Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Preliminary Site Investigation (Contamination)

Proposed Residential Development
Site 68, Sydney Olympic Park

Prepared for
Ecove Group Pty Ltd

Project 73942
September 2014

Douglas Partners
Geotechnics / Environment / Groundwater

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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

	Signature	Date
Author		19 September 2014
Reviewer	 for TW	19 September 2014

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1. Introduction

This report presents the results of a Preliminary Site Investigation (Contamination) undertaken for a proposed residential development at Site 68 on the corner of Australia Avenue and Bennelong Parkway, Sydney Olympic Park. The work was commissioned by Ecove Group Pty Ltd, developers of the site.

The project involves the construction of a multi-storey residential unit building on the site of a stormwater detention basin. A large concrete tank will be constructed (by others) to the north of the site to replace the detention basin. The new building will be constructed to the south of the tank and will include several basement levels, one or two of which will be below the level of Bennelong Parkway. A new pedestrian bridge will also be constructed to replace an existing bridge across Bennelong Parkway that links Bicentennial Park with the Sydney Olympic Park precinct.

The Preliminary Site Investigation was undertaken to:

- assess the previous land uses and subsurface conditions to determine the potential for soil and groundwater contamination in the area of the site in which development is proposed (the 'site');
- provide a preliminary assessment of the suitability of the site for the proposed development; and
- provide recommendations for additional investigation, if required.

The Preliminary Site Investigation has been prepared to address the requirements of *State Environmental Planning Policy No 55 – Remediation of Land*. The overall approach for the Preliminary Site Investigation included a review of available historical information and a review of 12 borehole logs and associated laboratory testing undertaken as part of a geotechnical investigation on the site. Details of the site history and geotechnical testing are given in this report, as well as comments on the issues outlined above.

This report has not been prepared for site audit purposes. The geotechnical investigations undertaken by Douglas Partners are reported separately. Relevant information from the geotechnical investigations has been included in this report.

It is noted that the Sydney Olympic Park Authority uses a separate height datum (Australian Height Datum + 100.078 m), although for the purposes of this report AHD has been used.

2. Site Description

The site is an irregular shaped lot with maximum dimensions of approximately 170 m by 70 m. It is bounded by a commercial premise to the north, Bennelong Parkway to the east and south, and the Sydney Olympic Park rail loop to the west. The rail loop is elevated above the site and is supported by retaining walls. The site is currently used as a stormwater detention basin which is confined by earth embankments. The surface at the top of the embankments varies from about RL 8 m to RL 13 m AHD which is some 4 m to 8 m above the levels of Bennelong Parkway.

3. Regional Geology and Hydrogeology

The *Sydney 1:100 000 Geological Series Sheet* shows that the site is close to a boundary between man-placed filling over alluvial and estuarine sediments, and Ashfield Shale. Ashfield Shale typically comprises black to dark grey shale and laminite, and weathers to form clayey soils of high plasticity. An extract from the geological map is shown in Figure 1.

Figure 1: Extract from geological map

The natural groundwater flow direction is likely to be to the east and north-east towards Powells Creek/Homebush Bay. Bicentennial Park is a former landfill and therefore leachate production may be an issue. However, the Bennelong Parkway road alignment is unlikely to be underlain by landfill and therefore a relatively wide buffer exists between the former landfill and the proposed basement. The leachate would also be expected to flow towards Powells Creek unless natural or artificial barriers exist that alter the flow direction.

4. Scope of Works

The scope of the Preliminary Site Investigation was as follows:

- Review various historical documents including aerial photographs, the EPA Contaminated Land register and other background information to determine the nature of previous activities that may have occurred on the site;
- Review the results of the geotechnical investigations undertaken for the project. This included some chemical analysis of soil samples for preliminary waste classification purposes; and
- Provide a Preliminary Site Investigation report which comments on the historical uses of the site, the potential for soil and groundwater contamination to be present, and provides recommendations for follow up action (if required).

5. Site History

5.1 Aerial Photographs

Aerial photographs from 1951, 1961, 1970, 1982, 1991, 1998, 2009 and 2014 were used to assess historical land-use patterns on the site. The 1951 photograph shows that the site is fenced, vacant and contains several trees. The southern portion of Homebush Bay is yet to be reclaimed.

