11.9 - ≥13.4	12.5 - ≥14.5	12.5 - ≥15.85	13.7 - ≥14.45	13.58 - ≥15.25	12.85 - ≥15.0

NOTES:

1. Peat layer between 1.8m and 2.4m in BH3



Groundwater was encountered during the drilling of all eight drill rig boreholes. A summary of the groundwater observations is presented in Table 2.

Table 2: Summary of Groundwater Observations

Borehole	Inflow Depth During Drilling (m)	Depth to Water After Completion of Drilling (m)
BH1	Not recorded ⁽¹⁾	Not recorded ⁽²⁾
BH2	1.5	1.1
BH3	1.5	Not recorded ⁽²⁾
BH4	1.6	1.1
BH5	1.3	Not recorded ⁽²⁾
BH6	1.0	0.6
BH7	1.2	Not recorded ⁽²⁾
BH8	1.0	1.0

NOTES:

1. Borehole advanced by wash boring methods from 0.6m therefore no meaningful groundwater observations possible.
2. No meaningful groundwater observations possible due to water introduced during core drilling.

It should be noted that groundwater levels may fluctuate seasonally and in response to rainfall and tidal variations.

6 GENERAL SITE CONDITIONS AND CONSTRUCTION PLANNING

The upper soil profile comprises very loose to loose sands which will tend to settle when disturbed by vibration induced movements. Therefore care should be exercised during demolition and construction activities to reduce the potential damage to neighbouring houses and lightly loaded elements of surrounding larger developments which are likely to be founded on shallow footings within the sands. Prior to construction, detailed property condition surveys should be completed for all immediately surrounding properties.

Once demolition of the existing structures is complete, including the removal of footings and services, site works will include the removal of all fill and building debris, any root affected material and any obvious deleterious or otherwise unsuitable material. All such material should be disposed of off-site in accordance with local regulations. Waste classification testing may be required to appropriately assess disposal requirements. Further comments in this regard are provided in the site contamination report (RGS01385.1–AB)

To avoid the risk of damage to adjoining properties during initial site preparation works care should be taken to limit excavations to no more than 1m prior to installing appropriate retention.



Site trafficability was good at the time of the fieldwork which was undertaken over a period of prolonged moderate to heavy rainfall. The near surface soils comprise sands and therefore working platforms comprising durable crushed rock or recycled crushed concrete would be beneficial in areas of high traffic flows such as site access points.

7 EXCAVATIONS

7.1 Excavation Conditions

The proposed development includes a single basement level and therefore excavations of up to about 3m are anticipated on the southern side of the existing stormwater drainage channel. The excavations will extend up to the property boundaries along all four sides of the excavation. Excavations will generally encounter sand to depths of about 2.5m and clays below 2.5m. Groundwater will be encountered at approximately 1m depth causing collapse of the sand profile into excavations and therefore pre-support and dewatering will be required to support the saturated sands.

Excavation to 3m depth will be achievable using conventional earthmoving equipment such as medium to large sized (20 to 30 tonne) hydraulic excavators.

Other than the bulk excavation required for basement construction temporary, localised excavations such as service trenches that are required to extend into the sands at depths of more than 1.0m will require shoring boxes and/or horizontal dewatering prior to excavation.

7.2 Pre-support and Dewatering

Excavations will extend through the permeable upper sand profile into the underlying low permeability clay below 2.5m depth. The preferred system of pre-support and dewatering would therefore be installation of sheet piles or contiguous reinforced concrete piles around the perimeter of the excavation, socketed into the clay profile below bulk excavation level to a minimum depth of 5m.

Following installation of a system of this nature the excavation could be conducted within the pile walls with inflow restricted to some seepage into the base of the excavation. It is anticipated that inflow through the low permeability clays in the base of the excavation would be restricted to isolated seepage paths such as fissures within the clay. Such inflows could be managed by grading the base of the excavation towards a sump fitted with a pumpout system, and placing a drainage blanket over the floor of the bulk excavation. Taking into account the nature of the materials that will be encountered at bulk excavation level, a working platform over the base of the excavation will be required, and the drainage blanket could be incorporated into this layer.

The basement will be partially constructed below the groundwater table and should be constructed as fully tanked.



7.3 Working Platform

Bulk excavation to basement levels 3m below the existing surface will expose stiff clay below the water table over the floor of the excavation and as such a working platform will be required to render the site trafficable for construction machinery and personnel. The working platform should be underlain by a drainage blanket draining to a sump and pump system to facilitate dewatering of the excavation.

The following procedure is therefore recommended:

- Extend bulk excavation to 700mm below design levels and grade base of excavation towards a sump or series of sumps;
- Place a heavy duty geofabric such as a Bidim A34 over the base of the excavation;
- Place a drainage blanket of 400mm of free draining rockfill, nominally 50 to 100mm particle size, over the base of the excavation;
- Place geofabric over the surface of the rock fill;
- Place 300mm select fill working platform over the fabric.

Earthworks should be carried out in accordance with the recommendations outlined in Australian Standard AS3798-1996, *Guidelines on Earthworks for Commercial and Residential Developments*.

8 RETENTION SYSTEMS

8.1 Options and design considerations

Options for pre-support of excavations and permanent support of the basement excavations include sheet piles, contiguous pile walls, and secant pile walls, or a combination of these methods. The use of sheet piles near existing structures is not recommended due to the possibility of damage caused by vibrations during installation.

A contiguous pile wall would be feasible around the majority of the site however secant piles are preferred around the boundary of the property located in the south-western corner of the block. Secant piles will provide a better seal than contiguous piles resulting in lower groundwater inflows into the excavation and reduced chance of loss of material from behind the wall. Any gaps between the piles in a contiguous pile wall will need to be sealed during excavation to reduce loss of material from behind the wall.

8.2 Design Parameters

Retaining walls should be designed on the basis of a triangular lateral earth pressure distribution using the geotechnical parameters presented in Table 3.



Table 3 – Retention Design Parameters

Founding Material	Material Unit Weight (kN/m³)	Effective Friction Angle (°)	At Rest Earth Coefficient K_o	Active Earth Coefficient K_a	Passive Earth Coefficient K_p	Allowable Lateral Capacity (kPa)
Unit 1 Topsoil & Fill	18	25	0.55	0.40	2.5	Nil
Unit 2 Loose Sand	18	28	0.55	0.375	2.8	Nil
Unit 3 Alluvial Clay	17	20	0.5	0.49	2.0	Nil
Unit 4 Residual Clay	18	22	0.7	0.45	2.2	80
Unit 5 EW Siltstone	21	30	0.8	0.3	3.0	450
Unit 6 Sandstone	21	35	0.8	0.27	3.7	800

8.3 Anchored retaining walls

Depending on the amount of lateral movement that can be tolerated and the lateral capacity of the piles, lateral restraint in the form of ground anchors or internal props may be required to support the sheet piles or secant piles. Permission will need to be obtained from adjacent land owners and/or council prior to installing anchors beyond property boundaries. For long term support the retaining walls can be braced by the ground floor slab

The following points are noted in relation to the design of anchored or propped retaining walls:

- Where some adjacent soil movement on the outside of the wall can be tolerated (such as along the eastern and western boundaries adjacent to the footpaths) a rectangular earth pressure distribution of magnitude $6H$ kPa (where H equals the height of the retained soil in metres) may be adopted.
- Where movement cannot occur (such as along the boundary of the house in the south-western corner) a rectangular earth pressure distribution of magnitude $8H$ kPa may be adopted.
- Anchors with the bond length within loose sand may be designed using an internal friction angle of 28° and bond stress of 15kPa for the active bond length of the anchor. Anchors



should have a minimum bond length of 3m with the entire bond zone being located behind a line drawn up at 45° from the toe of the excavation. Anchors should be proof loaded to at least 1.3 times their design working capacity before locking off.

- Toe restraint may be designed using the parameters provided in Table 3 (but using a factor of safety of 2) for the materials supporting that portion of the pile founded at least 1m below bulk excavation level.
- For piles founded within the underlying siltstone and sandstone (where retaining wall piles are to be incorporated into the structural footings) lateral resistance can be calculated using the allowable lateral capacities provided in Table 3.
- Any surcharge affecting the walls (e.g. adjacent footings or retaining walls or inclined slopes, traffic loads) should be allowed for in the design.
- Installation of drainage measures will not be possible behind the retaining walls as such they should be designed to withstand full hydrostatic pressures.

8.4 Cantilevered pile walls

Cantilever pile walls can be designed on the basis of a triangular lateral earth pressure distribution using the following parameters outlined in Table 3. The following points are noted:

- For cantilever walls where movement is of little concern, the active earth pressure coefficients (k_a) provided in Table 3 may be adopted for soils assuming a horizontal backfill surface.
- Where the top of the wall is restrained, such as by ground floor slab, or if the walls are retaining areas which are sensitive to movement "at rest" earth pressure coefficients (k_o) should be adopted.
- Any surcharge affecting the walls (e.g. traffic loads, adjacent footings or retaining walls or inclined slopes, traffic loads) should be allowed for in the design.
- Installation of drainage measures will not be possible behind the retaining walls as such they should be designed to withstand full hydrostatic pressures.

9 FOUNDATIONS

9.1 Preferred foundation types

Minor structures that are independent of the main structures may be supported by shallow footings founded with the natural sands. For lightly loaded flexible structures strip footings founded on natural sands with a density index of 50% or better can be proportioned for an allowable base bearing pressure of 50kPa. A peat layer was encountered in borehole BH3 between 1.8 and 2.4m. Therefore where lightly loaded structures on shallow footings are proposed some investigations should be undertaken to assess the presence of localised peat layers or lenses in the building footprint.

On the bases of the investigations undertaken the upper soil profile comprises non-reactive sand soil to beyond the depth of the water table. As such in its current condition the site could be classified as Class 'A' (Non-reactive) in accordance with AS2870 – 2011.



A localised area of fill up to about 0.4m deep was encountered in BH6a and the potential exists for localised deeper fill to be located in other parts of the site. Further to this on completion of earthworks the site classification may change and the resultant classification will be dependent on the nature and reactivity of foundation soils, depth and nature of any fill placed and the degree of compaction, and degree of control testing undertaken on the fill.

All filling required to support structures should be undertaken in accordance with Level 1 construction monitoring and testing as defined in AS3798 – 2007.

9.2 Non-displacement Piles

The main structures on site can be supported by piles founded in the weathered rock below the alluvial and residual soil profile. Options include bored (non-displacement) or driven (displacement) piles.

Non-displacement piles such as bored piles will be required to penetrate low strength soils below the water table and therefore casing will be required in the upper profile to prevent collapse. Alternatively, grout injected continuous flight auger (CFA) piles or steel screw piles could be adopted.

Parameters for the design of non-displacement pile types are outlined in Table 4. Parameters are provided for both limit state design (Ultimate and Serviceability values) or Factor of Safety based design (allowable values based on a FOS = 3). For the purpose of limit state design, serviceability values are based on an assumed tolerable settlement of <1% of pile diameter.

When using the ultimate values outlined in Table 4 for limit state design, a design geotechnical reduction factor should be applied. Selection of appropriate geotechnical reduction factors is discussed in Section 9.4.

Table 4 - Foundation Design Parameters for Non-displacement Piles

Founding Material	Ultimate End Bearing Pressure (MPa)	Serviceability End Bearing Pressure (MPa)	Ultimate Shaft Adhesion (kPa)	Allowable End Bearing Pressure (MPa)	Allowable Lateral Capacity (MPa)	Elastic Modulus (MPa)
Fill and Sand	-	-	-	-	-	-
Alluvial Clay	-	-	-	-	10	-
Residual Clay	-	-	20	-	75	20
EW - HW Siltstone	2.5	0.7	75	0.8	0.45	75
MW Sandstone	4.0	1.0	300	1.5	0.8	200



Notes:

1. *Ultimate values only occur at settlements >5% of minimum footing dimensions.*
2. *Serviceability end bearing values are based on serviceability criteria of estimated settlements <1% of minimum footing dimension*
3. *For pile to carry design loads it is assumed that the pile bases are and walls cleared of debris and for rock socket piles the shaft is roughened to category R2 or better (R2-defined as grooves of depth 1mm to 4mm and width greater than 2mm, at spacing of 50mm to 100mm.*
4. *Minimum socket length of 2 x pile diameter assumed.*

The base of pier holes should be cleaned using a clean out bucket or hand tool as open flight augers often cannot remove sufficient spoil to expose the majority of the base. Pile holes should be dewatered prior to pouring concrete. Alternatively, concrete could be poured using a tremmie line extending to the base of the hole after base cleaning has been completed.

For steel screw piles, shaft adhesion values should be reduced by 50% due to disturbance of material surrounding the shaft. If CFA piles are adopted, effective diameter assumed in shaft adhesion should be reduced by 50mm to allow for the disturbed or smeared zone at the edge of the pile.

Consideration should be given to the uplift loads imposed due to buoyancy forces acting on the tanked basement. The weight of the structure may be sufficient to overcome these forces however if not the piles will need to be designed to accommodate these loads.

9.3 Displacement (driven) Piles

Following bulk excavation, the depth to weathered rock founding material is likely to be of the order of 5m and as such the use of driven timber piles would be feasible. For driven piles taken to a refusal set on the weathered rock, bearing strength will be governed by the structural capacity of the pile. As a guide, 175mm diameter treated timber minipiles driven to refusal will have a structural capacity of the order of 200kN.

9.4 Geotechnical Reduction Factor

For pile design in accordance with AS2159-2009, 'Piling-Design and installation', the ultimate geotechnical strength ($R_{d,ug}$) can be calculated using the shaft capacity and ultimate end bearing capacity values provided in Table 4. Calculation of the design geotechnical strength ($R_{d,g}$) requires an assessment of the geotechnical strength reduction factor (Φ_g), which is based on a series of project specific variables. In assessing a suitable geotechnical strength reduction factor for this project, the following assumptions have been made:

- Design of piles and pile groups will be undertaken in accordance with the recommendations presented in this report;
- Limited geotechnical involvement will occur during pile installation;
- No performance monitoring of the supported structure during or after construction; and



- At least one of the piles will be dynamically load tested and analysed with a signal matching system (PDA/CAPWAP or approved equivalent);
- The foundations will be designed by a designer of at least moderate experience in similar geotechnical profiles and pile design;
- Well established pile design methods will be adopted.

Based on the above and in accordance with AS2159-2009, an Individual Risk Rating (IRR) of 3.6 is estimated for the site. Assuming a structure of this type will have low redundancy, a Geotechnical Strength Reduction Factor of $\Phi_g=0.5$ would be appropriate for the site. In the event that any of the assumptions outlined above are not correct, the Geotechnical Strength Reduction Factor may change and in such a case further advice should be sought.

9.5 Earthquake Design Requirements

In accordance with AS1170.4-2007 based on the soil profile present the site would be considered a Class D_e site. A site hazard factor of 0.11 can be adopted for the purposes of earthquake design in the Lake Macquarie area.

9.6 Aggressivity to Buried Structural Elements

The aggressivity test results presented in Table 5 below are compared to the exposure classifications provided in Australian Standard AS2159-2009, *Piling Design and Installation*.

Table 5: Results of Soil Aggressivity Testing

Sample Location	Sample Depth (m)	Sample Type	pH	Soluble Sulfate (%)	Chloride (mg/kg)	Resistivity (ohm.cm)
BH1	4.5 to 4.95	Soil	7.6	<0.1	950	380
BH2	1.6 to 1.95	Soil	6.6	<0.1	65	11200
BH3	7.0 to 7.45	Soil	6.4	<0.1	750	450
BH8	9.0 to 9.45	Soil	6.2	<0.1	1049	370

Comparing the laboratory test results to the exposure classifications provided in Australian Standard AS2159-2009, *Piling Design and Installation* indicates the soil is mildly aggressive to concrete and moderately aggressive to steel elements. As such, it is recommended that concrete elements that come into contact with the ground be designed for a mild exposure classification while steel elements be designed for a moderate exposure classification.



9.7 Bored Pile Excavation Conditions

Due to the presence of ground water within sands well above the level of the founding rock, open bored piles would not be suitable due to likely hole collapse. Construction of bored piles will require casing advanced into the profile using vibratory or screwing methods, embedded into the rock and cleaned out to the rock base. Alternatively, grout injected continuous flight auger (CFA) piles can be adopted.

Soilmec provides a guideline for bored tool selection based on typical RQD and UCS, as shown in Figure 2 below.

For indicative UCS values of 20MPa – 40MPa for HW to SW siltstone and sandstone and RQD of 0% - 70% based on investigations, anticipated sockets into the rock are likely to be achievable using auger and conventional bucket methods.

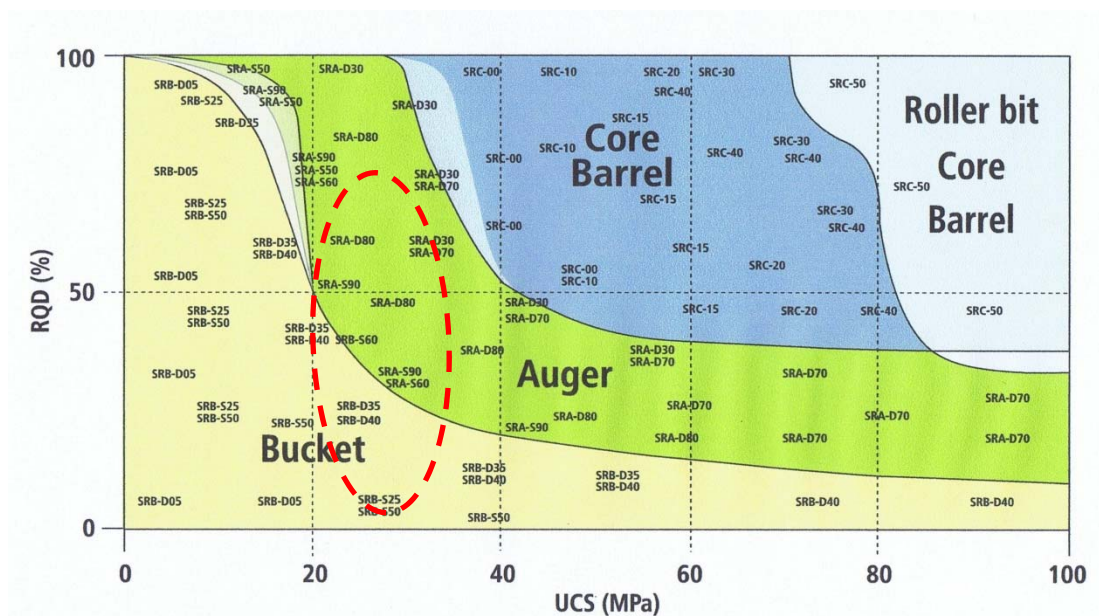


Figure 5.4.1 – Guide to bored pile tool selection, characteristics of HW to SW siltstone and sandstone denoted by red dashed circle. (Reproduced from Soilmec document 'Rock Drilling Tools' www.soilmec.com)

10 ACID SULFATE SOILS (ASS)

10.1 ASS Testing

Samples collected during the fieldwork were sent to Biotrack for ASS laboratory testing. The following testing was undertaken:

- Twenty one Screening tests;
- Eight Chromium Reducible Sulfur (CRS) tests.

The results of the screening tests are presented in Appendix B. The following points are noted from the screening tests:



- Soil in water did not produce pH < 4 for the samples tested. Soil in water with a pH < 4 in this test is an indication of actual acid sulfate soil;
- Oxidation with hydrogen peroxide produced pH < 3 for nine of the samples tested. Soil in a peroxide solution with a pH < 3 in this test is an indication of potential acid sulfate soil.

Based on the results of the screening tests eight samples were selected for CRS analysis. Results for %S_{KCl}, S_{Cr} and TAA are compared to action criteria presented in the ASSMAC 1998 *Acid Sulfate Soil Assessment Guidelines* in Table 6 below. The laboratory CRS test results are presented in Appendix B.

Table 6: Summary of ASS CRS Laboratory Testing

Sample Location	Depth (m)	Texture	Percentage Sulphur in the KCL Extract (%S _{KCl})	Reduced Inorganic Sulfur (%S _{Cr})	Action Criteria For %S _{Cr}	Total Actual Acidity (TAA) moleH ⁺ /tonne	Action Criteria for TAA
BH1	3.0 to 3.45	Fine	0.01	0.13	0.03	3	18
BH2	1.6 to 1.95	Coarse	< 0.01	0.01	0.03	< 1	18
BH4	1.5 to 1.95	Coarse	< 0.01	< 0.01	0.03	< 1	18
BH5	3.1 to 3.45	Fine	< 0.01	0.14	0.03	< 1	18
BH6	1.5 to 1.95	Coarse	0.02	0.14	0.03	8	18
BH7	3.0 to 3.45	Fine	0.02	0.53	0.03	3	18
BH7	6.0 to 6.45	Fine	<0.01	0.05	0.03	< 1	18
BH8	3 to 3.45	Fine	0.03	0.61	0.03	< 1	18

NOTE:

1. Action criteria adopted are based on disturbance of over 1000 tonnes of acid sulfate soils.

The ASSMAC (1998) action criteria trigger the need to prepare an Acid Sulfate Soil Management Plan and obtain development consent. The action criteria are based on oxidisable sulfur concentrations for three differing soil textures, however, where more than 1000 tonnes of soil is to be disturbed the criteria for coarse textured soils applies. The proposed development will disturb more than 1000 tonnes of soil, therefore action criteria for this site are based on 0.03% oxidisable sulphur, or an acidity of 18 moles per tonne.



10.2 Conclusions

Testing showed concentrations of TAA below the action criteria of 18 moles H^+ /tonne. The soils are slightly acidic, and extractable sulfur ($\%S_{KCl}$) levels are low which indicates that the acidity is not sulfuric in nature. However, S_{Cr} and S_{EQ} levels are high in two cases (BH7 and BH8) indicating these soils are Potential Acid Sulfate Soils (PASS).

The testing indicates the sands overlying the site are naturally slightly acidic however the acid is not sulfuric in nature. The alluvial clays underlying the sands at depths of between about 2.4m and 4.5m are PASS. An ASS Management Plan will be required for the excavation of the alluvial clays.

A preliminary ASSMP is provided in Appendix C. This plan can form the basis of a detailed ASSMP which can be prepared for the site once final details of excavation location, extent and depth are known.

11 BASEMENT FLOOR SLABS AND PAVEMENTS

The basement floor slab will be cast over the working platform to be constructed on the alluvial clay subgrade exposed at the base of the excavation. A fully tanked basement will be required. As such the floor slab will be integral with the basement perimeter walls and internal columns.

The slab will be required to support vehicular movements associated with the car park. It has been assumed that the basement car park will not be accessible to heavy vehicles. Therefore, taking into account anticipated vehicle loads and likely subgrade conditions, the floor slab should incorporate a minimum 170mm thick slab of 4.0MPa concrete. It is likely that the structural design of the slab will be governed by the requirement to resist uplift pressures on the base of the slab.

12 LIMITATIONS

The findings presented in the report and used as the basis for recommendations presented herein were obtained using normal, industry accepted geotechnical and pavement design practises and standards. To our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, however, can it be considered that these findings represent the actual state of the site at all points. If site conditions encountered during construction vary significantly from those discussed in this report, Regional Geotechnical Solutions Pty Ltd should be contacted for further advice.

This report alone should not be used by contractors as the basis for preparation of tender documents or project estimates. Contractors using this report as a basis for preparation of tender documents should avail themselves of all relevant background information regarding the site before deciding on selection of construction materials and equipment.



If you have any questions regarding this project, or require any additional consultations, please contact the undersigned.

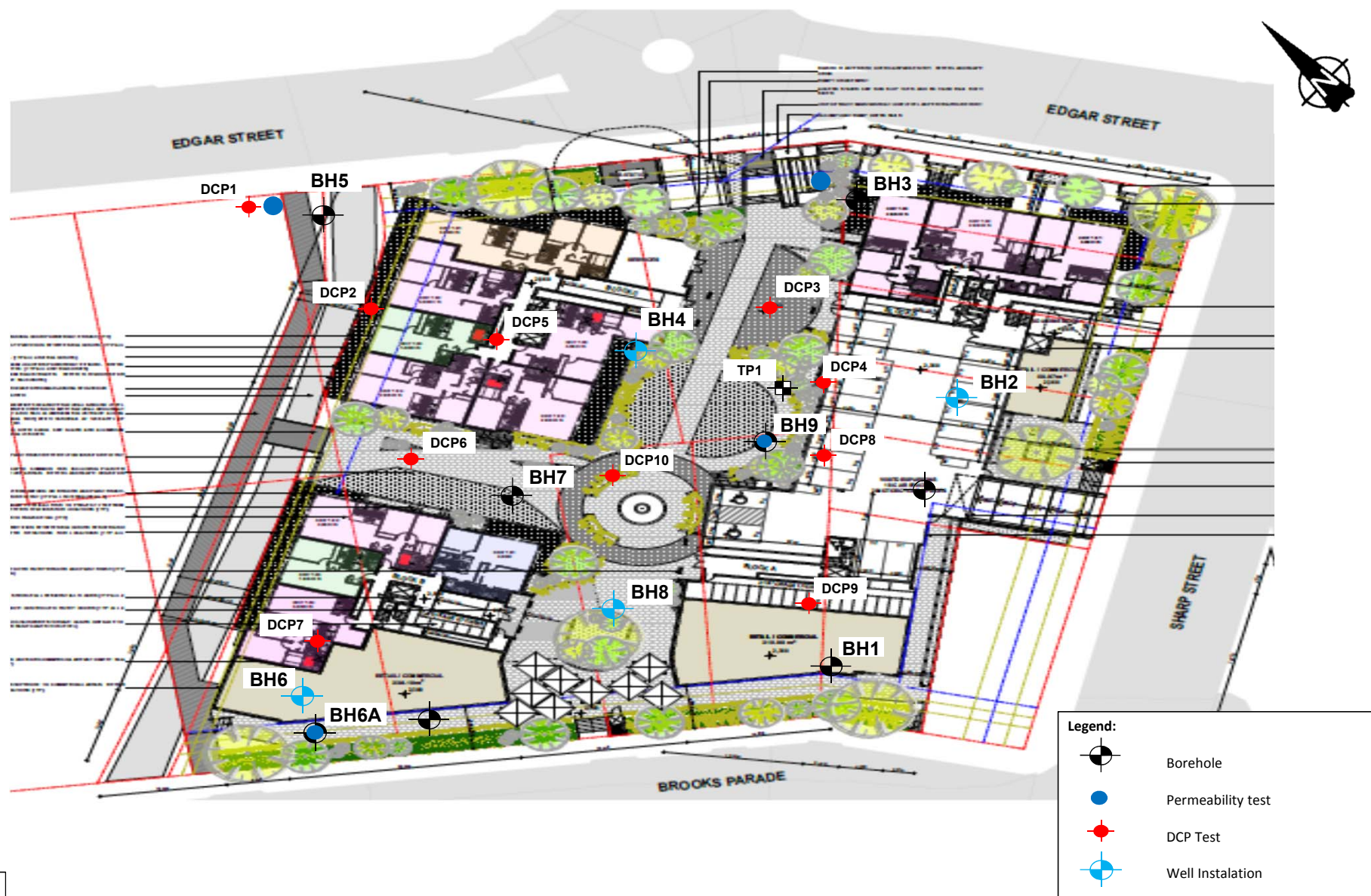
For and on behalf of

Regional Geotechnical Solutions Pty Ltd

Steve Morton

Principal Geotechnical Engineer

Figures



Client	KML Joint Venture	Job No.	RGS01385.1
Project:	Proposed Multi-storey Development	Drawn By:	AH
	Belmont	Date:	26-Aug-16
Title:	Test Location Plan	Drawing No.	FIGURE 1

Appendix A

Results of Field Investigations



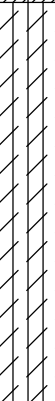
ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH1
PAGE: 1 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
ADTC							Topsoil/Fill: Silty SAND, fine grained, brown, contains fine to medium rounded gravel and rootlets	M				0.00: TOPSOIL: FILL: Grassed
CB		1.50m SPT 2,2,1 N=3 1.95m		1.0		SP	SAND, medium to coarse grained, orange, brown, contains medium to coarse subrounded gravel	W	L			0.30: ALLUVIAL
							Gravelly SAND, medium to coarse subrounded, grey, gravel is fine to medium grained, subrounded					
		3.00m SPT 2,3,3 N=6 3.45m		2.0		SP						
							Gravelly CLAY, medium plasticity, grey, gravel is medium to coarse grained, subrounded, claystone, contains medium to coarse grained Sand					
		4.50m SPT 3,5,8 N=13 4.95m		3.0		CL		M ~ w _p	St - VSt			4.00: RESIDUAL
							Silty CLAY, high plasticity, pale grey, contains coal bands					
		6.00m SPT 3,4,6 N=10 6.45m		4.0		CH		M ~ w _p				
							Clayey SILT, medium to high plasticity, pale grey					
				5.0		MH		W	VSt			
				6.0		MH						
				7.0		MH						

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition	
Water		U ₅₀ 50mm Diameter tube sample		VS	Very Soft	<25	D	Dry
Water Level (Date and time shown)		CBR Bulk sample for CBR testing		S	Soft	25 - 50	M	Moist
Water Inflow		E Environmental sample (Glass jar, sealed and chilled on site)		F	Firm	50 - 100	W	Wet
Water Outflow		ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)		St	Stiff	100 - 200	w _p	Plastic Limit
Strata Changes		B Bulk Sample		VSt	Very Stiff	200 - 400	w _L	Liquid Limit
Gradational or transitional strata		Field Tests		H	Hard	>400		
Definitive or distinct strata change		PID Photoionisation detector reading (ppm)		Fb	Friable			
		DCP(x-y) Dynamic penetrometer test (test depth interval shown)		Density		V	Very Loose	Density Index <15%
		HP Hand Penetrometer test (UCS kPa)				L	Loose	Density Index 15 - 35%
						MD	Medium Dense	Density Index 35 - 65%
						D	Dense	Density Index 65 - 85%
						VD	Very Dense	Density Index 85 - 100%



ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BH1**
PAGE: 2 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER: 100 mm
SURFACE RL: AHD
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
RR				9.0		MH	Clayey SILT, medium to high plasticity, pale grey (continued)	W	VSt			8.60: Reduction in Drilling Resistance
						MH	SILTSTONE, fine to medium grained, grey-brown and orange-brown, very low strength					
				9.0			Continued as Cored Drill Hole					
				10.0								
				11.0								
				12.0								
				13.0								
				14.0								
				15.0								

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition	
Water		U ₅₀ 50mm Diameter tube sample		VS	Very Soft	<25	D	Dry
Water Level (Date and time shown)		CBR Bulk sample for CBR testing		S	Soft	25 - 50	M	Moist
Water Inflow		E Environmental sample (Glass jar, sealed and chilled on site)		F	Firm	50 - 100	W	Wet
Water Outflow		ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)		St	Stiff	100 - 200	W _p	Plastic Limit
Strata Changes		B Bulk Sample		VSt	Very Stiff	200 - 400	W _L	Liquid Limit
Gradational or transitional strata		Field Tests		H	Hard	>400		
Definitive or distinct strata change		PID Photoionisation detector reading (ppm)		Fb	Friable			
		DCP(x-y) Dynamic penetrometer test (test depth interval shown)		Density	V	Very Loose	Density Index <15%	
		HP Hand Penetrometer test (UCS kPa)			L	Loose	Density Index 15 - 35%	
					MD	Medium Dense	Density Index 35 - 65%	
					D	Dense	Density Index 65 - 85%	
					VD	Very Dense	Density Index 85 - 100%	



ENGINEERING LOG - CORED BOREHOLE

BOREHOLE NO: **BH1**
PAGE: 3 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL: AHD
DATUM: AHD

Drilling and Sampling					Material description and profile information				Testing		Rock Mass Defects		
METHOD	WATER	CORE LIFT / TEST	RL (m)	DEPTH (m)	GRAPHIC LOG	Material Description: Rock type, particle characteristics, colour, minor components, structure	WEATHERING	ESTIMATED STRENGTH	I _{s(50)} D/A	RQD %	Defect Spacing mm	Defect Description: Type, inclination, planarity, roughness, coating, thickness	
				9.0		START CORING AT 9.00m							
NMLC						Start Coring at 9.0m, No Core 0.4m							
						SILTSTONE, fine grained, grey with orange-brown bands	EW	VL	A=0.45	0	50	PT 0° SN PT 0° SN PT 0° SN PT 0° SN PT 0° SN CS PT 0° SN PT 0° SN PT 0° SN PT 0° SN	
					HW		L						
					HW - MW		VL - L						
		10.5				SANDSTONE, fine to medium grained, grey, instinctly bedded	SW	L - M	A=1.42	13	50	PT 0° SN PT 0° SN PT 0° SN CZ 30mm thick PT 0°	
		11.7									100	PT 5° PT 0° SZ 0° PT 5° SZ 5° PT 0° PT 5° JT 10° CN UN RO PT 5° PT 10°	
										60	300		
							</						



	Client	KML Joint Venture	Job No.	RGS01385.1
	Project:	Proposed Multi-storey Development Belmont	Drawn By:	Adam Holzhauser
			Date:	28-May-12
	Title:	Core Photograph - BH1	Photo No.	1



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH2
PAGE: 1 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result		
NMLC		1.30m SPT 3.1,1 N=2 1.75m		0.20m			TOPSOIL, Silty SAND, fine grained, orange-brown, contains rootlets	D				0.00: TOPSOIL: GRASSED	
					SM	Silty SAND, fine grained, dark grey	D	VL	0.20: AEOLIAN				
				0.80m									
				1.0		SP	Gravelly SAND, medium to coarse grained, grey, gravel is medium to coarse grained, rounded	M				0.80: ALUVIAL	
				1.50m									
				2.0		SP	SAND, fine to medium grained, grey, contains a trace of fine to medium rounded gravel		VL				
				2.60m									
				2.80m			Sandy Clay, medium plasticity dark Grey		St				
				2.90m									
				3.0		CH	Gravelly Clay, medium to high plasticity dark grey, Gravel is medium to coarse grained subrounded Siltstone ironstone contains some fine to medium grained Sand		VSt			3.00: ALLUVIAL CLAY	
		4.20m SPT 2.3,3 N=6 4.65m		4.00m			Silty Clay, medium to high plasticity, pale grey contains trace of thin coal seams					4.00: RESIDUAL NO SAMPLE RECOVERY	
				5.0		CH			VSt				
				6.0									
				7.0									
		7.00m SPT 3.12,7 N=19 7.45m		6.95m			Silty Clay medium to high plasticity, pale grey mottled Orange brown with some highly weathered Siltstone Sands		VSt - H		6.80: EXTREMELY WEATHERED SILTSTONE		

LEGEND:
Water
Water Level
(Date and time shown)
Water Inflow
Water Outflow
Strata Changes
Gradational or transitional strata
Definitive or distinct strata change

Notes, Samples and Tests
U₅₀ 50mm Diameter tube sample
CBR Bulk sample for CBR testing
E Environmental sample
(Glass jar, sealed and chilled on site)
ASS Acid Sulfate Soil Sample
(Plastic bag, air expelled, chilled)
B Bulk Sample
Field Tests
PID Photoionisation detector reading (ppm)
DCP(x-y) Dynamic penetrometer test (test depth interval shown)
HP Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)	Moisture Condition	
VS	Very Soft	<25	D	Dry
S	Soft	25 - 50	M	Moist
F	Firm	50 - 100	W	Wet
St	Stiff	100 - 200	W _p	Plastic Limit
VSt	Very Stiff	200 - 400	W _L	Liquid Limit
H	Hard	>400		
Fb	Friable			
Density				
V	Very Loose		Density Index <15%	
L	Loose		Density Index 15 - 35%	
MD	Medium Dense		Density Index 35 - 65%	
D	Dense		Density Index 65 - 85%	
VD	Very Dense		Density Index 85 - 100%	



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH2
PAGE: 2 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER: 100 mm

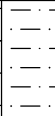
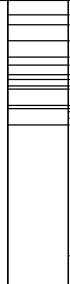
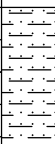
SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
						CH	Silty Clay medium to high plasticity, pale grey mottled Orange brown with some highly weathered Siltstone Sands (<i>continued</i>)		VSt - H			
				9.0			Continued as Cored Drill Hole					
				10.0								
				11.0								
				12.0								
				13.0								
				14.0								
				15.0								

LEGEND: Water Water Level (Date and time shown) Water Inflow Water Outflow Strata Changes Gradational or transitional strata Definitive or distinct strata change		Notes, Samples and Tests U ₅₀ 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample (Glass jar, sealed and chilled on site) ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled) B Bulk Sample Field Tests PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)		Consistency VS Very Soft <25 S Soft 25 - 50 F Firm 50 - 100 St Stiff 100 - 200 VSt Very Stiff 200 - 400 H Hard >400 Fb Friable Density V Very Loose L Loose MD Medium Dense D Dense VD Very Dense		UCS (kPa) Moisture Condition D Dry M Moist W Wet W _p Plastic Limit W _L Liquid Limit Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	
---	--	--	--	--	--	--	--

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information				Testing		Rock Mass Defects		
METHOD	WATER	CORE LIFT / TEST	RL (m)	DEPTH (m)	GRAPHIC LOG	Material Description: Rock type, particle characteristics, colour, minor components, structure	WEATHERING	ESTIMATED STRENGTH	I _{s(50)} D/A	RQD %	Defect Spacing mm	Defect Description: Type, inclination, planarity, roughness, coating, thickness	
						START CORING AT 8.75m							
NMLC				9.0		Siltstone fine grey with Orange brown bands indistinctly bedded	EW	EL	A=0.38				
							HW	VL					
							HW	VL					
							MW	L					
				10.0		Siltstone fine dark grey mottled pale grey, distinctly bedded at 5° - 20°	MW	L					
				11.0		Interbedded Sandstone and Siltstone, fine Sandstone is pale grey, Siltstone dark grey, distinctly bedded at 0° - 5°	MW - SW	L - M					
				12.0		Sandstone, fine to medium grained grey indistinctly bedded	SW - FR	M	A=1.00				
				13.0		Hole Terminated at 12.90 m							
				14.0									
				15.0									
LEGEND:					Method			Weathering		Strength		Defect Type	
Water					AS Auger Screwing			EW Extremely Weathered		VL Very Low <0.1		JT Joint	
 Water Level (Date and time shown)					AD Auger Drilling			HW Highly Weathered		L Low 0.1 - 0.3		PT Parting	
 Water Inflow					RR Roller/tricone			MW Moderately Weathered		M Medium 0.3 - 1		SM Seam	
 Water Outflow					CB Claw or Blade bit			SW Slightly Weathered		H High 1 - 3		SZ Shear Zone	
Strata Changes					NMLC NMLC Core			FR Fresh		VH Very High 3 - 10		SS Sheared Surface	
 Gradational or transitional strata										>10		CS Crushed Seam	
 Definitive or distinct strata change													
					Field Tests					Roughness		Coating	
					HP Hand Penetrometer					VR Very Rough		CN Clean	
										RO Rough		SN Stained	
										SO Smooth		VN Veneer	
										SL Slickensided		CO Coating	
												IR Irregular	