The 1961 and 1970 photographs show similar site conditions as the earlier photograph. Reclamation of Homebush Bay has been undertaken and some earthworks activities, presumably associated with landfilling on the eastern side of Bennelong Parkway, are evident.

The site remains vacant in the 1982 and 1991 photographs although a small building appears on the site immediately to the north. Landfilling operations remain evident on the eastern side of Bennelong Parkway in the 1982 photograph but the site appears to have been converted into parkland in the 1991 view.

The 1998 photograph shows the stormwater detention basin on the site and it appears to have been recently constructed as the batters are yet to be covered with vegetation. The Olympic Park railway loop and the pedestrian bridge into Bicentennial Park are also seen in this photograph. A new building to the north is also evident, and the building in the 1982 and 1991 photographs is no longer present.

The 2009 and 2014 photographs show the site in its current condition. The most recent photograph shows development works on the western side of the railway loop (residential buildings) and in the south-western corner of Bicentennial Park (electricity substation).

There is no evidence in the aerial photographs to suggest contaminating activities have previously been undertaken on Site 68 itself. The aerial photographs are attached in Appendix C.

5.2 Historical Land Uses

It is known from previous investigations in Sydney Olympic Park that Site 68 is in the area formerly owned by the Metropolitan Meat Industry Board from the early 1900s. This organisation was responsible for operating an abattoir and meat works in the Homebush Bay area. It is evident from the aerial photographs that the abattoir was located to the north-west of the site and that Site 68 was used as a holding paddock for animals awaiting slaughter.

More recently the site has been used as a stormwater detention basin to collect stormwater runoff from the southern portion of the Sydney Olympic Park precinct prior to discharge into the Powells Creek/Homebush Bay system. Surrounding sites have been developed for commercial purposes and more recently residential use.

The area to the east of the site (now Bicentennial Park) is known to be underlain by former landfill material. Recent involvement on the Ausgrid substation which is currently under construction suggests that the area closest to Site 68 was filled with building waste (including asbestos-containing materials); putrescible materials were not encountered and therefore the risk of landfill gas migrating into Site 68 is considered to be low.

Apart from the previous filling operations and use of the site to store stormwater, there is no evidence from our knowledge of the area to suggest contaminating activities have previously been undertaken on Site 68 itself.

5.3 Contaminated Lands Register

A search of the record of notices issued by the NSW EPA was undertaken on 11 September 2014. There are several sites that are or have been the subject of a control order issued under the *Contaminated Land Management Act 1997* in Sydney Olympic Park. The various sites were consolidated during development works for the Sydney 2000 Olympic Games and are maintained under an Environmental Management Plan by the Sydney Olympic Park Authority (SOPA). A plan showing the various sites is provided in Appendix C.

The maintenance areas closest to Site 68 are Bicentennial Park and the former Golf Driving Range site which has recently been redeveloped by the Australian Football League as a training facility for the GWS Giants. Both of these sites are underlain by landfill materials.

There is no evidence from the contaminated lands register to suggest contaminating activities have previously been undertaken on Site 68 itself.

5.4 Licenced Groundwater Wells

There are no licenced groundwater wells on the site. The nearest wells are located within Bicentennial Park and are understood to be groundwater quality monitoring wells. The use of the groundwater aquifer for domestic or industrial purposes within Sydney Olympic Park is considered highly unlikely. The locations of the licenced wells within Bicentennial Park are shown in Figure 2.

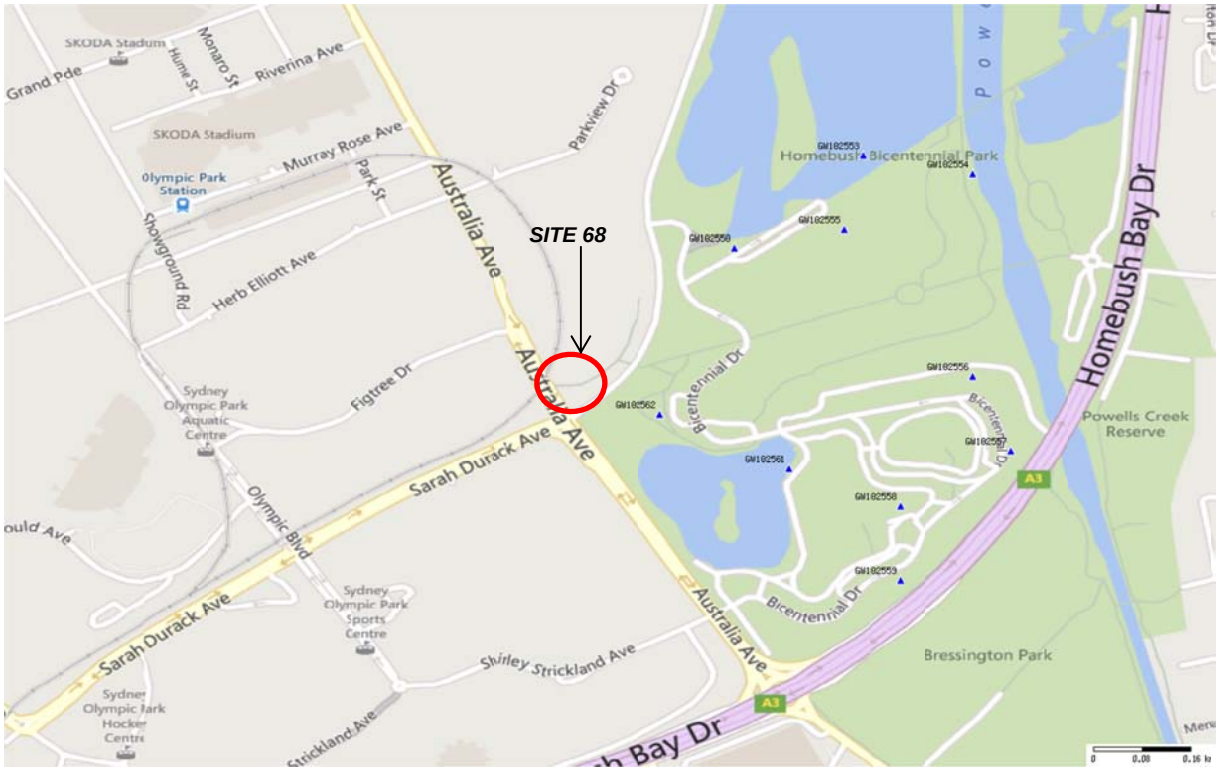


Figure 2: Locations of licenced groundwater wells

6. Geotechnical Field Work

6.1 Previous Investigation

Five cored boreholes (BH1 to BH4 and BH6) were drilled to depths of 12.7 m to 14.7 m using a truck-mounted DT100 drilling rig. They were commenced using solid flight augers then continued using rotary wash-boring equipment inside top casing, where required. Standard penetration tests were undertaken within the overburden at regular depth intervals. Soon after rock was encountered, the bores were advanced using NMLC-sized diamond core drilling equipment to obtain 50 mm diameter continuous samples of the rock for identification and strength testing purposes.

Borehole BH5 was drilled to a depth of 2.5 m at which point auger refusal occurred on what was inferred to be a large steel plate. The rig was moved three times in an attempt to penetrate beyond the level of the obstruction without success. Restrictions on blocking pedestrian access prevented additional attempts at this location.

A groundwater monitoring well was installed in BH2 at the completion of drilling.

The locations of the boreholes are shown on Drawing C1 in Appendix B. The ground surface levels at the bores were measured to AHD using differential global positioning system (dGPS).

6.2 Current Investigation

Five cored boreholes (BH101 to BH103, BH105 and BH106) were drilled to depths of 6.0 m to 12.1 m using a truck-mounted DT100 drilling rig. They were commenced using solid flight augers then continued using rotary wash-boring equipment inside top casing, where required. Standard penetration tests were undertaken within the overburden at regular depth intervals. Soon after rock was encountered, the bores were advanced using NMLC-sized diamond core drilling equipment to obtain 50 mm diameter continuous samples of the rock for identification and strength testing purposes.