	Client	KML Joint venture	Job No.	RGS01385.1
	Project:	Proposed Multi-storey Development Belmont	Drawn By:	Adam Holzhauser
			Date:	28-May-12
	Title:	Core Photograph - BH2	Photo No.	2



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH3
PAGE: 1 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER:

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
NMLC							0.10m TOPSOIL: Silty Sand, fine dark grey, contains rootlets	M				0.00: TOPSOIL: GRASSED
							Silty Sand, fine grey	M				0.10: AEOLIAN
					1.0	SP	SAND, medium to coarse grey contains trace of Fine rounded gravel		VL			0.50: ALLUVIAL
		1.50m SPT 1,1,1 N=2 1.95m			1.60m		Peat Brown	W				
					2.50m		Gravelly Clay, high plasticity, pale grey - Gravel is fine to medium grained contains fine to medium grained sand	M > w _p	St - VSt			2.50: RESIDUAL
		4.00m SPT 3,4,6 N=10 4.45m			3.60m	CH	Clay, high plasticity, pale grey, contains trace of fine Sand and fine angular Siltstone gravel with some Orange brown mottle					
					5.00m	CH	Clay, high plasticity, pale grey, with some Orange brown mottle	W	VSt			
					7.00m	CH						
		7.45m SPT 3,4,5 N=9										

LEGEND:
Water
Water Level
(Date and time shown)
Water Inflow
Water Outflow
Strata Changes
Gradational or transitional strata
Definitive or distinct strata change

Notes, Samples and Tests
U₅₀ 50mm Diameter tube sample
CBR Bulk sample for CBR testing
E Environmental sample
(Glass jar, sealed and chilled on site)
ASS Acid Sulfate Soil Sample
(Plastic bag, air expelled, chilled)
B Bulk Sample
Field Tests
PID Photoionisation detector reading (ppm)
DCP(x-y) Dynamic penetrometer test (test depth interval shown)
HP Hand Penetrometer test (UCS kPa)

Consistency	UCS (kPa)	Moisture Condition
VS Very Soft	<25	D Dry
S Soft	25 - 50	M Moist
F Firm	50 - 100	W Wet
St Stiff	100 - 200	W _p Plastic Limit
VSt Very Stiff	200 - 400	W _L Liquid Limit
H Hard	>400	
Fb Friable		
Density		
V Very Loose	Density Index <15%	
L Loose	Density Index 15 - 35%	
MD Medium Dense	Density Index 35 - 65%	
D Dense	Density Index 65 - 85%	
VD Very Dense	Density Index 85 - 100%	



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH3
PAGE: 2 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER:

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
						CH	8.20m Silty Clay, medium plasticity pale grey mottled orange brown 9.0 9.20m	W M < W _p	VSt H			
							Continued as Cored Drill Hole					
				10.0								
				11.0								
				12.0								
				13.0								
				14.0								
				15.0								

LEGEND: Water Water Level (Date and time shown) Water Inflow Water Outflow Strata Changes Gradational or transitional strata Definitive or distinct strata change	Notes, Samples and Tests U ₅₀ 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample (Glass jar, sealed and chilled on site) ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled) B Bulk Sample Field Tests PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	Consistency VS Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard Fb Friable UCS (kPa) <25 25 - 50 50 - 100 100 - 200 200 - 400 >400 Density V Very Loose L Loose MD Medium Dense D Dense VD Very Dense	Moisture Condition D Dry M Moist W Wet W _p Plastic Limit W _L Liquid Limit Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%
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ENGINEERING LOG - CORED BOREHOLE

BOREHOLE NO: **BH3**
PAGE: 3 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER:

SURFACE RL: AHD
DATUM: AHD

Drilling and Sampling					Material description and profile information				Testing		Rock Mass Defects			
METHOD	WATER	CORE LIFT / TEST	RL (m)	DEPTH (m)	GRAPHIC LOG	Material Description: Rock type, particle characteristics, colour, minor components, structure	WEATHERING	ESTIMATED STRENGTH	$I_{s(50)}$ D/A	RQD %	Defect Spacing mm	Defect Description: Type, inclination, planarity, roughness, coating, thickness		
NMLC				9.0		START CORING AT 9.20m								
				10.0		Siltstone fine pale grey with occasional orange brown mottle, indistinctly bedded	EW	EL	A=1.02			CS 95° JT 60° SN JT 10° VN CS 30°		
				11.0		Siltstone: Fine pale grey mottled orange brown, bedded at 10° to 20°	EW - HW	EL - VL				SM 30° JT 20° VN PT 10° SN		
				12.0		Sandstone: Fine pale grey mottled orange brown bedded at 5° to 20° with thin Siltstone bands	MW SW	VL - L M				JT 45° CN JT 45° VN PT 5° PT 10°		
				13.0		Sandstone: Fine to medium grey, indistinctly bedded	SW - FR	M - H		A=1.36			PT 0°	
				14.0		Hole Terminated at 13.40 m								
				15.0										
LEGEND:				Method			Weathering			Strength		$I_{s(50)}$	Defect Type	
Water				AS Auger Screwing			EW Extremely Weathered			VL Very Low		<0.1	JT Joint	
Water Level (Date and time shown)				AD Auger Drilling			HW Highly Weathered			L Low		0.1 - 0.3	PT Parting	
Water Inflow				RR Roller/tricone			MW Moderately Weathered			M Medium		0.3 - 1	SM Seam	
Water Outflow				CB Claw or Blade bit			SW Slightly Weathered			H High		1 - 3	SZ Shear Zone	
Strata Changes				NMLC NMLC Core			FR Fresh			VH Very High		3 - 10	SS Sheared Surface	
										EH Extremely High		>10	CS Crushed Seam	
				Field Tests						Roughness		Coating	Planarity	
				HP Hand Penetrometer						VR Very Rough		CN Clean	PL Planar	
										RO Rough		SN Stained	CU Curved	
										SO Smooth		VN Veneer	ST Stepped	
										SL Slickensided		CO Coating	IR Irregular	



	Client	KML Joint Venture	Job No.	RGS01385.1
	Project:	Proposed Multi-storey Development Belmont	Drawn By:	Adam Holzhauser
			Date:	28-May-12
	Title:	Core Photograph - BH3	Photo No.	3



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH5
PAGE: 1 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
NMLC		3.00m SPT 2,4,5 N=9 3.45m		0.30m			TOPSOIL: Silty Sand, medium to coarse dark grey with fine to medium grained subrounded Gravel and rootlets	M				0.00: TOPSOIL CROSSED
				1.0		SM	Silty Sand, medium to coarse grey with medium to coarse subrounded Gravel	M				0.30: ALLUVIAL
				2.0		SM			VL			
				2.50m			Sandy Clay, medium to high plasticity, Grey, Sand fine to medium grained					2.50: ALLUVIAL
		6.00m SPT 5,5,5 N=10 6.45m		3.0		CH			M > w _p	VSt		
				4.00m			Clay, medium to high plasticity, pale Grey					4.00: RESIDUAL
				4.0								
				5.0								
				6.0		CH				VSt		
				7.0								

LEGEND:
Water
 Water Level
(Date and time shown)
 Water Inflow
 Water Outflow
Strata Changes
--- Gradational or transitional strata
— Definitive or distinct strata change

Notes, Samples and Tests
U₅₀ 50mm Diameter tube sample
CBR Bulk sample for CBR testing
E Environmental sample
(Glass jar, sealed and chilled on site)
ASS Acid Sulfate Soil Sample
(Plastic bag, air expelled, chilled)
B Bulk Sample
Field Tests
PID Photoionisation detector reading (ppm)
DCP(x-y) Dynamic penetrometer test (test depth interval shown)
HP Hand Penetrometer test (UCS kPa)

Consistency	UCS (kPa)	Moisture Condition
VS Very Soft	<25	D Dry
S Soft	25 - 50	M Moist
F Firm	50 - 100	W Wet
St Stiff	100 - 200	W _p Plastic Limit
VSt Very Stiff	200 - 400	W _L Liquid Limit
H Hard	>400	
Fb Friable		
Density		
V Very Loose	Density Index <15%	
L Loose	Density Index 15 - 35%	
MD Medium Dense	Density Index 35 - 65%	
D Dense	Density Index 65 - 85%	
VD Very Dense	Density Index 85 - 100%	



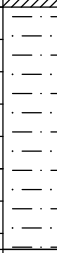
ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH5
PAGE: 2 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
NMLC		9.00m SPT 5,13,14 N=27 9.45m		8.50		CH	Clay, medium to high plasticity, pale Grey (<i>continued</i>)	M > w _p	VSt			8.50: EXTREMELY WEATHERED SILTSTONE
				9.0		CH	Clay, medium to high plasticity, pale Grey mottled Orange Brown					
				10.0					H			
				11.0			Siltstone, fine dark grey with pale grey bands, very low strength	M				11.00: EXTREMELY WEATHERED TO HIGHLY WEATHERED SILTSTONE
				12.0								
				12.50								
				13.0			Continued as Cored Drill Hole					
				14.0								
				15.0								

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition	
Water		U ₅₀ 50mm Diameter tube sample		VS	Very Soft	<25	D	Dry
Water Level (Date and time shown)		CBR Bulk sample for CBR testing		S	Soft	25 - 50	M	Moist
Water Inflow		E Environmental sample (Glass jar, sealed and chilled on site)		F	Firm	50 - 100	W	Wet
Water Outflow		ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)		St	Stiff	100 - 200	W _p	Plastic Limit
Strata Changes		B Bulk Sample		VSt	Very Stiff	200 - 400	W _L	Liquid Limit
Gradational or transitional strata		Field Tests		H	Hard	>400		
Definitive or distinct strata change		PID Photoionisation detector reading (ppm)		Fb	Friable			
		DCP(x-y) Dynamic penetrometer test (test depth interval shown)		Density		V	Very Loose	Density Index <15%
		HP Hand Penetrometer test (UCS kPa)		L		L	Loose	Density Index 15 - 35%
				MD		MD	Medium Dense	Density Index 35 - 65%
				D		D	Dense	Density Index 65 - 85%
				VD		VD	Very Dense	Density Index 85 - 100%



ENGINEERING LOG - CORED BOREHOLE

BOREHOLE NO: **BH5**
PAGE: 3 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information				Testing		Rock Mass Defects	
METHOD	WATER	CORE LIFT / TEST	RL (m)	DEPTH (m)	GRAPHIC LOG	Material Description: Rock type, particle characteristics, colour, minor components, structure	WEATHERING	ESTIMATED STRENGTH	$I_{s(50)}$ D/A	RQD %	Defect Spacing mm	Defect Description: Type, inclination, planarity, roughness, coating, thickness
				9.0 10.0 11.0 12.0								
						START CORING AT 12.50m						
NMLC				13.0		Sandstone, fine to medium pale grey with re brown staining, indistinctly bedded	HW	VL				PT 5° SN PT 0° SN PT 0° SN
				14.0			SW	M - H				PT 5° CN
						NO CORE 0.25M	EW	VL				SM 50° SM 20° SM 20°
				15.0		Sandstone, fine to medium grey, Indistinctly bedded	HW	VL				
							MW	L - M				
						NO CORE 0.28M						
						Sandstone, fine to medium grey indistinctly bedded	SW	M	A=5.80			SM 0° SM 0° SM 0° 40°
							EW	VL				
						Hole Terminated at 15.85 m						
LEGEND:					Method		Weathering		Strength		Defect Type	
Water					AS	Auger Screwing	EW	Extremely Weathered	VL	Very Low	JT	Joint
Water Level (Date and time shown)					AD	Auger Drilling	HW	Highly Weathered	L	Low	PT	Parting
Water Inflow					RR	Roller/tricone	MW	Moderately Weathered	M	Medium	SM	Seam
Water Outflow					CB	Claw or Blade bit	SW	Slightly Weathered	H	High	SZ	Shear Zone
					NMLC	NMLC Core	FR	Fresh	VH	Very High	SS	Sheared Surface
									EH	Extremely High	CS	Crushed Seam
Strata Changes					Field Tests				Roughness		Coating	
Gradational or transitional strata					HP	Hand Penetrometer			VR	Very Rough	CN	Clean
Definitive or distinct strata change									RO	Rough	SN	Stained
									SO	Smooth	VN	Veneer
									SL	Slickensided	CO	Coating
											PL	Planar
											CU	Curved
											ST	Stepped
											IR	Irregular



	Client	KML Joint Venture	Job No.	RGS01385.1
	Project:	Proposed Multi-storey Development Belmont	Drawn By:	Adam Holzhauser
			Date:	28-May-12
	Title:	Core Photograph - BH5	Photo No.	5



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH6
PAGE: 1 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 18/4/12

DRILL TYPE: Truck Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
NMLC		1.20m SPT 3,1,2 N=3 1.65m		0.02m		SP	TOPSOIL/FILL: Gravelly SAND, fine to medium grained dark grey, Gravel is fine to medium grained, subangular SAND, medium to coarse grained, grey with fine to medium grained subrounded gravel	W				0.00: TOPSOIL/FILL: GRASSED 0.02: ALLUVIAL 2.80: ALLUVIAL 4.00: RESIDUAL
				2.80m		CL	Sandy CLAY, medium plasticity, grey, Sand fine to medium grained	M > w _p	St			
		4.50m SPT 5,8,13 N=21 4.95m		4.00m		CH	CLAY, medium-high plasticity, grey mottled orange brown	M > w _p	H			
		7.10m SPT 5,10,14 N=24 7.55m										

LEGEND:
Water
 Water Level (Date and time shown)
 Water Inflow
 Water Outflow
Strata Changes
--- Gradational or transitional strata
— Definitive or distinct strata change

Notes, Samples and Tests
U₅₀ 50mm Diameter tube sample
CBR Bulk sample for CBR testing
E Environmental sample (Glass jar, sealed and chilled on site)
ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
B Bulk Sample
Field Tests
PID Photoionisation detector reading (ppm)
DCP(x-y) Dynamic penetrometer test (test depth interval shown)
HP Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)	Moisture Condition
VS	Very Soft	<25	D Dry
S	Soft	25 - 50	M Moist
F	Firm	50 - 100	W Wet
St	Stiff	100 - 200	W _p Plastic Limit
VSt	Very Stiff	200 - 400	W _L Liquid Limit
H	Hard	>400	
Fb	Friable		
Density			
V	Very Loose		Density Index <15%
L	Loose		Density Index 15 - 35%
MD	Medium Dense		Density Index 35 - 65%
D	Dense		Density Index 65 - 85%
VD	Very Dense		Density Index 85 - 100%



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH6
PAGE: 2 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 18/4/12

DRILL TYPE: Truck Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
NMLC						CH	CLAY, medium-high plasticity, grey mottled orange brown (<i>continued</i>)	M > w _p	H			9.00: EXTREMELY WEATHERED SILTSTONE
				9.0		CH	CLAY, medium plasticity, grey mottled orange, brown	M > w _p				
		10.70m SPT 10,20,150 N=170 11.15m		11.0			SILTSTONE, fine grained, grey mottled orange brown, very low strength with occasional low strength bands					10.80: EXTREMELY WEATHERED TO HIGHLY WEATHERED SILTSTONE
					11.70m		Continued as Cored Drill Hole					
				12.0								
				13.0								
				14.0								
				15.0								

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition	
Water		U ₅₀ 50mm Diameter tube sample		VS	Very Soft	<25	D	Dry
Water Level (Date and time shown)		CBR Bulk sample for CBR testing		S	Soft	25 - 50	M	Moist
Water Inflow		E Environmental sample (Glass jar, sealed and chilled on site)		F	Firm	50 - 100	W	Wet
Water Outflow		ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)		St	Stiff	100 - 200	W _p	Plastic Limit
Strata Changes		B Bulk Sample		VSt	Very Stiff	200 - 400	W _L	Liquid Limit
Gradational or transitional strata		Field Tests		H	Hard	>400		
Definitive or distinct strata change		PID Photoionisation detector reading (ppm)		Fb	Friable			
		DCP(x-y) Dynamic penetrometer test (test depth interval shown)		Density	V	Very Loose	Density Index <15%	
		HP Hand Penetrometer test (UCS kPa)			L	Loose	Density Index 15 - 35%	
					MD	Medium Dense	Density Index 35 - 65%	
					D	Dense	Density Index 65 - 85%	
					VD	Very Dense	Density Index 85 - 100%	



ENGINEERING LOG - CORED BOREHOLE

BOREHOLE NO: **BH6**
PAGE: 3 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 18/4/12

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

DRILL TYPE: Truck Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information				Testing		Rock Mass Defects		
METHOD	WATER	CORE LIFT / TEST	RL (m)	DEPTH (m)	GRAPHIC LOG	Material Description: Rock type, particle characteristics, colour, minor components, structure	WEATHERING	ESTIMATED STRENGTH	$I_{s(50)}$ D/A	RQD %	Defect Spacing mm	Defect Description: Type, inclination, planarity, roughness, coating, thickness	
				9.0 <									



	Client	KML Joint Venture	Job No.	RGS01385.1
	Project:	Proposed Multi-storey Development Belmont	Drawn By:	Adam Holzhauser
			Date:	28-May-12
	Title:	Core Photograph - BH6	Photo No.	6



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development

LOCATION: Refer to Figure 1

BOREHOLE NO: **BH6A**
PAGE: 1 OF 1
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 18/4/12

DRILL TYPE: Hand Excavator
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
HA				1.0		SM	0.20m FILL: Sandy Gravel medium to coarse angular orange brown	W	VL			0.00: FILL: GRASSED
							0.35m FILL: Gravely Sand, fine to medium grained dark grey mottled pale grey gravel is fine to medium grained subangular contains charcoal					0.45: ALLUVIAL
				1.0			FILL SAND: fine to medium grained orange brown					
							Silty SAND: medium coarsed dark grey with some fine to medium subrounded gravel					
				2.0								
				3.0								
				4.0								
				5.0			Hole Terminated at 4.00 m					
				6.0								
				7.0								
LEGEND: Water Water Level (Date and time shown) Water Inflow Water Outflow Strata Changes --- Gradational or transitional strata — Definitive or distinct strata change					Notes, Samples and Tests U ₅₀ 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample (Glass jar, sealed and chilled on site) ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled) B Bulk Sample Field Tests PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)					Consistency VS Very Soft <25 S Soft 25 - 50 F Firm 50 - 100 St Stiff 100 - 200 VSt Very Stiff 200 - 400 H Hard >400 Fb Friable		UCS (kPa) Moisture Condition D Dry M Moist W Wet W _p Plastic Limit W _L Liquid Limit
										Density V Very Loose L Loose MD Medium Dense D Dense VD Very Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development

LOCATION: Refer to Figure 1

BOREHOLE NO: **BH7**
PAGE: 1 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 19/4/12

DRILL TYPE: Truck Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
NMLC				0.00m			Concrete, 10mm	M		VL		0.00: CONCRETE 130MM THICK 0.13: FILL 0.40: ALLUVIAL
				0.13m			Fill: Sandy Gravel medium to coarse angular with some Clay	M				
				0.40m			Fill: Silty Sand, fine to medium grained dark grey, with some fine to medium grained subrounded Gravel					
				1.0			Silty Sand: medium to coarse dark grey					
				2.0				M > w _p				
		3.00m SPT 0,1,2 N=3 3.45m		3.0			Sandy Clay, medium to high plasticity, grey with some medium to coarse subrounded gravel	M > w _p	F			2.95: ALLUVIAL CLAY
		6.00m SPT 4,4,6 N=10 6.45m		4.0								4.20: RESIDUAL
			4.20m			Clay, high plasticity, grey with occasional Orange Brown mottle						
			5.0				M > w _p	St				
				6.0								
				7.0								

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition	
Water		U ₅₀ 50mm Diameter tube sample		VS	Very Soft	<25	D	Dry
	Water Level (Date and time shown)	CBR Bulk sample for CBR testing		S	Soft	25 - 50	M	Moist
	Water Inflow	E Environmental sample (Glass jar, sealed and chilled on site)		F	Firm	50 - 100	W	Wet
	Water Outflow	ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)		St	Stiff	100 - 200	W _p	Plastic Limit
Strata Changes		B Bulk Sample		VSt	Very Stiff	200 - 400	W _L	Liquid Limit
	Gradational or transitional strata	Field Tests		H	Hard	>400		
	Definitive or distinct strata change	PID Photoionisation detector reading (ppm)		Fb	Friable			
		DCP(x-y) Dynamic penetrometer test (test depth interval shown)		Density	V	Very Loose	Density Index <15%	
		HP Hand Penetrometer test (UCS kPa)			L	Loose	Density Index 15 - 35%	
					MD	Medium Dense	Density Index 35 - 65%	
					D	Dense	Density Index 65 - 85%	
					VD	Very Dense	Density Index 85 - 100%	



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH7
PAGE: 2 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 19/4/12

DRILL TYPE: Truck Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL: AHD
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result		
NMLC		9.00m SPT 3.8,12 N=20 9.45m		9.0		CH	Clay, high plasticity, grey with occasional Orange Brown mottle (continued)	M > w _p				10.00: EXTREMELY WEATHERED SILTSTONE 11.20: HIGHLY WEATHERED SILTSTONE	
				10.0		CH	Clay, medium plasticity, grey mottled Orange brown contains bands of highly weathered siltstone		St				
				11.0									
				12.0			Siltstone, fine grey banded pale grey, very low strength with low strength bands	M > w _p					
		12.00m SPT 10,0,0 N=R 12.45m		12.0			Interbedded Siltstone and Sandstone, fine Siltstone is dark grey and Sandstone is pale grey bedded @ 0° to 10° Sandstone fine to medium pale grey bedded @ 10° to 20° Continued as Cored Drill Hole						
				13.0									
				14.0									
				15.0									

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition	
Water		U ₅₀ 50mm Diameter tube sample		VS	Very Soft	<25	D	Dry
Water Level (Date and time shown)		CBR Bulk sample for CBR testing		S	Soft	25 - 50	M	Moist
Water Inflow		E Environmental sample (Glass jar, sealed and chilled on site)		F	Firm	50 - 100	W	Wet
Water Outflow		ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)		St	Stiff	100 - 200	W _p	Plastic Limit
Strata Changes		B Bulk Sample		VSt	Very Stiff	200 - 400	W _L	Liquid Limit
Gradational or transitional strata		Field Tests		H	Hard	>400		
Definitive or distinct strata change		PID Photoionisation detector reading (ppm)		Fb	Friable			
		DCP(x-y) Dynamic penetrometer test (test depth interval shown)		Density	V	Very Loose	Density Index <15%	
		HP Hand Penetrometer test (UCS kPa)			L	Loose	Density Index 15 - 35%	
					MD	Medium Dense	Density Index 35 - 65%	
					D	Dense	Density Index 65 - 85%	
					VD	Very Dense	Density Index 85 - 100%	



ENGINEERING LOG - CORED BOREHOLE

BOREHOLE NO: **BH7**
PAGE: 3 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 19/4/12

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

DRILL TYPE: Truck Mounted
BOREHOLE DIAMETER: 100 mm
SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information				Testing		Rock Mass Defects		
METHOD	WATER	CORE LIFT / TEST	RL (m)	DEPTH (m)	GRAPHIC LOG	Material Description: Rock type, particle characteristics, colour, minor components, structure	WEATHERING	ESTIMATED STRENGTH	$I_{s(50)}$ D/A	RQD %	Defect Spacing mm	Defect Description: Type, inclination, planarity, roughness, coating, thickness	
				9.0									
				10.0									
				11.0									
				12.0									
NMLC				13.0			SW	M	A=0.41			PT 0° CN	
				PT 10° CN									
				14.0			SW	VL - H	A=0.90			PT 0° CN	
			15.0									JT 30° VN	
												PT 0° CN	
												PT 10° CN	
												PT 10° CN	
												PT 15° CN	
												PT 10° CN	
												JT 30° CN	
												PT 15° CN	
LEGEND:					Method		Weathering		Strength		$I_{s(50)}$	Defect Type	
Water					AS Auger Screwing		EW Extremely Weathered		VL Very Low		<0.1	JT Joint	
Water Level (Date and time shown)					AD Auger Drilling		HW Highly Weathered		L Low		0.1 - 0.3	PT Parting	
Water Inflow					RR Roller/tricone		MW Moderately Weathered		M Medium		0.3 - 1	SM Seam	
Water Outflow					CB Claw or Blade bit		SW Slightly Weathered		H High		1 - 3	SZ Shear Zone	
Strata Changes					NMLC NMLC Core		FR Fresh		VH Very High		3 - 10	SS Sheared Surface	
									EH Extremely High		>10	CS Crushed Seam	



	Client	KML Joint Venture	Job No.	RGS01385.1
	Project:	Proposed Multi-storey Development Belmont	Drawn By:	Adam Holzhauser
			Date:	28-May-12
	Title:	Core Photograph - BH7	Photo No.	7



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH8
PAGE: 1 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 19/4/12

DRILL TYPE:
BOREHOLE DIAMETER: 100 mm
SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations			
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result				
NMLC							0.13m Concrete 130mm thick	M				0.00: CONCRETE 130MM THICK F72 REO 50MM COVER 0.13: FILL 0.50: ALLUVIAL			
						Fill: Sandy Gravel medium to coarse sub angular Orange Brown with Clay									
						0.50m	Fill: Gravelly Sand, fine to medium grained, dark grey Gravel is medium to coarse subrounded	D							
						0.70m	Sand: medium to coarse grey								
				1.0		SP		W	VS						
				2.0											
				3.0											
</															

LEGEND:
Water
 Water Level (Date and time shown)
 Water Inflow
 Water Outflow
Strata Changes
--- Gradational or transitional strata
— Definitive or distinct strata change

Notes, Samples and Tests
U₅₀ 50mm Diameter tube sample
CBR Bulk sample for CBR testing
E Environmental sample (Glass jar, sealed and chilled on site)
ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
B Bulk Sample
Field Tests
PID Photoionisation detector reading (ppm)
DCP(x-y) Dynamic penetrometer test (test depth interval shown)
HP Hand Penetrometer test (UCS kPa)

Consistency	UCS (kPa)	Moisture Condition
VS Very Soft	<25	D Dry
S Soft	25 - 50	M Moist
F Firm	50 - 100	W Wet
St Stiff	100 - 200	w _p Plastic Limit
VSt Very Stiff	200 - 400	w _L Liquid Limit
H Hard	>400	
Fb Friable		
Density		
V Very Loose	Density Index <15%	
L Loose	Density Index 15 - 35%	
MD Medium Dense	Density Index 35 - 65%	
D Dense	Density Index 65 - 85%	
VD Very Dense	Density Index 85 - 100%	



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH8
PAGE: 2 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 19/4/12

DRILL TYPE:
BOREHOLE DIAMETER: 100 mm
SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
NMLC		9.00m SPT 10,12,16 N=28 9.45m		9.0		CH	CLAY, high plasticity pale grey with some orange-brown mottle	M > w _p				10.00: EXTREMELY WEATHERED SILTSTONE 10.35: HIGHLY WEATHERED SILTSTONE
			10.0		CL	Clay medium plasticity grey, mottled orange brown						
			11.0			Siltstone fine, dark grey mottled pale grey very low strength with medium strength (sandstone bands)	H					
			12.0			Continued as Cored Drill Hole						
				13.0								
				14.0								
				15.0								

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition	
Water		U ₅₀ 50mm Diameter tube sample		VS	Very Soft	<25	D	Dry
Water Level (Date and time shown)		CBR Bulk sample for CBR testing		S	Soft	25 - 50	M	Moist
Water Inflow		E Environmental sample (Glass jar, sealed and chilled on site)		F	Firm	50 - 100	W	Wet
Water Outflow		ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)		St	Stiff	100 - 200	W _p	Plastic Limit
Strata Changes		B Bulk Sample		VSt	Very Stiff	200 - 400	W _L	Liquid Limit
Gradational or transitional strata		Field Tests		H	Hard	>400		
Definitive or distinct strata change		PID Photoionisation detector reading (ppm)		Fb	Friable			
		DCP(x-y) Dynamic penetrometer test (test depth interval shown)		Density	V	Very Loose	Density Index <15%	
		HP Hand Penetrometer test (UCS kPa)			L	Loose	Density Index 15 - 35%	
					MD	Medium Dense	Density Index 35 - 65%	
					D	Dense	Density Index 65 - 85%	
					VD	Very Dense	Density Index 85 - 100%	



ENGINEERING LOG - CORED BOREHOLE

BOREHOLE NO: BH8
PAGE: 3 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 19/4/12

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

DRILL TYPE: **SURFACE RL:**
BOREHOLE DIAMETER: 100 mm **DATUM:** AHD

Drilling and Sampling					Material description and profile information				Testing		Rock Mass Defects		
METHOD	WATER	CORE LIFT / TEST	RL (m)	DEPTH (m)	GRAPHIC LOG	Material Description: Rock type, particle characteristics, colour, minor components, structure	WEATHERING	ESTIMATED STRENGTH	I _{s(50)} D/A	RQD %	Defect Spacing mm	Defect Description: Type, inclination, planarity, roughness, coating, thickness	
				9.0									
				10.0									
				11.0									
				12.0		START CORING AT 12.00m							
NMLC				13.0		Interbedded siltstone and sandstone fine Siltstone is dark grey, Sandstone is pale grey, bedded at 0° to 10°	SW	L - M	A=0.37 				



	Client	KML Joint Venture	Job No.	RGS01385.1
	Project:	Proposed Multi-storey Development Belmont	Drawn By:	Adam Holzhauser
			Date:	28-May-12
	Title:	Core Photograph - BH8	Photo No.	8



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH9
PAGE: 1 OF 1
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 19/4/12

DRILL TYPE: Hand AUGER
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
HA				0.00		SP	0.10m Topsoil: Silty Sand, fine to medium dark grey contains rootlets	M				0.00: TOPSOIL: GRASSED 0.10: ALLUVIAL
				0.10			Silty Sand: Fine to medium dark grey	M	VL			
				0.70								
				1.00			Sand: medium to coarse grey	W	L			
				1.0								
				2.0								
				3.0								
				4.0								
				5.0								
				6.0								
				7.0								
							Hole Terminated at 4.00 m					

LEGEND: Water Water Level (Date and time shown) Water Inflow Water Outflow Strata Changes Gradational or transitional strata Definitive or distinct strata change	Notes, Samples and Tests U ₅₀ 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample (Glass jar, sealed and chilled on site) ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled) B Bulk Sample Field Tests PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	Consistency VS Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard Fb Friable Density V Very Loose L Loose MD Medium Dense D Dense VD Very Dense	UCS (kPa) <25 25 - 50 50 - 100 100 - 200 200 - 400 >400 Moisture Condition D Dry M Moist W Wet W _p Plastic Limit W _L Liquid Limit Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%
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ENGINEERING LOG - TEST PIT

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

TEST PIT NO: TP1
PAGE: 1 OF 1
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 19/4/12

EQUIPMENT TYPE: Hand Excavator
TEST PIT LENGTH: 0.5 m
WIDTH: 0.5 m
SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
SHOVEL	(None encountered)						0.30m TOPSOIL: Silty Sand, fine to medium grained, dark grey contains rootlets Silty Sand: Fine to medium grained dark grey	M				0.00: TOPSOIL: GRASSED 0.30: ALLUVIAL
				1.0			Hole Terminated at 0.80 m					
				2.0								
				3.0								
				4.0								
				5.0								
				6.0								
				7.0								

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition	
Water		U ₅₀	50mm Diameter tube sample	VS	Very Soft	<25	D	Dry
Water Level (Date and time shown)		CBR	Bulk sample for CBR testing	S	Soft	25 - 50	M	Moist
Water Inflow		E	Environmental sample (Glass jar, sealed and chilled on site)	F	Firm	50 - 100	W	Wet
Water Outflow		ASS	Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)	St	Stiff	100 - 200	W _p	Plastic Limit
Strata Changes		B	Bulk Sample	VSt	Very Stiff	200 - 400	W _L	Liquid Limit
Gradational or transitional strata		Field Tests		H	Hard	>400		
Definitive or distinct strata change		PID	Photoionisation detector reading (ppm)	Fb	Friable			
		DCP(x-y)	Dynamic penetrometer test (test depth interval shown)	Density		V	Very Loose	Density Index <15%
		HP	Hand Penetrometer test (UCS kPa)	L	Loose			Density Index 15 - 35%
				MD	Medium Dense			Density Index 35 - 65%
				D	Dense			Density Index 65 - 85%
				VD	Very Dense			Density Index 85 - 100%

Dynamic Penetrometer

Project Number: RGS01385.1

Date: 17 - 19 April 2012

Client	KML Joint Venture
Project	Proposed Multi-storey Development
Location	Refer to Figure 1

Test Details: Hammer Mass: 9kg
Hammer drop: 600mm

Rod Tip: Flat
Depth to groundwater:

Test as per AS1289 6.3.3

Depth to base of test section (mm)	Test Number and blows recorded per 100mm							Comments (soil type, general information)
	1	2	3	4	5	6	7	
0 - 100	1	2	1	2	1	1	3	
200	0	1	2	2	1	1	6	
300	1	2	2	2	1	1	3	
400	1	2	2	2	1	1	3	
500	1	2	2	2	1	0	3	
600	1	1	1	2	2	1	2	
700	1	2	2	1	2	1	1	
800	1	2	2	2	2	2	3	
900	1	2	2	2	2	3	3	
1000	2	2	3	2	3	3	3	
1100	2	2	4	3	3	4	4	
1200	3	2	4	3	4	3	3	
1300	3	1	4	4	4	3	4	
1400	3	2	4	4	4	3	4	
1500	2	2	4	3	4	3	3	
1600	3	2	3	3	3	3	2	
1700	2	1	2	3	4	3	2	
1800	2	2	2	2	3	3	2	
1900	END	END	END	END	END	END	END	
2000								
2100								
2200								
2300								
2400								
2500								
2600								
2700								
2800								
2900								

Dynamic Cone Penetrometer

Project Number: RGS01385.1

Date: 17 - 19 April 2012

Client	KML Joint Venture
Project	Proposed Multi-storey Development
Location	Refer to Figure 1

Test Details: Hammer Mass: 9kg
Hammer drop: 600mm

Rod Tip: Flat
Depth to groundwater:

Test as per AS1289 6.3.3

Depth to base of test section (mm)	Test Number and blows recorded per 100mm							Comments (soil type, general information)
	8	9	10					
0 - 100	1	1	5					
200	1	1	5					
300	2	2	3					
400	1	1	3					
500	1	2	5					
600	2	1	5					
700	2	1	5					
800	1	1	5					
900	2	2	3					
1000	1	2	5					
1100	2	2	4					
1200	1	3	3					
1300	2	2	3					
1400	2	2	4					
1500	5	2	3					
1600	5	2	5					
1700	2	2	5					
1800	2	2	4					
1900	END	END	END					
2000								
2100								
2200								
2300								
2400								
2500								
2600								
2700								
2800								
2900								

FALLING HEAD INFILTRATION TEST - SLOTTED CASED HOLE

CLIENT: KML Joint Venture

Job No.: RGS01385.1



PROJECT: Proposed Multi-storey Development

LOCATION: Refer to Figure 1

Date: 29-May-12

Test number:		4		Test Location:		BH3	
Hole radius (m):		0.05		Surface RL:		N/A	
Hole depth(m):		1		Casing stickup(m):		0	
Depth to water table(m):		0.57		Water table RL(m)		N/A	
Slotted section:		0 to 1		Slotted length (m):		0.61	
Reading	Time elapsed (min)	Depth to water (m)	Head loss (m)	Cum. head loss (m)	Volume loss (L)	Cum. Volume loss (L)	Calculations
1	0	0	0	0	0	0	Constant loss time period:
2	0.5	0.28	0.11	0.11	8.6E-04	8.6E-04	Time 1: 1 Depth: 0.39
3	1	0.39	0.06	0.17	4.7E-04	1.3E-03	Time 2: 20 Depth: 0.552
4	1.5	0.45	0.02	0.19	1.6E-04	1.5E-03	Total time (min): 19
5	2	0.47	0.015	0.205	1.2E-04	1.6E-03	Total head loss (m): 0.162
6	2.5	0.485	0.01	0.215	7.9E-05	1.7E-03	Volume of water lost (L): 1.2721
7	3	0.495	0.01	0.225	7.9E-05	1.8E-03	Flow rate (L/sec): 0.001115882
8	3.5	0.505	0.005	0.23	3.9E-05	1.8E-03	Factor: 1.531928 Hc: 0.18
9	4	0.51	0.005	0.235	3.9E-05	1.8E-03	In situ Permeability: 1.31115E-07 m/sec
11	5	0.515	0.005	0.24	3.9E-05	1.9E-03	
13	6	0.52	0.005	0.245	3.9E-05	1.9E-03	
14	7	0.525	0.005	0.25	3.9E-05	2.0E-03	
15	8	0.53	0.005	0.255	3.9E-05	2.0E-03	
16	9	0.535	0.002	0.257	1.6E-05	2.0E-03	
17	10	0.537	0.002	0.259	1.6E-05	2.0E-03	
18	11	0.539	0.001	0.26	7.9E-06	2.0E-03	
19	12	0.54	0.001	0.261	7.9E-06	2.0E-03	
20	13	0.541	0.001	0.262	7.9E-06	2.1E-03	
21	14	0.542	0.001	0.263	7.9E-06	2.1E-03	
22	15	0.543	0.009	0.272	7.1E-05	2.1E-03	
23	20	0.552	0.008	0.28	6.3E-05	2.2E-03	
24	30	0.56	0.56	0.84	4.4E-03	6.6E-03	

FALLING HEAD INFILTRATION TEST - SLOTTED CASED HOLE

CLIENT: KML Joint Venture

Job No.: RGS01385.1



PROJECT: Proposed Multi-storey Development

LOCATION: Refer to Figure 1

Date: 29-May-12

Test number:		1		Test Location:		BH5	
Hole radius (m):		0.05		Surface RL:		N/A	
Hole depth(m):		1		Casing stickup(m):		0	
Depth to water table(m):		1.3		Water table RL(m)		N/A	
Slotted section:		0 to 1		Slotted length (m):		1	
Reading	Time elapsed (min)	Depth to water (m)	Head loss (m)	Cum. head loss (m)	Volume loss (L)	Cum. Volume loss (L)	Calculations
1	0	0	0	0	0	0	Constant loss time period:
2	0.5	0.06	0.06	0.06	4.7E-04	4.7E-04	Time 1: 2 Depth: 0.205
3	1	0.12	0.05	0.11	3.9E-04	8.6E-04	Time 2: 15 Depth: 0.76
4	1.5	0.17	0.035	0.145	2.7E-04	1.1E-03	Total time (min): 13
5	2	0.205	0.04	0.185	3.1E-04	1.5E-03	Total head loss (m): 0.555
6	2.5	0.245	0.035	0.22	2.7E-04	1.7E-03	Volume of water lost (L): 4.3581
7	3	0.28	0.03	0.25	2.4E-04	2.0E-03	Flow rate (L/sec): 0.005587356
8	3.5	0.31	0.02	0.27	1.6E-04	2.1E-03	Factor: 2.096983 Hc: -1.095
9	4	0.33	0.02	0.29	1.6E-04	2.3E-03	In situ Permeability: -2.9176E-06 m/sec
10	4.5	0.35	0.02	0.31	1.6E-04	2.4E-03	
11	5	0.37	0.035	0.345	2.7E-04	2.7E-03	
12	5.5	0.405	0.035	0.38	2.7E-04	3.0E-03	
13	6	0.44	0.03	0.41	2.4E-04	3.2E-03	
14	7	0.47	0.01	0.42	7.9E-05	3.3E-03	
15	8	0.48	0.01	0.43	7.9E-05	3.4E-03	
16	9	0.49	0.02	0.45	1.6E-04	3.5E-03	
17	10	0.51	0.04	0.49	3.1E-04	3.8E-03	
18	11	0.55	0.02	0.51	1.6E-04	4.0E-03	
19	12	0.57	0.01	0.52	7.9E-05	4.1E-03	
20	13	0.58	0.04	0.56	3.1E-04	4.4E-03	
21	14	0.62	0.14	0.7	1.1E-03	5.5E-03	
22	15	0.76	0.03	0.73	2.4E-04	5.7E-03	
23	20	0.79	0.06	0.79	4.7E-04	6.2E-03	
24	30	0.85	0.85	1.64	6.7E-03	1.3E-02	