Borehole BH104 was drilled to a depth of 0.7 m at which point an underground conduit was encountered. Restrictions on blocking pedestrian access and space limitations prevented additional drilling at this location.

A groundwater monitoring well was installed in BH105 and BH106 at the completion of drilling.

The locations of the boreholes are also shown on Drawing C1 in Appendix B. The ground surface levels at the bores were measured to AHD using an automatic level, relative to known benchmarks on the site.

7. Field Work Results

The subsurface conditions encountered in the boreholes are presented in the borehole logs in Appendix D. Notes defining descriptive terms and classification methods are included in Appendix A. The boreholes encountered:

- FILLING – concrete, asphalt, roadbase, topsoil, pavers and woodchips to depths of 0.1 m to 0.3 m. Clayey, sandy and gravelly filling with brick, metal, wood, charcoal, glass, rubber, wire, concrete, plastic, coal, slag and asbestos sheeting to depths of 0.3 m to 9.4 m. A hydrocarbon odour was detected in BH2 and BH4;
- RESIDUAL SOIL – firm to hard clay, silty clay and shaly clay with some ironstone gravel and bands to depths of 2.5 m to 11.0 m; and
- BEDROCK – shale bedrock which was initially extremely low strength and extremely weathered, grading to low, medium and medium to high strength rock to the base of the bores at 12.0 m to 14.7 m depth. Very high strength sideritic bands were encountered in BH2 and BH3.

Seepage was observed at a depth of 4.0 m (RL 6.2 m AHD) in BH4 and 1.5 m (RL 2.1 m AHD) in BH105 during augering. Free groundwater was not observed during augering in the other bores and the use of drilling fluid prevented groundwater observations during rotary wash-boring and coring.

Table 1 summarises the groundwater observations made in the monitoring wells installed on the site.

Table 1: Summary of Groundwater Observations in Monitoring Wells (RL, m AHD)

Date	BH2	BH105	BH106
28 May 2014	5.2	NM	NM
9 Sep 2014	3.0	2.4	3.2

Notes: NM = not measured

8. Laboratory Testing

Nine soil samples were sent to a NATA accredited analytical laboratory and were analysed for a range of potential organic and inorganic contaminants to provide preliminary information for waste classification purposes as part of the geotechnical investigation. The results of the analysis have also been used in this Preliminary Site Investigation and are summarised in Tables 2 to 5. The detailed results are included in Appendix E.

Table 2: Analytical Results for Selected Organic Compounds in Soil (mg/kg)

Sample/ Depth (m)	Benzene	Toluene	Ethyl-benzene	Xylene	TRH $_{C6-C9}$	TRH $_{C10-C36}$
BH1/1-1.45	<0.2	<0.5	<1	<3	<25	<250
BH1/2.5-2.95	<0.2	<0.5	<1	<3	<25	<250
BH2/1.7	<0.2	<0.5	<1	<3	<25	<250
BH2/4.0	<0.2	<0.5	<1	<3	<25	1170
BH2/5.5	<0.2	<0.5	<1	<3	<25	3240
BH4/1.9	<0.2	<0.5	<1	<3	<25	290
BH4/5.0	<0.2	<0.5	<1	<3	<25	1030
BH5/5.5	<0.2	<0.5	<1	<3	<25	960
BH5/2.5	<0.2	<0.5	<1	<3	<25	330

Notes: TRH = total recoverable hydrocarbons

Table 3: Analytical Results for Selected Organic Compounds in Soil (mg/kg)

Sample/ Depth (m)	Total PAH	Benzo(a) pyrene	OCP	PCB	Phenol
BH1/1-1.45	NIL(+)VE	<0.05	NIL(+)VE	NIL(+)VE	<5
BH1/2.5-2.95	NIL(+)VE	<0.05	NIL(+)VE	NIL(+)VE	<5
BH2/1.7	5.4	0.45	NIL(+)VE	NIL(+)VE	<5
BH2/4.0	11	0.69	NIL(+)VE	NIL(+)VE	<5
BH2/5.5	6.4	0.41	NIL(+)VE	NIL(+)VE	<5
BH4/1.9	5.3	0.39	NIL(+)VE	NIL(+)VE	<5
BH4/5.0	3.4	0.25	NIL(+)VE	NIL(+)VE	<5
BH5/5.5	4.0	0.30	NIL(+)VE	NIL(+)VE	<5
BH5/2.5	5.3	0.39	NIL(+)VE	NIL(+)VE	14

Notes: PAH = polycyclic aromatic hydrocarbons; OCP = organochlorine pesticides; PCB = polychlorinated biphenyls

Table 4: Analytical Results for Selected Heavy Metals in Soil (mg/kg)

Sample/ Depth (m)	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
BH1/1-1.45	5	<0.4	12	17	16	<0.1	2	8
BH1/2.5-2.95	7	<0.4	13	19	16	<0.1	1	7
BH2/1.7	30	6.4	30	270	220	0.2	27	310
BH2/4.0	20	4.9	36	700	360	0.3	29	450
BH2/5.5	20	3	37	470	240	0.2	34	370
BH4/1.9	20	2	15	160	180	0.1	16	560
BH4/5.0	30	0.8	21	160	190	0.3	13	210
BH5/5.5	40	1	25	200	190	0.3	15	280
BH5/2.5	20	2	46	710	510	0.4	48	700

Table 5: Analytical Results for the Toxicity Characteristics Leaching Procedure

Sample/Depth (m)	Sample pH (pH units)	Lead (mg/L)
BH2/1.7	8.1	0.3
BH2/4.0	8.6	5.9
BH2/5.5	8.9	0.5
BH4/1.9	8.5	0.2
BH4/5.0	8.7	0.5
BH5/5.5	8.8	0.4
BH5/2.5	8.4	0.3

In addition to the results outlined above, the nine samples were also tested for asbestos. Chrysotile asbestos was detected in the sample from BH2/5.5 m but respirable fibres were not detected within the reportable limits. Bonded and fibrous asbestos was encountered in other samples from BH2 and in BH5 but were below the reporting limits of the laboratory.

One piece of fibre cement sheeting recovered from a depth of 2.0 m in BH5 was also analysed. The sample contained Chrysotile asbestos.

9. Conclusions and Recommendations

The site history information indicates that the site was used as a holding paddock for animals awaiting slaughter in the nearby abattoir, possibly up until the late 1980s or early 1990s. The site has been used as a stormwater detention basin since the late 1990s.

Potentially contaminating activities that have occurred on or near the site include:

- The placement of filling on the site;
- Leaching of contaminants from the adjacent landfill areas;
- Residual contamination from stormwater storage (i.e. hydrocarbons and heavy metals);
- Contaminants associated with maintenance of the site (e.g. herbicides and pesticides); and
- Naturally occurring elements in the soils and rock underlying the site (e.g. heavy metals).

The laboratory testing undertaken for preliminary waste classification purposes as part of the geotechnical investigation indicated concentrations of hydrocarbons and some heavy metals above likely background levels but typically still below health-based criteria for high-density residential sites outlined in the recently updated *National Environment Protection (Assessment of Site Contamination) Measure* (NEPM).

Some asbestos-containing material (ACM) was also detected in the filling on the site.

It is noted that the proposed development will involve the excavation of a basement into rock and the removal of the existing filling and soil materials from the area of the proposed building. As such, the contaminant concentrations within the existing filling and soil in this area of the site are somewhat irrelevant from a land use perspective as this material will be removed from the site as part of the redevelopment works.

It is possible that contaminated groundwater may be present below the site due to the location of landfill cells adjacent to the site and known poor groundwater quality in other areas of Sydney Olympic Park. Groundwater quality on the site is currently being assessed to determine appropriate groundwater control and drainage measures that will be required within the basement area. This information will be used in the detailed design phase of the project. Regardless of the quality of the groundwater, control measures can be incorporated into the structure (if required) to reduce the impacts of contaminated groundwater (if present) on the residents of the building.