FALLING HEAD INFILTRATION TEST - SLOTTED CASED HOLE

CLIENT: KML Joint Venture

Job No.: RGS01385.1



PROJECT: Proposed Multi-storey Development

LOCATION: Refer to Figure 1

Date: 29-May-12

Test number:		2		Test Location:		BH6A	
Hole radius (m):		0.05		Surface RL:		N/A	
Hole depth(m):		1		Casing stickup(m):		0	
Depth to water table(m):		1		Water table RL(m)		N/A	
Slotted section:		0 to 1		Slotted length (m):		1	
Reading	Time elapsed (min)	Depth to water (m)	Head loss (m)	Cum. head loss (m)	Volume loss (L)	Cum. Volume loss (L)	Calculations
1	0	0	0	0	0	0	Constant loss time period:
2	0.5	0.155	0.1	0.1	7.9E-04	7.9E-04	Time 1: 2 Depth: 0.38
3	1	0.255	0.06	0.16	4.7E-04	1.3E-03	Time 2: 20 Depth: 0.67
4	1.5	0.315	0.065	0.225	5.1E-04	1.8E-03	Total time (min): 18
5	2	0.38	0.04	0.265	3.1E-04	2.1E-03	Total head loss (m): 0.29
6	2.5	0.42	0.03	0.295	2.4E-04	2.3E-03	Volume of water lost (L): 2.2772
7	3	0.45	0.025	0.32	2.0E-04	2.5E-03	Flow rate (L/sec): 0.002108542
8	3.5	0.475	0.025	0.345	2.0E-04	2.7E-03	Factor: 2.096983 Hc: -0.62
9	4	0.5	0.02	0.365	1.6E-04	2.9E-03	In situ Permeability: -6.23417E-07 m/sec
10	4.5	0.52	0.01	0.375	7.9E-05	2.9E-03	
11	5	0.53	0.025	0.4	2.0E-04	3.1E-03	
13	6	0.555	0.02	0.42	1.6E-04	3.3E-03	
14	7	0.575	0.02	0.44	1.6E-04	3.5E-03	
15	8	0.595	0.01	0.45	7.9E-05	3.5E-03	
16	9	0.605	0.015	0.465	1.2E-04	3.7E-03	
17	10	0.62	0.01	0.475	7.9E-05	3.7E-03	
18	11	0.63	0.01	0.485	7.9E-05	3.8E-03	
19	12	0.64	0.005	0.49	3.9E-05	3.8E-03	
20	13	0.645	0.005	0.495	3.9E-05	3.9E-03	
21	14	0.65	0.005	0.5	3.9E-05	3.9E-03	
22	15	0.655	0.015	0.515	1.2E-04	4.0E-03	
23	20	0.67	0.02	0.535	1.6E-04	4.2E-03	
24	30	0.69	0.69	1.225	5.4E-03	9.6E-03	

FALLING HEAD INFILTRATION TEST - SLOTTED CASED HOLE

CLIENT: KML Joint Venture

Job No.: RGS01385.1



PROJECT: Proposed Multi-storey Development

LOCATION: Refer to Figure 1

Date: 29-May-12

Test number:		3		Test Location:		BH9	
Hole radius (m):		0.05		Surface RL:		N/A	
Hole depth(m):		1		Casing stickup(m):		0	
Depth to water table(m):		0.9		Water table RL(m)		N/A	
Slotted section:		0 to 1		Slotted length (m):		1	
Reading	Time elapsed (min)	Depth to water (m)	Head loss (m)	Cum. head loss (m)	Volume loss (L)	Cum. Volume loss (L)	Calculations
1	0	0	0	0	0	0	Constant loss time period:
2	0.5	0.42	0.125	0.125	9.8E-04	9.8E-04	Time 1: 2 Depth: 0.635
3	1	0.545	0.06	0.185	4.7E-04	1.5E-03	Time 2: 20 Depth: 0.845
4	1.5	0.605	0.03	0.215	2.4E-04	1.7E-03	Total time (min): 18
5	2	0.635	0.035	0.25	2.7E-04	2.0E-03	Total head loss (m): 0.21
6	2.5	0.67	0.025	0.275	2.0E-04	2.2E-03	Volume of water lost (L): 1.6490
7	3	0.695	0.017	0.292	1.3E-04	2.3E-03	Flow rate (L/sec): 0.001526875
8	3.5	0.712	0.013	0.305	1.0E-04	2.4E-03	Factor: 2.096983 Hc: -0.265
9	4	0.725	0.01	0.315	7.9E-05	2.5E-03	In situ Permeability: -1.92954E-07 m/sec
10	4.5	0.735	0.01	0.325	7.9E-05	2.6E-03	
11	5	0.745	0.015	0.34	1.2E-04	2.7E-03	
13	6	0.76	0.015	0.355	1.2E-04	2.8E-03	
14	7	0.775	0.013	0.368	1.0E-04	2.9E-03	
15	8	0.788	0.012	0.38	9.4E-05	3.0E-03	
16	9	0.8	0.01	0.39	7.9E-05	3.1E-03	
17	10	0.81	0.005	0.395	3.9E-05	3.1E-03	
18	11	0.815	0.003	0.398	2.4E-05	3.1E-03	
19	12	0.818	0.004	0.402	3.1E-05	3.2E-03	
20	13	0.822	0.006	0.408	4.7E-05	3.2E-03	
21	14	0.828	0.006	0.414	4.7E-05	3.3E-03	
22	15	0.834	0.011	0.425	8.6E-05	3.3E-03	
23	20	0.845	0.019	0.444	1.5E-04	3.5E-03	
24	30	0.864	0.864	1.308	6.8E-03	1.0E-02	

Appendix B

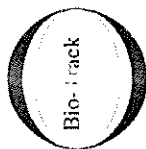
Laboratory Test results

Client: Regional Geotechnical Solutions Project No. CH11-069 Report No.: 1945
Address: 44 Bent Street
Wingham NSW 2429 Sample Date: 7/05/2012 By: Client
Project: Test Date: 15/5/2012 By: AS, DD, DM
Location: Lot No. Page 1 of 1

CALIFORNIA BEARING RATIO TEST REPORT AS1289.6.1.1

Sample No.	A			
Location	TP 1 / 0.5-0.8m			
Description	Silty SAND			
COMPACTION DETAILS				
Compactive Effort (Standard/modified)	Standard			
Maximum Dry Density t/m ³	1.67			
Moulded Dry Density t/m ³	1.68			
Laboratory Density Ratio %	100.5			
% Retained on 19mm sieve	0.0			
>19mm material substituted (yes/no)	No			
MOISTURE CONTENT DETAILS				
Field Moisture Content %	15.2			
Optimum Moisture Content %	15.4			
Moulded Moisture Content %	15.0			
Laboratory Moisture Ratio %	97			
Top 30mm After Penetration %	18.6			
Remainder of Sample After Penetration %	18.0			
CBR TEST DETAILS				
Duration of Soaking (days)	4			
Surcharge Applied kg	4.5			
Swell %	0.1			
CALIFORNIA BEARING RATIO %	15			
Test Methods Used	A,C			
Test Methods A. AS 1289 5.1.1 Dry Density/Moisture Relationship (Standard Compaction). B. AS 1289 5.2.1 Dry Density/Moisture Relationship (Modified Compaction). C. AS 1289 2.1.1 Determination of Moisture Content (Standard Method). D. Sampled according to AS 1141.3.1				
 Approved Signatory: J Morrison				15/05/2011
NATA Accredited Laboratory No. 17240				Date
This document is issued in accordance with NATA's accreditation requirements for compliance with ISO/IEC 17025. This document shall not be reproduced unless in full.				

CERTIFICATE OF ANALYSIS



Analysis By: Bio-Track Pty Ltd
 ABN 91 111 237 275
 Mr George Reed
 Heracle, Brisbane, Australia, 4200
 Ph: 07 3289 7179 Fax: 07 3289 7155

DATE OF REPORT: 15 MAY 2012 Page 1 of 1 Report Pages:
 CLIENT NAME: Adam Holzhauser c/o Regional Geotechnical Solutions Pty Ltd
 CLIENT ADDRESS: 1/21 Cook Drive Coffs Harbour Coffs Harbour 2450
 PROJECT NAME: YOUR PROJECT/JOB REFERENCE RGS
 SAMPLING DATE: NUMBER OF SAMPLES: 4 SAMPLE TYPE: Soil
 PACKAGING: Plastic Bag ** SAMPLES DISPOSED ON 3/05/2013
 DATE RECEIVED: 3/05/2012 4:01:15 PM LAB REF: LR030512.671

METHODOLOGY: EC Cl as 1:5 pH 1:2.5; air dried soil in water, 30 minute rolling snake, Cl by ion selective electrode, S as 1:49 IN KCl extract measured by ICP OES.
 RESIS: soil resistivity per AS1289.4.1 SO4 calculated as S x 3 SO3 calculated as S x 2.5

SAMPLE ID	EC dS/m	pH	Cl mg/kg	S mg/kg	SO4 %	SO3 %	RESIS ohm-cm
BH1 4.5-4.95	0.94	7.6	950	86	<0.1	<0.1	380
BH2 1.6-1.95	0.04	6.6	65	10	<0.1	<0.1	11200
BH3 7.7-45	0.68	6.4	750	50	<0.1	<0.1	450
BH8 9.9-45	0.90	6.2	1049	52	<0.1	<0.1	370

Signature: *P. Edwards*

For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS



Analysis By: Bio-Track Pty Ltd AIN 91 086 237 275

781 Mt Coleraine Road Highvale, Brisbane, Australia, 4820 Ph 07 3289 7179 Fx 07 3289 7155

LAB REFERENCE LR070512.740 DATE OF REPORT 14 MAY 2012 09:38:31
 CLIENT NAME Adam Holzhauser c/o Regional Geotechnical Solutions Pty Ltd 1/21 Cook Drive Coffs Harbour Coffs Harbour 2450
 PROJECT NAME YOUR PROJECT/JOB REFERENCE RGS
 SAMPLING DATE 7/05/2012 5:44:24 PM PACKAGING Plastic Bag Ground Oven Dry Samples DISPOSED ON 7/05/2013
 DATE RECEIVED

Page 1 of 1 Report Pages.

Sample ID as received. METHODOLOGY: As per (DNR QASSIT May 2004), oven dried (85°C), >1000 um shell removed, fine grind. All reported values gravimetric, dry mass.
 %SEQ (equivalent sulphur) calculated as moles TAA/624 + %S Cr + %SNAS - SANC BT (SNAS included irrespective of pH).
 LIME1 rates calculated to neutralise TPA (or TAA if >TPA) + aS RAS -ANC_BT/1.5 LIME2 rates calculated to neutralise TAA + aS_POS or S_Cr + aS_RAS -ANC_BT/ 1.5
 NB. Lime rates assume 97% lime neutralisation but DO NOT include any safety factors. Suggested factor=1.5-2. Rates are kg/ton. Multiply by bulk density to convert to kg/m³.
 Fineness Factor (FF)=1.5 CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
 Blanks represent unmeasured values, zeros & <0.x represent measured values. If pH KCl>4.5 then s-RAS (calculated from acid extract) may be zero for undisturbed soil. Ca NAS is the acid reactive calcium calculated as the difference between 1 M KCl and 4 M HCl soluble Ca.

ID.	DEPTH m	pH KCL	23A	pH OX	23B	TPA m/t	23G	SA m/t	23H	S KCL %	23Ce	S P %	23De	S POS %	S Cr %	s-NAS %	s20Je	EQ s	Ca KCL mg/kg	23Vh	Ca P mg/kg	23Wh	Mg KCL mg/kg	23Sm	Mg P mg/kg	23Tm	CBN m/t	LIME1 kg/t	LIME2 kg/t	sANC_BT %	Ca NAS mg/kg	20E
BH1	3-3.45	5.65				3		0.01		0.13	<0.01	0.138	265		0.01	<0.01	0.013	140					384									<10
BH2	1.6-1.95	5.35				<1		<0.01		0.01	<0.01	0.013	140		<0.01	<0.01	0.008	158					23									<10
BH4	1.5-1.95	5.85				<1		<0.01		<0.01	<0.01	0.138	231		0.14	<0.01	0.138	231					55									<10
BH5	3.1-3.45	5.39				<1		<0.01		0.14	<0.01	0.138	231		0.14	<0.01	0.155	186					453									<10
BH6	1.5-1.95	5.02				8		0.02		0.14	<0.01	0.155	186		0.53	<0.01	0.538	333					112									32
BH7	3-3.45	5.93				3		0.02		0.05	<0.01	0.054	164		0.05	<0.01	0.054	164					369									36
BH7	6-6.45	5.49				<1		<0.01		0.61	<0.01	0.612	320		0.61	<0.01	0.612	320					517									<10
BH8	3-3.45	5.43				<1		0.03		0.61	<0.01	0.612	320		0.61	<0.01	0.612	320					667									<10

Signature *P. Schmitt*

For and on behalf of Bio-Track Pty Ltd

A.S.S. FIELD SCREEN ANALYSIS REPORT

CERTIFICATE OF ANALYSIS



Analysis By: **Bio-Track Pty Ltd** ABN 91 056 237 275 781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 EMAIL pe@biotrack.com.au

DATE OF REPORT 04 MAY 2012 Page 1 of 1 Report Pages.
CLIENT NAME Adam Holzhauser
CLIENT FIRM Regional Geotechnical Solutions Pty Ltd YOUR PROJECT/JOB REFERENCE RGS
CLIENT ADDRESS 1/21 Cook Drive Coffs Harbour Coffs Harbour 2450
PROJECT NAME SAMPLING DATE
NUMBER OF SAMPLES 21 SAMPLE TYPE Soil
PACKAGING Plastic Bag
SAMPLES DISPOSED ON 1/08/2012
LOG-IN DATE 3/05/2012 4:08:38 PM LAB REF. LR030512.676

TEST METHODOLOGY FOR pH_f AND pH_{fox} AS PER QASSIT 2004 Laboratory Methods. Indications based on pH data only.
RATE: 0=none 1=slight 2=moderate 3=high 4=very high (steam evolved) visual observation at 0-5 minutes.
TEMP: Surface temperature rise (°C) oxidised sample at 5 minutes.

SAMPLE ID	Upper	Lower (m)	pH _f	pH _{fox}	change	RATE	TEMP	INDICATION
BH1	0.5	0.6	5.7	4.4	-1.3	2	4	low TAA
BH1	1.6	1.95	4.2	1.7	-2.5	4	3	high TPA & sulphide possible
BH1	3	3.45	5.4	2.7	-2.7	2	7	low TAA & moderate TPA & sulphide possible
BH1	6	6.45	6.0	3.4	-2.6	2	5	low TAA & moderate TPA & sulphide possible
BH2	1.6	1.95	5.6	2.7	-2.9	2	3	low TAA & moderate TPA & sulphide possible
BH2	3	3.45	5.7	3.8	-1.9	3	7	low TAA
BH3	4	4.95	6.5	6.4	-0.1	4	18	low TAA & low TPA & low sulphide
BH4	1.5	1.95	5.4	2.5	-2.9	2	4	low TAA & moderate TPA & sulphide possible
BH4	2.5	2.6	5.7	1.9	-3.8	4	0	low TAA & high TPA & high sulphide/low buffer
BH4	3	3.45	7.0	3.0	-4.0	3	4	no TAA & moderate TPA & high sulphide/low buffer
BH4	4.5	4.95	7.8	7.5	-0.3	3	7	no TAA & no TPA & low sulphide
BH5	3.1	3.45	6.7	3.8	-2.9	3	5	no TAA & sulphide possible
BH5	6	6.45	6.6	5.6	-1.0	1	5	no TAA & low TPA
BH6	1.5	1.95	4.5	1.8	-2.7	4	3	low TAA & high TPA & sulphide possible
BH6	4.5	4.95	6.5	6.1	-0.4	2	8	low TAA & low TPA & low sulphide
BH7	0.5	0.6	8.1	6.1	-2.0	4	5	no TAA & low TPA
BH7	3	3.45	6.3	2.0	-4.3	4	3	low TAA & high TPA & high sulphide/low buffer
BH7	6	6.45	6.8	2.4	-4.4	2	6	no TAA & high TPA & high sulphide/low buffer
BH8	1.5	1.6	7.9	6.6	-1.3	1	5	no TAA & no TPA
BH8	3	3.45	6.9	2.6	-4.3	4	2	no TAA & moderate TPA & high sulphide/low buffer
BH8	6	6.45	6.3	4.8	-1.5	4	15	low TAA & low TPA

Signatory For and behalf of Bio-Track Pty Ltd

Chandler Morrison Geotechnical Pty Ltd

3/18 Jambali Road, Port Macquarie NSW 2444

Tel: +61 2 65815992

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ABN 55 139 985 050

CMG

Client: Regional Geotechnical Solutions Project No: P12018 Report No: P12018-1
Address: 1/21 Cook Drive
Coffs Harbour Test Date: 23/05/12 Technician: TM
Project:
Location: Belmont, Newcastle Sample Date: Submitted by client Page 1 of 1
Material: Submitted Core Samples

DETERMINATION OF THE POINT LOAD STRENGTH OF ROCK SPECIMENS Test Method: RTA T223

Sample No.	Sample Location	Test Type	⁵⁰ Is() (Mpa)	Rock Type	Moisture Condition	Interpreted Rock Strength
S-3280	BH1, 10.52m	A	0.45	SS	D	Medium
S-3281	BH1, 12.48m	A	1.42	SS	D	High
S-3282	BH2, 10.34m	A	0.38	SS	D	Medium
S-3283	BH2, 12.00m	A	1.00	SS	D	Medium/High
S-3284	BH3, 12.37m	A	1.02	SS	D	Medium/High
S-3285	BH3, 12.96m	A	1.36	SS	D	High
S-3286	BH4, 12.70m	A	0.49	SS	D	Medium
S-3287	BH4, 14.23m	A	1.30	SS	D	High
S-3288	BH5, 15.20m	A	5.80	SS	D	Very High
S-3289	BH6, 12.14m	A	0.49	SS	D	Medium
S-3290	BH6, 13.80m	A	1.09	SS	D	High
S-3291	BH6, 14.09m	A	0.12	SS	D	Low
S-3292	BH7, 13.34m	A	0.41	SS	D	Medium
S-3293	BH7, 14.33m	A	0.90	SS	D	Medium
S-3294	BH8, 13.86m	A	0.37	SS	D	Medium
S-3295	BH8, 14.29m	A	1.35	SS	D	High

Test Type	Moisture Condition	Rock Type	⁵⁰ Is() (Mpa)	Interpreted Rock Strength	
A= Axial	W= Wet	SS= Sandstone		Term	Abbreviation
D= Diametral	M= Moist	ST= Siltstone	>10	Extremely High	EH
I= Irregular	D= Dry	SH= Shale	3-10	Very High	VH
C= Cube	N= Natural	BA= Basalt	1-3	High	H
Remarks:			0.3-1	Medium	M
			0.1-0.3	Low	L
			0.03-0.1	Very Low	VL
			<0.03	Extremely Low	EL



Approved Signatory: **S Chandler**
NATA Accredited Laboratory No. 17255

25/05/2012
Date

Appendix C

Preliminary Acid Sulfate Soil Management Plan

APPENDIX C - ACID SULFATE SOILS MANAGEMENT PLAN

C.1 INTRODUCTION

The site investigations undertaken for the development encountered a profile of minor topsoil and fill overlying wind-blown sand, with alluvial clays below depths averaging 2.5m. Testing indicated some acidity in the sand, although the source of the acidity was predominantly found to be other than acid sulphate related pyrite. The underlying alluvial clays were found to be Potential Acid Sulfate Soils or PASS. The groundwater table was encountered within the sand at depths of 0.6m to 1.3m below the ground surface.

The proposed development incorporates a single basement level car park and therefore bulk excavations to depths of the order of 3m are anticipated. The majority of the excavation will therefore encounter acidic sands, with the lower 0.5m or so to involve removal of PASS clays. Dewatering of the site will involve sealing the basement excavation into the low permeability clays using sheet piling or similar to restrict water inflow. There will, however, be a need to remove water from the sand profile within the excavation area. Management of the removal and discharge of water will be covered by a separate document and does not form part of this Acid Sulfate Soils Management Plan (ASSMP)

The ASSMP outlined herein has been prepared for the management of the acidic sands and the PASS and is to be adopted for all works undertaken at the site where disturbance of the natural soils is likely to occur. Of particular importance will be works such as excavation to depths of more than 2.5m where alluvial clay soils will be exposed. The purpose of the ASSMP is to allow for management of the risks associated with Acid Sulfate Soils (ASS) on the site.

Project specific details such as full extent and depth of proposed excavations, and the off-site or on-site disposal/re-use preferences were not known at the time of writing this plan. The plan should therefore be considered preliminary in nature and should be revised and finalised once further details of the proposed development are known.

C2. RESPONSIBILITY FOR IMPLEMENTATION

Implementation of the ASSMP will be the responsibility of the Contractor undertaking the bulk earthworks. Where ambiguity or uncertainty exists in the requirements of the ASSMP, the Project Manager or Superintendent must be referred to for clarification.

C3. TRAINING AND ORIENTATION

Training and orientation sessions should be conducted for all Contractors' staff involved in the excavation, transport or handling of soils or earthworks on the site. The training sessions should be designed by an appropriately qualified ASS consultant and must be conducted prior to the excavation of any soils on the site. The sessions shall be designed to ensure that staff are aware of

the ASS issues involved on the site, that they can recognise the ASS on the site and that they are familiar with their responsibilities in managing the acidity.

Training is to include coverage of the health and safety issues associated with working with lime.

C4. PRE-EXCAVATION TESTING REGIME

All soils to be excavated shall be sampled and tested prior to disturbance. The sampling frequency shall be 1 sample per 100m³. The location and depth of all test samples shall be accurately recorded on a plan of the works area. The recommended test regime is TAA and pre-oxidation sulphur (S_{KCl}) to determine the nature and severity of the actual acidity and chromium reducible sulfur (CRS) to determine acid sulfate potential. The analytical results should be reviewed by an ASS consultant who will classify the soils as:-

- Non acidic ($pH > 5.5$ and $CRS < 0.03\%$)
- Naturally acidic but not sulphuric ($TAA > 18$ moles per tonne, CRS and $S_{KCl} < 0.03\%$)
- AASS or PASS ($TAA > 18$ moles/tonne and $S_{KCl} > 0.03\%$ or $CRS > 0.03\%$)

Soils shall be treated according to category as set out in this ASSMP.

C5. TREATMENT

Soils shall be treated according to their acidity classification as set out above. It is therefore important that the sands and underlying PASS clay soils be excavated and stockpiled separately, and treated as outlined below:

- **Non acidic** soils may be handled and disposed of without specific treatment or management in regards to acid sulfate soils. These include existing fill and topsoil.
- **Naturally acidic** soils. These are likely to include the majority of the naturally occurring sands on site that typically occur to depths of the order of 2.5m. Soils which are to be re-used on site shall be limed at a rate determined based on neutralising the measured TAA. The soil shall be placed in a treatment area or on any proposed final fill platform and mixed with lime applied at the appropriate rate by discing or rotary hoeing. Initial testing undertaken during the site investigation indicates a likely liming rate of the order of 6kg_{lime}/tonne_{soil}. Soils to be removed from site should be treated at the site prior to removal by being placed in a prepared treatment area. The rate of lime application shall be determined from the testing based on neutralising the TAA with a factor of safety of 1.5.

- **AASS and PASS** shall be placed in a prepared treatment area. The soil shall be spread in layers not more than 100 mm thick and lime applied at the appropriate rate and mixed with the soil by discing or rotary hoeing. The rate of lime application shall be as determined as TAA plus the acidity equivalent of the measured CRS with a factor of safety of 1.5. Validation testing of treated soils shall be undertaken as specified in this ASSMP. If it is necessary to remove the soils from the site in order to treat them, they must be removed in leak proof, covered trucks so that no soil can fall from the truck during transport.

C6. TREATMENT AREA

The treatment area shall be at a location approved by Council prior to the disposal of any PASS/AASS. The treatment area shall be bunded to a height of at least 0.5 metres with nonPASS or treated PASS material. The base and bund batters shall be limed at the rate of 10 kilograms fine agricultural lime per square metre.

The lime to be used in the treatment process will be a medium-fine aglime with at least 85% by weight passing 1mm and 100% passing 2.5mm. The aglime purity is to be >90%.

C7. POST TREATMENT VALIDATION TESTING

The treated PASS/AASS shall be subject to validation testing at the rate of 1 test per 100m³ of treated soil. The validation testing shall consist of the measurement of soil pH, the soil pH after peroxide oxidation (pHox), TAA, Sras and Scr and the measurement of acid neutralising capacity (ANC) to pH 6. A soil shall be deemed to be effectively treated when pH and pHox are greater than 6 and the ANC is greater than the sum of the acidity (TAA+Sras+Scr) by a factor not less than 1.5.

C8. WATER QUALITY MONITORING

Any waters collected in the excavation shall be tested for pH on a daily basis during construction. If the recorded pH of any sample is less than 6, it shall be immediately retested. If the pH is again below 6, the pH shall be adjusted by the application of hydrated lime until it is in the range 6 to 8 prior to discharge.

Where the pH is less than 4.0, the ASS Consultant shall be engaged within 6 hours to review the site practices and monitoring results and to recommend remedial measures. Where ponded leachate requires rapid neutralisation prior to disposal a calcium hydroxide solution can be used. Solution can be prepared from slaked lime or quicklime, by stirring approximately 0.3kg into a 200 litre drum of water. The slurry should be allowed to settle and the clear solution pumped or sprayed into the ponded leachate in small doses with agitation of the water body until the pH reaches acceptable levels. Constant monitoring is to be undertaken to avoid overdosing. Complete records of all monitoring results shall be maintained by the Contractor.

Quicklime is a reactive and corrosive substance requiring specific handling and safety procedures. Mixing quicklime with water will generate heat. It is therefore critical to add the substance slowly and avoid contact.

C9. MANAGEMENT PRACTICES

At all times, current best management practices shall be adopted by the Contractor.

Complete records of all testing and treatment shall be maintained by the Contractor. Such records shall be available to Council for inspection. Any amendments proposed to the ASSMP shall be discussed with and approved by Council prior to the implementation of such changes.

KML Joint venture

Proposed Multi-storey Development

Belmont NSW

Environmental Site Assessment

Report No. RGS01385.1-AB

31 August 2016

REGIONAL
GEOTECHNICAL SOLUTIONS





Manning-Great Lakes

Port Macquarie

Coffs Harbour

RGS01385.1-AB

31 August 2016

KML Joint venture
Suite 1
20 Smart Street
CHARLESTOWN NSW 2290

Attention: Tony Brown

Dear Tony

RE: Proposed Multi-storey Development – Belmont NSW

Environmental Site Assessment

Regional Geotechnical Solutions Pty Ltd (RGS) has completed geotechnical and environmental site assessments at the site of the proposed multi-storey development to be constructed on the block encompassed by Brooks Parade, Sharp Street and Edgar Streets Belmont NSW. This report presents the results of the investigations.

The geotechnical and environmental assessments are presented in separate reports. This report presents the results of the environmental site assessment. The geotechnical assessment is presented separately, in report number RGS01385.1-AA.

If you have any questions regarding this project, or require any further assistance with this project, please do not hesitate to contact the undersigned.

For and on behalf of

Regional Geotechnical Solutions Pty Ltd

A handwritten signature in black ink, appearing to read 'S. Morton'.

Steven Morton

Principal



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Figure 101 Test Location Plan

Appendices

Appendix A Results of Field Investigations

Appendix B Laboratory Test Results



1 INTRODUCTION

Regional Geotechnical Solutions Pty Ltd (RGS) has undertaken an Environmental Site Assessment for the proposed multi-storey development to be constructed on the block encompassed by Brooks Parade, Sharp Street and Edgar Streets Belmont NSW.

The proposed development is comprised of three, six storey towers and one, eight storey tower with basement parking level parking, surface level parking and landscaped gardens. The towers will be comprised of commercial premises and one, two and three bedroom residential apartments.

The development site is generally level and is situated on the north eastern shore of Lake Macquarie at Belmont, in an area underlain by interbedded sands and estuarine sediments with a high groundwater table.

The scope of the work was to conduct a Phase 1 site contamination assessment, as well as to provide a Waste Classification for excavated soil materials that may require removal from the site during development.

The assessment involved a brief review of site history to assess evidence of potentially contaminating past land uses, followed by observation of site conditions and sampling and analysis of site soils for a broad suite of common contaminants.

2 METHODOLOGY

The assessment was undertaken in accordance with the relevant sections of the NSW EPA, *Guidelines for Consultants Reporting on Contaminated Sites* and involved the following process:

- A brief study of site history, with the aim of identifying past activities on or near the site that might have the potential to cause contamination;
- Site walkover to assess visible surface conditions and identify any evidence of contamination, or past activities that may cause contamination;
- Review of selected aerial photographs for to identify visible evidence of potential contamination or potentially contaminating activities;
- Search of government records of groundwater use in the area;
- Search of Environmental Protection Authority (EPA) website for any Contamination Notices for the site
- Discussion with current landowners to assess possible past land uses or activities that may present potential sources of contamination or contaminating activities.

The results of the site history study are presented in Appendix A.

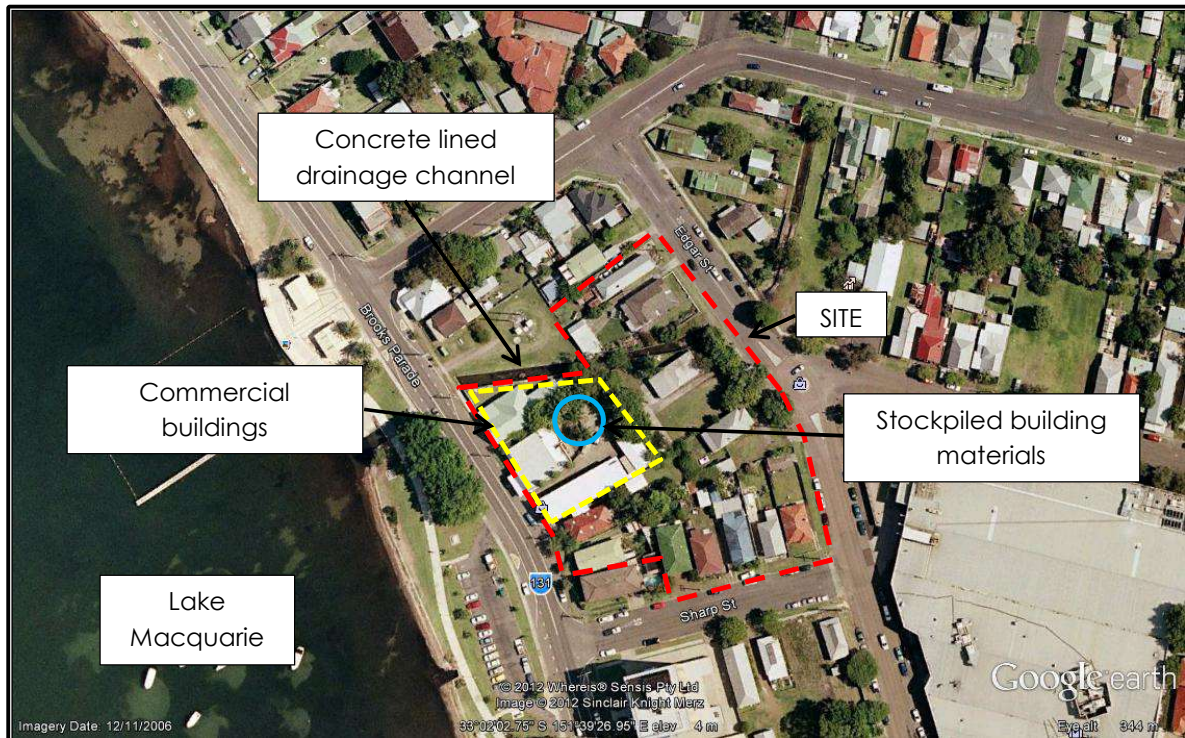
Sampling and testing was undertaken from the boreholes drilled as part of the geotechnical investigations and from additional hand augered boreholes drilled at targeted areas across the site. The samples collected were analysed for a suite of potential contaminants associated with past land use activities. The results have been evaluated against industry accepted criteria for the proposed development.

3 SITE SETTING AND HISTORY

3.1 Site Description

The site is located within a coastal environment on the eastern shore of Lake Macquarie approximately 2 km from the coast. The Google earth image below illustrates the site setting and site features.

Diagram 1: Site Setting and Features



The site is generally level and located within a low lying aeolian sand plain at the base of a broad depression within the surrounding gently undulating topography. Beyond the site residual hill-slopes rise gradually to the north and south. Coastal dune systems are situated to the east.

Lake Macquarie is located approximately 50m to the west beyond Brooks Parade and a park reserve. The mean tide level of the lake is approximately 1 to 1.5m below site level.

A concrete lined stormwater drain flows from east to west through the northern end of the site.

Existing structures generally comprise single storey houses of timber and brick construction. Three commercial buildings of brick and timber construction occupy the north western corner of the site (refer to Diagram 1) which front Brooks Parade. The existing developments are surrounded by yards comprising grassed lawns, border gardens, localised concrete pavements and numerous scattered trees and shrubs. The area behind the central commercial building is concrete paved and contains a number of stockpiles of building materials, including timber and steel.

A pump station is located to the north of the stormwater drain at the north western corner of the site. A recently constructed five storey residential complex with basement car park is located at



the corner of Brooks Parade and Maude Street. A similar development is located to the south of the site. The remainder of the site is surrounded by one and two storey residential development. A single level precast panel shopping centre is located to the south east on the opposite side of Edgar Street.

3.2 NSW EPA Records

A search of the NSW EPA website (www.environment.nsw.gov.au) revealed that no notices have been issued on the site under the Contaminated Land Management Act (1997).

4 GEOLOGY

The 1:250,000 Geology sheet for Sydney indicates the site is underlain by Quaternary alluvial deposits comprising sand, silts clays and gravel. To the north and south of the site the underlying geology comprise the Newcastle Coal Measures comprising shale, sandstone, conglomerate, chert, tuff and coal seams.

In summary the boreholes encountered a subsurface profile generally comprising aeolian and alluvial sand overlying alluvial and residual clays which grade into siltstone which intern overly moderately weathered to fresh sandstone.

Further details of the profile encountered are provided below with detailed descriptions in the engineering logs which are presented in Appendix A.

Unit 1 - Topsoil / Fill: comprising predominately sand was encountered in all boreholes to depths of between 0.1m to 0.7m; overlying,

Unit 2 - Alluvial / Aeolian Sand: comprising very loose to loose sand and gravelly sand, encountered below the topsoil and fill in all boreholes to depths of between 2.4m to 2.8m.

Unit 3 - Alluvial Clay: gravelly clay and sandy clay, medium to high plasticity varying from firm to very stiff strength was encountered below the alluvial sands and extended to depths between 3.1m and 4.5m. A layer of peat approximately 0.6m thick was encountered in in BH3 from a depth of 1.8m.

Unit 4 - Residual Clay: clay and silty clay of medium to high plasticity, very stiff to hard strength was encountered below the alluvial clays in all boreholes to depths of between 6.8m and 10m. The residual clays graded into extremely weathered siltstone.

Unit 5 - Weathered Siltstone: The siltstone was initially extremely weathered (hard residual clay) generally improving with depth to highly to moderately weathered and very low to low strength. The siltstone was interbedded with sandstone in BH2, BH6, BH7 and BH8 near the siltstone / sandstone interface.

Unit 6 - Weathered sandstone: The sandstone was generally moderately weathered and low to medium strength improving to slightly weathered to fresh and of medium to high strength.

Groundwater was encountered during the drilling of all eight drill rig boreholes. A summary of the groundwater observations is presented in Table 1.

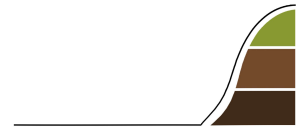


Table 1: Summary of Groundwater Observations

Borehole	Inflow Depth During Drilling (m)	Depth to Water After Completion of Drilling (m)
BH1	Not recorded ⁽¹⁾	Not recorded ⁽²⁾
BH2	1.5	1.1
BH3	1.5	Not recorded ⁽²⁾
BH4	1.6	1.1
BH5	1.3	Not recorded ⁽²⁾
BH6	1.0	0.6
BH7	1.2	Not recorded ⁽²⁾
BH8	1.0	1.0

NOTES:

1. Borehole advanced by wash boring methods from 0.6m therefore no meaningful groundwater observations possible.
2. No meaningful groundwater observations possible due to water introduced during core drilling.

It should be noted that groundwater levels may fluctuate seasonally and in response to rainfall and tidal variations.

A groundwater bore search on the NSW Water Information website, <http://waterinfo.nsw.gov.au/gw/> indicated that there are no licensed groundwater bores within the property boundary, however, several are located to the south. The closest bore is located near the intersection of The Pacific Highway and Robert Street approximately 1.5km to the south. The bore is for domestic use.

5 SITE CONTAMINATION ASSESSMENT

5.1 Areas of Environmental Concern and Chemicals of Concern

Based on the site observations and knowledge obtained about site activities as outlined above, the areas of environmental concern and chemicals of concern outlined in Table 2 were identified for the assessment.