On the basis of this Preliminary Site Investigation and the nature of the proposed development, it is considered that the site may be or can be made suitable for the proposed high-density residential land use. The following additional works will be required once the development scheme has been approved (i.e. post-DA approval):

- Further assessment of contaminant levels in any existing filling and soil that will remain on the site (i.e. areas outside the proposed basement excavation) if applicable;
- Assessment of groundwater quality on the site to determine appropriate control and disposal options that will need to be incorporated into the building (if required); and
- Waste classification of all materials requiring removal from the site to ensure they are disposed of in an appropriate manner.

10. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for a project at Site 68, Sydney Olympic Park in accordance with instructions received from Ecove Group Pty Ltd. The report is provided for the use of Ecove Group Pty Ltd for this project only and for the purpose(s) described in the report. It should not be used for other projects or by a third party.

The results provided in the report are indicative of the sub-surface conditions only at the specific sampling or testing locations, and then only to the depths investigated and at the time the work was carried out. Subsurface conditions can change abruptly due to variable geological processes and also as a result of anthropogenic influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be limited by undetected variations in ground conditions between sampling locations. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

This report must be read in conjunction with all of the attached notes and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion given in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk.

Douglas Partners Pty Ltd

Appendix A

About this Report

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Soil Descriptions

Douglas Partners

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 -5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

Soil Descriptions

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

Rock Strength

Rock strength is defined by the Point Load Strength Index ($Is_{(50)}$) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The test procedure is described by Australian Standard 4133.4.1 - 1993. The terms used to describe rock strength are as follows:

Term	Abbreviation	Point Load Index $Is_{(50)}$ MPa	Approx Unconfined Compressive Strength MPa*
Extremely low	EL	<0.03	<0.6
Very low	VL	0.03 - 0.1	0.6 - 2
Low	L	0.1 - 0.3	2 - 6
Medium	M	0.3 - 1.0	6 - 20
High	H	1 - 3	20 - 60
Very high	VH	3 - 10	60 - 200
Extremely high	EH	>10	>200

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Extremely weathered	EW	Rock substance has soil properties, i.e. it can be remoulded and classified as a soil but the texture of the original rock is still evident.
Highly weathered	HW	Limonite staining or bleaching affects whole of rock substance and other signs of decomposition are evident. Porosity and strength may be altered as a result of iron leaching or deposition. Colour and strength of original fresh rock is not recognisable
Moderately weathered	MW	Staining and discolouration of rock substance has taken place
Slightly weathered	SW	Rock substance is slightly discoloured but shows little or no change of strength from fresh rock
Fresh stained	Fs	Rock substance unaffected by weathering but staining visible along defects
Fresh	Fr	No signs of decomposition or staining

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with some fragments
Fractured	Core lengths of 40-200 mm with some shorter and longer sections
Slightly Fractured	Core lengths of 200-1000 mm with some shorter and loner sections
Unbroken	Core lengths mostly > 1000 mm

Rock Descriptions

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq \text{100 mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or better. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Symbols & Abbreviations

Douglas Partners

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core Drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

Symbols & Abbreviations

Graphic Symbols for Soil and Rock

General


Asphalt


Road base


Concrete


Filling

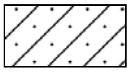
Soils


Topsoil

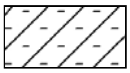

Peat


Clay

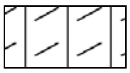

Silty clay

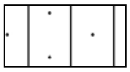

Sandy clay

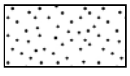

Gravelly clay

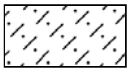

Shaly clay

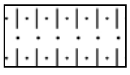

Silt


Clayey silt


Sandy silt

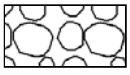

Sand

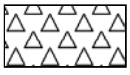

Clayey sand


Silty sand


Gravel


Sandy gravel


Cobbles, boulders

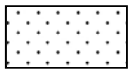

Talus

Sedimentary Rocks

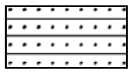

Boulder conglomerate

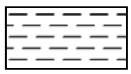

Conglomerate


Conglomeratic sandstone

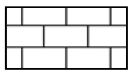

Sandstone


Siltstone


Laminite

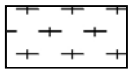

Mudstone, claystone, shale

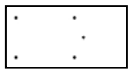

Coal


Limestone

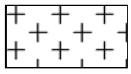
Metamorphic Rocks

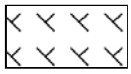

Slate, phyllite, schist

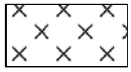

Gneiss

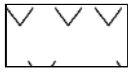

Quartzite

Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote

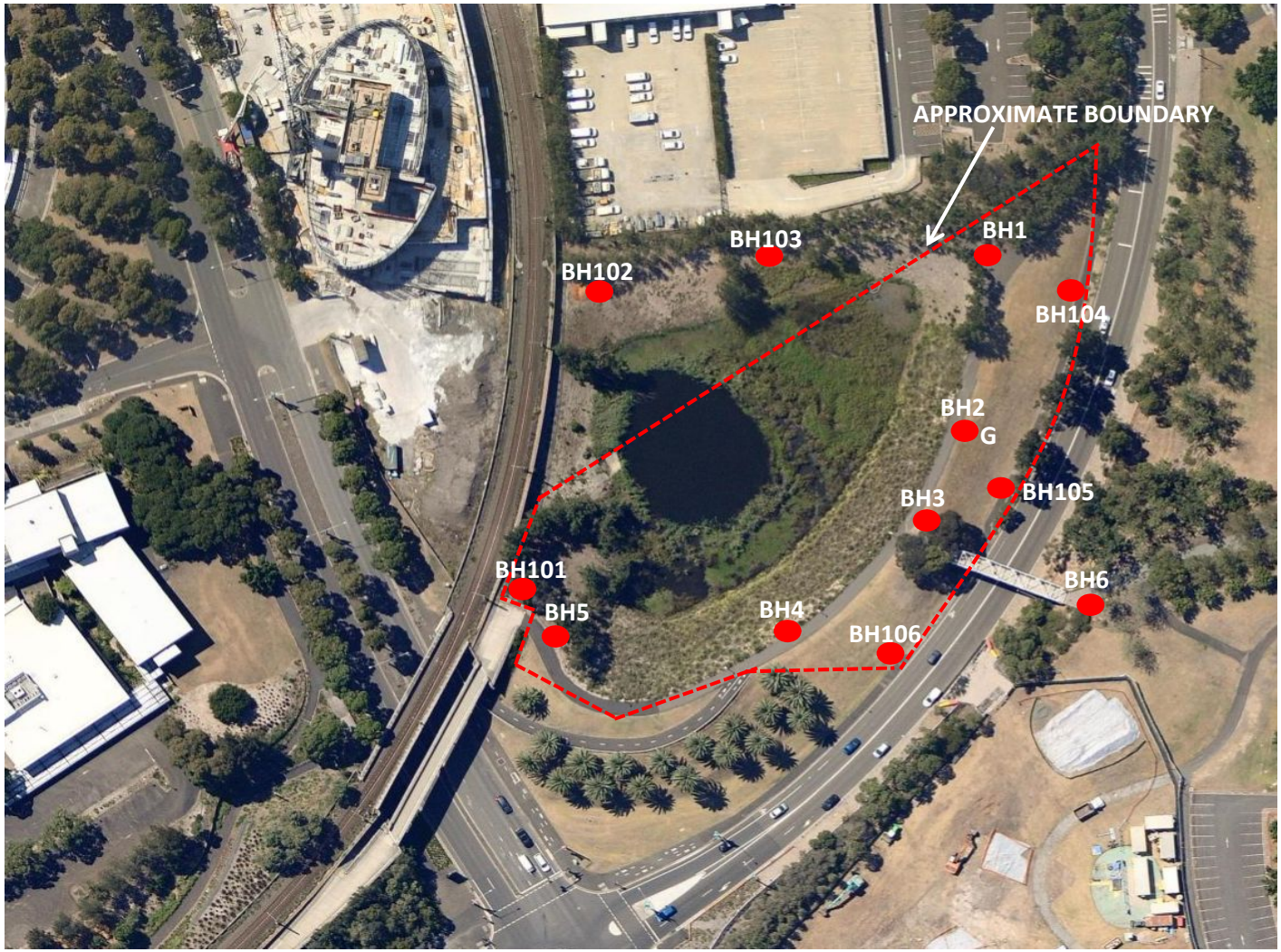

Tuff, breccia


Porphyry

Appendix B

Drawing

N



● Location of Borehole **G** Groundwater monitoring well

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Ecove Group Pty Ltd	**Locations of Boreholes**	PROJECT No: 73942
	OFFICE: Sydney	**Site 68 Geotechnical Investigation**	DWG No: C1
	DATE: 9 Sep 2014	**Sydney Olympic Park**	REVISION: 0