Table 2: Areas of Concern and Chemicals of Concern

Area of Environmental Concern	Mode of potential contamination	Chemicals of Concern
General site area subjected to herbicide and pesticide use for gardening purposes	Spraying, spillage or storage of pesticides and herbicides.	Heavy Metals, OC/OPP
Commercial buildings and yards along Brooks parade frontage	Potential spillage or leakage of chemicals and fuels from containers.	Heavy Metals, TPH, BTEX, PAH,
Localised areas around workshops, garages etc	Potential spillage or leakage of chemicals and fuels from containers.	Heavy Metals, TPH, BTEX, PAH,
General site area containing refuse or fragments from older buildings	Possible asbestos fragments, or remnants of leaded paint	Asbestos, lead, other heavy metals
General site contaminants	Fuel and oils, lead containing paints, asbestos containing building materials, general contamination and spillage	Heavy Metals, Asbestos, TPH, BTEX, PAH, OC/OPP
<i>Heavy Metals - Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel and Zinc</i> <i>BTEX - Benzene, Toluene, Ethylbenzene and Xylene</i> <i>TPH - Total Petroleum Hydrocarbons</i> <i>PAH - Polycyclic Aromatic Hydrocarbons</i> <i>OC/OPP - Organochlorine and Organophosphorus Pesticides</i>		

5.2 Guidelines and Assessment Criteria

The NSW DEC *Guidelines for the NSW Site Auditor Scheme (2006 2nd Edition)* present health based investigation guidelines for different land uses (e.g. industrial/commercial, residential, recreational etc.) as well as provisional phytotoxicity based investigation levels.

The future land use on the site is intended to be primarily residential with some commercial space. Therefore the investigation levels for "residential with limited soil access" land use have been adopted as the primary investigation criteria.

The NSW DEC (2006) *Guidelines for the NSW Site Auditor Scheme* does not provide investigation criteria for Total Petroleum Hydrocarbons (TPH). The NSW EPA (1994) *Guidelines for Assessing Service Station Sites* provides acceptable threshold concentrations for petroleum hydrocarbons compounds at service station sites to be reused for sensitive land uses such as residential.



On the basis of the above, the guidelines presented in Table 3 below have been adopted for this assessment.

Table 3 Adopted Soil Investigation Criteria (mg/kg)

Analyte	Adopted Soil Investigation Criteria	Analyte	Adopted Soil Investigation Criteria
Benzene	1	Copper	4,000
Toluene	1.4	Lead	1,200
Ethyl-benzene	3.1	Zinc	28,000
Xylene	14	Cadmium	80
TRH C ₆ – C ₉	65	Chromium (III)	48%
TRH C ₁₀ – C ₃₅	1000	Arsenic	400
Total PAH	80	Nickel	2,400
Benzo- α -pyrene	4	Mercury	60
Aldrin + Dieldrin	40	DDT + DDD + DDE	800
Chlordane	200	Heptachlor	40

5.3 Sampling Plan and Field Work

NSW EPA 1995 Sampling Design Guidelines indicate that sampling can be undertaken on a targeted basis, ie targeting identified areas of potential contamination. Where no such specific areas of concern exist, sampling can be undertaken on a systematic grid basis, with samples evenly spaced over the subject area. The site occupies an area of 0.6 hectares, for which the guidelines indicate a systematic sampling grid would require a minimum of 15 sample locations.

Fieldwork was carried out in April 2012 and comprised a site walkover assessment and the logging and sampling of site soils at 26 locations. Soil samples were collected at various depths across the site. Samples were then selected for analysis based on a combination of sample location and field observations (i.e. material type and proximity to areas of environmental concern). Test locations are shown in Figure 101.

The samples were collected from the split tube sampler and from the auger. The samples were collected in acid-rinsed 250mL glass jars and placed in an ice-chilled cooler while on site and during transit to the laboratory where the samples were refrigerated.



5.4 Laboratory testing

Samples were transported under chain-of-custody conditions to ALS Laboratory Group, a NATA accredited specialist chemical testing laboratory. Samples were tested for the following suite of contaminants:

- Polycyclic Aromatic Hydrocarbons (PAH)
- Total Petroleum Hydrocarbons (TPH)
- Benzene, Toluene, Ethyl-benzene, Xylenes (BTEX)
- Organochlorine Pesticides (OCPs)
- Polychlorinated Biphenyls (PCB)
- Heavy metals (arsenic, cadmium, chromium, cobalt, copper, lead, mercury, and zinc)
- Asbestos.

The results are presented in Appendix B.

5.5 Quality Control

Samples were obtained using industry accepted protocols for sample treatment, preservation, and equipment decontamination. Four duplicate samples were submitted to the laboratory for analysis, as outlined below:

1. Primary BH5 - 0.1 to 0.2, duplicate BH5 – 0.2 to 0.3;
2. Primary BH7 - 0.15 to 0.25, duplicate BH7 – 0.35 to 0.45;
3. Primary 106, Duplicate 126;
4. Primary 117, Duplicate 127.

Comparison of the test results on the primary and duplicate samples show good correlation.

In addition to the field QC procedures, the laboratory conducted internal quality control testing including surrogates, blanks, and laboratory duplicate samples. The results are presented with the laboratory test results in Appendix B.

All laboratory quality control data is within acceptable limits for the tests carried out. Therefore on the basis of the results of the field and laboratory quality control procedures and testing the data is considered to reasonably represent the concentrations of contaminants in the soils at the sample locations at the time of sampling and the results can be adopted for this assessment.

5.6 Results

Laboratory test results are presented in Appendix B. An evaluation of the laboratory test results against the adopted soil assessment criteria is provided below:

- Results of heavy metal analysis revealed concentrations were below the adopted soil investigation criteria in all samples analysed;



- Results of BTEX analysis revealed concentrations below the level of reporting in all but one sample (113, which recorded low concentrations of Toluene). All results were below the adopted assessment criteria for all BTEX compounds analysed.
- Results of TRH C6-C9 analysis revealed concentrations below the laboratory detection limits for all samples and therefore well below the adopted assessment criteria for all TRH C6-C9 compounds analysed.
- Results of TRH C10-C36 analysis in all samples revealed some detectable concentrations in a number of samples tested however concentrations were below the adopted assessment criteria for all samples analysed.
- Results of organochlorine and organophosphorus pesticide analysis revealed some detectable concentrations in a number of samples tested from the northeastern corner of the site, however, all levels were below the adopted assessment criteria.
- Asbestos was detected in a soil sample from location BH1 at 0.1 to 0.2m. No asbestos was detected in any of the other soil samples analysed.

6 ASSESSMENT AND CONCLUSIONS REGARDING SITE CONTAMINATION

The majority of the site has been used for residential purposes since at least the last 50 years. Some commercial activities have taken place in several properties along the Brooks Parade frontage. No specific evidence of potentially contaminating sources or activities was identified.

Analysis of soil samples found heavy metals, TPH, BTEX, PAH, PCB and OC/OPP were either at concentrations below the laboratory detection limits or at concentrations below the adopted criteria for residential land use *'with minimal access to soil including high rise apartments and flats'*.

The slightly elevated levels of organochlorine pesticides encountered in samples recovered from BH5, 104, and 105, are likely to be associated with the use of pesticides in the lawns and gardens present in the vicinity of BH5. Discussions with the property owner at the time of the assessment support this. The concentrations encountered were below the adopted soil investigation criteria.

One soil sample from location BH1 revealed some asbestos fibres. This borehole was within a residential property and the soil or surrounding area did not reveal visible asbestos materials. It is likely that the asbestos encountered was an isolated occurrence resulting from past construction or refurbishment of the ageing dwelling on the property. It is recommended that prior to excavation of materials from this area, some additional sampling and analysis for the presence of asbestos should be undertaken to assess the extent of asbestos within the soil. Once identified, the affected area of the soil should be specifically excavated and removed as asbestos waste.

On the basis of the investigations and assessment undertaken it is considered that the site is appropriate for the proposed development with regards to contamination resulting from past or current land use.



7 WASTE CLASSIFICATION

7.1 Background and Classification Guidelines

The proposed development will incorporate basement level parking, and as such will require excavation to depths of the order of 3m across a large proportion of the site. This will involve excavation and removal of three general soil units:

- An upper soil profile comprising fill, topsoil and minor surface rubble;
- Aeolian sands to depths of the order of 2.5m;
- Alluvial clay soils below 2.5m.

Materials likely to be excavated have been classified in accordance with the NSW DECC 2010 Waste Classification Guidelines. The guidelines provide a process of waste classification that allows comparison of soil concentration test results against a range of Contaminant Threshold values for a broad range of contaminants. Where the test results exceed these thresholds the guidelines allow further evaluation based on evaluation of leachate test results, using the Toxicity Characteristics Leach Procedure (TCLP) test to simulate low pH conditions likely to be encountered in a waste landfill situation.

7.2 Evaluation against Contaminant Threshold Values

The results of all soil samples analysed were compared to the Contaminant Threshold criteria for General Solid Waste (CT1). The following samples exceeded these criteria:

- BH1 0.1 to 0.2m – exceeds CT1 for lead. This sample also revealed some detectable PAH for which the guidelines indicate leachate testing to be required for classification;
- BH5 0.1 to 0.2m – exceeds CT1 for lead. This sample also revealed some detectable PAH for which the guidelines indicate leachate testing to be required for classification;
- Samples 101, 103, 109, 110, 112 and 113 exceed CT1 for lead;
- Samples 104, 108 revealed some detectable PAH for which the guidelines indicate leachate testing to be required for classification

7.3 Leachate Testing

In accordance with the Waste Classification Guidelines, further evaluation was required for these samples to be classified as General Solid Waste, involving leachate testing which then allows results to be evaluated against TCLP1 criteria and Specific Contaminant Concentration (SCC1) values. Results of leachate testing are provided in Appendix B. The results indicated TCLP values within the TCLP1 concentrations for all samples analysed. Specific Contaminant Concentrations were below SCC1 concentrations. On this basis the material can be classified as General Solid Waste.

7.4 Waste Classification

Based on the results of the testing undertaken, the following waste classifications apply to the materials to be excavated from the site:



- The upper profile of fill, topsoil and the like would be classified as General Solid Waste, and would require disposal to an appropriately licensed landfill if it is to be removed from the site;
- Aeolian sands to depths of the order of 2.5m are classified as Virgin Excavated Natural Material (VENM);
- Alluvial clay soils below 2.5m would also classify as VENM, however, testing presented and discussed in the Geotechnical Report (Ref REGS00372.1-AC) indicates the clay soils to be Potential Acid Sulfate Soils (ASS). Treatment and disposal of these soils should therefore be undertaken in accordance with the ASS Management Plan provided in the geotechnical report.

8 WATER

Water samples were recovered from three monitoring wells installed within the sand aquifer in the upper profile. A fourth well was sealed into the underlying clay layers to assess whether different groundwater characteristics were present at depth, but due to the very low permeability of the clay horizons it was not possible to obtain a sample from that well.

Some dewatering is likely to be required to allow construction of the basement. The water samples obtained were analysed to assess background water quality, to assist with assessing options for discharge of the extracted groundwater. The test results are presented in Appendix B and summarised in Table 4. Table 4 compares the results to criteria derived from ANZECC 2000 Water Quality Guidelines. The guidelines present criteria for evaluation of waters to be discharged to a range of environmental scenarios. Criteria relevant to this project are presented in Table to allow comparison of results obtained, assuming the site and nearby receiving waters would constitute at least a moderately disturbed environment.

Table 4. Results of groundwater sampling and analysis

Analyte	Evaluation Criteria		BH6	BH4	BH2
	Fresh Water	Marine			
pH	6.5 - 8	7 – 8.5*	7.53	7.31	6.75
Conductivity(uS/cm)	20 - 30	N/A	4080	1350	3680
Chloride (ug/L)	3	N/A	1160	524	1090
Ammonia (ug/L)	900	910	540	<10	230
Nitrate (ug/L)	700	N/A	70	<10	120
Total N (ug/L)	350	300*	70	<10	120
Total P (ug/L)	10	30*	950	5930	1450

Note * denotes guideline for estuary waters

The results indicate the water would generally be suitable for discharge to marine or estuarine receiving water, however, further assessment of phosphorus concentrations should be undertaken.



Also, sampling and analysis of receiving waters should be undertaken to provide background data for assessment of other parameters tested including Dissolved Oxygen and BOD.

9 LIMITATIONS

The findings of this assessment are the result of sampling and analysis at specific locations using methodologies adopted in accordance with accepted industry practices and standards. It is considered that the results represent a reasonable interpretation of the conditions at the site in relation to contamination resulting from past site activities. Under no circumstances, however, can it be considered that these findings represent the actual state of the site at all points. The potential exists for 'hot spots' of soil contamination between sampling locations. Should conditions that differ from those described in this report be encountered during future site usage, further advice should be sought.

For and on behalf of

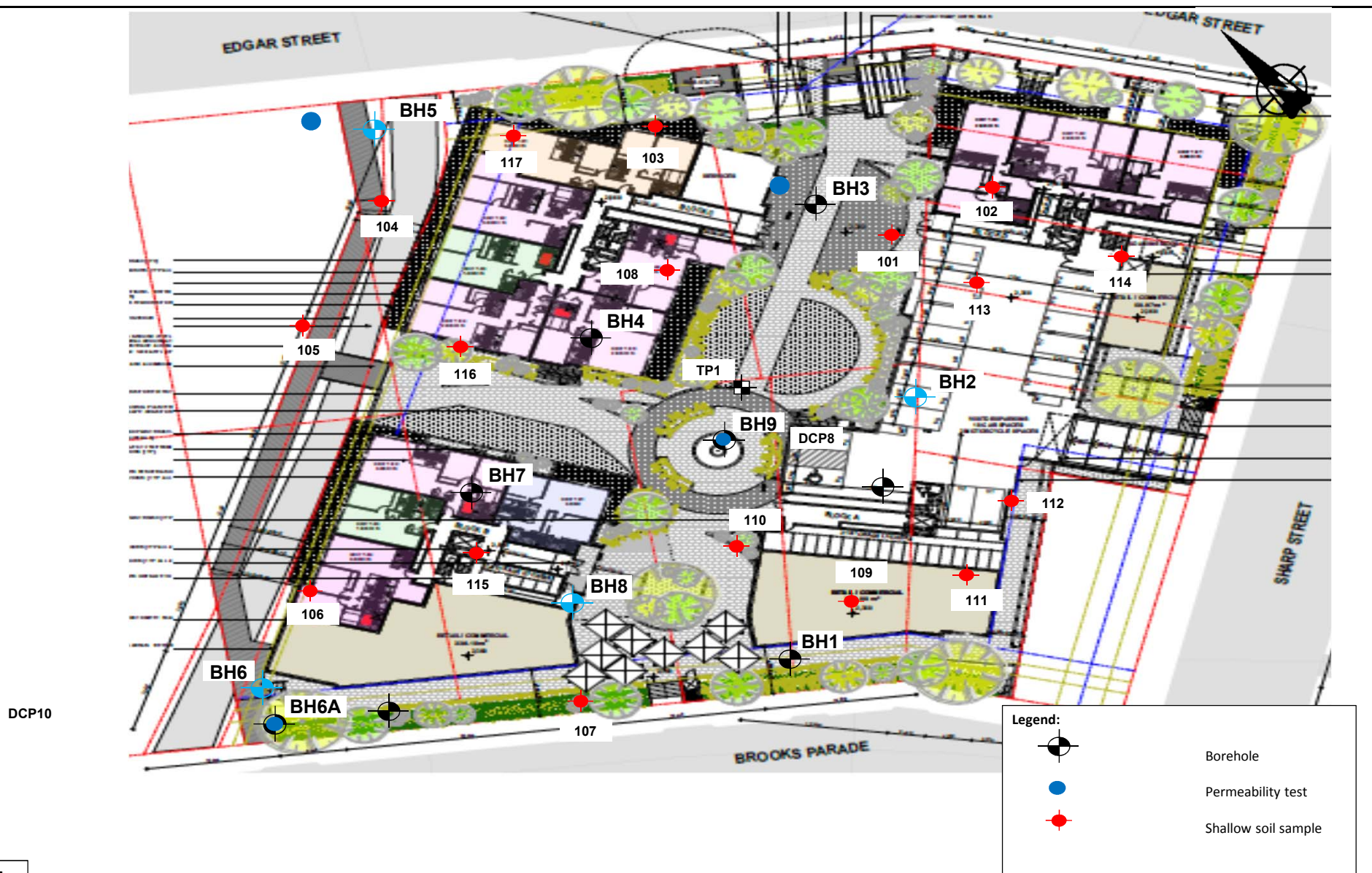
Regional Geotechnical Solutions Pty Ltd

Steven Morton

Principal



Figure



Client	KML Joint Venture	Job No.	RGS01385.1
Project:	Proposed Multi-storey Development Environmental Site Assessment	Drawn By:	AH
Title:	Test Location Plan	Date:	30-Aug-16
		Drawing No.	FIGURE 1



Appendix A

Results of Field Investigations



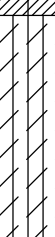
ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH1
PAGE: 1 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
ADTC							Topsoil/Fill: Silty SAND, fine grained, brown, contains fine to medium rounded gravel and rootlets	M				0.00: TOPSOIL: FILL: Grassed
CB		1.50m SPT 2.2,1 N=3 1.95m		1.0		SP	SAND, medium to coarse grained, orange, brown, contains medium to coarse subrounded gravel	W	L			0.30: ALLUVIAL
							Gravelly SAND, medium to coarse subrounded, grey, gravel is fine to medium grained, subrounded					
		3.00m SPT 2.3,3 N=6 3.45m		2.0		SP						
							Gravelly CLAY, medium plasticity, grey, gravel is medium to coarse grained, subrounded, claystone, contains medium to coarse grained Sand					
		4.50m SPT 3.5,8 N=13 4.95m		3.0		CL		M ~ w _p	St - VSt			4.00: RESIDUAL
							Silty CLAY, high plasticity, pale grey, contains coal bands					
		6.00m SPT 3.4,6 N=10 6.45m		4.0		CH		M ~ w _p				
							Clayey SILT, medium to high plasticity, pale grey					
RR				5.0				W	VSt			
				6.0		MH						
				7.0								

LEGEND:
Water
Water Level
(Date and time shown)
Water Inflow
Water Outflow
Strata Changes
Gradational or transitional strata
Definitive or distinct strata change

Notes, Samples and Tests
U₅₀ 50mm Diameter tube sample
CBR Bulk sample for CBR testing
E Environmental sample
(Glass jar, sealed and chilled on site)
ASS Acid Sulfate Soil Sample
(Plastic bag, air expelled, chilled)
B Bulk Sample
Field Tests
PID Photoionisation detector reading (ppm)
DCP(x-y) Dynamic penetrometer test (test depth interval shown)
HP Hand Penetrometer test (UCS kPa)

Consistency	UCS (kPa)	Moisture Condition
VS Very Soft	<25	D Dry
S Soft	25 - 50	M Moist
F Firm	50 - 100	W Wet
St Stiff	100 - 200	W _p Plastic Limit
VSt Very Stiff	200 - 400	W _L Liquid Limit
H Hard	>400	
Fb Friable		
Density		
V Very Loose	Density Index <15%	
L Loose	Density Index 15 - 35%	
MD Medium Dense	Density Index 35 - 65%	
D Dense	Density Index 65 - 85%	
VD Very Dense	Density Index 85 - 100%	



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH1
PAGE: 2 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
RR				9.0		MH	Clayey SILT, medium to high plasticity, pale grey (continued)	W	VSt			8.60: Reduction in Drilling Resistance
						MH	SILTSTONE, fine to medium grained, grey-brown and orange-brown, very low strength					
				9.0			Continued as Cored Drill Hole					
				10.0								
				11.0								
				12.0								
				13.0								
				14.0								
				15.0								

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition	
Water		U ₅₀ 50mm Diameter tube sample		VS	Very Soft	<25	D	Dry
Water Level (Date and time shown)		CBR Bulk sample for CBR testing		S	Soft	25 - 50	M	Moist
Water Inflow		E Environmental sample (Glass jar, sealed and chilled on site)		F	Firm	50 - 100	W	Wet
Water Outflow		ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)		St	Stiff	100 - 200	W _p	Plastic Limit
Strata Changes		B Bulk Sample		VSt	Very Stiff	200 - 400	W _L	Liquid Limit
Gradational or transitional strata		Field Tests		H	Hard	>400		
Definitive or distinct strata change		PID Photoionisation detector reading (ppm)		Fb	Friable			
		DCP(x-y) Dynamic penetrometer test (test depth interval shown)		Density	V	Very Loose	Density Index <15%	
		HP Hand Penetrometer test (UCS kPa)			L	Loose	Density Index 15 - 35%	
					MD	Medium Dense	Density Index 35 - 65%	
					D	Dense	Density Index 65 - 85%	
					VD	Very Dense	Density Index 85 - 100%	

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

[illegible]



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH2
PAGE: 1 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
NMLC							0.20m TOPSOIL, Silty SAND, fine grained, orange-brown, contains rootlets	D				0.00: TOPSOIL: GRASSED
						SM	Silty SAND, fine grained, dark grey	D	VL			0.20: AEOLIAN
				1.0		SP	Gravelly SAND, medium to coarse grained, grey, gravel is medium to coarse grained, rounded	M				0.80: ALUVIAL
		1.30m SPT 3,1,1 N=2 1.75m				SP	SAND, fine to medium grained, grey, contains a trace of fine to medium rounded gravel		VL			
				2.0		SP		W				
							2.60m Sandy Clay, medium plasticity dark Grey		St			
		2.90m SPT 2,4,6 N=10 3.35m				CH	Gravelly Clay, medium to high plasticity dark grey, Gravel is medium to coarse grained subrounded Siltstone ironstone contains some fine to medium grained Sand		VSt			3.00: ALLUVIAL CLAY
				4.0		CH	Silty Clay, medium to high plasticity, pale grey contains trace of thin coal seams					4.00: RESIDUAL NO SAMPLE RECOVERY
		4.20m SPT 2,3,3 N=6 4.65m				CH			VSt			
				5.0		CH						
				6.0								
				7.0			6.95m Silty Clay medium to high plasticity, pale grey mottled Orange brown with some highly weathered Siltstone Sands		VSt - H			6.80: EXTREMELY WEATHERED SILTSTONE
		7.00m SPT 3,12,7 N=19 7.45m				CH						
LEGEND: Water Water Level (Date and time shown) Water Inflow Water Outflow Strata Changes Gradational or transitional strata Definitive or distinct strata change					Notes, Samples and Tests U ₅₀ 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample (Glass jar, sealed and chilled on site) ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled) B Bulk Sample Field Tests PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)					Consistency VS Very Soft <25 S Soft 25 - 50 F Firm 50 - 100 St Stiff 100 - 200 VSt Very Stiff 200 - 400 H Hard >400 Fb Friable Density V Very Loose L Loose MD Medium Dense D Dense VD Very Dense		UCS (kPa) Moisture Condition D Dry M Moist W Wet W _p Plastic Limit W _L Liquid Limit Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%



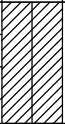
ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH2
PAGE: 2 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
						CH	Silty Clay medium to high plasticity, pale grey mottled Orange brown with some highly weathered Siltstone Sands (<i>continued</i>)		VSt - H			
				9.0			Continued as Cored Drill Hole					
				10.0								
				11.0								
				12.0								
				13.0								
				14.0								
				15.0								

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition	
Water		U ₅₀ 50mm Diameter tube sample		VS	Very Soft	<25	D	Dry
 Water Level (Date and time shown)		CBR Bulk sample for CBR testing		S	Soft	25 - 50	M	Moist
 Water Inflow		E Environmental sample (Glass jar, sealed and chilled on site)		F	Firm	50 - 100	W	Wet
 Water Outflow		ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)		St	Stiff	100 - 200	W _p	Plastic Limit
Strata Changes		B Bulk Sample		VSt	Very Stiff	200 - 400	W _L	Liquid Limit
 Gradational or transitional strata		Field Tests		H	Hard	>400		
 Definitive or distinct strata change		PID Photoionisation detector reading (ppm)		Fb	Friable			
		DCP(x-y) Dynamic penetrometer test (test depth interval shown)		Density	V	Very Loose	Density Index <15%	
		HP Hand Penetrometer test (UCS kPa)			L	Loose	Density Index 15 - 35%	
					MD	Medium Dense	Density Index 35 - 65%	
					D	Dense	Density Index 65 - 85%	
					VD	Very Dense	Density Index 85 - 100%	



ENGINEERING LOG - CORED BOREHOLE

BOREHOLE NO: **BH2**
PAGE: 3 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL: AHD
DATUM: AHD

Drilling and Sampling					Material description and profile information				Testing	Rock Mass Defects		
METHOD	WATER	CORE LIFT / TEST	RL (m)	DEPTH (m)	GRAPHIC LOG	Material Description: Rock type, particle characteristics, colour, minor components, structure	WEATHERING	ESTIMATED STRENGTH	$I_{s(50)}$ D/A	RQD %	Defect Spacing mm	Defect Description: Type, inclination, planarity, roughness, coating, thickness
NMLC						START CORING AT 8.75m						
				9.0		Siltstone fine grey with Orange brown bands indistinctly bedded	EW	EL	A=0.38			SM 0°
							HW	VL				JT 5 - 10°
												SZ
												SM 0°
				10.0		Siltstone fine dark grey mottled pale grey, distinctly bedded at 5° - 20°	HW - MW	VL - L	A=1.00			SZ
												JT 15°
												SM 5°
												SM
				11.0		Interbedded Sandstone and Siltstone, fine Sandstone is pale grey, Siltstone dark grey, distinctly bedded at 0° - 5°	MW - SW	L - M	A=1.00			PT 0° SN
												PT 0° SN
												PT 0° SN
												PT 0°
				12.0		Sandstone, fine to medium grained grey indistinctly bedded	SW - FR	M	A=1.00			CS 5°
												SM 0°
												SZ
												PT 5° VN
				13.0		Hole Terminated at 12.90 m						PT 5° VN
				14.0								PT 0° CN
				15.0								
LEGEND: Water Water Level (Date and time shown) Water Inflow Water Outflow Strata Changes Gradational or transitional strata Definitive or distinct strata change					Method AS Auger Screwing AD Auger Drilling RR Roller/tricone CB Claw or Blade bit NMLC NMLC Core		Weathering EW Extremely Weathered HW Highly Weathered MW Moderately Weathered SW Slightly Weathered FR Fresh		Strength VL Very Low <0.1 L Low 0.1 - 0.3 M Medium 0.3 - 1 H High 1 - 3 VH Very High 3 - 10 EH Extremely High >10		Defect Type JT Joint PT Parting SM Seam SZ Shear Zone SS Sheared Surface CS Crushed Seam	
					Field Tests HP Hand Penetrometer		Roughness VR Very Rough RO Rough SO Smooth SL Slickensided		Coating CN Clean SN Stained VN Veneer CO Coating		Planarity PL Planar CU Curved ST Stepped IR Irregular	



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH3
PAGE: 1 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER:

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
NMLC							0.10m TOPSOIL: Silty Sand, fine dark grey, contains rootlets	M				0.00: TOPSOIL: GRASSED
							0.50m Silty Sand, fine grey	M				0.10: AEOLIAN
						SP	SAND, medium to coarse grey contains trace of Fine rounded gravel		VL			0.50: ALLUVIAL
		1.50m					1.60m Peat Brown	W				
		SPT 1,1,1 N=2 1.95m					2.50m					
						CH	Gravelly Clay, high plasticity, pale grey - Gravel is fine to medium grained contains fine to medium grained sand	M > w _p	St - VSt			2.50: RESIDUAL
							3.60m					
		4.00m				CH	Clay, high plasticity, pale grey, contains trace of fine Sand and fine angular Siltstone gravel with some Orange brown mottle					
		SPT 3,4,6 N=10 4.45m					5.00m					
						CH	Clay, high plasticity, pale grey, with some Orange brown mottle	W	VSt			

LEGEND:
Water
Water Level
(Date and time shown)
Water Inflow
Water Outflow
Strata Changes
Gradational or transitional strata
Definitive or distinct strata change

Notes, Samples and Tests
U₅₀ 50mm Diameter tube sample
CBR Bulk sample for CBR testing
E Environmental sample
(Glass jar, sealed and chilled on site)
ASS Acid Sulfate Soil Sample
(Plastic bag, air expelled, chilled)
B Bulk Sample
Field Tests
PID Photoionisation detector reading (ppm)
DCP(x-y) Dynamic penetrometer test (test depth interval shown)
HP Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)	Moisture Condition
VS	Very Soft	<25	D Dry
S	Soft	25 - 50	M Moist
F	Firm	50 - 100	W Wet
St	Stiff	100 - 200	W _p Plastic Limit
VSt	Very Stiff	200 - 400	W _L Liquid Limit
H	Hard	>400	
Fb	Friable		
Density			
V	Very Loose		Density Index <15%
L	Loose		Density Index 15 - 35%
MD	Medium Dense		Density Index 35 - 65%
D	Dense		Density Index 65 - 85%
VD	Very Dense		Density Index 85 - 100%



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH3
PAGE: 2 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER:

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
						CH	8.20m Silty Clay, medium plasticity pale grey mottled orange brown 9.0 9.20m	W M < W _p	VSt H			
							Continued as Cored Drill Hole					
				10.0								
				11.0								
				12.0								
				13.0								
				14.0								
				15.0								

LEGEND: Water Water Level (Date and time shown) Water Inflow Water Outflow Strata Changes Gradational or transitional strata Definitive or distinct strata change		Notes, Samples and Tests U ₅₀ 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample (Glass jar, sealed and chilled on site) ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled) B Bulk Sample Field Tests PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	Consistency VS Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard Fb Friable Density V Very Loose L Loose MD Medium Dense D Dense VD Very Dense	UCS (kPa) <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	Moisture Condition D Dry M Moist W Wet W _p Plastic Limit W _L Liquid Limit Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%
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ENGINEERING LOG - CORED BOREHOLE

BOREHOLE NO: **BH3**
PAGE: 3 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER:

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information				Testing		Rock Mass Defects			
METHOD	WATER	CORE LIFT / TEST	RL (m)	DEPTH (m)	GRAPHIC LOG	Material Description: Rock type, particle characteristics, colour, minor components, structure	WEATHERING	ESTIMATED STRENGTH	I _{s(50)} D/A	RQD %	Defect Spacing mm	Defect Description: Type, inclination, planarity, roughness, coating, thickness		
				9.0		START CORING AT 9.20m								
NMLC				10.0		Siltstone fine pale grey with occasional orange brown mottle, indistinctly bedded	EW	EL	A=1.02			CS 95° JT 60° SN JT 10° VN CS 30°		
				11.0		Siltstone: Fine pale grey mottled orange brown, bedded at 10° to 20°	EW - HW	EL - VL		SM 30° JT 20° VN PT 10° SN				
				12.0		Sandstone: Fine pale grey mottled orange brown bedded at 5° to 20° with thin Siltstone bands	MW SW	VL - L M		JT 45° CN JT 45° VN PT 5° PT 10°				
				13.0		Sandstone: Fine to medium grey, indistinctly bedded	SW - FR	M - H		A=1.36	PT 0°			
				14.0		Hole Terminated at 13.40 m								
				15.0										
LEGEND:				Method			Weathering			Strength		I _{s(50)}	Defect Type	
Water				AS Auger Screwing			EW Extremely Weathered			VL Very Low		<0.1	JT Joint	
Water Level (Date and time shown)				AD Auger Drilling			HW Highly Weathered			L Low		0.1 - 0.3	PT Parting	
Water Inflow				RR Roller/tricone			MW Moderately Weathered			M Medium		0.3 - 1	SM Seam	
Water Outflow				CB Claw or Blade bit			SW Slightly Weathered			H High		1 - 3	SZ Shear Zone	
Strata Changes				NMLC NMLC Core			FR Fresh			VH Very High		3 - 10	SS Sheared Surface	
										EH Extremely High		>10	CS Crushed Seam	
				Field Tests						Roughness		Coating	Planarity	
				HP Hand Penetrometer						VR Very Rough		CN Clean	PL Planar	
										RO Rough		SN Stained	CU Curved	
										SO Smooth		VN Veneer	ST Stepped	
										SL Slickensided		CO Coating	IR Irregular	



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH5
PAGE: 1 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
NMLC							0.30m TOPSOIL: Silty Sand, medium to coarse dark grey with fine to medium grained subrounded Gravel and rootlets	M				0.00: TOPSOIL CROSSED
							Silty Sand, medium to coarse grey with medium to coarse subrounded Gravel	M				0.30: ALLUVIAL
					SM				VL			
						W						
				3.00m SPT 2,4,5 N=9 3.45m		2.50m	Sandy Clay, medium to high plasticity, Grey, Sand fine to medium grained					
				CH			M > w _p	VSt				
			4.00m		Clay, medium to high plasticity, pale Grey					4.00: RESIDUAL		
		6.00m SPT 5,5,5 N=10 6.45m			CH			VSt				
				7.0								

LEGEND:
Water
 Water Level
(Date and time shown)
 Water Inflow
 Water Outflow
Strata Changes
--- Gradational or transitional strata
— Definitive or distinct strata change

Notes, Samples and Tests
U₅₀ 50mm Diameter tube sample
CBR Bulk sample for CBR testing
E Environmental sample
(Glass jar, sealed and chilled on site)
ASS Acid Sulfate Soil Sample
(Plastic bag, air expelled, chilled)
B Bulk Sample
Field Tests
PID Photoionisation detector reading (ppm)
DCP(x-y) Dynamic penetrometer test (test depth interval shown)
HP Hand Penetrometer test (UCS kPa)

Consistency	UCS (kPa)	Moisture Condition
VS Very Soft	<25	D Dry
S Soft	25 - 50	M Moist
F Firm	50 - 100	W Wet
St Stiff	100 - 200	W _p Plastic Limit
VSt Very Stiff	200 - 400	W _L Liquid Limit
H Hard	>400	
Fb Friable		
Density		
V Very Loose	Density Index <15%	
L Loose	Density Index 15 - 35%	
MD Medium Dense	Density Index 35 - 65%	
D Dense	Density Index 65 - 85%	
VD Very Dense	Density Index 85 - 100%	



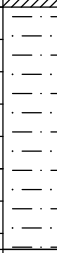
ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH5
PAGE: 2 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
NMLC		9.00m SPT 5,13,14 N=27 9.45m		8.50		CH	Clay, medium to high plasticity, pale Grey (<i>continued</i>)	M > w _p	VSt			8.50: EXTREMELY WEATHERED SILTSTONE
				9.0		CH	Clay, medium to high plasticity, pale Grey mottled Orange Brown					
				10.0					H			
				11.0			Siltstone, fine dark grey with pale grey bands, very low strength	M				11.00: EXTREMELY WEATHERED TO HIGHLY WEATHERED SILTSTONE
				12.0								
				12.50								
				13.0			Continued as Cored Drill Hole					
				14.0								
				15.0								

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition	
Water		U ₅₀ 50mm Diameter tube sample		VS	Very Soft	<25	D	Dry
Water Level (Date and time shown)		CBR Bulk sample for CBR testing		S	Soft	25 - 50	M	Moist
Water Inflow		E Environmental sample (Glass jar, sealed and chilled on site)		F	Firm	50 - 100	W	Wet
Water Outflow		ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)		St	Stiff	100 - 200	W _p	Plastic Limit
Strata Changes		B Bulk Sample		VSt	Very Stiff	200 - 400	W _L	Liquid Limit
Gradational or transitional strata		Field Tests		H	Hard	>400		
Definitive or distinct strata change		PID Photoionisation detector reading (ppm)		Fb	Friable			
		DCP(x-y) Dynamic penetrometer test (test depth interval shown)		Density		V	Very Loose	Density Index <15%
		HP Hand Penetrometer test (UCS kPa)		L		L	Loose	Density Index 15 - 35%
				MD		MD	Medium Dense	Density Index 35 - 65%
				D		D	Dense	Density Index 65 - 85%
				VD		VD	Very Dense	Density Index 85 - 100%



ENGINEERING LOG - CORED BOREHOLE

BOREHOLE NO: **BH5**
PAGE: 3 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 11/4/12

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

DRILL TYPE: XC Track Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information				Testing		Rock Mass Defects	
METHOD	WATER	CORE LIFT / TEST	RL (m)	DEPTH (m)	GRAPHIC LOG	Material Description: Rock type, particle characteristics, colour, minor components, structure	WEATHERING	ESTIMATED STRENGTH	$I_{s(50)}$ D/A	RQD %	Defect Spacing mm	Defect Description: Type, inclination, planarity, roughness, coating, thickness
				9.0 10.0 11.0 12.0								
						START CORING AT 12.50m						
NMLC				13.0		Sandstone, fine to medium pale grey with re brown staining, indistinctly bedded	HW	VL				PT 5° SN PT 0° SN PT 0° SN
				14.0			SW	M - H				PT 5° CN
						NO CORE 0.25M	EW	VL				SM 50° SM 20° SM 20°
				15.0		Sandstone, fine to medium grey, Indistinctly bedded	HW	VL				
							MW	L - M				
						NO CORE 0.28M						
						Sandstone, fine to medium grey indistinctly bedded	SW	M	A=5.80			SM 0° SM 0° SM 0° 40°
							EW	VL				
						Hole Terminated at 15.85 m						
LEGEND:					Method		Weathering		Strength		Defect Type	
Water					AS Auger Screwing		EW Extremely Weathered		VL Very Low <0.1		JT Joint	
Water Level (Date and time shown)					AD Auger Drilling		HW Highly Weathered		L Low 0.1 - 0.3		PT Parting	
Water Inflow					RR Roller/tricone		MW Moderately Weathered		M Medium 0.3 - 1		SM Seam	
Water Outflow					CB Claw or Blade bit		SW Slightly Weathered		H High 1 - 3		SZ Shear Zone	
Strata Changes					NMLC NMLC Core		FR Fresh		VH Very High 3 - 10		SS Sheared Surface	
Gradational or transitional strata									EH Extremely High >10		CS Crushed Seam	
Definitive or distinct strata change												
					Field Tests				Roughness		Coating	
					HP Hand Penetrometer				VR Very Rough		CN Clean	
									RO Rough		SN Stained	
									SO Smooth		VN Veneer	
									SL Slickensided		CO Coating	
											Planarity	
											PL Planar	
											CU Curved	
											ST Stepped	
											IR Irregular	

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ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH6
PAGE: 1 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 18/4/12

DRILL TYPE: Truck Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
NMLC		1.20m SPT 3,1,2 N=3 1.65m		0.02m		SP	TOPSOIL/FILL: Gravelly SAND, fine to medium grained dark grey, Gravel is fine to medium grained, subangular SAND, medium to coarse grained, grey with fine to medium grained subrounded gravel	W				0.00: TOPSOIL/FILL: GRASSED 0.02: ALLUVIAL 2.80: ALLUVIAL 4.00: RESIDUAL
				2.80m		CL	Sandy CLAY, medium plasticity, grey, Sand fine to medium grained	M > w _p	St			
		4.50m SPT 5,8,13 N=21 4.95m		4.00m		CH	CLAY, medium-high plasticity, grey mottled orange brown	M > w _p	H			
		7.10m SPT 5,10,14 N=24 7.55m										

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition	
Water		U ₅₀ 50mm Diameter tube sample		VS	Very Soft	<25	D	Dry
		CBR Bulk sample for CBR testing		S	Soft	25 - 50	M	Moist
(Date and time shown)		E Environmental sample		F	Firm	50 - 100	W	Wet
		(Glass jar, sealed and chilled on site)		St	Stiff	100 - 200	W _p	Plastic Limit
		ASS Acid Sulfate Soil Sample		VSt	Very Stiff	200 - 400	W _L	Liquid Limit
Strata Changes		(Plastic bag, air expelled, chilled)		H	Hard	>400		
--- Gradational or transitional strata		B Bulk Sample		Fb	Friable			
— Definitive or distinct strata change		Field Tests		Density				
		PID Photoionisation detector reading (ppm)		V	Very Loose		Density Index <15%	
		DCP(x-y) Dynamic penetrometer test (test depth interval shown)		L	Loose		Density Index 15 - 35%	
		HP Hand Penetrometer test (UCS kPa)		MD	Medium Dense		Density Index 35 - 65%	
				D	Dense		Density Index 65 - 85%	
				VD	Very Dense		Density Index 85 - 100%	



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH6
PAGE: 2 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 18/4/12

DRILL TYPE: Truck Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
NMLC							CLAY, medium-high plasticity, grey mottled orange brown (<i>continued</i>)	M > w _p	H			9.00: EXTREMELY WEATHERED SILTSTONE
				9.0		CH	CLAY, medium plasticity, grey mottled orange, brown	M > w _p				
			10.70m SPT 10,20,150 N=170 11.15m		10.0		CH					
					11.0		SILTSTONE, fine grained, grey mottled orange brown, very low strength with occasional low strength bands			10.80: EXTREMELY WEATHERED TO HIGHLY WEATHERED SILTSTONE		
							Continued as Cored Drill Hole					
				12.0								
				13.0								
				14.0								
				15.0								

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition	
Water		U ₅₀ 50mm Diameter tube sample		VS	Very Soft	<25	D	Dry
Water Level (Date and time shown)		CBR Bulk sample for CBR testing		S	Soft	25 - 50	M	Moist
Water Inflow		E Environmental sample (Glass jar, sealed and chilled on site)		F	Firm	50 - 100	W	Wet
Water Outflow		ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)		St	Stiff	100 - 200	W _p	Plastic Limit
Strata Changes		B Bulk Sample		VSt	Very Stiff	200 - 400	W _L	Liquid Limit
Gradational or transitional strata		Field Tests		H	Hard	>400		
Definitive or distinct strata change		PID Photoionisation detector reading (ppm)		Fb	Friable			
		DCP(x-y) Dynamic penetrometer test (test depth interval shown)		Density	V	Very Loose	Density Index <15%	
		HP Hand Penetrometer test (UCS kPa)			L	Loose	Density Index 15 - 35%	
					MD	Medium Dense	Density Index 35 - 65%	
					D	Dense	Density Index 65 - 85%	
					VD	Very Dense	Density Index 85 - 100%	



ENGINEERING LOG - CORED BOREHOLE

BOREHOLE NO: **BH6**
PAGE: 3 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 18/4/12

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

DRILL TYPE: Truck Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information				Testing		Rock Mass Defects		
METHOD	WATER	CORE LIFT / TEST	RL (m)	DEPTH (m)	GRAPHIC LOG	Material Description: Rock type, particle characteristics, colour, minor components, structure	WEATHERING	ESTIMATED STRENGTH	$I_{s(50)}$ D/A	RQD %	Defect Spacing mm	Defect Description: Type, inclination, planarity, roughness, coating, thickness	
				9.0 									



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH6A
PAGE: 1 OF 1
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 18/4/12

DRILL TYPE: Hand Excavator
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
HA				1.0		SM	0.20m FILL: Sandy Gravel medium to coarse angular orange brown	W	VL			0.00: FILL: GRASSED
							0.35m FILL: Gravely Sand, fine to medium grained dark grey mottled pale grey gravel is fine to medium grained subangular contains charcoal					0.45: ALLUVIAL
				1.00m			FILL SAND: fine to medium grained orange brown					
							Silty SAND: medium coarsed dark grey with some fine to medium subrounded gravel					
				2.0								
				3.0								
				4.0								
				5.0			Hole Terminated at 4.00 m					
				6.0								
				7.0								
LEGEND: Water Water Level (Date and time shown) Water Inflow Water Outflow Strata Changes Gradational or transitional strata Definitive or distinct strata change				Notes, Samples and Tests U ₅₀ 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample (Glass jar, sealed and chilled on site) ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled) B Bulk Sample Field Tests PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)				Consistency VS Very Soft <25 S Soft 25 - 50 F Firm 50 - 100 St Stiff 100 - 200 VSt Very Stiff 200 - 400 H Hard >400 Fb Friable		UCS (kPa) Very Loose Loose Medium Dense Dense Very Dense	Moisture Condition D Dry M Moist W Wet W _p Plastic Limit W _L Liquid Limit Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development

LOCATION: Refer to Figure 1

BOREHOLE NO: **BH7**
PAGE: 1 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 19/4/12

DRILL TYPE: Truck Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
NMLC				0.00m			Concrete, 10mm	M				0.00: CONCRETE 130MM THICK 0.13: FILL 0.40: ALLUVIAL
				0.13m			Fill: Sandy Gravel medium to coarse angular with some Clay	M				
				0.40m			Fill: Silty Sand, fine to medium grained dark grey, with some fine to medium grained subrounded Gravel					
				1.0			Silty Sand: medium to coarse dark grey					
				2.0				M > w _p	VL			
		3.00m SPT 0,1,2 N=3 3.45m		3.0			Sandy Clay, medium to high plasticity, grey with some medium to coarse subrounded gravel	M > w _p	F			2.95: ALLUVIAL CLAY
		6.00m SPT 4,4,6 N=10 6.45m		4.0								
				4.20m			Clay, high plasticity, grey with occasional Orange Brown mottle					4.20: RESIDUAL
				5.0								
				6.0				M > w _p	St			
				7.0								

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition	
Water		U ₅₀ 50mm Diameter tube sample		VS	Very Soft	<25	D	Dry
	Water Level (Date and time shown)	CBR Bulk sample for CBR testing		S	Soft	25 - 50	M	Moist
	Water Inflow	E Environmental sample (Glass jar, sealed and chilled on site)		F	Firm	50 - 100	W	Wet
	Water Outflow	ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)		St	Stiff	100 - 200	W _p	Plastic Limit
Strata Changes		B Bulk Sample		VSt	Very Stiff	200 - 400	W _L	Liquid Limit
	Gradational or transitional strata	Field Tests		H	Hard	>400		
	Definitive or distinct strata change	PID Photoionisation detector reading (ppm)		Fb	Friable			
		DCP(x-y) Dynamic penetrometer test (test depth interval shown)		Density	V	Very Loose	Density Index <15%	
		HP Hand Penetrometer test (UCS kPa)			L	Loose	Density Index 15 - 35%	
					MD	Medium Dense	Density Index 35 - 65%	
					D	Dense	Density Index 65 - 85%	
					VD	Very Dense	Density Index 85 - 100%	



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH7
PAGE: 2 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 19/4/12

DRILL TYPE: Truck Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL: AHD
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result		
NMLC		9.00m SPT 3.8,12 N=20 9.45m		9.0		CH	Clay, high plasticity, grey with occasional Orange Brown mottle (continued)	M > w _p				10.00: EXTREMELY WEATHERED SILTSTONE 11.20: HIGHLY WEATHERED SILTSTONE	
				10.0		CH	Clay, medium plasticity, grey mottled Orange brown contains bands of highly weathered siltstone		St				
				11.0									
				12.0			Siltstone, fine grey banded pale grey, very low strength with low strength bands	M > w _p					
		12.00m SPT 10,0,0 N=R 12.45m		12.0			Interbedded Siltstone and Sandstone, fine Siltstone is dark grey and Sandstone is pale grey bedded @ 0° to 10° Sandstone fine to medium pale grey bedded @ 10° to 20° Continued as Cored Drill Hole						
				13.0									
				14.0									
				15.0									

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition	
Water		U ₅₀ 50mm Diameter tube sample		VS	Very Soft	<25	D	Dry
Water Level (Date and time shown)		CBR Bulk sample for CBR testing		S	Soft	25 - 50	M	Moist
Water Inflow		E Environmental sample (Glass jar, sealed and chilled on site)		F	Firm	50 - 100	W	Wet
Water Outflow		ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)		St	Stiff	100 - 200	W _p	Plastic Limit
Strata Changes		B Bulk Sample		VSt	Very Stiff	200 - 400	W _L	Liquid Limit
Gradational or transitional strata		Field Tests		H	Hard	>400		
Definitive or distinct strata change		PID Photoionisation detector reading (ppm)		Fb	Friable			
		DCP(x-y) Dynamic penetrometer test (test depth interval shown)		Density	V	Very Loose	Density Index <15%	
		HP Hand Penetrometer test (UCS kPa)			L	Loose	Density Index 15 - 35%	
					MD	Medium Dense	Density Index 35 - 65%	
					D	Dense	Density Index 65 - 85%	
					VD	Very Dense	Density Index 85 - 100%	



ENGINEERING LOG - CORED BOREHOLE

BOREHOLE NO: **BH7**
PAGE: 3 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 19/4/12

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

DRILL TYPE: Truck Mounted
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information				Testing		Rock Mass Defects	
METHOD	WATER	CORE LIFT / TEST	RL (m)	DEPTH (m)	GRAPHIC LOG	Material Description: Rock type, particle characteristics, colour, minor components, structure	WEATHERING	ESTIMATED STRENGTH	$I_{s(50)}$ D/A	RQD %	Defect Spacing mm	Defect Description: Type, inclination, planarity, roughness, coating, thickness
				9.0 10.0 11.0 12.0								
				13.0 14.0 15.0			SW SW	M M	A=0.41 A=0.90			PT 0° CN PT 10° CN PT 0° CN JT 30° VN PT 0° CN PT 10° CN PT 10° CN PT 15° CN PT 10° CN JT 30° CN PT 15° CN
LEGEND: Water Water Level (Date and time shown) Water Inflow Water Outflow Strata Changes Gradational or transitional strata Definitive or distinct strata change					Method AS Auger Screwing AD Auger Drilling RR Roller/tricone CB Claw or Blade bit NMLC NMLC Core		Weathering EW Extremely Weathered HW Highly Weathered MW Moderately Weathered SW Slightly Weathered FR Fresh		Strength VL Very Low <0.1 L Low 0.1 - 0.3 M Medium 0.3 - 1 H High 1 - 3 VH Very High 3 - 10 EH Extremely High >10		Defect Type JT Joint PT Parting SM Seam SZ Shear Zone SS Sheared Surface CS Crushed Seam	
					Field Tests HP Hand Penetrometer		Roughness VR Very Rough RO Rough SO Smooth SL Slickensided		Coating CN Clean SN Stained VN Veneer CO Coating		Planarity PL Planar CU Curved ST Stepped IR Irregular	



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH8
PAGE: 1 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 19/4/12

DRILL TYPE:
BOREHOLE DIAMETER: 100 mm
SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
NMLC							0.13m Concrete 130mm thick	M				0.00: CONCRETE 130MM THICK F72 REO 50MM COVER 0.13: FILL 0.50: ALLUVIAL <

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition	
Water		U ₅₀ 50mm Diameter tube sample		VS	Very Soft	<25	D	Dry
	Water Level (Date and time shown)	CBR Bulk sample for CBR testing		S	Soft	25 - 50	M	Moist
	Water Inflow	E Environmental sample (Glass jar, sealed and chilled on site)		F	Firm	50 - 100	W	Wet
	Water Outflow	ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)		St	Stiff	100 - 200	w _p	Plastic Limit
Strata Changes		B Bulk Sample		VSt	Very Stiff	200 - 400	w _L	Liquid Limit
	Gradational or transitional strata	Field Tests		H	Hard	>400		
	Definitive or distinct strata change	PID Photoionisation detector reading (ppm)		Fb	Friable			
		DCP(x-y) Dynamic penetrometer test (test depth interval shown)		Density	V	Very Loose	Density Index <15%	
		HP Hand Penetrometer test (UCS kPa)			L	Loose	Density Index 15 - 35%	
					MD	Medium Dense	Density Index 35 - 65%	
					D	Dense	Density Index 65 - 85%	
					VD	Very Dense	Density Index 85 - 100%	



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH8
PAGE: 2 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 19/4/12

DRILL TYPE: **SURFACE RL:**
BOREHOLE DIAMETER: 100 mm **DATUM:** AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
NMLC		9.00m SPT 10,12,16 N=28 9.45m		9.0		CH	CLAY, high plasticity pale grey with some orange-brown mottle	M > w _p	H			10.00: EXTREMELY WEATHERED SILTSTONE 10.35: HIGHLY WEATHERED SILTSTONE
				10.0		CL	Clay medium plasticity grey, mottled orange brown					
				11.0			Siltstone fine, dark grey mottled pale grey very low strength with medium strength (sandstone bands)					
				12.0			Continued as Cored Drill Hole					
				13.0								
				14.0								
				15.0								

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition	
Water		U ₅₀ 50mm Diameter tube sample		VS	Very Soft	<25	D	Dry
Water Level (Date and time shown)		CBR Bulk sample for CBR testing		S	Soft	25 - 50	M	Moist
Water Inflow		E Environmental sample (Glass jar, sealed and chilled on site)		F	Firm	50 - 100	W	Wet
Water Outflow		ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)		St	Stiff	100 - 200	W _p	Plastic Limit
Strata Changes		B Bulk Sample		VSt	Very Stiff	200 - 400	W _L	Liquid Limit
Gradational or transitional strata		Field Tests		H	Hard	>400		
Definitive or distinct strata change		PID Photoionisation detector reading (ppm)		Fb	Friable			
		DCP(x-y) Dynamic penetrometer test (test depth interval shown)		Density	V	Very Loose	Density Index <15%	
		HP Hand Penetrometer test (UCS kPa)			L	Loose	Density Index 15 - 35%	
					MD	Medium Dense	Density Index 35 - 65%	
					D	Dense	Density Index 65 - 85%	
					VD	Very Dense	Density Index 85 - 100%	



ENGINEERING LOG - CORED BOREHOLE

BOREHOLE NO: BH8
PAGE: 3 OF 3
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 19/4/12

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

DRILL TYPE: **SURFACE RL:**
BOREHOLE DIAMETER: 100 mm **DATUM:** AHD

Drilling and Sampling					Material description and profile information				Testing		Rock Mass Defects		
METHOD	WATER	CORE LIFT / TEST	RL (m)	DEPTH (m)	GRAPHIC LOG	Material Description: Rock type, particle characteristics, colour, minor components, structure	WEATHERING	ESTIMATED STRENGTH	$I_{s(50)}$ D/A	RQD %	Defect Spacing mm	Defect Description: Type, inclination, planarity, roughness, coating, thickness	
				9.0									
				10.0									
				11.0									
				12.0		START CORING AT 12.00m							
NMLC				13.0		Interbedded siltstone and sandstone fine Siltstone is dark grey, Sandstone is pale grey, bedded at 0° to 10°	SW	L - M	A=0.37 				



ENGINEERING LOG - BOREHOLE

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

BOREHOLE NO: BH9
PAGE: 1 OF 1
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 19/4/12

DRILL TYPE: Hand AUGER
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
HA				0.00		SP	0.10m Topsoil: Silty Sand, fine to medium dark grey contains rootlets	M				0.00: TOPSOIL: GRASSED 0.10: ALLUVIAL
				0.70			Silty Sand: Fine to medium dark grey	M	VL			
				1.00			Sand: medium to coarse grey	W	L			
				4.00			Hole Terminated at 4.00 m					

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition	
Water		U ₅₀ 50mm Diameter tube sample		VS	Very Soft	<25	D	Dry
Water Level (Date and time shown)		CBR Bulk sample for CBR testing		S	Soft	25 - 50	M	Moist
Water Inflow		E Environmental sample (Glass jar, sealed and chilled on site)		F	Firm	50 - 100	W	Wet
Water Outflow		ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)		St	Stiff	100 - 200	W _p	Plastic Limit
Strata Changes		B Bulk Sample		VSt	Very Stiff	200 - 400	W _L	Liquid Limit
Gradational or transitional strata		Field Tests		H	Hard	>400		
Definitive or distinct strata change		PID Photoionisation detector reading (ppm)		Fb	Friable			
		DCP(x-y) Dynamic penetrometer test (test depth interval shown)		Density	V	Very Loose	Density Index <15%	
		HP Hand Penetrometer test (UCS kPa)			L	Loose	Density Index 15 - 35%	
					MD	Medium Dense	Density Index 35 - 65%	
					D	Dense	Density Index 65 - 85%	
					VD	Very Dense	Density Index 85 - 100%	



ENGINEERING LOG - TEST PIT

CLIENT: KML Joint Venture
PROJECT NAME: Proposed Multi-Storey Development
LOCATION: Refer to Figure 1

TEST PIT NO: TP1
PAGE: 1 OF 1
JOB NO: RGS1385.1
LOGGED BY: AH
DATE: 19/4/12

EQUIPMENT TYPE: Hand Excavator
TEST PIT LENGTH: 0.5 m
WIDTH: 0.5 m
SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
SHOVEL	(None encountered)						0.30m TOPSOIL: Silty Sand, fine to medium grained, dark grey contains rootlets	M				0.00: TOPSOIL: GRASSED
							0.80m Silty Sand: Fine to medium grained dark grey	M	VL - L			0.30: ALLUVIAL
				1.0			Hole Terminated at 0.80 m					
				2.0								
				3.0								
				4.0								
				5.0								
				6.0								
				7.0								

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition	
Water		U ₅₀ 50mm Diameter tube sample		VS	Very Soft	<25	D	Dry
Water Level (Date and time shown)		CBR Bulk sample for CBR testing		S	Soft	25 - 50	M	Moist
Water Inflow		E Environmental sample (Glass jar, sealed and chilled on site)		F	Firm	50 - 100	W	Wet
Water Outflow		ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)		St	Stiff	100 - 200	W _p	Plastic Limit
Strata Changes		B Bulk Sample		VSt	Very Stiff	200 - 400	W _L	Liquid Limit
Gradational or transitional strata		Field Tests		H	Hard	>400		
Definitive or distinct strata change		PID Photoionisation detector reading (ppm)		Fb	Friable			
		DCP(x-y) Dynamic penetrometer test (test depth interval shown)		Density		V	Very Loose	Density Index <15%
		HP Hand Penetrometer test (UCS kPa)				L	Loose	Density Index 15 - 35%
						MD	Medium Dense	Density Index 35 - 65%
						D	Dense	Density Index 65 - 85%
						VD	Very Dense	Density Index 85 - 100%



Appendix B

Laboratory Test results

***Note:** *Project number on laboratory results is based on a previous internal RGS project number.*

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: ES1209295	Page	: 1 of 18
Client	: REGIONAL GEOTECHNICAL SOLUTION	Laboratory	: Environmental Division Sydney
Contact	: MR STEVE MORTON	Contact	: Client Services
Address	: 5/97 ISABELLA STREET WINGHAM NSW, AUSTRALIA 2429	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: steve.m@regionalgeotech.com.au	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 6553 5641	Telephone	: +61-2-8784 8555
Facsimile	: ---	Facsimile	: +61-2-8784 8500
Project	: RGS00372 1	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ---	Date Samples Received	: 19-APR-2012
C-O-C number	: ---	Issue Date	: 30-APR-2012
Sampler	: ---	No. of samples received	: 24
Site	: ---	No. of samples analysed	: 16
Quote number	: SY/395/10		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results
- Surrogate Control Limits



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Evie Sidarta	Inorganic Chemist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics
Peter Rennie	Team Leader - Asbestos	Newcastle
Raymond Commodor	Instrument Chemist	Sydney Inorganics



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

- **EA200 Legend for Asbestos Type:**
- **EA200 'Am'** Amosite (brown asbestos)
- **EA200 'Ch'** Chrysotile (white asbestos)
- **EA200 'Cr'** Crocidolite (blue asbestos)
- **EA200 't'** Trace levels
- **EA200 'UMF'** Unknown mineral fibres
- **EA200:** Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- **EA200:** Confirmation by alternative techniques is recommended for samples where unknown mineral fibres are detected. Negative results for vinyl tiles should be confirmed by an independent analytical technique.



Analytical Results

Sub-Matrix: SOIL

Client sample ID

Client sampling date / time

Compound	CAS Number	LOR	Unit	BH1 0.1-0.2	BH2 0.1-0.2	BH2 0.5-0.6	BH3 0.4-0.5	BH4 0.1-0.2
				19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00
				ES1209295-001	ES1209295-002	ES1209295-003	ES1209295-004	ES1209295-005
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	11.0	5.4	8.2	13.4	12.6
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples								
Asbestos Detected	1332-21-4	0.1	g/kg	Yes	----	----	----	No
Asbestos Type	1332-21-4	0.1	--	Am	----	----	----	-
Sample weight (dry)	----	0.01	g	82.7	----	----	----	77.5
APPROVED IDENTIFIER:	----	-	--	P.RENNIE	----	----	----	P.RENNIE
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	13
Cadmium	7440-43-9	1	mg/kg	1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	8	2	<2	<2	15
Copper	7440-50-8	5	mg/kg	21	8	9	<5	20
Lead	7439-92-1	5	mg/kg	309	82	31	18	15
Nickel	7440-02-0	2	mg/kg	3	<2	<2	<2	17
Zinc	7440-66-6	5	mg/kg	395	111	96	28	59
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.10	mg/kg	----	<0.10	----	<0.10	<0.10
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	----	0.68	----	<0.05	<0.05
4,4'-DDE	72-55-9	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
4,4'-DDD	72-54-8	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	----	<0.05	----	<0.05	<0.05



Analytical Results

Sub-Matrix: SOIL

Client sample ID

Client sampling date / time

Compound	CAS Number	LOR	Unit	BH1 0.1-0.2	BH2 0.1-0.2	BH2 0.5-0.6	BH3 0.4-0.5	BH4 0.1-0.2
				19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00
				ES1209295-001	ES1209295-002	ES1209295-003	ES1209295-004	ES1209295-005
EP068A: Organochlorine Pesticides (OC) - Continued								
Endosulfan sulfate	1031-07-8	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
4,4'-DDT	50-29-3	0.2	mg/kg	----	<0.2	----	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	----	<0.2	----	<0.2	<0.2
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Demeton-S-methyl	919-86-8	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Monocrotophos	6923-22-4	0.2	mg/kg	----	<0.2	----	<0.2	<0.2
Dimethoate	60-51-5	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Diazinon	333-41-5	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Parathion-methyl	298-00-0	0.2	mg/kg	----	<0.2	----	<0.2	<0.2
Malathion	121-75-5	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Fenthion	55-38-9	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Chlorpyrifos	2921-88-2	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Parathion	56-38-2	0.2	mg/kg	----	<0.2	----	<0.2	<0.2
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Chlorfenvinphos	470-90-6	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Bromophos-ethyl	4824-78-6	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Fenamiphos	22224-92-6	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Prothiofos	34643-46-4	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Ethion	563-12-2	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Carbophenothion	786-19-6	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
Azinphos Methyl	86-50-0	0.05	mg/kg	----	<0.05	----	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	0.8	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	4.3	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	0.9	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	8.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	8.0	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	2.3	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	2.5	<0.5	<0.5	<0.5	<0.5
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	3.3	<0.5	<0.5	<0.5	<0.5

Sub-Matrix: **SOIL**

Client sample ID

Client sampling date / time

Sub-Matrix: SOIL				Client sample ID	BH1 0.1-0.2	BH2 0.1-0.2	BH2 0.5-0.6	BH3 0.4-0.5	BH4 0.1-0.2
				Client sampling date / time	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00
Compound	CAS Number	LOR	Unit	ES1209295-001	ES1209295-002	ES1209295-003	ES1209295-004	ES1209295-005	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	1.4	<0.5	<0.5	<0.5	<0.5	
Benzo(a)pyrene	50-32-8	0.5	mg/kg	2.3	<0.5	<0.5	<0.5	<0.5	
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	1.4	<0.5	<0.5	<0.5	<0.5	
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	1.9	<0.5	<0.5	<0.5	<0.5	
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	37.6	<0.5	<0.5	<0.5	<0.5	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10	
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50	
C15 - C28 Fraction	----	100	mg/kg	290	220	<100	<100	<100	
C29 - C36 Fraction	----	100	mg/kg	170	130	<100	<100	<100	
^ C10 - C36 Fraction (sum)	----	50	mg/kg	460	350	<50	<50	<50	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft									
C6 - C10 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10	
^ C6 - C10 Fraction minus BTEX (F1)	----	10	mg/kg	<10	<10	<10	<10	<10	
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50	
>C16 - C34 Fraction	----	100	mg/kg	360	270	<100	<100	<100	
>C34 - C40 Fraction	----	100	mg/kg	210	150	<100	<100	<100	
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	570	420	<50	<50	<50	
EP080: BTEX									
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
EP080: BTEXN									
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
^ Total Xylenes	1330-20-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1	
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%	----	88.8	----	98.1	102	
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.1	%	----	92.7	----	86.2	82.8	
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.1	%	----	80.6	----	75.7	83.1	
EP075(SIM)S: Phenolic Compound Surrogates									



Analytical Results

Sub-Matrix: SOIL

Client sample ID

Client sampling date / time

				BH1 0.1-0.2	BH2 0.1-0.2	BH2 0.5-0.6	BH3 0.4-0.5	BH4 0.1-0.2
				19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00
Compound	CAS Number	LOR	Unit	ES1209295-001	ES1209295-002	ES1209295-003	ES1209295-004	ES1209295-005
EP075(SIM)S: Phenolic Compound Surrogates - Continued								
Phenol-d6	13127-88-3	0.1	%	85.8	81.2	76.3	78.3	74.7
2-Chlorophenol-D4	93951-73-6	0.1	%	89.4	81.0	78.6	79.6	77.3
2,4,6-Tribromophenol	118-79-6	0.1	%	84.7	78.5	76.0	81.6	66.9
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	85.8	80.6	77.2	78.2	76.6
Anthracene-d10	1719-06-8	0.1	%	88.1	82.0	79.9	83.6	80.0
4-Terphenyl-d14	1718-51-0	0.1	%	86.8	81.0	78.2	82.2	78.5
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	0.1	%	81.5	85.4	85.8	89.5	78.5
Toluene-D8	2037-26-5	0.1	%	97.6	107	113	103	91.1
4-Bromofluorobenzene	460-00-4	0.1	%	87.5	94.9	98.6	94.1	83.9



Analytical Results

Sub-Matrix: SOIL

Client sample ID

Client sampling date / time

Sub-Matrix: SOIL				Client sample ID	BH4 0.4-0.5	BH5 0.1-0.2	BH5 0.2-0.3	BH5 1.1-1.2	BH6A 0.1-0.2
				Client sampling date / time	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00
Compound	CAS Number	LOR	Unit	ES1209295-006	ES1209295-007	ES1209295-008	ES1209295-009	ES1209295-010	
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%	10.8	19.0	19.6	23.0	18.0	
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples									
Asbestos Detected	1332-21-4	0.1	g/kg	----	----	----	----	No	
Asbestos Type	1332-21-4	0.1	--	----	----	----	----	-	
Sample weight (dry)	----	0.01	g	----	----	----	----	80.4	
APPROVED IDENTIFIER:	----	-	--	----	----	----	----	P.RENNIE	
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	10	
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1	
Chromium	7440-47-3	2	mg/kg	<2	4	4	<2	9	
Copper	7440-50-8	5	mg/kg	7	6	7	<5	18	
Lead	7439-92-1	5	mg/kg	22	268	233	<5	31	
Nickel	7440-02-0	2	mg/kg	<2	<2	<2	<2	8	
Zinc	7440-66-6	5	mg/kg	177	127	112	<5	94	
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.10	mg/kg	----	<0.10	<0.10	----	<0.10	
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg	----	<0.05	<0.05	----	<0.05	
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	<0.05	<0.05	----	<0.05	
beta-BHC	319-85-7	0.05	mg/kg	----	<0.05	<0.05	----	<0.05	
gamma-BHC	58-89-9	0.05	mg/kg	----	<0.05	<0.05	----	<0.05	
delta-BHC	319-86-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05	
Heptachlor	76-44-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05	
Aldrin	309-00-2	0.05	mg/kg	----	<0.05	<0.05	----	<0.05	
Heptachlor epoxide	1024-57-3	0.05	mg/kg	----	0.19	0.21	----	<0.05	
trans-Chlordane	5103-74-2	0.05	mg/kg	----	0.13	0.23	----	<0.05	
alpha-Endosulfan	959-98-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05	
cis-Chlordane	5103-71-9	0.05	mg/kg	----	0.14	0.22	----	<0.05	
Dieldrin	60-57-1	0.05	mg/kg	----	<0.05	<0.05	----	<0.05	
4,4'-DDE	72-55-9	0.05	mg/kg	----	<0.05	<0.05	----	<0.05	
Endrin	72-20-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05	
beta-Endosulfan	33213-65-9	0.05	mg/kg	----	<0.05	<0.05	----	<0.05	
4,4'-DDD	72-54-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05	
Endrin aldehyde	7421-93-4	0.05	mg/kg	----	<0.05	<0.05	----	<0.05	



Analytical Results

Sub-Matrix: SOIL

Client sample ID

Client sampling date / time

Compound	CAS Number	LOR	Unit	BH4 0.4-0.5	BH5 0.1-0.2	BH5 0.2-0.3	BH5 1.1-1.2	BH6A 0.1-0.2
				19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00
				ES1209295-006	ES1209295-007	ES1209295-008	ES1209295-009	ES1209295-010
EP068A: Organochlorine Pesticides (OC) - Continued								
Endosulfan sulfate	1031-07-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
4,4'-DDT	50-29-3	0.2	mg/kg	----	<0.2	<0.2	----	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	----	<0.2	<0.2	----	<0.2
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Demeton-S-methyl	919-86-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Monocrotophos	6923-22-4	0.2	mg/kg	----	<0.2	<0.2	----	<0.2
Dimethoate	60-51-5	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Diazinon	333-41-5	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Parathion-methyl	298-00-0	0.2	mg/kg	----	<0.2	<0.2	----	<0.2
Malathion	121-75-5	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Fenthion	55-38-9	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Chlorpyrifos	2921-88-2	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Parathion	56-38-2	0.2	mg/kg	----	<0.2	<0.2	----	<0.2
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Chlorfenvinphos	470-90-6	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Bromophos-ethyl	4824-78-6	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Fenamiphos	22224-92-6	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Prothiofos	34643-46-4	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Ethion	563-12-2	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Carbophenothion	786-19-6	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Azinphos Methyl	86-50-0	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	0.6	0.5	<0.5	0.6
Pyrene	129-00-0	0.5	mg/kg	<0.5	0.5	0.5	<0.5	0.6
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Sub-Matrix: **SOIL**

Client sample ID

Client sampling date / time

Sub-Matrix: SOIL				Client sample ID	BH4 0.4-0.5	BH5 0.1-0.2	BH5 0.2-0.3	BH5 1.1-1.2	BH6A 0.1-0.2
				Client sampling date / time	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00
Compound	CAS Number	LOR	Unit	ES1209295-006	ES1209295-007	ES1209295-008	ES1209295-009	ES1209295-010	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	1.1	1.0	<0.5	1.2	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10	
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50	
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100	
C29 - C36 Fraction	----	100	mg/kg	<100	110	270	<100	<100	
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	110	270	<50	<50	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft									
C6 - C10 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10	
^ C6 - C10 Fraction minus BTEX (F1)	----	10	mg/kg	<10	<10	<10	<10	<10	
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50	
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	120	<100	<100	
>C34 - C40 Fraction	----	100	mg/kg	<100	160	430	<100	<100	
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	160	550	<50	<50	
EP080: BTEX									
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
EP080: BTEXN									
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
^ Total Xylenes	1330-20-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1	
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%	----	95.6	101	----	92.2	
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.1	%	----	89.7	91.9	----	87.9	
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.1	%	----	67.2	71.9	----	61.6	
EP075(SIM)S: Phenolic Compound Surrogates									



Analytical Results

Sub-Matrix: SOIL

Client sample ID

Client sampling date / time

				BH4 0.4-0.5	BH5 0.1-0.2	BH5 0.2-0.3	BH5 1.1-1.2	BH6A 0.1-0.2
				19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00
Compound	CAS Number	LOR	Unit	ES1209295-006	ES1209295-007	ES1209295-008	ES1209295-009	ES1209295-010
EP075(SIM)S: Phenolic Compound Surrogates - Continued								
Phenol-d6	13127-88-3	0.1	%	78.6	100	103	96.6	95.1
2-Chlorophenol-D4	93951-73-6	0.1	%	79.6	97.3	100	92.5	90.3
2,4,6-Tribromophenol	118-79-6	0.1	%	76.1	93.4	96.3	77.6	73.6
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	79.1	98.4	108	91.7	93.2
Anthracene-d10	1719-06-8	0.1	%	82.3	101	111	104	98.7
4-Terphenyl-d14	1718-51-0	0.1	%	80.6	100	106	93.9	93.5
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	0.1	%	83.1	80.5	86.3	79.9	80.0
Toluene-D8	2037-26-5	0.1	%	100	105	95.3	91.8	100
4-Bromofluorobenzene	460-00-4	0.1	%	90.8	85.5	93.2	81.6	86.8



Analytical Results

Sub-Matrix: SOIL

Client sample ID

Client sampling date / time

Compound	CAS Number	LOR	Unit	BH6A 0.2-0.3	BH7 0.15-0.25	BH7 0.35-0.45	BH7 0.25-0.35	BH8 0.15-0.25
				19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00
				ES1209295-011	ES1209295-012	ES1209295-013	ES1209295-014	ES1209295-015
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	----	17.8	17.1	15.1	9.6
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples								
Asbestos Detected	1332-21-4	0.1	g/kg	No	No	----	----	No
Asbestos Type	1332-21-4	0.1	--	-	-	----	----	-
Sample weight (dry)	----	0.01	g	33.3	98.1	----	----	119
APPROVED IDENTIFIER:	----	-	--	P.RENNIE	P.RENNIE	----	----	P.RENNIE
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	----	8	11	8	12
Cadmium	7440-43-9	1	mg/kg	----	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	----	6	9	7	11
Copper	7440-50-8	5	mg/kg	----	10	16	25	18
Lead	7439-92-1	5	mg/kg	----	7	8	103	26
Nickel	7440-02-0	2	mg/kg	----	8	12	8	25
Zinc	7440-66-6	5	mg/kg	----	27	41	144	50
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	----	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.10	mg/kg	----	----	<0.10	<0.10	<0.10
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
4,4'-DDE	72-55-9	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
4,4'-DDD	72-54-8	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	----	----	<0.05	<0.05	<0.05



Analytical Results

Sub-Matrix: SOIL

Client sample ID

Client sampling date / time

Compound	CAS Number	LOR	Unit	BH6A 0.2-0.3	BH7 0.15-0.25	BH7 0.35-0.45	BH7 0.25-0.35	BH8 0.15-0.25
				19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00
				ES1209295-011	ES1209295-012	ES1209295-013	ES1209295-014	ES1209295-015
EP068A: Organochlorine Pesticides (OC) - Continued								
Endosulfan sulfate	1031-07-8	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
4,4'-DDT	50-29-3	0.2	mg/kg	----	----	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	----	----	<0.2	<0.2	<0.2
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Demeton-S-methyl	919-86-8	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Monocrotophos	6923-22-4	0.2	mg/kg	----	----	<0.2	<0.2	<0.2
Dimethoate	60-51-5	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Diazinon	333-41-5	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Parathion-methyl	298-00-0	0.2	mg/kg	----	----	<0.2	<0.2	<0.2
Malathion	121-75-5	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Fenthion	55-38-9	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Chlorpyrifos	2921-88-2	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Parathion	56-38-2	0.2	mg/kg	----	----	<0.2	<0.2	<0.2
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Chlorfenvinphos	470-90-6	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Bromophos-ethyl	4824-78-6	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Fenamiphos	22224-92-6	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Prothiofos	34643-46-4	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Ethion	563-12-2	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Carbophenothion	786-19-6	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Azinphos Methyl	86-50-0	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	----	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	----	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	----	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	----	<0.5	<0.5	0.9	<0.5
Anthracene	120-12-7	0.5	mg/kg	----	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	----	<0.5	<0.5	2.1	<0.5
Pyrene	129-00-0	0.5	mg/kg	----	<0.5	<0.5	2.4	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	<0.5	<0.5	0.6	<0.5
Chrysene	218-01-9	0.5	mg/kg	----	<0.5	<0.5	0.6	<0.5
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	----	<0.5	<0.5	0.8	<0.5

Sub-Matrix: **SOIL**

Client sample ID

Client sampling date / time

Sub-Matrix: SOIL				Client sample ID	BH6A 0.2-0.3	BH7 0.15-0.25	BH7 0.35-0.45	BH7 0.25-0.35	BH8 0.15-0.25
				Client sampling date / time	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00
Compound	CAS Number	LOR	Unit	ES1209295-011	ES1209295-012	ES1209295-013	ES1209295-014	ES1209295-015	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	<0.5	<0.5	<0.5	<0.5	
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	<0.5	<0.5	<0.5	<0.5	
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	<0.5	<0.5	<0.5	<0.5	
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	<0.5	<0.5	<0.5	<0.5	
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	<0.5	<0.5	<0.5	<0.5	
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	----	<0.5	<0.5	7.4	<0.5	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg	----	<10	<10	<10	<10	
C10 - C14 Fraction	----	50	mg/kg	----	<50	<50	<50	<50	
C15 - C28 Fraction	----	100	mg/kg	----	<100	<100	<100	<100	
C29 - C36 Fraction	----	100	mg/kg	----	<100	<100	<100	<100	
^ C10 - C36 Fraction (sum)	----	50	mg/kg	----	<50	<50	<50	<50	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft									
C6 - C10 Fraction	----	10	mg/kg	----	<10	<10	<10	<10	
^ C6 - C10 Fraction minus BTEX (F1)	----	10	mg/kg	----	<10	<10	<10	<10	
>C10 - C16 Fraction	----	50	mg/kg	----	<50	<50	<50	<50	
>C16 - C34 Fraction	----	100	mg/kg	----	<100	<100	<100	<100	
>C34 - C40 Fraction	----	100	mg/kg	----	<100	<100	<100	<100	
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	----	<50	<50	<50	<50	
EP080: BTEX									
Benzene	71-43-2	0.2	mg/kg	----	<0.2	<0.2	<0.2	<0.2	
Toluene	108-88-3	0.5	mg/kg	----	<0.5	<0.5	<0.5	<0.5	
Ethylbenzene	100-41-4	0.5	mg/kg	----	<0.5	<0.5	<0.5	<0.5	
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	----	<0.5	<0.5	<0.5	<0.5	
ortho-Xylene	95-47-6	0.5	mg/kg	----	<0.5	<0.5	<0.5	<0.5	
EP080: BTEXN									
^ Sum of BTEX	----	0.2	mg/kg	----	<0.2	<0.2	<0.2	<0.2	
^ Total Xylenes	1330-20-7	0.5	mg/kg	----	<0.5	<0.5	<0.5	<0.5	
Naphthalene	91-20-3	1	mg/kg	----	<1	<1	<1	<1	
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%	----	----	99.1	124	89.7	
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.1	%	----	----	83.1	124	81.0	
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.1	%	----	----	66.6	60.8	56.2	
EP075(SIM)S: Phenolic Compound Surrogates									



Analytical Results

Sub-Matrix: SOIL

Client sample ID

Client sampling date / time

				BH6A 0.2-0.3	BH7 0.15-0.25	BH7 0.35-0.45	BH7 0.25-0.35	BH8 0.15-0.25
				19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00	19-APR-2012 15:00
Compound	CAS Number	LOR	Unit	ES1209295-011	ES1209295-012	ES1209295-013	ES1209295-014	ES1209295-015
EP075(SIM)S: Phenolic Compound Surrogates - Continued								
Phenol-d6	13127-88-3	0.1	%	----	98.2	95.4	84.1	94.7
2-Chlorophenol-D4	93951-73-6	0.1	%	----	92.7	90.2	93.0	89.9
2,4,6-Tribromophenol	118-79-6	0.1	%	----	76.0	72.2	53.1	65.1
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	----	95.9	95.0	101	93.4
Anthracene-d10	1719-06-8	0.1	%	----	98.0	99.2	111	97.3
4-Terphenyl-d14	1718-51-0	0.1	%	----	97.0	93.9	114	91.9
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	0.1	%	----	88.0	87.2	90.0	82.9
Toluene-D8	2037-26-5	0.1	%	----	96.7	94.2	99.3	103
4-Bromofluorobenzene	460-00-4	0.1	%	----	91.1	88.9	105	92.2

Sub-Matrix: **SOIL**

Client sample ID

Client sampling date / time

Sub-Matrix: SOIL				Client sample ID	BH8 0.5-0.6	----	----	----	----
				Client sampling date / time	19-APR-2012 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1209295-016	----	----	----	----	
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%	6.9	----	----	----	----	
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg	<5	----	----	----	----	
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----	
Chromium	7440-47-3	2	mg/kg	3	----	----	----	----	
Copper	7440-50-8	5	mg/kg	<5	----	----	----	----	
Lead	7439-92-1	5	mg/kg	15	----	----	----	----	
Nickel	7440-02-0	2	mg/kg	3	----	----	----	----	
Zinc	7440-66-6	5	mg/kg	24	----	----	----	----	
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	----	----	----	
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	----	----	----	
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	----	----	----	
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	----	----	----	
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	----	----	----	
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	----	----	----	
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	----	----	----	----	
Pyrene	129-00-0	0.5	mg/kg	<0.5	----	----	----	----	
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	----	----	----	
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	----	----	----	
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	----	----	----	----	
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	----	----	----	
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	----	----	----	
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	----	----	----	----	
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	----	----	----	
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	----	----	----	----	
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	----	----	----	----	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	----	----	
C10 - C14 Fraction	----	50	mg/kg	<50	----	----	----	----	
C15 - C28 Fraction	----	100	mg/kg	<100	----	----	----	----	
C29 - C36 Fraction	----	100	mg/kg	<100	----	----	----	----	
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft									



Analytical Results

Sub-Matrix: **SOIL**

Client sample ID

BH8 0.5-0.6

Client sampling date / time

19-APR-2012 15:00

Compound	CAS Number	LOR	Unit	ES1209295-016	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft - Continued								
C6 - C10 Fraction	----	10	mg/kg	<10	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	----	10	mg/kg	<10	----	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	----	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEX								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	----	----	----	----
EP080: BTEXN								
^ Sum of BTEX	----	0.2	mg/kg	<0.2	----	----	----	----
^ Total Xylenes	1330-20-7	0.5	mg/kg	<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	96.3	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	90.7	----	----	----	----
2,4,6-Tribromophenol	118-79-6	0.1	%	62.6	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	95.8	----	----	----	----
Anthracene-d10	1719-06-8	0.1	%	99.3	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	93.2	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	0.1	%	111	----	----	----	----
Toluene-D8	2037-26-5	0.1	%	114	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	103	----	----	----	----



Analytical Results

Descriptive Results

Sub-Matrix: SOIL		
Method: <i>Compound</i>	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples		
EA200: Description	BH1 0.1-0.2 - 19-APR-2012 15:00	Dark brown sandy soil with some coal grains plus some vegetation and one small friable asbestos fibre bundle
EA200: Description	BH4 0.1-0.2 - 19-APR-2012 15:00	Mid brown clay soil with some small red rocks plus some quartz and coal grains and a trace of vegetation
EA200: Description	BH6A 0.1-0.2 - 19-APR-2012 15:00	Mid brown clay soil with some small grey rocks plus some quartz grains and a trace of vegetation
EA200: Description	BH6A 0.2-0.3 - 19-APR-2012 15:00	Pale grey soil with some small grey rocks and a trace of vegetation
EA200: Description	BH7 0.15-0.25 - 19-APR-2012 15:00	Pale brown clay soil with some small grey rocks and some vegetation
EA200: Description	BH8 0.15-0.25 - 19-APR-2012 15:00	Pale brown clay soil with some small grey rocks and some vegetation



Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	30.8	155.7
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	19.5	167.0
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	22.7	163.5
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	56.3	133.3
2-Chlorophenol-D4	93951-73-6	53.8	133.8
2,4,6-Tribromophenol	118-79-6	23.1	134.9
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	58.9	132.7
Anthracene-d10	1719-06-8	55.0	137.6
4-Terphenyl-d14	1718-51-0	54.0	147.8
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	72.8	133.2
Toluene-D8	2037-26-5	73.9	132.1
4-Bromofluorobenzene	460-00-4	71.6	130.0

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: ES1209295	Page	: 1 of 7
Client	: REGIONAL GEOTECHNICAL SOLUTION	Laboratory	: Environmental Division Sydney
Contact	: MR STEVE MORTON	Contact	: Client Services
Address	: 5/97 ISABELLA STREET WINGHAM NSW, AUSTRALIA 2429	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: steve.m@regionalgeotech.com.au	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 6553 5641	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: RGS00372 1	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----	Date Samples Received	: 19-APR-2012
C-O-C number	: ----	Issue Date	: 30-APR-2012
Sampler	: ----	No. of samples received	: 24
Order number	: ----	No. of samples analysed	: 16
Quote number	: SY/395/10		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers



Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non-volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **SOIL**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content							
Soil Glass Jar - Unpreserved (EA055-103) BH1 0.1-0.2, BH2 0.5-0.6, BH4 0.1-0.2, BH5 0.1-0.2, BH5 1.1-1.2, BH7 0.15-0.25, BH8 0.15-0.25, BH2 0.1-0.2, BH3 0.4-0.5, BH4 0.4-0.5, BH5 0.2-0.3, BH6A 0.1-0.2, BH7 0.35-0.45, BH8 0.5-0.6	19-APR-2012	----	----	----	24-APR-2012	03-MAY-2012	✓
Soil Glass Jar - Unpreserved (EA055-103) BH7 0.25-0.35	19-APR-2012	----	----	----	27-APR-2012	03-MAY-2012	✓
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples							
Snap Lock Bag (EA200) BH1 0.1-0.2, BH6A 0.1-0.2, BH7 0.15-0.25, BH4 0.1-0.2, BH6A 0.2-0.3, BH8 0.15-0.25	19-APR-2012	---	16-OCT-2012	----	27-APR-2012	24-OCT-2012	✓
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T) BH1 0.1-0.2, BH2 0.5-0.6, BH4 0.1-0.2, BH5 0.1-0.2, BH5 1.1-1.2, BH7 0.15-0.25, BH8 0.15-0.25, BH2 0.1-0.2, BH3 0.4-0.5, BH4 0.4-0.5, BH5 0.2-0.3, BH6A 0.1-0.2, BH7 0.35-0.45, BH8 0.5-0.6	19-APR-2012	24-APR-2012	16-OCT-2012	✓	26-APR-2012	16-OCT-2012	✓
Soil Glass Jar - Unpreserved (EG005T) BH7 0.25-0.35	19-APR-2012	30-APR-2012	16-OCT-2012	✓	30-APR-2012	16-OCT-2012	✓

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T) BH1 0.1-0.2, BH2 0.5-0.6, BH4 0.1-0.2, BH5 0.1-0.2, BH5 1.1-1.2, BH7 0.15-0.25, BH8 0.15-0.25,	BH2 0.1-0.2, BH3 0.4-0.5, BH4 0.4-0.5, BH5 0.2-0.3, BH6A 0.1-0.2, BH7 0.35-0.45, BH8 0.5-0.6	19-APR-2012	24-APR-2012	17-MAY-2012	✓	26-APR-2012	17-MAY-2012	✓
Soil Glass Jar - Unpreserved (EG035T) BH7 0.25-0.35		19-APR-2012	30-APR-2012	17-MAY-2012	✓	30-APR-2012	17-MAY-2012	✓
EP066: Polychlorinated Biphenyls (PCB)								
Soil Glass Jar - Unpreserved (EP066) BH2 0.1-0.2, BH4 0.1-0.2, BH5 0.2-0.3, BH7 0.35-0.45,	BH3 0.4-0.5, BH5 0.1-0.2, BH6A 0.1-0.2, BH8 0.15-0.25	19-APR-2012	24-APR-2012	03-MAY-2012	✓	27-APR-2012	03-JUN-2012	✓
Soil Glass Jar - Unpreserved (EP066) BH7 0.25-0.35		19-APR-2012	27-APR-2012	03-MAY-2012	✓	27-APR-2012	06-JUN-2012	✓
EP068A: Organochlorine Pesticides (OC)								
Soil Glass Jar - Unpreserved (EP068) BH2 0.1-0.2, BH4 0.1-0.2, BH5 0.2-0.3, BH7 0.35-0.45,	BH3 0.4-0.5, BH5 0.1-0.2, BH6A 0.1-0.2, BH8 0.15-0.25	19-APR-2012	24-APR-2012	03-MAY-2012	✓	27-APR-2012	03-JUN-2012	✓
Soil Glass Jar - Unpreserved (EP068) BH7 0.25-0.35		19-APR-2012	27-APR-2012	03-MAY-2012	✓	27-APR-2012	06-JUN-2012	✓
EP068B: Organophosphorus Pesticides (OP)								
Soil Glass Jar - Unpreserved (EP068) BH2 0.1-0.2, BH4 0.1-0.2, BH5 0.2-0.3, BH7 0.35-0.45,	BH3 0.4-0.5, BH5 0.1-0.2, BH6A 0.1-0.2, BH8 0.15-0.25	19-APR-2012	24-APR-2012	03-MAY-2012	✓	27-APR-2012	03-JUN-2012	✓
Soil Glass Jar - Unpreserved (EP068) BH7 0.25-0.35		19-APR-2012	27-APR-2012	03-MAY-2012	✓	27-APR-2012	06-JUN-2012	✓
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP071) BH1 0.1-0.2, BH2 0.5-0.6, BH4 0.1-0.2,	BH2 0.1-0.2, BH3 0.4-0.5, BH4 0.4-0.5	19-APR-2012	24-APR-2012	03-MAY-2012	✓	26-APR-2012	03-JUN-2012	✓
Soil Glass Jar - Unpreserved (EP071) BH5 0.1-0.2, BH5 1.1-1.2, BH7 0.15-0.25, BH8 0.15-0.25,	BH5 0.2-0.3, BH6A 0.1-0.2, BH7 0.35-0.45, BH8 0.5-0.6	19-APR-2012	26-APR-2012	03-MAY-2012	✓	26-APR-2012	05-JUN-2012	✓
Soil Glass Jar - Unpreserved (EP071) BH7 0.25-0.35		19-APR-2012	27-APR-2012	03-MAY-2012	✓	28-APR-2012	06-JUN-2012	✓



Matrix: **SOIL**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM)) BH1 0.1-0.2, BH2 0.5-0.6, BH4 0.1-0.2,	BH2 0.1-0.2, BH3 0.4-0.5, BH4 0.4-0.5	19-APR-2012	24-APR-2012	03-MAY-2012	✓	26-APR-2012	03-JUN-2012	✓
Soil Glass Jar - Unpreserved (EP075(SIM)) BH5 0.1-0.2, BH5 1.1-1.2, BH7 0.15-0.25, BH8 0.15-0.25,	BH5 0.2-0.3, BH6A 0.1-0.2, BH7 0.35-0.45, BH8 0.5-0.6	19-APR-2012	26-APR-2012	03-MAY-2012	✓	26-APR-2012	05-JUN-2012	✓
Soil Glass Jar - Unpreserved (EP075(SIM)) BH7 0.25-0.35		19-APR-2012	27-APR-2012	03-MAY-2012	✓	27-APR-2012	06-JUN-2012	✓
EP080: BTEX								
Soil Glass Jar - Unpreserved (EP080) BH1 0.1-0.2, BH2 0.5-0.6, BH4 0.1-0.2, BH5 0.1-0.2, BH5 1.1-1.2, BH7 0.15-0.25, BH8 0.15-0.25,	BH2 0.1-0.2, BH3 0.4-0.5, BH4 0.4-0.5, BH5 0.2-0.3, BH6A 0.1-0.2, BH7 0.35-0.45, BH8 0.5-0.6	19-APR-2012	24-APR-2012	03-MAY-2012	✓	26-APR-2012	03-MAY-2012	✓
Soil Glass Jar - Unpreserved (EP080) BH7 0.25-0.35		19-APR-2012	27-APR-2012	03-MAY-2012	✓	27-APR-2012	03-MAY-2012	✓
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080) BH1 0.1-0.2, BH2 0.5-0.6, BH4 0.1-0.2, BH5 0.1-0.2, BH5 1.1-1.2, BH7 0.15-0.25, BH8 0.15-0.25,	BH2 0.1-0.2, BH3 0.4-0.5, BH4 0.4-0.5, BH5 0.2-0.3, BH6A 0.1-0.2, BH7 0.35-0.45, BH8 0.5-0.6	19-APR-2012	24-APR-2012	03-MAY-2012	✓	26-APR-2012	03-MAY-2012	✓
Soil Glass Jar - Unpreserved (EP080) BH7 0.25-0.35		19-APR-2012	27-APR-2012	03-MAY-2012	✓	27-APR-2012	03-MAY-2012	✓
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP080) BH1 0.1-0.2, BH2 0.5-0.6, BH4 0.1-0.2, BH5 0.1-0.2, BH5 1.1-1.2, BH7 0.15-0.25, BH8 0.15-0.25,	BH2 0.1-0.2, BH3 0.4-0.5, BH4 0.4-0.5, BH5 0.2-0.3, BH6A 0.1-0.2, BH7 0.35-0.45, BH8 0.5-0.6	19-APR-2012	24-APR-2012	03-MAY-2012	✓	26-APR-2012	03-MAY-2012	✓
Soil Glass Jar - Unpreserved (EP080) BH7 0.25-0.35		19-APR-2012	27-APR-2012	03-MAY-2012	✓	27-APR-2012	03-MAY-2012	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: * = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Moisture Content	EA055-103	2	16	12.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	5	34	14.7	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	2	9	22.2	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	2	9	22.2	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	3	22	13.6	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	3	22	13.6	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	5	34	14.7	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	3	15	20.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	3	34	8.8	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	2	9	22.2	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	2	9	22.2	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	22	9.1	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	22	9.1	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	3	34	8.8	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	15	13.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	3	34	8.8	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	2	9	22.2	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	2	9	22.2	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	22	9.1	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	22	9.1	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	3	34	8.8	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	15	13.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	3	34	8.8	5.0	✓	ALS QCS3 requirement
Pesticides by GCMS	EP068	2	9	22.2	5.0	✓	ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	2	9	22.2	5.0	✓	ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	22	9.1	5.0	✓	ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	22	9.1	5.0	✓	ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	3	34	8.8	5.0	✓	ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	15	13.3	5.0	✓	ALS QCS3 requirement



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055-103	SOIL	A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2010 Draft) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Asbestos Identification in bulk solids	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples
Total Metals by ICP-AES	EG005T	SOIL	(APHA 21st ed., 3120; USEPA SW 846 - 6010) (ICPAES) Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (1999) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 504)
Pesticides by GCMS	EP068	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM (1999) Schedule B(3) (Method 504,505)
TPH - Semivolatile Fraction	EP071	SOIL	(USEPA SW 846 - 8015A) Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C36. This method is compliant with NEPM (1999) Schedule B(3) (Method 506.1)
PAH/Phenols (SIM)	EP075(SIM)	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 502 and 507)
TPH Volatiles/BTEX	EP080	SOIL	(USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 501)

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	USEPA 200.2 Mod. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (1999) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	* ORG16	SOIL	(USEPA SW 846 - 5030A) 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids (Option A - Concentrating)	ORG17A	SOIL	In-house, Mechanical agitation (tumbler). 20g of sample, Na ₂ SO ₄ and surrogate are extracted with 150mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Tumbler Extraction of Solids (Option B - Non-concentrating)	ORG17B	SOIL	In-house, Mechanical agitation (tumbler). 10g of sample, Na ₂ SO ₄ and surrogate are extracted with 20mL 1:1 DCM/Acetone by end over end tumble. The solvent is transferred directly to a GC vial for analysis.



Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: SOIL

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	ES1209295-001	BH1 0.1-0.2	Sum of polycyclic aromatic hydrocarbons	----	34.3 %	0-20%	RPD exceeds LOR based limits

- For all matrices, no Method Blank value outliers occur.
- For all matrices, no Laboratory Control outliers occur.
- For all matrices, no Matrix Spike outliers occur.

Regular Sample Surrogates

- For all regular sample matrices, no surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- No Quality Control Sample Frequency Outliers exist.

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : ES1209295

Client	: REGIONAL GEOTECHNICAL SOLUTION	Laboratory	: Environmental Division Sydney
Contact	: MR STEVE MORTON	Contact	: Client Services
Address	: 5/97 ISABELLA STREET WINGHAM NSW, AUSTRALIA 2429	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: steve.m@regionalgeotech.com.au	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 6553 5641	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: RGS00372 1	Page	: 1 of 3
Order number	: ----	Quote number	: ES2010REGGEO0001 (SY/395/10)
C-O-C number	: ----	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
Sampler	: ----		

Dates

Date Samples Received	: 19-APR-2012	Issue Date	: 25-APR-2012 14:21
Client Requested Due Date	: 30-APR-2012	Scheduled Reporting Date	: 30-APR-2012

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 14°C - Ice present
No. of coolers/boxes	: 1 HARD	No. of samples received	: 25
Security Seal	: Intact.	No. of samples analysed	: 16

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Asbestos analysis will be conducted by ALS Newcastle.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- **7 additional samples were received and placed on hold.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (60 days) from date of completion of work order.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exist.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default to 15:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory for processing purposes and will be shown bracketed without a time component.

Matrix: SOIL

Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) SOIL No analysis requested	SOIL - EA200 Asbestos Identification in Soils	SOIL - S-16 TPH/BTEX/PAH/OC/OP/PCB/8Metals	SOIL - S-26 8 metals/TPH/BTEX/PAH
ES1209295-001	19-APR-2012 15:00	BH1 0.1-0.2		✓		✓
ES1209295-002	19-APR-2012 15:00	BH2 0.1-0.2			✓	
ES1209295-003	19-APR-2012 15:00	BH2 0.5-0.6				✓
ES1209295-004	19-APR-2012 15:00	BH3 0.4-0.5			✓	
ES1209295-005	19-APR-2012 15:00	BH4 0.1-0.2		✓	✓	
ES1209295-006	19-APR-2012 15:00	BH4 0.4-0.5				✓
ES1209295-007	19-APR-2012 15:00	BH5 0.1-0.2			✓	
ES1209295-008	19-APR-2012 15:00	BH5 0.2-0.3			✓	
ES1209295-009	19-APR-2012 15:00	BH5 1.1-1.2				✓
ES1209295-010	19-APR-2012 15:00	BH6A 0.1-0.2		✓	✓	
ES1209295-011	19-APR-2012 15:00	BH6A 0.2-0.3		✓		
ES1209295-012	19-APR-2012 15:00	BH7 0.15-0.25		✓		✓
ES1209295-013	19-APR-2012 15:00	BH7 0.35-0.45			✓	
ES1209295-014	19-APR-2012 15:00	BH7 0.25-0.35			✓	
ES1209295-015	19-APR-2012 15:00	BH8 0.15-0.25		✓	✓	
ES1209295-016	19-APR-2012 15:00	BH8 0.5-0.6				✓
ES1209295-017	12-APR-2012 15:00	BH2 1.0-1.1	✓			
ES1209295-018	12-APR-2012 15:00	BH2 1.5-1.6	✓			
ES1209295-019	13-APR-2012 15:00	BH3 0.1-0.2	✓			
ES1209295-020	13-APR-2012 15:00	BH3 1.5-1.6	✓			
ES1209295-021	15-APR-2012 15:00	BH4 1.0-1.1	✓			
ES1209295-022	16-APR-2012 15:00	BH5 3.0-3.1	✓			
ES1209295-023	16-APR-2012 15:00	BH5 0.4-0.5	✓			
ES1209295-024	19-APR-2012 15:00	BH7 0.25-0.35	✓			
ES1209295-025	19-APR-2012 15:00	BH7 3.0-3.1	✓			

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.



Requested Deliverables

MR ADAM HOLZHAUSER

- *AU Certificate of Analysis - NATA (COA)
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)
- A4 - AU Tax Invoice (INV)
- Chain of Custody (CoC) (COC)
- EDI Format - ENMRG (ENMRG)

Email	adam.h@regionalgeotech.com.au
Email	adam.h@regionalgeotech.com.au
Email	adam.h@regionalgeotech.com.au
Email	adam.h@regionalgeotech.com.au
Email	adam.h@regionalgeotech.com.au
Email	adam.h@regionalgeotech.com.au
Email	adam.h@regionalgeotech.com.au

MR STEVE MORTON

- *AU Certificate of Analysis - NATA (COA)
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)
- A4 - AU Tax Invoice (INV)
- Chain of Custody (CoC) (COC)

Email	steve.m@regionalgeotech.com.au
Email	steve.m@regionalgeotech.com.au
Email	steve.m@regionalgeotech.com.au
Email	steve.m@regionalgeotech.com.au
Email	steve.m@regionalgeotech.com.au

MR TIM MORRIS

- *AU Certificate of Analysis - NATA (COA)
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)
- A4 - AU Tax Invoice (INV)
- Chain of Custody (CoC) (COC)

Email	tim.morris@regionalgeotech.com.au
Email	tim.morris@regionalgeotech.com.au
Email	tim.morris@regionalgeotech.com.au
Email	tim.morris@regionalgeotech.com.au
Email	tim.morris@regionalgeotech.com.au



CHAIN OF CUSTODY

ALS Laboratory: please tick →

11 Sydney 277 Macleay Rd, Smithfield NSW 2176
Ph: 02 8724 8555 E: samples@sydney.als.com.au
11 Newcastle 5 Beaumont Rd, Wyndbrook NSW 2204
Ph: 02 4966 0733 E: samples@newcastle.als.com.au

11 Brisbane 32 Strand St, Stirling QLD 4053
Ph: 07 3243 7222 E: samples@brisbane.als.com.au
11 Townsville 14-15 Dorrain Ct, Bolnisi QLD 4818
Ph: 07 4766 0600 E: samples@townsville.als.com.au

11 Melbourne 2-4 Wessell Rd, Springvale VIC 3171
Ph: 03 8579 9600 E: samples@melbourne.als.com.au
11 Adelaide 2-1 Bannock Rd, Parafield SA 5094
Ph: 08 8520 0800 E: samples@adelaide.als.com.au

11 Perth 10 Havel Way, Manjimup WA 6090
Ph: 08 9206 7650 E: samples@perth.als.com.au
11 Launceston 27 Vennings St, Launceston TAS 7250
Ph: 03 6331 2544 E: samples@launceston.als.com.au

CLIENT: Regional Geotechnical Solutions PROJECT NO.: RS00372.1 TUNNAROUND REQUIREMENTS: ☒ Standard TAT (last due date): ☐ Non Standard or urgent TAT (last due date):

OFFICE: RS00372.1 PROJECT NO.: RS00372.1 (Standard TAT may be longer for some tests) ☐ Non Standard or urgent TAT (last due date):

ORDER NUMBER: STEVE MORTON PURCHASE ORDER NO.: 04332858578 COUNTRY OF ORIGIN:

SAMPLER: Adam Holtzhausen CONTACT PH: 0413057228 REMARKS: Asbestos RECEIVED BY: AK DATE/TIME: 19/4/12

COC Emailed to ALS? (YES / NO) YES EMD FORM (or default): Asbestos RECEIVED BY: AK DATE/TIME: 17-15

Email Reports to (will default to PM if no other addresses are listed): adam.holtzhausen@regionalgeotech.com.au DATE/TIME: 17-00

Email Invoice to (will default to PM if no other addresses are listed): adrian@regionalgeotech.com.au DATE/TIME: 20/4/12

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Asbestos DATE/TIME: 17-00

distillates, or samples requiring specific QC analysis etc.

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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Environmental Division
Sydney
Work Order

ES1209295



Telephone : +61-2-8784 8555

1062



CHAIN OF CUSTODY

ALS Laboratory: please tick →

11 Sydney 277 Westpoint Rd, Smithfield NSW 2118
Ph: 02 8724 1555 E: samples@regionalced.com
11 Newcastle 3 Rosegum Rd, Waratah NSW 2244
Ph: 02 4958 3133 E: samples@regionalced.com

11 Brisbane 32 Stroud St, Stoney Creek NSW 1585
Ph: 07 2943 7222 E: samples@regionalced.com
11 Townsville 14-15 Denham Ct, Sebrae QLD 4818
Ph: 07 4796 0900 E: team@regionalced.com

11 Melbourne 2-4 Warrall Rd, Springvale VIC 3171
Ph: 03 8249 1666 E: samples@regionalced.com
11 Adelaide 2-1 Spence Rd, Torrensville SA 5036
Ph: 08 8359 0820 E: samples@regionalced.com

11 Perth 10 Havel Way, Midland WA 6150
Ph: 08 9228 7656 E: samples@regionalced.com
11 Lismore 27 Trillingham St, Lismore NSW 2480
Ph: 02 6631 2118 E: samples@regionalced.com

CLIENT: **Regional Ceredical Solutions**

OFFICE:

PROJECT:

ORDER NUMBER:

PROJECT MANAGER:

SAMPLER:

COC

Email Reports to (will default to PM if no other addresses are listed):

Email Invoice to (will default to PM if no other addresses are listed):

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS: ☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.:

COUNTRY OF ORIGIN:

CONTRACT NO.:

SAMPLER MOBILE: 0423057270

EDS FORMAT (or default):

RECEIVED BY: *[Signature]*

DATE/TIME: 19/11/12

REINQUISHED BY:

DATE/TIME:

DATE/TIME:

DATE/TIME:

DATE/TIME:

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FOR LABORATORY USE ONLY (Circle):

Client/Spec Inlet?

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No

No

No

No

No

No

No

No

No

No

No

No

No

No

2012

1062

CHAIN OF CUSTODY

ALS Laboratory: please tick →

- 1.1 Sydney 277 Waverley Rd, Smithfield NSW 2176
Ph 02 8754 8555 E samples@sydney.als.com.au
1.1 Newcastle 5 Rangi Rd, Waratah NSW 2304
Ph 02 4968 0133 E samples@newcastle.als.com.au
1.1 Brisbane 32 Sharn St, Stretton QLD 4052
Ph 07 3243 7222 E samples@brisbane.als.com.au
1.1 Melbourne 24 Pritchard Rd, Springvale VIC 3171
Ph 03 8543 5600 E samples@melbourne.als.com.au
1.1 Perth 10 Hind Way, Malaga WA 6091
Ph 08 9204 7555 E samples@perth.als.com.au
1.1 Johannesburg 2751 Lingson St, Lenasia 7525
Ph 05 6331 2152 E samples@johannesburg.als.com

CLIENT: Regional Geotechnical Solutions
OFFICE: AL500372.1
PROJECT: AL500372.1
ORDER NUMBER: AL500372.1
PROJECT MANAGER: Steve Morton
SAMPLER: Adam Holzhauser
COC Emailed to ALS? (YES / NO)
Email Reports to (will default to PM if no other addresses are listed): adam.holzhauser@regionalgeotech.com.au
Email Invoice to (will default to PM if no other addresses are listed): adam.holzhauser@regionalgeotech.com.au
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS: ☒ Standard TAT (List due date):
☐ Non-Standard or urgent TAT (List due date):
PROJECT NO.: AL500372.1
PURCHASE ORDER NO.:
COUNTRY OF ORIGIN:
CONTACT PH: 0432258578
SAMPLER MOBILE: 0423057278
EDD FORMAT (or default):
RECEIVED BY: Adam Holzhauser
DATE/TIME: 19/4/12 17:15
RELINQUISHED BY: Adam Holzhauser
DATE/TIME: 20/4/12 17:00
RECEIVED BY: HP
DATE/TIME: 20/4/12 17:00

FOR LABORATORY USE ONLY (Circle)
Custody/Seal intact? Yes No
Freezer/Freezer on truck present upon receipt? Yes No
Random Sample Temperature on Receipt: °C
Other comments:

LAB ID	SAMPLE DETAILS		CONTAINER INFORMATION		ANALYSIS REQUIRED INCLUDING SUITES (NB: Suite Codes must be listed to attract suite price)		Additional Information	
	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Where Made are required, specify Total (unfiltered bottle required) or Disposed (field filtered bottle required)	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.	
1	BH1 0.1-0.2					Asbestos	Subcon Forward Lab / Split WO	
2	BH2 0.1-0.2					TMH, BTEX, PAH	Lab / Analysis: New Cont. Asbestos	
3	BH2 0.5-0.6					Site S-16	Organised By / Date: 1-5-11-12-15	
4	BH3 0.4-0.5						Relinquished By / Date: 1-5-11-12-15	
5	BH4 0.1-0.2						Connote / Courier: WO No: 1-5-11-12-15	
6	BH4 0.4-0.5						Attach By PO / Internal Sheet:	
7	BH5 0.1-0.2							
8	BH5 0.2-0.3							
9	BH5 1.1-1.2							
10	BH6A 0.1-0.2							
11	BH6A 0.2-0.3							
12	BH7 0.15-0.25							
TOTAL								

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitro Preserved ORC; SH = Sodium Hydroxide/Cu Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airweight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulfate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airweight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation bottle; SP = Sulfuric Preserved Plastic
Z = Zinc Acetate Preserved Bottle; EI = EDTA Preserved Bottle; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugold Iodine Preserved Bottle; STT = Sterile Sodium Thiosulfate Preserved Bottle.

Environmental Division
Sydney
Work Order
ES1209295



Telephone : + 61-2-8784 8555

2012

CHAIN OF CUSTODY

ALS Laboratory: please tick →

1. Sydney 277 Woodpark Rd. Smallbrook NSW 2176
Ph: 02 8744 1155 E: samples@als.com.au

1. Brisbane 32 Shane St. St Albans QLD 4153
Ph: 07 3245 7222 E: samples@als.com.au

1. Melbourne 241 Wicksall Rd. Springvale VIC 3171
Ph: 03 9593 5600 E: samples@als.com.au

1. Perth 10 Hrd W. Mt. Mudge WA 6050
Ph: 08 9479 7650 E: samples@als.com.au

CLIENT: Regional Technical Solutions

OFFICE: PROJECT NO.: PURCHASE ORDER NO.: COUNTRY OF ORIGIN:

ORDER NUMBER: PROJECT MANAGER: Steve Morton

SAMPLER: Adam Holbease

COO Emailled to ALS? (YES / NO)

Email Reports to (will default to PM if no other addresses are listed): adam.holbease@regionaltechnical.com.au

Email Invoice to (will default to PM if no other addresses are listed): as above

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS: ☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):

Standard TAT may be longer for some tests e.g. Ultra Trace Organics

ALS QUOTE NO.: CONTACT PH: 0432 258 578

SAMPLER MOBILE: 04230 57270

EDD FORMAT (or default): 19-4-12 5:15 PM

RELINQUISHED BY: [Signature]

DATE/TIME: 19/4/12

FOR LABORATORY USE ONLY (Circle)

Container Sealed? Yes No

Free (or frozen) for analysis upon receipt? Yes No

Random Sample Temperature on Receipt °C

On Receipt: 7

RECEIVED BY: [Signature]

DATE/TIME: 19/4/12

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	ANALYSIS REQUIRED INCLUDING SUITES (NB. Suite Codes must be listed to attract suite price)		Additional Information
						Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (filtered bottle required).		
13	BH7 0.35-0.45					Asbestos		
14	BH7 0.25-0.35					TTA, BTEX, PAH, BTEX		
15	BH8 0.15-0.25					Suite 5-16		
16	BH8 0.5-0.6							
17	BH2 1.0-1.1	12-4-19		24 BH7 0.25-0.35	19-4-12			
18	BH2 1.5-1.6	12-4-19		25 BH7 3.0-3.1	19-4-12			
19	BH3 0.1-0.2	13-4-12						
20	BH3 1.5-1.6	13-4-12						
21	BH4 1.0-1.1	15-4-12						
22	BH5 3.0-3.1	16-4-12						
23	BH5 0.4-0.5	16-4-12						
TOTAL								

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved Plastic; AP = Airfreight Unpreserved Plastic; V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Spatulation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.



CHAIN OF CUSTODY

ALS Laboratory please tick →

11 Sydney 277 Macquarie Rd, Southfield NSW 2176
Ph: 02 8784 8800 E: samples@als.com.au
11 Newcastle 5 Rossington Rd, Warabook NSW 2204
Ph: 02 4963 9435 E: samples@als.com.au
11 Brisbane 32 Strand St, Stinson QLD 4051
Ph: 07 3241 7222 E: samples@als.com.au
11 Melbourne 2-4 Wessall Rd, Springvale VIC 3171
Ph: 03 9591 5600 E: samples@als.com.au
11 Adelaide 21 Barrow Rd, Perseus SA 5005
Ph: 08 8550 0050 E: samples@als.com.au
11 Perth 10 Havelock Way, Malaga WA 6055
Ph: 08 9293 7650 E: samples@als.com.au
11 Launceston 2774 Ingham St, Launceston TAS 7250
Ph: 03 6331 2164 E: samples@als.com.au

CLIENT: Residential Geotek Soil Solids

OFFICE: 15500372.1

PROJECT: PROJECT NO: 15500372.1

ORDER NUMBER: PURCHASE ORDER NO: 01372258578

PROJECT MANAGER: Steve Morton

SAMPLES: Alan Holthouse

COC: COC Emailed to ALS71 (YES / NO)

Email Reports to (will default to PM if no other addresses are listed): adam.holthouse@geotek.com.au

Email Invoice to (will default to PM if no other addresses are listed): adam.holthouse@geotek.com.au

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS: Standard TAT (List due date):
Non Standard or urgent TAT (List due date):

COC SEQUENCE NUMBER (Circle)

COG: 1 2 3 4 5 6 7

RECEIVED BY: CC

DATE/TIME: 19/4/12

RELINQUISHED BY: CC

DATE/TIME: 17-00

RECEIVED BY: HP

DATE/TIME: 20/4/12

FOR LABORATORY USE ONLY (Circle)

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

Yes/No

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	ANALYSIS REQUIRED including SUITES (NB: Suite Codes must be listed to attract suite price) Where Matrix are required, specify Total (unfilled bottles required) or Dissolved (final filtered bottles required)	Additional Information
1	BH1 0.1-0.2					Asbestos Suites-16 TMA, BTEX, PAH 8 metals	
2	BH2 0.1-0.2						
3	BH3 0.5-0.6						
4	BH4 0.4-0.5						
5	BH5 0.1-0.2						
6	BH6 0.4-0.5						
7	BH7 0.1-0.2						
8	BH8 0.2-0.3						
9	BH9 1.1-1.2						
10	BH10 0.1-0.2						
11	BH11 0.2-0.3						
12	BH12 0.5-0.6						
TOTAL							

Subcon/Forward Lab / Split WO
Lab / Analysis: 2004-04-12
Organised By / Date: J.S. 12-11-12-15
Relinquished By / Date: _____
Console / Counter: _____
WO No: _____
Attach by PO / Internal Sheet: _____

Environmental Division
Sydney
Work Order
ES1209295



Telephone : +61-2-8784 8555



CHAIN OF CUSTODY

ALS Laboratory please tick ->

11 Sydney 277 Woodhatch Rd. Smithfield NSW 2178
Ph 02 8794 8555 E samples@als.com.au
11 Newcastle 5 Kangaroo Rd. Wyahook NSW 2201
Ph 02 4968 9133 E samples@als.com.au

11 Brisbane 30 Spang St. Smithfield QLD 4053
Ph 07 3243 7222 E samples@als.com.au
11 Townsville 14 45 Denham Ct. Bealiba QLD 4818
Ph 07 4766 6800 E samples@als.com.au

11 Melbourne 3-4 Woodall Rd. Springvale VIC 3171
Ph 03 8591 5600 E samples@als.com.au
11 Adelaide 2-1 Bannock Rd. Para Hills SA 5045
Ph 08 8559 0820 E samples@als.com.au

11 Perth 10 Havelock Way. Malaga WA 6060
Ph 08 9280 7555 E samples@als.com.au
11 Launceston 27 Wellington St. Launceston TAS 7250
Ph 03 6333 2155 E samples@als.com.au

CLIENT: **Regions Ceredical Solutions**

TURNAROUND REQUIREMENTS:
☐ Standard TAT (List due date)
☐ Non Standard or urgent TAT (List due date)

FOR LABORATORY USE ONLY (Circle)
Type (solid/frozen/other) and preserve (unpreserved/frozen/other)
Random Sample Temperature on Receipt
Other comments

OFFICE: PROJECT NO.: PURCHASE ORDER NO.: COUNTRY OF ORIGIN:

PROJECT MANAGER: **Steve Norton** CONTACT PH: **04332258578**

SAMPLER: **Adam Holbrook** SAMPLER MOBILE: **04230572270**

COC Emailed to ALS? (YES / NO) **EDU FORMAT (or default):**

Email Reports to (will default to PM if no other addresses are listed): **adam.holbrook@cederical.com.au**

Email Invoice to (will default to PM if no other addresses are listed): **as above**

DATE/TIME: **19/14/12**

RECEIVED BY: **CE**

DATE/TIME: **17.15**

[Signature]

[Signature]

[Signature]

[Signature]

[Signature]

COMMENT/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS MATRX: Solid(S) Water(W)	CONTAINER INFORMATION	ANALYSIS REQUIRED including SUITES (NB, Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered solids required) or Dissolved (low filtered solids required).	Additional Information
--------------	--	-----------------------	---	------------------------

LAB ID	SAMPLE ID	DATE / TIME	MATRX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	ANALYSIS REQUIRED including SUITES (NB, Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered solids required) or Dissolved (low filtered solids required).	Additional Information
--------	-----------	-------------	-------	--	---------------	---	------------------------

13	BH7 0.35-0.45					Asbestos	
----	---------------	--	--	--	--	----------	--

14	BH7 0.25-0.35					Suite S-16	
----	---------------	--	--	--	--	------------	--

15	BH8 0.15-0.25					TPH, BTEX, PAH 8 metals	
----	---------------	--	--	--	--	-------------------------	--

16	BH8 0.5-0.6						
----	-------------	--	--	--	--	--	--

	Received Extra sample						
--	-----------------------	--	--	--	--	--	--

17	BH2 1.0-1.1	12-4-19					
----	-------------	---------	--	--	--	--	--

18	BH2 1.5-1.6	12-4-19					
----	-------------	---------	--	--	--	--	--

19	BH3 0.1-0.2	13-4-12					
----	-------------	---------	--	--	--	--	--

20	BH3 1.5-1.6	13-4-12					
----	-------------	---------	--	--	--	--	--

21	BH4 1.0-1.1	15-4-12					
22	BHS 3.0-3.1	16-4-12					
23	BHS 0.4-0.5	16-4-12					
TOTAL							

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airflight Unpreserved Plastic
V = VOA Vial (HCl Preserved); VB = VOA Vial (Sulfuric Preserved); VS = VOA Vial (Sulfuric Preserved); AV = Airflight Unpreserved Vial; SC = Sulfuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottle; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Solids; B = Unpreserved Bag; LI = Lungs Iodine Preserved Bottle; STI = Sterile Sodium Thiosulfate Preserved Bottle.

2062

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: ES1210665	Page	: 1 of 22
Client	: REGIONAL GEOTECHNICAL SOLUTION	Laboratory	: Environmental Division Sydney
Contact	: MR STEVE MORTON	Contact	: Client Services
Address	: 5/97 ISABELLA STREET WINGHAM NSW, AUSTRALIA 2429	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: steve.m@regionalgeotech.com.au	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 6553 5641	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: RGS00372	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----	Date Samples Received	: 02-MAY-2012
C-O-C number	: ----	Issue Date	: 11-MAY-2012
Sampler	: ----	No. of samples received	: 22
Site	: ----	No. of samples analysed	: 22
Quote number	: SY/395/10		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results
- Surrogate Control Limits



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Evie.Sidarta	Inorganic Chemist	Sydney Inorganics
Hoa Nguyen	Inorganic Chemist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics
Peter Keyte	Newcastle Manager	Newcastle
Peter Rennie	Team Leader - Asbestos	Newcastle
Phalak Inthaksone	Laboratory Manager - Organics	Sydney Organics
Raymond Commodor	Instrument Chemist	Sydney Inorganics
Sarah Millington	Senior Inorganic Chemist	Sydney Inorganics



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

- **EA200 Legend for Asbestos Type:**
- **EA200 'Am'** Amosite (brown asbestos)
- **EA200 'Ch'** Chrysotile (white asbestos)
- **EA200 'Cr'** Crocidolite (blue asbestos)
- **EA200 't'** Trace levels
- **EA200 'UMF'** Unknown mineral fibres
- **EA200:** Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- **EA200:** Confirmation by alternative techniques is recommended for samples where unknown mineral fibres are detected. Negative results for vinyl tiles should be confirmed by an independent analytical technique.
- **ED041G** LOR raised for SO₄ on the sample ID (BH4) due to sample matrix.
- **EG-005T:** LCS recovery for Chromium falls outside ALS Dynamic Control Limit. However, it is within the acceptance criteria based on ALS DQO. No further action is required.
- **EK055G** LOR raised for NH₃ on the sample ID (BH4) due to sample matrix.
- **EK057G** LOR raised for NO₂ on the sample ID (BH4) due to sample matrix.
- **EK059G** LOR raised for NO_x on the sample ID (BH4) due to sample matrix.
- **EK071G** LOR raised for RP on the sample ID (BH4) due to sample matrix.
- **EK085:** LOR raised for Sulphide on sample ID BH4 due to sample matrix.
- **EK085:** Poor matrix spike recovery for sample ID BH6 due to sample matrix. Confirmed by re-analysis.
- **EP071:** Poor duplicate precision for sample 111 due to sample heterogeneity. Confirmed by re-extraction and re-analysis.
- **MW017 - VIC** is ALS's internal code and is equivalent to in-house method MW055.



Analytical Results

Sub-Matrix: **SOIL**

Client sample ID

Client sampling date / time

				101	102	103	104	105
				02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00
Compound	CAS Number	LOR	Unit	ES1210665-001	ES1210665-002	ES1210665-003	ES1210665-004	ES1210665-005
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	4.2	11.2	12.3	8.5	24.5
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples								
Asbestos Detected	1332-21-4	0.1	g/kg	No	----	----	No	----
Asbestos Type	1332-21-4	0.1	--	-	----	----	-	----
Sample weight (dry)	----	0.01	g	37.8	----	----	26.8	----
APPROVED IDENTIFIER:	----	-	--	P.RENNIE	----	----	P.RENNIE	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	15	<5	10	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	5	8	6	2	2
Copper	7440-50-8	5	mg/kg	22	18	28	15	7
Lead	7439-92-1	5	mg/kg	107	69	101	91	58
Nickel	7440-02-0	2	mg/kg	11	3	5	<2	<2
Zinc	7440-66-6	5	mg/kg	262	67	452	114	20
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.10	mg/kg	----	----	----	<0.10	<0.10
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	----	----	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	----	----	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	----	----	----	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	----	----	----	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	----	----	----	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	----	----	----	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	----	----	----	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	----	----	----	0.20	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	----	----	----	0.96	0.40
alpha-Endosulfan	959-98-8	0.05	mg/kg	----	----	----	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	----	----	----	0.75	0.32
Dieldrin	60-57-1	0.05	mg/kg	----	----	----	<0.05	0.96
4,4'-DDE	72-55-9	0.05	mg/kg	----	----	----	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg	----	----	----	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	----	----	----	<0.05	<0.05
4,4'-DDD	72-54-8	0.05	mg/kg	----	----	----	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	----	----	----	<0.05	<0.05



Analytical Results

Sub-Matrix: SOIL

Client sample ID

Client sampling date / time

				101	102	103	104	105
				02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00
Compound	CAS Number	LOR	Unit	ES1210665-001	ES1210665-002	ES1210665-003	ES1210665-004	ES1210665-005
EP068A: Organochlorine Pesticides (OC) - Continued								
Endosulfan sulfate	1031-07-8	0.05	mg/kg	----	----	----	<0.05	<0.05
4,4'-DDT	50-29-3	0.2	mg/kg	----	----	----	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	----	----	----	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	----	----	----	<0.2	<0.2
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	----	----	----	<0.05	<0.05
Demeton-S-methyl	919-86-8	0.05	mg/kg	----	----	----	<0.05	<0.05
Monocrotophos	6923-22-4	0.2	mg/kg	----	----	----	<0.2	<0.2
Dimethoate	60-51-5	0.05	mg/kg	----	----	----	<0.05	<0.05
Diazinon	333-41-5	0.05	mg/kg	----	----	----	<0.05	<0.05
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	----	----	----	<0.05	<0.05
Parathion-methyl	298-00-0	0.2	mg/kg	----	----	----	<0.2	<0.2
Malathion	121-75-5	0.05	mg/kg	----	----	----	<0.05	<0.05
Fenthion	55-38-9	0.05	mg/kg	----	----	----	<0.05	<0.05
Chlorpyrifos	2921-88-2	0.05	mg/kg	----	----	----	<0.05	<0.05
Parathion	56-38-2	0.2	mg/kg	----	----	----	<0.2	<0.2
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	----	----	----	<0.05	<0.05
Chlorfenvinphos	470-90-6	0.05	mg/kg	----	----	----	<0.05	<0.05
Bromophos-ethyl	4824-78-6	0.05	mg/kg	----	----	----	<0.05	<0.05
Fenamiphos	22224-92-6	0.05	mg/kg	----	----	----	<0.05	<0.05
Prothiofos	34643-46-4	0.05	mg/kg	----	----	----	<0.05	<0.05
Ethion	563-12-2	0.05	mg/kg	----	----	----	<0.05	<0.05
Carbophenothion	786-19-6	0.05	mg/kg	----	----	----	<0.05	<0.05
Azinphos Methyl	86-50-0	0.05	mg/kg	----	----	----	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Sub-Matrix: SOIL				Client sample ID	101	102	103	104	105
				Client sampling date / time	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00
Compound	CAS Number	LOR	Unit	ES1210665-001	ES1210665-002	ES1210665-003	ES1210665-004	ES1210665-005	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10	
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50	
C15 - C28 Fraction	----	100	mg/kg	180	<100	<100	190	<100	
C29 - C36 Fraction	----	100	mg/kg	<100	<100	130	380	<100	
^ C10 - C36 Fraction (sum)	----	50	mg/kg	180	<50	130	570	<50	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft									
C6 - C10 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10	
^ C6 - C10 Fraction minus BTEX (F1)	----	10	mg/kg	<10	<10	<10	<10	<10	
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50	
>C16 - C34 Fraction	----	100	mg/kg	230	<100	160	260	<100	
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	120	530	<100	
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	230	<50	280	790	<50	
EP080: BTEX									
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
EP080: BTEXN									
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
^ Total Xylenes	1330-20-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1	
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%	----	----	----	78.3	76.3	
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.1	%	----	----	----	126	128	
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.1	%	----	----	----	88.4	91.5	
EP075(SIM)S: Phenolic Compound Surrogates									



Analytical Results

Sub-Matrix: **SOIL**

Client sample ID

Client sampling date / time

				101	102	103	104	105
				02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00
Compound	CAS Number	LOR	Unit	ES1210665-001	ES1210665-002	ES1210665-003	ES1210665-004	ES1210665-005
EP075(SIM)S: Phenolic Compound Surrogates - Continued								
Phenol-d6	13127-88-3	0.1	%	112	106	110	100	88.0
2-Chlorophenol-D4	93951-73-6	0.1	%	97.7	96.8	112	95.1	97.6
2,4,6-Tribromophenol	118-79-6	0.1	%	94.8	98.4	97.5	102	104
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	101	110	107	95.5	105
Anthracene-d10	1719-06-8	0.1	%	109	112	112	103	114
4-Terphenyl-d14	1718-51-0	0.1	%	111	114	119	103	106
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	0.1	%	108	106	107	116	95.3
Toluene-D8	2037-26-5	0.1	%	97.6	98.4	104	109	83.0
4-Bromofluorobenzene	460-00-4	0.1	%	85.8	86.8	91.2	96.2	73.7



Analytical Results

Sub-Matrix: SOIL

Client sample ID

Client sampling date / time

				106	107	108	109	110
				02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00
Compound	CAS Number	LOR	Unit	ES1210665-006	ES1210665-007	ES1210665-008	ES1210665-009	ES1210665-010
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	2.8	11.9	10.3	8.1	13.8
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples								
Asbestos Detected	1332-21-4	0.1	g/kg	No	No	----	No	----
Asbestos Type	1332-21-4	0.1	--	-	-	----	-	----
Sample weight (dry)	----	0.01	g	35.2	29.4	----	29.0	----
APPROVED IDENTIFIER:	----	-	--	P.RENNIE	P.RENNIE	----	P.RENNIE	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	7	<5	<5	7
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	1
Chromium	7440-47-3	2	mg/kg	17	5	5	7	12
Copper	7440-50-8	5	mg/kg	7	7	19	30	131
Lead	7439-92-1	5	mg/kg	21	37	56	404	328
Nickel	7440-02-0	2	mg/kg	13	<2	4	4	6
Zinc	7440-66-6	5	mg/kg	67	80	236	349	624
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.10	mg/kg	<0.10	----	<0.10	<0.10	<0.10
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
4,4'-DDE	72-55-9	0.05	mg/kg	<0.05	----	<0.05	<0.05	0.20
Endrin	72-20-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
4,4'-DDD	72-54-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05



Analytical Results

Sub-Matrix: SOIL

Client sample ID

Client sampling date / time

				106	107	108	109	110
				02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00
Compound	CAS Number	LOR	Unit	ES1210665-006	ES1210665-007	ES1210665-008	ES1210665-009	ES1210665-010
EP068A: Organochlorine Pesticides (OC) - Continued								
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
4,4'-DDT	50-29-3	0.2	mg/kg	<0.2	----	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	----	<0.2	<0.2	<0.2
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	----	<0.2	<0.2	<0.2
Dimethoate	60-51-5	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Diazinon	333-41-5	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	----	<0.2	<0.2	<0.2
Malathion	121-75-5	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Fenthion	55-38-9	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Parathion	56-38-2	0.2	mg/kg	<0.2	----	<0.2	<0.2	<0.2
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Ethion	563-12-2	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	1.0	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	2.3	1.1	1.1
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	2.3	1.1	1.1
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.7	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.7	<0.5	<0.5
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	1.2	0.6	0.5

Sub-Matrix: **SOIL**

Client sample ID

Client sampling date / time

Sub-Matrix: SOIL				Client sample ID				
				106	107	108	109	110
Client sampling date / time				02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00
Compound	CAS Number	LOR	Unit	ES1210665-006	ES1210665-007	ES1210665-008	ES1210665-009	ES1210665-010
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.8	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.7	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	9.7	2.8	2.7
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	230	<100	<100	110
C29 - C36 Fraction	----	100	mg/kg	<100	150	<100	100	110
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	380	<50	100	220
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft								
C6 - C10 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	----	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	330	130	150	180
>C34 - C40 Fraction	----	100	mg/kg	<100	110	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	440	130	150	180
EP080: BTEX								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
EP080: BTEXN								
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	1330-20-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	90.2	----	81.2	79.1	81.7
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	125	----	112	121	93.4
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	95.1	----	87.9	90.0	85.2
EP075(SIM)S: Phenolic Compound Surrogates								



Analytical Results

Sub-Matrix: **SOIL**

Client sample ID

Client sampling date / time

				106	107	108	109	110
				02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00
Compound	CAS Number	LOR	Unit	ES1210665-006	ES1210665-007	ES1210665-008	ES1210665-009	ES1210665-010
EP075(SIM)S: Phenolic Compound Surrogates - Continued								
Phenol-d6	13127-88-3	0.1	%	107	91.0	88.8	94.1	97.5
2-Chlorophenol-D4	93951-73-6	0.1	%	102	103	95.4	100	93.7
2,4,6-Tribromophenol	118-79-6	0.1	%	94.6	105	100	100	74.9
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	106	113	90.3	106	100
Anthracene-d10	1719-06-8	0.1	%	98.8	111	108	111	106
4-Terphenyl-d14	1718-51-0	0.1	%	114	118	114	113	95.7
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	0.1	%	113	107	102	116	103
Toluene-D8	2037-26-5	0.1	%	99.9	94.5	95.4	105	93.9
4-Bromofluorobenzene	460-00-4	0.1	%	83.3	85.1	84.4	90.4	78.0



Analytical Results

Sub-Matrix: SOIL

Client sample ID

Client sampling date / time

				111	112	113	114	115
				02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00
Compound	CAS Number	LOR	Unit	ES1210665-011	ES1210665-012	ES1210665-013	ES1210665-014	ES1210665-015
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	5.2	6.7	14.4	14.8	3.5
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples								
Asbestos Detected	1332-21-4	0.1	g/kg	----	No	No	No	No
Asbestos Type	1332-21-4	0.1	--	----	-	-	-	-
Sample weight (dry)	----	0.01	g	----	42.4	30.5	46.8	45.4
APPROVED IDENTIFIER:	----	-	--	----	P.RENNIE	P.RENNIE	P.RENNIE	P.RENNIE
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	9	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	5	5	9	4	<2
Copper	7440-50-8	5	mg/kg	12	18	41	12	<5
Lead	7439-92-1	5	mg/kg	76	224	521	80	9
Nickel	7440-02-0	2	mg/kg	3	3	4	<2	<2
Zinc	7440-66-6	5	mg/kg	126	286	759	238	35
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.10	mg/kg	<0.10	----	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	----	----	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	----	----	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	----	----	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	----	----	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	----	----	----	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	----	----	----	----
4,4'-DDE	72-55-9	0.05	mg/kg	<0.05	----	----	----	----
Endrin	72-20-8	0.05	mg/kg	<0.05	----	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	----	----	----	----
4,4'-DDD	72-54-8	0.05	mg/kg	<0.05	----	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	----	----	----	----



Analytical Results

Sub-Matrix: SOIL

Client sample ID

Client sampling date / time

				111	112	113	114	115
				02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00
Compound	CAS Number	LOR	Unit	ES1210665-011	ES1210665-012	ES1210665-013	ES1210665-014	ES1210665-015
EP068A: Organochlorine Pesticides (OC) - Continued								
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	----	----	----	----
4,4'-DDT	50-29-3	0.2	mg/kg	<0.2	----	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	----	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	----	----	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	----	----	----	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	----	----	----	----
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	----	----	----	----
Dimethoate	60-51-5	0.05	mg/kg	<0.05	----	----	----	----
Diazinon	333-41-5	0.05	mg/kg	<0.05	----	----	----	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	----	----	----	----
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	----	----	----	----
Malathion	121-75-5	0.05	mg/kg	<0.05	----	----	----	----
Fenthion	55-38-9	0.05	mg/kg	<0.05	----	----	----	----
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	----	----	----	----
Parathion	56-38-2	0.2	mg/kg	<0.2	----	----	----	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	----	----	----	----
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	----	----	----	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	----	----	----	----
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	----	----	----	----
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	----	----	----	----
Ethion	563-12-2	0.05	mg/kg	<0.05	----	----	----	----
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	----	----	----	----
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	0.6	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	0.5	1.6	<0.5	0.6	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	1.6	<0.5	0.6	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	0.6	<0.5	<0.5	<0.5
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	0.8	<0.5	<0.5	<0.5

Sub-Matrix: **SOIL**

Client sample ID

Client sampling date / time

Sub-Matrix: SOIL				Client sample ID				
				Client sampling date / time				
				111	112	113	114	115
				02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00
Compound	CAS Number	LOR	Unit	ES1210665-011	ES1210665-012	ES1210665-013	ES1210665-014	ES1210665-015
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	0.5	6.2	<0.5	1.2	<0.5
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	220	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	250	<100	170	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	470	<50	170	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft								
C6 - C10 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	----	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	410	140	190	130	<100
>C34 - C40 Fraction	----	100	mg/kg	200	120	170	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	610	260	360	130	<50
EP080: BTEX								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.9	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
EP080: BTEXN								
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	0.9	<0.2	<0.2
^ Total Xylenes	1330-20-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	78.6	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	118	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	81.1	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								



Analytical Results

Sub-Matrix: **SOIL**

Client sample ID

Client sampling date / time

				111	112	113	114	115
				02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00
Compound	CAS Number	LOR	Unit	ES1210665-011	ES1210665-012	ES1210665-013	ES1210665-014	ES1210665-015
EP075(SIM)S: Phenolic Compound Surrogates - Continued								
Phenol-d6	13127-88-3	0.1	%	91.0	98.2	91.6	114	88.5
2-Chlorophenol-D4	93951-73-6	0.1	%	96.0	101	94.3	108	98.8
2,4,6-Tribromophenol	118-79-6	0.1	%	101	111	106	108	110
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	113	101	100	115	97.4
Anthracene-d10	1719-06-8	0.1	%	116	107	116	106	113
4-Terphenyl-d14	1718-51-0	0.1	%	116	96.2	100	115	117
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	0.1	%	123	118	113	109	116
Toluene-D8	2037-26-5	0.1	%	110	106	101	96.8	101
4-Bromofluorobenzene	460-00-4	0.1	%	94.9	90.8	88.3	84.5	85.7

Sub-Matrix: **SOIL**

Client sample ID

Client sampling date / time

Sub-Matrix: SOIL				Client sample ID		116	117	126	127	----
				Client sampling date / time		02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	----
Compound	CAS Number	LOR	Unit	ES1210665-016	ES1210665-017	ES1210665-018	ES1210665-019	----		
EA055: Moisture Content										
Moisture Content (dried @ 103°C)	----	1.0	%	21.6	8.8	2.8	7.5	----		
EG005T: Total Metals by ICP-AES										
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	----		
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	----		
Chromium	7440-47-3	2	mg/kg	3	3	10	4	----		
Copper	7440-50-8	5	mg/kg	6	13	10	15	----		
Lead	7439-92-1	5	mg/kg	24	32	25	43	----		
Nickel	7440-02-0	2	mg/kg	<2	2	7	2	----		
Zinc	7440-66-6	5	mg/kg	115	110	67	119	----		
EG035T: Total Recoverable Mercury by FIMS										
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	----		
EP066: Polychlorinated Biphenyls (PCB)										
Total Polychlorinated biphenyls	----	0.10	mg/kg	----	----	<0.10	----	----		
EP068A: Organochlorine Pesticides (OC)										
alpha-BHC	319-84-6	0.05	mg/kg	----	----	<0.05	----	----		
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	----	<0.05	----	----		
beta-BHC	319-85-7	0.05	mg/kg	----	----	<0.05	----	----		
gamma-BHC	58-89-9	0.05	mg/kg	----	----	<0.05	----	----		
delta-BHC	319-86-8	0.05	mg/kg	----	----	<0.05	----	----		
Heptachlor	76-44-8	0.05	mg/kg	----	----	<0.05	----	----		
Aldrin	309-00-2	0.05	mg/kg	----	----	<0.05	----	----		
Heptachlor epoxide	1024-57-3	0.05	mg/kg	----	----	<0.05	----	----		
trans-Chlordane	5103-74-2	0.05	mg/kg	----	----	<0.05	----	----		
alpha-Endosulfan	959-98-8	0.05	mg/kg	----	----	<0.05	----	----		
cis-Chlordane	5103-71-9	0.05	mg/kg	----	----	<0.05	----	----		
Dieldrin	60-57-1	0.05	mg/kg	----	----	<0.05	----	----		
4,4'-DDE	72-55-9	0.05	mg/kg	----	----	<0.05	----	----		
Endrin	72-20-8	0.05	mg/kg	----	----	<0.05	----	----		
beta-Endosulfan	33213-65-9	0.05	mg/kg	----	----	<0.05	----	----		
4,4'-DDD	72-54-8	0.05	mg/kg	----	----	<0.05	----	----		
Endrin aldehyde	7421-93-4	0.05	mg/kg	----	----	<0.05	----	----		
Endosulfan sulfate	1031-07-8	0.05	mg/kg	----	----	<0.05	----	----		
4,4'-DDT	50-29-3	0.2	mg/kg	----	----	<0.2	----	----		
Endrin ketone	53494-70-5	0.05	mg/kg	----	----	<0.05	----	----		
Methoxychlor	72-43-5	0.2	mg/kg	----	----	<0.2	----	----		
EP068B: Organophosphorus Pesticides (OP)										



Analytical Results

Sub-Matrix: SOIL

Client sample ID

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				116	117	126	127	----
				02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	----
Compound	CAS Number	LOR	Unit	ES1210665-016	ES1210665-017	ES1210665-018	ES1210665-019	----
EP068B: Organophosphorus Pesticides (OP) - Continued								
Dichlorvos	62-73-7	0.05	mg/kg	----	----	<0.05	----	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	----	----	<0.05	----	----
Monocrotophos	6923-22-4	0.2	mg/kg	----	----	<0.2	----	----
Dimethoate	60-51-5	0.05	mg/kg	----	----	<0.05	----	----
Diazinon	333-41-5	0.05	mg/kg	----	----	<0.05	----	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	----	----	<0.05	----	----
Parathion-methyl	298-00-0	0.2	mg/kg	----	----	<0.2	----	----
Malathion	121-75-5	0.05	mg/kg	----	----	<0.05	----	----
Fenthion	55-38-9	0.05	mg/kg	----	----	<0.05	----	----
Chlorpyrifos	2921-88-2	0.05	mg/kg	----	----	<0.05	----	----
Parathion	56-38-2	0.2	mg/kg	----	----	<0.2	----	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	----	----	<0.05	----	----
Chlorfenvinphos	470-90-6	0.05	mg/kg	----	----	<0.05	----	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg	----	----	<0.05	----	----
Fenamiphos	22224-92-6	0.05	mg/kg	----	----	<0.05	----	----
Prothiofos	34643-46-4	0.05	mg/kg	----	----	<0.05	----	----
Ethion	563-12-2	0.05	mg/kg	----	----	<0.05	----	----
Carbophenothion	786-19-6	0.05	mg/kg	----	----	<0.05	----	----
Azinphos Methyl	86-50-0	0.05	mg/kg	----	----	<0.05	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----



Analytical Results

Sub-Matrix: SOIL

Client sample ID

Client sampling date / time

				116	117	126	127	----
				02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	----
Compound	CAS Number	LOR	Unit	ES1210665-016	ES1210665-017	ES1210665-018	ES1210665-019	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	----
C29 - C36 Fraction	----	100	mg/kg	160	<100	<100	<100	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	160	<50	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft								
C6 - C10 Fraction	----	10	mg/kg	<10	<10	<10	<10	----
^ C6 - C10 Fraction minus BTEX (F1)	----	10	mg/kg	<10	<10	<10	<10	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	----
>C16 - C34 Fraction	----	100	mg/kg	200	<100	<100	<100	----
>C34 - C40 Fraction	----	100	mg/kg	130	<100	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	330	<50	<50	<50	----
EP080: BTEX								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
EP080: BTEXN								
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
^ Total Xylenes	1330-20-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	----	----	91.4	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	----	----	127	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	----	----	86.9	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	96.8	90.8	96.0	97.9	----
2-Chlorophenol-D4	93951-73-6	0.1	%	99.2	91.9	101	100	----
2,4,6-Tribromophenol	118-79-6	0.1	%	83.4	89.7	114	114	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	105	96.3	112	110	----



Analytical Results

Sub-Matrix: SOIL

				Client sample ID	116	117	126	127	----
				Client sampling date / time	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	----
Compound	CAS Number	LOR	Unit		ES1210665-016	ES1210665-017	ES1210665-018	ES1210665-019	----
EP075(SIM)T: PAH Surrogates - Continued									
Anthracene-d10	1719-06-8	0.1	%		115	117	118	112	----
4-Terphenyl-d14	1718-51-0	0.1	%		120	116	118	117	----
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.1	%		102	115	121	119	----
Toluene-D8	2037-26-5	0.1	%		104	99.6	108	102	----
4-Bromofluorobenzene	460-00-4	0.1	%		93.7	78.8	86.7	81.8	----



Analytical Results

Sub-Matrix: **WATER**

				Client sample ID	BH6	BH4	BH2		
				Client sampling date / time	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	----	----
Compound	CAS Number	LOR	Unit		ES1210665-020	ES1210665-021	ES1210665-022	----	----
EA005: pH									
pH Value	----	0.01	pH Unit		7.52	7.31	6.75	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		4080	1350	3680	----	----
EA020EC: Salinity									
Salinity	----	0.01	g/kg		2.16	0.67	1.94	----	----
EA075: Redox Potential									
Redox Potential	----	0.1	mV		177	-118	123	----	----
pH Redox	----	0.01	pH Unit		7.6	6.9	6.6	----	----
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		15	100	60	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		140	<10	41	----	----
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		1160	524	1090	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.54	<0.10	0.23	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	----	0.01	mg/L		<0.01	<0.10	<0.01	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.07	<0.10	0.12	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.07	<0.10	0.12	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.95	59.3	1.45	----	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	----	0.01	mg/L		<0.01	<0.10	<0.01	----	----
EK085M: Sulfide as S2-									
Sulfide as S2-	18496-25-8	0.1	mg/L		<0.1	<1.0	<0.1	----	----
EP025: Oxygen - Dissolved (DO)									
Dissolved Oxygen	----	0.1	mg/L		4.5	0.2	2.9	----	----
EP030: Biochemical Oxygen Demand (BOD)									
Biochemical Oxygen Demand	----	2	mg/L		12	96	<2	----	----



Analytical Results

Descriptive Results

Sub-Matrix: SOIL		
Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples		
EA200: Description	101 - 02-MAY-2012 15:00	Grey-brown sandy soil with some vegetation and small grey rocks and large quantity coal pieces
EA200: Description	104 - 02-MAY-2012 15:00	Grey-brown sandy soil with some vegetation and small white rocks and coal pieces
EA200: Description	106 - 02-MAY-2012 15:00	Light brown sandy soil with some vegetation and small white rocks
EA200: Description	107 - 02-MAY-2012 15:00	Light grey soil with some vegetation and small white and dark grey rocks
EA200: Description	109 - 02-MAY-2012 15:00	Dark brown sandy soil with some vegetation and small white and red-brown rocks and coal pieces
EA200: Description	112 - 02-MAY-2012 15:00	Grey-brown sandy soil with some vegetation and small red-brown, grey and white rocks and coal pieces
EA200: Description	113 - 02-MAY-2012 15:00	Dark brown sandy soil with some vegetation and small white and red-brown rocks and coal pieces
EA200: Description	114 - 02-MAY-2012 15:00	Grey-brown sandy soil with some vegetation and small red-brown and white rocks and coal pieces
EA200: Description	115 - 02-MAY-2012 15:00	Light brown sandy soil with some vegetation and small white, grey and red-brown rocks and coal pieces



Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	30.8	155.7
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	19.5	167.0
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	22.7	163.5
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	56.3	133.3
2-Chlorophenol-D4	93951-73-6	53.8	133.8
2,4,6-Tribromophenol	118-79-6	23.1	134.9
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	58.9	132.7
Anthracene-d10	1719-06-8	55.0	137.6
4-Terphenyl-d14	1718-51-0	54.0	147.8
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	72.8	133.2
Toluene-D8	2037-26-5	73.9	132.1
4-Bromofluorobenzene	460-00-4	71.6	130.0

Environmental Division

QUALITY CONTROL REPORT

Work Order	: ES1210665	Page	: 1 of 15
Client	: REGIONAL GEOTECHNICAL SOLUTION	Laboratory	: Environmental Division Sydney
Contact	: MR STEVE MORTON	Contact	: Client Services
Address	: 5/97 ISABELLA STREET WINGHAM NSW, AUSTRALIA 2429	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: steve.m@regionalgeotech.com.au	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 6553 5641	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: RGS00372	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 02-MAY-2012
Sampler	: ----	Issue Date	: 11-MAY-2012
Order number	: ----		
Quote number	: SY/395/10	No. of samples received	: 22
		No. of samples analysed	: 22

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Evie.Sidarta	Inorganic Chemist	Sydney Inorganics
Hoa Nguyen	Inorganic Chemist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics
Peter Keyte	Newcastle Manager	Newcastle
Peter Rennie	Team Leader - Asbestos	Newcastle
Phalak Inthaksone	Laboratory Manager - Organics	Sydney Organics
Raymond Commodor	Instrument Chemist	Sydney Inorganics
Sarah Millington	Senior Inorganic Chemist	Sydney Inorganics



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA055: Moisture Content (QC Lot: 2287678)									
ES1210344-025	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	51.9	51.3	1.2	0% - 20%
ES1210665-011	111	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	5.2	5.0	4.6	No Limit
EA055: Moisture Content (QC Lot: 2287679)									
ES1210734-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	10.9	11.4	4.3	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 2287608)									
ES1210277-001	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	13	13	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	8	8	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	8	8	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	10	11	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	36	38	3.5	No Limit
ES1210665-004	104	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	2	2	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	15	15	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	91	94	3.0	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	114	116	2.2	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 2287610)									
ES1210665-014	114	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	4	4	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	12	12	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	80	81	1.5	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	238	242	1.8	0% - 20%
ES1210734-005	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	10	8	25.4	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	28	18	46.2	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	7	6	15.6	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	<5	<5	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2287609)									



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2287609) - continued									
ES1210277-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES1210665-004	104	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 2287803)									
ES1210665-004	104	EP066: Total Polychlorinated biphenyls	----	0.10	mg/kg	<0.10	<0.10	0.0	No Limit
ES1210665-011	111	EP066: Total Polychlorinated biphenyls	----	0.10	mg/kg	<0.10	<0.10	0.0	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2287802)									
ES1210665-004	104	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	0.20	0.19	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	0.96	0.97	0.0	0% - 50%
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	0.75	0.73	1.8	0% - 50%
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4,4'-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4,4'-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4,4'-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
ES1210665-011	111	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4,4'-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2287802) - continued									
ES1210665-011	111	EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4,4'-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4,4'-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 2287802)									
ES1210665-004	104	EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
ES1210665-011	111	EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 2287802) - continued									
ES1210665-011	111	EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 2287863)									
ES1210665-002	102	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
ES1210665-011	111	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 2287863) - continued									
ES1210665-011	111	EP075(SIM): Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	0.5	<0.5	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2287639)									
ES1210544-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
ES1210665-010	110	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2287862)									
ES1210665-002	102	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
ES1210665-011	111	EP071: C15 - C28 Fraction	----	100	mg/kg	220	390	57.4	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	250	460	59.5	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QC Lot: 2287639)									
ES1210544-001	Anonymous	EP080: C6 - C10 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
ES1210665-010	110	EP080: C6 - C10 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QC Lot: 2287862)									
ES1210665-002	102	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
ES1210665-011	111	EP071: >C16 - C34 Fraction	----	100	mg/kg	410	720	55.4	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	200	360	56.1	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080: BTEXN (QC Lot: 2287639)									
ES1210544-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
ES1210665-010	110	EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
		EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit

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 Work Order : ES1210665
 Client : REGIONAL GEOTECHNICAL SOLUTION
 Project : RGS00372



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005: pH (QC Lot: 2288906)									
EN1201658-001	Anonymous	EA005: pH Value	----	0.01	pH Unit	8.12	8.15	0.4	0% - 20%
ES1210668-005	Anonymous	EA005: pH Value	----	0.01	pH Unit	6.88	6.87	0.1	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 2287578)									
ES1210665-020	BH6	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	4080	4080	0.0	0% - 20%
EA075: Redox Potential (QC Lot: 2289854)									
ES1210338-001	Anonymous	EA075: Redox Potential	----	0.1	mV	161	161	0.0	0% - 20%
		EA075: pH Redox	----	0.01	pH Unit	8.6	8.6	0.0	0% - 20%
ES1210649-009	Anonymous	EA075: Redox Potential	----	0.1	mV	204	204	0.0	0% - 20%
		EA075: pH Redox	----	0.01	pH Unit	6.9	6.9	0.0	0% - 20%
ED038A: Acidity (QC Lot: 2288197)									
ES1210665-020	BH6	ED038: Acidity as CaCO3	----	1	mg/L	15	20	28.6	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 2287459)									
ES1210555-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.0	No Limit
ED045G: Chloride Discrete analyser (QC Lot: 2287458)									
ES1210555-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	4	5	0.0	No Limit
ES1210726-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	1460	1480	1.7	0% - 20%
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 2287576)									
ES1210665-020	BH6	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.54	0.52	4.9	0% - 20%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 2287456)									
ES1210555-001	Anonymous	EK057G: Nitrite as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES1210723-001	Anonymous	EK057G: Nitrite as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 2287575)									
ES1210665-020	BH6	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.07	0.07	0.0	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 2287590)									
ES1210028-004	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.40	0.40	0.0	0% - 20%
ES1210059-002	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.22	0.20	8.4	0% - 20%
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 2287457)									
ES1210555-001	Anonymous	EK071G: Reactive Phosphorus as P	----	0.01	mg/L	<0.01	0.01	0.0	No Limit
ES1210726-002	Anonymous	EK071G: Reactive Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK085M: Sulfide as S2- (QC Lot: 2287797)									
ES1210665-020	BH6	EK085: Sulfide as S2-	18496-25-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
EP030: Biochemical Oxygen Demand (BOD) (QC Lot: 2288873)									
ES1210665-021	BH4	EP030: Biochemical Oxygen Demand	----	2	mg/L	96	115	18.0	0% - 20%



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 2287608)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	13.11 mg/kg	109	70	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	2.76 mg/kg	94.0	83.3	111
EG005T: Chromium	7440-47-3	2	mg/kg	<2	60.93 mg/kg	97.7	89.2	117
EG005T: Copper	7440-50-8	5	mg/kg	<5	54.68 mg/kg	98.0	90.1	114
EG005T: Lead	7439-92-1	5	mg/kg	<5	54.76 mg/kg	95.5	85.2	111
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55.23 mg/kg	96.8	88.3	116
EG005T: Zinc	7440-66-6	5	mg/kg	<5	103.88 mg/kg	94.8	88.9	112
EG005T: Total Metals by ICP-AES (QCLot: 2287610)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	101	70	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	93.0	83.3	111
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	# 82.6	89.2	117
EG005T: Copper	7440-50-8	5	mg/kg	<5	32.0 mg/kg	96.8	90.1	114
EG005T: Lead	7439-92-1	5	mg/kg	<5	40.0 mg/kg	95.1	85.2	111
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55.23 mg/kg	92.0	88.3	116
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	91.2	88.9	112
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2287609)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	1.4 mg/kg	81.7	67	118
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 2287803)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.10	1 mg/kg	77.0	57.4	117
EP068A: Organochlorine Pesticides (OC) (QCLot: 2287802)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	103	60.8	116
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	104	59.4	115
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	97.6	59.8	117
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	102	59.8	118
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	97.2	65.8	114
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	99.5	65.6	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	105	67	113
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	107	65.6	113
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	107	60.7	113
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	100	65.8	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	107	57.3	120
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	101	67.4	116
EP068: 4,4'-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	92.5	67.5	114
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	98.9	63	121



Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 2287802) - continued								
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	88.8	66.1	117
EP068: 4,4'-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	81.6	65.3	116
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	107	57.3	115
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	111	63.6	119
EP068: 4,4'-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	105	58.4	127
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	98.7	63.6	117
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	88.9	50.4	132
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2287802)								
EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	0.5 mg/kg	94.3	25.5	124
EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	89.1	10.1	159
EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	0.5 mg/kg	88.0	2.88	149
EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	0.5 mg/kg	88.2	48.6	126
EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	0.5 mg/kg	109	64.9	111
EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	0.5 mg/kg	102	65.1	111
EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	0.5 mg/kg	94.2	61.4	113
EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	0.5 mg/kg	106	60.4	127
EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	0.5 mg/kg	97.8	64.7	110
EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	0.5 mg/kg	104	64.2	111
EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	0.5 mg/kg	99.3	60	116
EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	0.5 mg/kg	# 112	64.8	111
EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	0.5 mg/kg	106	61.4	123
EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	0.5 mg/kg	105	64.3	114
EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	0.5 mg/kg	77.3	45.5	128
EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	0.5 mg/kg	97.5	65.4	111
EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	0.5 mg/kg	92.1	62	116
EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	0.5 mg/kg	103	59.5	119
EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	0.5 mg/kg	70.8	29.8	137
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2287863)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	4 mg/kg	103	81.9	113
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	4 mg/kg	105	79.6	113
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	4 mg/kg	107	81.5	112
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	4 mg/kg	105	79.9	112
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	4 mg/kg	110	79.4	114
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	4 mg/kg	110	81.1	112
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	4 mg/kg	98.4	78.8	113
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	4 mg/kg	105	78.9	113
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	4 mg/kg	110	77.2	112
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	4 mg/kg	102	79.8	114
EP075(SIM): Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	4 mg/kg	100	71.8	118



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
Method: Compound	CAS Number	LOR	Unit		Result	Spike	Spike Recovery (%)	Recovery Limits (%)	
						Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2287863) - continued									
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	4 mg/kg	97.0	74.2	117	
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	4 mg/kg	95.4	76.4	113	
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	4 mg/kg	85.4	71	113	
EP075(SIM): Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg	<0.5	4 mg/kg	88.4	71.7	113	
EP075(SIM): Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	<0.5	4 mg/kg	91.1	72.4	114	
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2287639)									
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	82.2	68.4	128	
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2287862)									
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	200 mg/kg	88.0	59	131	
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	300 mg/kg	114	74	138	
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	200 mg/kg	92.0	63	131	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2287639)									
EP080: C6 - C10 Fraction	----	10	mg/kg	<10	31 mg/kg	84.1	68.4	128	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2287862)									
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	250 mg/kg	89.6	59	131	
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	350 mg/kg	108	74	138	
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	----	----	----	----	
		50	mg/kg	----	150 mg/kg	93.3	63	131	
EP080: BTEXN (QCLot: 2287639)									
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	83.8	62	120	
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	83.9	62	128	
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	78.2	58	118	
EP080: meta- & para-Xylene	108-38-3	0.5	mg/kg	<0.5	2 mg/kg	75.4	60	120	
	106-42-3								
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	74.8	60	120	
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	74.6	62	138	

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA010P: Conductivity by PC Titrator (QCLot: 2287578)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	2000 µS/cm	102	92	116
EA075: Redox Potential (QCLot: 2289854)								
EA075: Redox Potential	----	0.1	mV	----	86 mV	102	96	120
ED038A: Acidity (QCLot: 2288197)								
ED038: Acidity as CaCO3	----	1	mg/L	<1	20 mg/L	100	89.8	103
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2287459)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	98.4	77	121



Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			LCS	Low
ED045G: Chloride Discrete analyser (QCLot: 2287458)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	1000 mg/L	97.8	79	123
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2287576)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1.00 mg/L	102	86	116
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2287456)								
EK057G: Nitrite as N	----	0.01	mg/L	<0.01	0.5 mg/L	85.2	78	128
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2287575)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	118	80	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2287590)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	90.8	67	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 2287457)								
EK071G: Reactive Phosphorus as P	----	0.01	mg/L	<0.01	0.50 mg/L	105	85	115
EK085M: Sulfide as S2- (QCLot: 2287797)								
EK085: Sulfide as S2-	18496-25-8	0.10	mg/L	<0.1	0.50 mg/L	115	70.2	121
EP030: Biochemical Oxygen Demand (BOD) (QCLot: 2288873)								
EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	200 mg/L	88.5	76	108



Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery (%) MS	Recovery Limits (%) LowHigh	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number				
EG005T: Total Metals by ICP-AES (QCLot: 2287608)							
ES1210277-001	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	98.7	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	95.0	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	101	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	105	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	97.3	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	98.0	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	95.2	70	130
EG005T: Total Metals by ICP-AES (QCLot: 2287610)							
ES1210665-014	114	EG005T: Arsenic	7440-38-2	50 mg/kg	99.1	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	92.8	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	96.0	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	104	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	92.6	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	98.8	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	89.6	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2287609)							
ES1210277-001	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	82.8	70	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 2287803)							
ES1210665-004	104	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	85.0	70	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 2287802)							
ES1210665-004	104	EP068: gamma-BHC	58-89-9	0.5 mg/kg	97.0	70	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	97.6	70	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	77.0	70	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	82.3	70	130
		EP068: Endrin	72-20-8	2 mg/kg	82.6	70	130
		EP068: 4,4'-DDT	50-29-3	2 mg/kg	80.2	70	130
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2287802)							
ES1210665-004	104	EP068: Diazinon	333-41-5	0.5 mg/kg	104	70	130
		EP068: Chlorpyrifos-methyl	5598-13-0	0.5 mg/kg	98.2	70	130
		EP068: Pirimphos-ethyl	23505-41-1	0.5 mg/kg	91.8	70	130
		EP068: Bromophos-ethyl	4824-78-6	0.5 mg/kg	84.3	70	130
		EP068: Prothiofos	34643-46-4	0.5 mg/kg	80.9	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2287863)							
ES1210665-002	102	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	85.1	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	88.0	70	130



Sub-Matrix: SOIL				Matrix Spike (MS) Report			
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike	Spike Recovery (%)	Recovery Limits (%)	
				Concentration	MS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2287639)							
ES1210544-001	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	94.9	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2287862)							
ES1210665-002	102	EP071: C10 - C14 Fraction	----	640 mg/kg	101	73	137
		EP071: C15 - C28 Fraction	----	3140 mg/kg	120	53	131
		EP071: C29 - C36 Fraction	----	2860 mg/kg	101	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2287639)							
ES1210544-001	Anonymous	EP080: C6 - C10 Fraction	----	37.5 mg/kg	100	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2287862)							
ES1210665-002	102	EP071: >C10 - C16 Fraction	----	850 mg/kg	114	73	137
		EP071: >C16 - C34 Fraction	----	4800 mg/kg	110	53	131
		EP071: >C34 - C40 Fraction	----	2400 mg/kg	111	52	132
EP080: BTEXN (QCLot: 2287639)							
ES1210544-001	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	83.0	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	85.1	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	79.5	70	130
		EP080: meta- & para-Xylene	108-38-3	2.5 mg/kg	80.8	70	130
			106-42-3				
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	81.2	70	130
	EP080: Naphthalene	91-20-3	2.5 mg/kg	70.7	70	130	
Sub-Matrix: WATER				Matrix Spike (MS) Report			
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike	Spike Recovery (%)	Recovery Limits (%)	
				Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2287459)							
ES1210555-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	106	70	130
ED045G: Chloride Discrete analyser (QCLot: 2287458)							
ES1210555-001	Anonymous	ED045G: Chloride	16887-00-6	250 mg/L	113	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2287576)							
ES1210665-020	BH6	EK055G: Ammonia as N	7664-41-7	1.00 mg/L	106	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2287456)							
ES1210555-001	Anonymous	EK057G: Nitrite as N	----	0.5 mg/L	87.0	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2287575)							
ES1210665-020	BH6	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	125	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2287590)							
ES1210028-004	Anonymous	EK067G: Total Phosphorus as P	----	1.00 mg/L	99.4	70	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 2287457)							
ES1210555-001	Anonymous	EK071G: Reactive Phosphorus as P	----	0.50 mg/L	104	70	130



Sub-Matrix: WATER

				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
					MS	Low	High
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number				
EK085M: Sulfide as S2- (QCLot: 2287797)							
ES1210665-020	BH6	EK085: Sulfide as S2-	18496-25-8	0.33 mg/L	# 30.3	70	130

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: ES1210665	Page	: 1 of 13
Client	: REGIONAL GEOTECHNICAL SOLUTION	Laboratory	: Environmental Division Sydney
Contact	: MR STEVE MORTON	Contact	: Client Services
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Project	: RGS00372	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 02-MAY-2012
Sampler	: ----	Issue Date	: 11-MAY-2012
Order number	: ----		
Quote number	: SY/395/10	No. of samples received	: 22
		No. of samples analysed	: 22

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL** Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content							
Soil Glass Jar - Unpreserved (EA055-103)							
101, 102,	02-MAY-2012	----	----	----	04-MAY-2012	16-MAY-2012	✓
103, 104,							
105, 106,							
107, 108,							
109, 110,							
111, 112,							
113, 114,							
115, 116,							
117, 126,							
127							
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples							
Snap Lock Bag (EA200)							
101, 104,	02-MAY-2012	---	29-OCT-2012	----	07-MAY-2012	03-NOV-2012	✓
106, 107,							
109, 112,							
113, 114,							
115							
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
101, 102,	02-MAY-2012	04-MAY-2012	29-OCT-2012	✓	04-MAY-2012	29-OCT-2012	✓
103, 104,							
105, 106,							
107, 108,							
109, 110,							
111, 112,							
113, 114,							
115, 116,							
117, 126,							
127							

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T)								
101, 103, 105, 107, 109, 111, 113, 115, 117, 127	102, 104, 106, 108, 110, 112, 114, 116, 126	02-MAY-2012	04-MAY-2012	30-MAY-2012	✓	07-MAY-2012	30-MAY-2012	✓
EP066: Polychlorinated Biphenyls (PCB)								
Soil Glass Jar - Unpreserved (EP066)								
104, 106, 109, 111	105, 108, 110, 126	02-MAY-2012	04-MAY-2012	16-MAY-2012	✓	06-MAY-2012	13-JUN-2012	✓
EP068A: Organochlorine Pesticides (OC)								
Soil Glass Jar - Unpreserved (EP068)								
104, 106, 109, 111	105, 108, 110, 126	02-MAY-2012	04-MAY-2012	16-MAY-2012	✓	06-MAY-2012	13-JUN-2012	✓
EP068B: Organophosphorus Pesticides (OP)								
Soil Glass Jar - Unpreserved (EP068)								
104, 106, 109, 111	105, 108, 110, 126	02-MAY-2012	04-MAY-2012	16-MAY-2012	✓	06-MAY-2012	13-JUN-2012	✓
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP071)								
101, 103, 105, 107, 109, 111, 113, 115, 117, 127	102, 104, 106, 108, 110, 112, 114, 116, 126	02-MAY-2012	04-MAY-2012	16-MAY-2012	✓	04-MAY-2012	13-JUN-2012	✓

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM))							
101, 103, 105, 107, 109, 111, 113, 115, 117, 127	102, 104, 106, 108, 110, 112, 114, 116, 126,	02-MAY-2012	04-MAY-2012	16-MAY-2012	✓	04-MAY-2012	13-JUN-2012 ✓
EP080: BTEX							
Soil Glass Jar - Unpreserved (EP080)							
101, 103, 105, 107, 109, 111, 113, 115, 117, 127	102, 104, 106, 108, 110, 112, 114, 116, 126,	02-MAY-2012	04-MAY-2012	16-MAY-2012	✓	04-MAY-2012	16-MAY-2012 ✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080)							
101, 103, 105, 107, 109, 111, 113, 115, 117, 127	102, 104, 106, 108, 110, 112, 114, 116, 126,	02-MAY-2012	04-MAY-2012	16-MAY-2012	✓	04-MAY-2012	16-MAY-2012 ✓

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Matrix: **WATER** Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005: pH								
Clear Plastic Bottle - Natural (EA005) BH6, BH2	BH4,	02-MAY-2012	----	----	----	02-MAY-2012	02-MAY-2012	✓
EA010P: Conductivity by PC Titrator								
Clear Plastic Bottle - Natural (EA010-P) BH6, BH2	BH4,	02-MAY-2012	---	30-MAY-2012	----	04-MAY-2012	30-MAY-2012	✓
EA075: Redox Potential								
Clear Plastic Bottle - Natural (EA075) BH6, BH2	BH4,	02-MAY-2012	----	----	----	04-MAY-2012	02-MAY-2012	✗
ED038A: Acidity								
Clear Plastic Bottle - Natural (ED038) BH6, BH2	BH4,	02-MAY-2012	----	----	----	04-MAY-2012	16-MAY-2012	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G) BH6, BH2	BH4,	02-MAY-2012	---	30-MAY-2012	----	04-MAY-2012	30-MAY-2012	✓
ED045G: Chloride Discrete analyser								
Clear Plastic Bottle - Natural (ED045G) BH6, BH2	BH4,	02-MAY-2012	---	30-MAY-2012	----	04-MAY-2012	30-MAY-2012	✓
EK055G: Ammonia as N by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK055G) BH6, BH2	BH4,	02-MAY-2012	---	30-MAY-2012	----	04-MAY-2012	30-MAY-2012	✓



Matrix: **WATER**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EK057G: Nitrite as N by Discrete Analyser								
Clear Plastic Bottle - Natural (EK057G) BH6, BH2	BH4,	02-MAY-2012	---	04-MAY-2012	----	04-MAY-2012	04-MAY-2012	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK059G) BH6, BH2	BH4,	02-MAY-2012	---	30-MAY-2012	----	04-MAY-2012	30-MAY-2012	✓
EK067G: Total Phosphorus as P by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK067G) BH6, BH2	BH4,	02-MAY-2012	04-MAY-2012	30-MAY-2012	✓	04-MAY-2012	30-MAY-2012	✓
EK071G: Reactive Phosphorus as P by discrete analyser								
Clear Plastic Bottle - Natural (EK071G) BH6, BH2	BH4,	02-MAY-2012	---	04-MAY-2012	----	04-MAY-2012	04-MAY-2012	✓
EK085M: Sulfide as S2-								
Clear Plastic Bottle - Zinc Acetate/NaOH (EK085) BH6, BH2	BH4,	02-MAY-2012	----	----	----	04-MAY-2012	09-MAY-2012	✓
EP025: Oxygen - Dissolved (DO)								
Clear Plastic Bottle - Natural (EP025) BH6, BH2	BH4,	02-MAY-2012	----	----	----	02-MAY-2012	02-MAY-2012	✓
EP030: Biochemical Oxygen Demand (BOD)								
Clear Plastic Bottle - Natural (EP030) BH6, BH2	BH4,	02-MAY-2012	----	----	----	03-MAY-2012	04-MAY-2012	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Moisture Content	EA055-103	3	33	9.1	10.0	✖	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	2	19	10.5	10.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	2	20	10.0	10.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	2	16	12.5	10.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	20	10.0	10.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	4	37	10.8	10.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	2	20	10.0	10.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	20	10.0	10.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	19	5.3	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	20	5.0	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	16	6.3	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	5.0	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	37	5.4	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	20	5.0	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	20	5.0	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	19	5.3	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	20	5.0	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	16	6.3	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	5.0	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	37	5.4	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	20	5.0	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	20	5.0	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	19	5.3	5.0	✔	ALS QCS3 requirement
Pesticides by GCMS	EP068	1	20	5.0	5.0	✔	ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	16	6.3	5.0	✔	ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	5.0	5.0	✔	ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	37	5.4	5.0	✔	ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	20	5.0	5.0	✔	ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	20	5.0	5.0	✔	ALS QCS3 requirement

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Acidity as Calcium Carbonate	ED038	1	3	33.3	10.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	3	33.3	10.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Biochemical Oxygen Demand (BOD)	EP030	1	6	16.7	10.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement



Matrix: **WATER** Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP) - Continued							
Chloride by Discrete Analyser	ED045G	2	11	18.2	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	3	33.3	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	3	33.3	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	2	19	10.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	12	16.7	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Redox Potential	EA075	2	13	15.4	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	7	14.3	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfide as S2-	EK085	1	3	33.3	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	16	12.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Acidity as Calcium Carbonate	ED038	1	3	33.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	3	33.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Biochemical Oxygen Demand (BOD)	EP030	1	6	16.7	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	11	18.2	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	3	33.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	3	33.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	19	5.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	12	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Redox Potential	EA075	3	13	23.1	15.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	7	14.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfide as S2-	EK085	1	3	33.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	16	6.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Acidity as Calcium Carbonate	ED038	1	3	33.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	3	33.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Biochemical Oxygen Demand (BOD)	EP030	1	6	16.7	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	11	9.1	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	3	33.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	3	33.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	19	5.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	12	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	7	14.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Sulfide as S2-	EK085	1	3	33.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	16	6.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	3	33.3	5.0	✓	ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	11	9.1	5.0	✓	ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	3	33.3	5.0	✓	ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	19	5.3	5.0	✓	ALS QCS3 requirement
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	12	8.3	5.0	✓	ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	7	14.3	5.0	✓	ALS QCS3 requirement
Sulfide as S2-	EK085	1	3	33.3	5.0	✓	ALS QCS3 requirement



Matrix: **WATER** Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Matrix Spikes (MS) - Continued							
Total Phosphorus as P By Discrete Analyser	EK067G	1	16	6.3	5.0	✔	ALS QCS3 requirement



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055-103	SOIL	A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2010 Draft) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Asbestos Identification in bulk solids	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples
Total Metals by ICP-AES	EG005T	SOIL	(APHA 21st ed., 3120; USEPA SW 846 - 6010) (ICPAES) Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (1999) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 504)
Pesticides by GCMS	EP068	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM (1999) Schedule B(3) (Method 504,505)
TPH - Semivolatile Fraction	EP071	SOIL	(USEPA SW 846 - 8015A) Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C36. This method is compliant with NEPM (1999) Schedule B(3) (Method 506.1)
PAH/Phenols (SIM)	EP075(SIM)	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 502 and 507)
TPH Volatiles/BTEX	EP080	SOIL	(USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 501)
pH	EA005	WATER	APHA 21st ed. 4500 H+ B. pH of water samples is determined by ISE either manually or by automated pH meter. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Conductivity by PC Titrator	EA010-P	WATER	APHA 21st ed., 2510 B This procedure determines conductivity by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Salinity	EA020-EC-P	WATER	APHA 21st ed. 2520B Calculation from Electrical conductivity. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Redox Potential	EA075	WATER	In House (Ion selective electrode)
Acidity as Calcium Carbonate	ED038	WATER	APHA 21st ed., 2310 B Acidity is determined by titration with a standardised alkali to an end-point pH of 8.3. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Sulfate (Turbidimetric) as SO ₄ 2- by Discrete Analyser	ED041G	WATER	APHA 21st ed., 4500-SO ₄ Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO ₄ suspension is measured by a photometer and the SO ₄ -2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)



Analytical Methods	Method	Matrix	Method Descriptions
Chloride by Discrete Analyser	ED045G	WATER	APHA 21st ed., 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA 21st edition seal method 2017-1-L april 2003
Ammonia as N by Discrete analyser	EK055G	WATER	APHA 21st ed., 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N by Discrete Analyser	EK057G	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrate as N by Discrete Analyser	EK058G	WATER	APHA 21st ed., 4500-NO3- F. Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by Discrete Analyser. Nitrite is determined separately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	APHA 21st ed., 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	APHA 21st ed., 4500-P B&F This procedure involves sulphuric acid digestion of a 100mL sample to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	APHA 21st ed., 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with orthophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Sulfide as S2-	EK085	WATER	APHA 21st ed., 4500-S2- D Sulfide species present in water samples are immediately precipitated when collected in pretreated caustic/zinc acetate preserved sample containers. After the supernatant is discarded, the resultant precipitate is then coloured using methylene blue indicator and measured using UV-VIS detection at 664nm. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Oxygen - Dissolved	EP025	WATER	APHA 21st ed., 4500-O G. Dissolved Oxygen Probe. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Biochemical Oxygen Demand (BOD)	EP030	WATER	APHA 21st ed., 5210 B The 5-Day BOD test provides an empirical measure of the oxygen consumption capacity of a given water. A portion of the sample is diluted into oxygenated, nutrient rich water, and a seed added to begin biological decay. The initial dissolved oxygen content is measured, then the bottle is sealed and incubated for five days. The remaining dissolved oxygen is measured, and from the difference, the demand for oxygen, by biological decay, is determined. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	USEPA 200.2 Mod. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (1999) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	* ORG16	SOIL	(USEPA SW 846 - 5030A) 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids (Option A - Concentrating)	ORG17A	SOIL	In-house, Mechanical agitation (tumbler). 20g of sample, Na2SO4 and surrogate are extracted with 150mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Tumbler Extraction of Solids (Option B - Non-concentrating)	ORG17B	SOIL	In-house, Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 20mL 1:1 DCM/Acetone by end over end tumble. The solvent is transferred directly to a GC vial for analysis.



Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	APHA 21st ed., 4500 Norg - D; APHA 21st ed., 4500 P - H. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)



Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Laboratory Control Spike (LCS) Recoveries							
EG005T: Total Metals by ICP-AES	2709382-032	----	Chromium	7440-47-3	82.6 %	89.2-117%	Recovery less than lower control limit
EP068B: Organophosphorus Pesticides (OP)	2709557-002	----	Pirimphos-ethyl	23505-41-1	112 %	64.8-111%	Recovery greater than upper control limit

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EK085M: Sulfide as S2-	ES1210665-020	BH6	Sulfide as S2-	18496-25-8	30.3 %	70-130%	Recovery less than lower data quality objective

- For all matrices, no Method Blank value outliers occur.
- For all matrices, no Duplicate outliers occur.

Regular Sample Surrogates

- For all regular sample matrices, no surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method			Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA075: Redox Potential								
Clear Plastic Bottle - Natural								
BH6,	BH4,		----	----	----	04-MAY-2012	02-MAY-2012	2
BH2								

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

Matrix: **SOIL**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Moisture Content	3	33	9.1	10.0	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

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CHAIN OF CUSTODY

ALS Laboratory, please fax →
ALS Laboratory, please fax →
ALS Laboratory, please fax →

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CLIENT: Regional Geobiochem and Solutions
OFFICE: PROJECT: R2000372
ORDER NUMBER: PURCHASE ORDER NO.:
PROJECT MANAGER: STEVE ROBERTSON CONTACT PH:
SAMPLER: SAMPLER MOBILE:
COC Emailled to ALS? (YES / NO) EDD FORMAT (for default):
Email Reports to (will default to PM if no other addresses are listed): STEVE.M.ROBERTSON@geobiochem.com.au
Email Invoice to (will default to PM if no other addresses are listed):
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS: □ Standard TAT (List due date):
(Standard TAT may be longer for some tests e.g., Urea, Trace Organics)
□ Non Standard or urgent TAT (List due date):

FOR LABORATORY USE ONLY (Client)
COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OP: 1 2 3 4 5 6 7
RECEIVED BY: DATE/TIME: 2/5/12 17:00
RELINQUISHED BY: DATE/TIME: 2/5/12 19:00

RECEIVED BY: Frank
DATE/TIME: 2-5-12 19:00
RELINQUISHED BY: DATE/TIME: 2/5 16:20

LAB ID		SAMPLE ID		DATE / TIME	MATRIX	CONTAINER INFORMATION		ANALYSIS REQUIRED INCLUDING SUITES (NB. Suite Codes must be listed to attract suite price)					Additional Information
LAB ID		SAMPLE ID		DATE / TIME	MATRIX	CONTAINER INFORMATION		ANALYSIS REQUIRED INCLUDING SUITES (NB. Suite Codes must be listed to attract suite price)					Additional Information
LAB ID		SAMPLE ID		DATE / TIME	MATRIX	CONTAINER INFORMATION		ANALYSIS REQUIRED INCLUDING SUITES (NB. Suite Codes must be listed to attract suite price)					Additional Information
LAB ID		SAMPLE ID		DATE / TIME	MATRIX	CONTAINER INFORMATION		ANALYSIS REQUIRED INCLUDING SUITES (NB. Suite Codes must be listed to attract suite price)					Additional Information
LAB ID		SAMPLE ID		DATE / TIME	MATRIX	CONTAINER INFORMATION		ANALYSIS REQUIRED INCLUDING SUITES (NB. Suite Codes must be listed to attract suite price)					Additional Information
LAB ID		SAMPLE ID		DATE / TIME	MATRIX	CONTAINER INFORMATION		ANALYSIS REQUIRED INCLUDING SUITES (NB. Suite Codes must be listed to attract suite price)					Additional Information
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CHAIN OF CUSTODY

ALS Laboratory, please tick →

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CLIENT: REGIONAL GEOTECHNICAL SURVEY

OFFICE: ☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):

PROJECT: R2300372

ORDER NUMBER: PURCHASE ORDER NO.: COUNTRY OF ORIGIN:

PROJECT MANAGER: STEVE MORTON CONTACT PH: SAMPLER MOBILE: EDD FORMAT (for default):

SAMPLER: COC Emailled to ALS? (YES / NO) Email Reports to (will default to PM if no other addresses are listed): Email Invoice to (will default to PM if no other addresses are listed):

RECEIVED BY: DATE/TIME: RELINQUISHED BY: DATE/TIME:

FOR LABORATORY USE ONLY (COC)

Quantity (Suits)	Yes	No
Final Use (Not for resale)	Yes	No
Preserve Sample Temperature for Records	Yes	No
Other Comments	Yes	No

SAMPLE DETAILS MATRIX: Solid(S) Water(W)		CONTAINER INFORMATION		ANALYSIS REQUIRED INCLUDING SUITES (NB: Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (filtered bottle required).		Additional Information Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	
19	BH6	2/5/12	Water			Acidity Ammonia BODs Chloride Conductivity DO Nitrate Nitrite Ortho P, pH Redox Salinity Sulphate Sulphide Total P Sulfate reducing bacteria
20	BH4	"	Water			
21	BH2	"	Water			

Water Container Codes: P = Unpreserved Plastic; N = Nitro Preserved Plastic; OTC = Nitro Preserved OTC; SH = Sodium Hydroxide Preserved; S = Sodium Hydroxide Preserved; AG = Amber Glass Unpreserved; AP = Airtight Unpreserved Plastic; V = VOA Val HCl Preserved; VB = VOA Val Sodium Blue Preserved; VS = VOA Val Sulfuric Preserved; AV = Airtight Unpreserved Val SG = Sulfuric Preserved; Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Plastic; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottle; ASS = Plastic Bag for Acid Sulphate Solids; B = Unpreserved Bag; U = Unpreserved Bag; L = Lugs Code Preserved Bottles; ST = Sterile Sodium Thiosulfate Preserved Bottles.

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: ES1212943	Page	: 1 of 7
Client	: REGIONAL GEOTECHNICAL SOLUTION	Laboratory	: Environmental Division Sydney
Contact	: MR STEVE MORTON	Contact	: Client Services
Address	: 5/97 ISABELLA STREET WINGHAM NSW, AUSTRALIA 2429	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: steve.m@regionalgeotech.com.au	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 6553 5641	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: RGS00372	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: This is a rebatch of ES1209295	Date Samples Received	: 24-MAY-2012
C-O-C number	: ----	Issue Date	: 04-JUN-2012
Sampler	: AH	No. of samples received	: 10
Site	: ----	No. of samples analysed	: 10
Quote number	: SY/395/10		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Alex Rossi	Organic Chemist	Sydney Organics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting



Analytical Results

Sub-Matrix: SOIL

				Client sample ID				
				Client sampling date / time	BH1 0.1-0.2	BH5 0.1-0.2	BH5 0.2-0.3	BH7 0.25-0.35
					11-APR-2012 15:00	12-APR-2012 15:00	16-APR-2012 15:00	19-APR-2012 15:00
					02-MAY-2012 15:00			
Compound	CAS Number	LOR	Unit		ES1212943-001	ES1212943-002	ES1212943-003	ES1212943-004
					ES1212943-005			
EN33: TCLP Leach								
Initial pH	----	0.1	pH Unit		8.6	8.0	7.6	7.6
After HCl pH	----	0.1	pH Unit		1.6	1.7	1.6	1.7
Extraction Fluid Number	----	1	-		1	1	1	1
Final pH	----	0.1	pH Unit		4.9	4.9	4.9	5.0



Analytical Results

Sub-Matrix: SOIL

				Client sample ID	103	109	110	112	113
				Client sampling date / time	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00	02-MAY-2012 15:00
Compound	CAS Number	LOR	Unit		ES1212943-006	ES1212943-007	ES1212943-008	ES1212943-009	ES1212943-010
EN33: TCLP Leach									
Initial pH	----	0.1	pH Unit		6.4	6.3	7.3	6.2	5.6
After HCl pH	----	0.1	pH Unit		1.7	1.7	1.9	1.7	1.7
Extraction Fluid Number	----	1	-		1	1	1	1	1
Final pH	----	0.1	pH Unit		5.0	5.0	5.1	4.9	4.9



Analytical Results

Sub-Matrix: TCLP LEACHATE

Client sample ID

Client sampling date / time

Compound	CAS Number	LOR	Unit	BH1 0.1-0.2	BH5 0.1-0.2	BH5 0.2-0.3	BH7 0.25-0.35	101
				28-MAY-2012 12:00	28-MAY-2012 12:00	28-MAY-2012 12:00	28-MAY-2012 12:00	29-MAY-2012 12:00
				ES1212943-001	ES1212943-002	ES1212943-003	ES1212943-004	ES1212943-005
EG005C: Leachable Metals by ICPAES								
Lead	7439-92-1	0.1	mg/L	0.2	0.2	0.1	----	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	----	----	<1.0	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	----	----	<1.0	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	----	----	<1.0	----
Fluorene	86-73-7	1.0	µg/L	<1.0	----	----	<1.0	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	----	----	<1.0	----
Anthracene	120-12-7	1.0	µg/L	<1.0	----	----	<1.0	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	----	----	<1.0	----
Pyrene	129-00-0	1.0	µg/L	<1.0	----	----	<1.0	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	----	----	<1.0	----
Chrysene	218-01-9	1.0	µg/L	<1.0	----	----	<1.0	----
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	----	----	<1.0	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	----	----	<1.0	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	----	----	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	----	----	<1.0	----
Dibenz(a,h)anthracene	53-70-3	1.0	µg/L	<1.0	----	----	<1.0	----
Benzo(g,h,i)perylene	191-24-2	1.0	µg/L	<1.0	----	----	<1.0	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	----	----	<0.5	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	32.4	----	----	31.4	----
2-Chlorophenol-D4	93951-73-6	0.1	%	77.2	----	----	76.2	----
2,4,6-Tribromophenol	118-79-6	0.1	%	95.8	----	----	95.2	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	66.3	----	----	65.7	----
Anthracene-d10	1719-06-8	0.1	%	83.8	----	----	81.4	----
4-Terphenyl-d14	1718-51-0	0.1	%	96.2	----	----	90.6	----



Analytical Results

Sub-Matrix: TCLP LEACHATE

				Client sample ID	103	109	110	112	113
				Client sampling date / time	29-MAY-2012 12:00	29-MAY-2012 12:00	29-MAY-2012 12:00	29-MAY-2012 12:00	29-MAY-2012 12:00
Compound	CAS Number	LOR	Unit		ES1212943-006	ES1212943-007	ES1212943-008	ES1212943-009	ES1212943-010
EG005C: Leachable Metals by ICPAES									
Lead	7439-92-1	0.1	mg/L		<0.1	2.8	<0.1	0.2	0.2



Surrogate Control Limits

Sub-Matrix: TCLP LEACHATE		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10.0	64.1
2-Chlorophenol-D4	93951-73-6	11.3	122.9
2,4,6-Tribromophenol	118-79-6	11.7	144.0
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	19.9	122.8
Anthracene-d10	1719-06-8	23.3	125.8
4-Terphenyl-d14	1718-51-0	20.3	134.5

Environmental Division

QUALITY CONTROL REPORT

Work Order	: ES1212943	Page	: 1 of 5
Client	: REGIONAL GEOTECHNICAL SOLUTION	Laboratory	: Environmental Division Sydney
Contact	: MR STEVE MORTON	Contact	: Client Services
Address	: 5/97 ISABELLA STREET WINGHAM NSW, AUSTRALIA 2429	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: steve.m@regionalgeotech.com.au	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 6553 5641	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: RGS00372	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----	Date Samples Received	: 24-MAY-2012
C-O-C number	: ----	Issue Date	: 04-JUN-2012
Sampler	: AH	No. of samples received	: 10
Order number	: This is a rebatch of ES1209295	No. of samples analysed	: 10
Quote number	: SY/395/10		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits



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Accredited for compliance with
ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Alex Rossi	Organic Chemist	Sydney Organics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC



Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: WATER

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG005C: Leachable Metals by ICPAES (QC Lot: 2325453)									
ES1212943-001	BH1 0.1-0.2	EG005C: Lead	7439-92-1	0.1	mg/L	0.2	0.2	0.0	No Limit
EG005C: Leachable Metals by ICPAES (QC Lot: 2332733)									
ES1212943-005	101	EG005C: Lead	7439-92-1	0.1	mg/L	<0.1	<0.1	0.0	No Limit
ES1213190-004	Anonymous	EG005C: Lead	7439-92-1	0.1	mg/L	<0.1	<0.1	0.0	No Limit



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EG005C: Leachable Metals by ICPAES (QCLot: 2325453)								
EG005C: Lead	7439-92-1	0.1	mg/L	<0.1	0.1 mg/L	92.9	70	130
EG005C: Leachable Metals by ICPAES (QCLot: 2332733)								
EG005C: Lead	7439-92-1	0.1	mg/L	<0.1	0.1 mg/L	111	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2332378)								
EP075(SIM): Naphthalene	91-20-3	0.2	µg/L	----	5 µg/L	77.1	58.6	119
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Acenaphthylene	208-96-8	0.2	µg/L	----	5 µg/L	81.6	63.6	114
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Acenaphthene	83-32-9	0.2	µg/L	----	5 µg/L	83.2	62.2	113
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Fluorene	86-73-7	0.2	µg/L	----	5 µg/L	85.4	63.9	115
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Phenanthrene	85-01-8	0.2	µg/L	----	5 µg/L	91.8	62.6	116
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Anthracene	120-12-7	0.2	µg/L	----	5 µg/L	91.6	64.3	116
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Fluoranthene	206-44-0	0.2	µg/L	----	5 µg/L	95.0	63.6	118
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Pyrene	129-00-0	0.2	µg/L	----	5 µg/L	96.0	63.1	118
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Benz(a)anthracene	56-55-3	0.2	µg/L	----	5 µg/L	96.2	64.1	117
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Chrysene	218-01-9	0.2	µg/L	----	5 µg/L	96.9	62.5	116
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Benzo(b)fluoranthene	205-99-2	0.2	µg/L	----	5 µg/L	95.6	61.7	119
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.2	µg/L	----	5 µg/L	98.1	61.7	117
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Benzo(a)pyrene	50-32-8	0.2	µg/L	----	5 µg/L	95.5	63.3	117
		0.5	µg/L	<0.5	----	----	----	----
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.2	µg/L	----	5 µg/L	92.4	59.9	118
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Dibenz(a,h)anthracene	53-70-3	0.2	µg/L	----	5 µg/L	93.2	61.2	117
		1	µg/L	<1.0	----	----	----	----



Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2332378) - continued								
EP075(SIM): Benzo(g,h,i)perylene	191-24-2	0.2	µg/L	----	5 µg/L	93.4	59.1	118
		1	µg/L	<1.0	----	----	----	----
EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	1	µg/L	<1.0	----	----	----	----

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery (%) MS	Recovery Limits (%) Low High	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number				
EG005C: Leachable Metals by ICPAES (QCLot: 2325453)							
ES1212943-002	BH5 0.1-0.2	EG005C: Lead	7439-92-1	1 mg/L	105	70	130
EG005C: Leachable Metals by ICPAES (QCLot: 2332733)							
ES1212943-006	103	EG005C: Lead	7439-92-1	1 mg/L	116	70	130

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

The quality control term Matrix Spike (MS) and Matrix Spike Duplicate (MSD) refers to intralaboratory split samples spiked with a representative set of target analytes. The purpose of these QC parameters are to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: WATER				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report					
				Spike Concentration	Spike Recovery (%) MS MSD		Recovery Limits (%) Low High		RPDs (%) Value Control Limit
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number						
EG005C: Leachable Metals by ICPAES (QCLot: 2325453)									
ES1212943-002	BH5 0.1-0.2	EG005C: Lead	7439-92-1	1 mg/L	105	----	70	130	----
EG005C: Leachable Metals by ICPAES (QCLot: 2332733)									
ES1212943-006	103	EG005C: Lead	7439-92-1	1 mg/L	116	----	70	130	----

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: ES1212943	Page	: 1 of 5
Client	: REGIONAL GEOTECHNICAL SOLUTION	Laboratory	: Environmental Division Sydney
Contact	: MR STEVE MORTON	Contact	: Client Services
Address	: 5/97 ISABELLA STREET WINGHAM NSW, AUSTRALIA 2429	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: steve.m@regionalgeotech.com.au	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 6553 5641	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: RGS00372	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----	Date Samples Received	: 24-MAY-2012
C-O-C number	: ----	Issue Date	: 04-JUN-2012
Sampler	: AH	No. of samples received	: 10
Order number	: This is a rebatch of ES1209295	No. of samples analysed	: 10
Quote number	: SY/395/10		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers



Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non-volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG005C: Leachable Metals by ICPAES								
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG005C) BH1 0.1-0.2, BH5 0.2-0.3	BH5 0.1-0.2,	28-MAY-2012	28-MAY-2012	24-NOV-2012	✓	28-MAY-2012	24-NOV-2012	✓
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG005C) 101, 109, 112,	103, 110, 113	29-MAY-2012	31-MAY-2012	25-NOV-2012	✓	31-MAY-2012	25-NOV-2012	✓
EN33: TCLP Leach								
Lab Split: Leach for metals excl. Hg (EN33a) 101, 109, 112,	103, 110, 113	02-MAY-2012	---	29-OCT-2012	----	29-MAY-2012	29-OCT-2012	✓
Lab Split: Leach for metals excl. Hg (EN33a) BH5 0.1-0.2		12-APR-2012	---	09-OCT-2012	----	28-MAY-2012	09-OCT-2012	✓
Lab Split: Leach for metals excl. Hg (EN33a) BH5 0.2-0.3		16-APR-2012	---	13-OCT-2012	----	28-MAY-2012	13-OCT-2012	✓
LabSplit: Leach for organics and other tests (EN33a) BH1 0.1-0.2		11-APR-2012	---	25-APR-2012	----	28-MAY-2012	25-APR-2012	✗
LabSplit: Leach for organics and other tests (EN33a) BH7 0.25-0.35		19-APR-2012	---	03-MAY-2012	----	28-MAY-2012	03-MAY-2012	✗
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP075(SIM)) BH1 0.1-0.2,	BH7 0.25-0.35	28-MAY-2012	31-MAY-2012	04-JUN-2012	✓	01-JUN-2012	10-JUL-2012	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER** Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Leachable Metals by ICPAES	EG005C	3	15	20.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Leachable Metals by ICPAES	EG005C	2	15	13.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	10	10.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Leachable Metals by ICPAES	EG005C	2	15	13.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	10	10.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Leachable Metals by ICPAES	EG005C	2	15	13.3	5.0	✓	ALS QCS3 requirement



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

<i>Analytical Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Leachable Metals by ICPAES	EG005C	SOIL	APHA 21st ed., 3120; USEPA SW 846 - 6010 The ICPAES technique ionises leachate sample atoms emitting a characteristic spectrum. This spectrum is then compared against matrix matched standards for quantification. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	SOIL	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
<i>Preparation Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Digestion for Total Recoverable Metals in TCLP Leachate	EN25C	SOIL	USEPA SW846-3005 Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TCLP for Non & Semivolatile Analytes	EN33a	SOIL	(USEPA SW846-1311, ALS QWI-EN/33) The TCLP procedure is designed to determine the mobility of both organic and inorganic analytes present in wastes. The standard TCLP leach is for non-volatile and Semivolatile test parameters.
Separatory Funnel Extraction of Liquids	ORG14	SOIL	USEPA SW 846 - 3510B 500 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2). ALS default excludes sediment which may be resident in the container.



Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- For all matrices, no Method Blank value outliers occur.
- For all matrices, no Duplicate outliers occur.
- For all matrices, no Laboratory Control outliers occur.
- For all matrices, no Matrix Spike outliers occur.

Regular Sample Surrogates

- For all regular sample matrices, no surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: SOIL

Method Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EN33: TCLP Leach						
LabSplit: Leach for organics and other tests BH1 0.1-0.2	----	----	----	28-MAY-2012	25-APR-2012	33
LabSplit: Leach for organics and other tests BH7 0.25-0.35	----	----	----	28-MAY-2012	03-MAY-2012	25

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- No Quality Control Sample Frequency Outliers exist.