Appendix C

Site History Information

Photo 1: Aerial photo from 1951

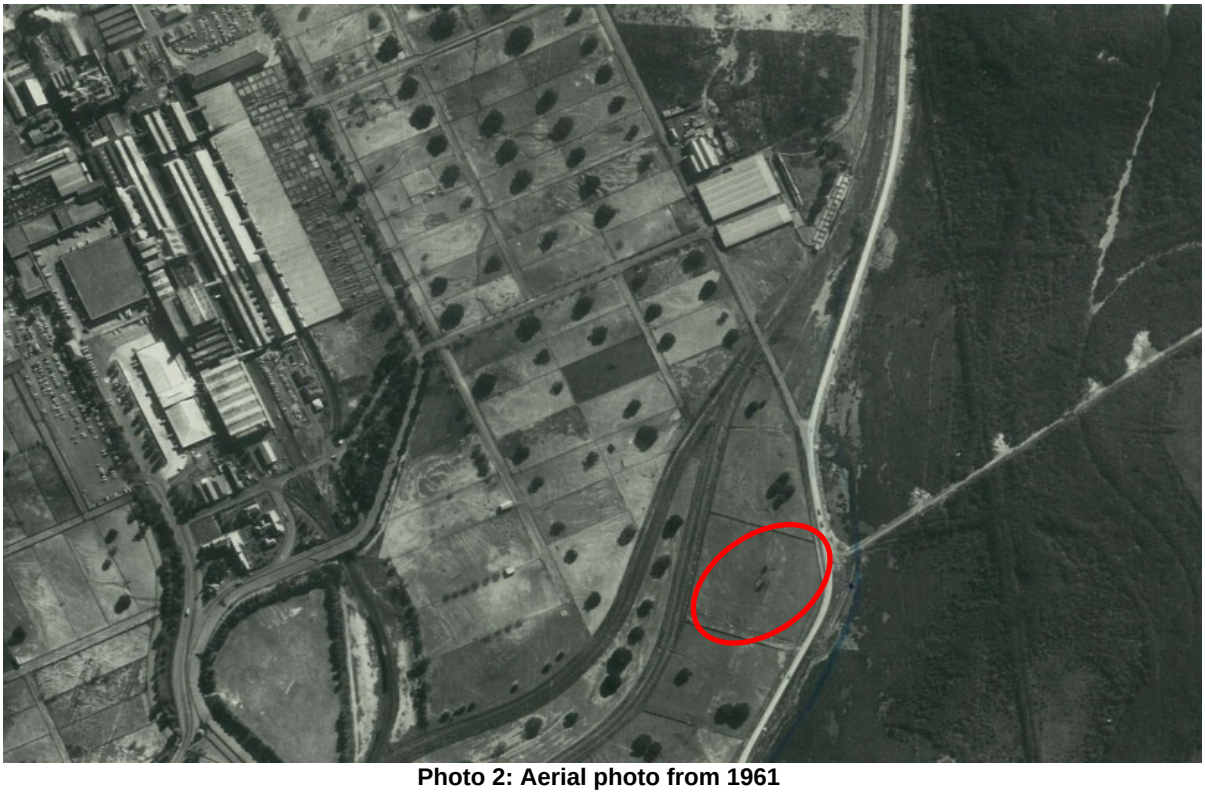


Photo 2: Aerial photo from 1961

Douglas Partners Geotechnics / Environment / Groundwater	**Historical Photographs** **Site 68** **Sydney Olympic Park**	PROJECT: 73942 PLATE No: 1 REV: 0
	CLIENT: Ecove Group Pty Ltd	DATE: 11-Sep-14

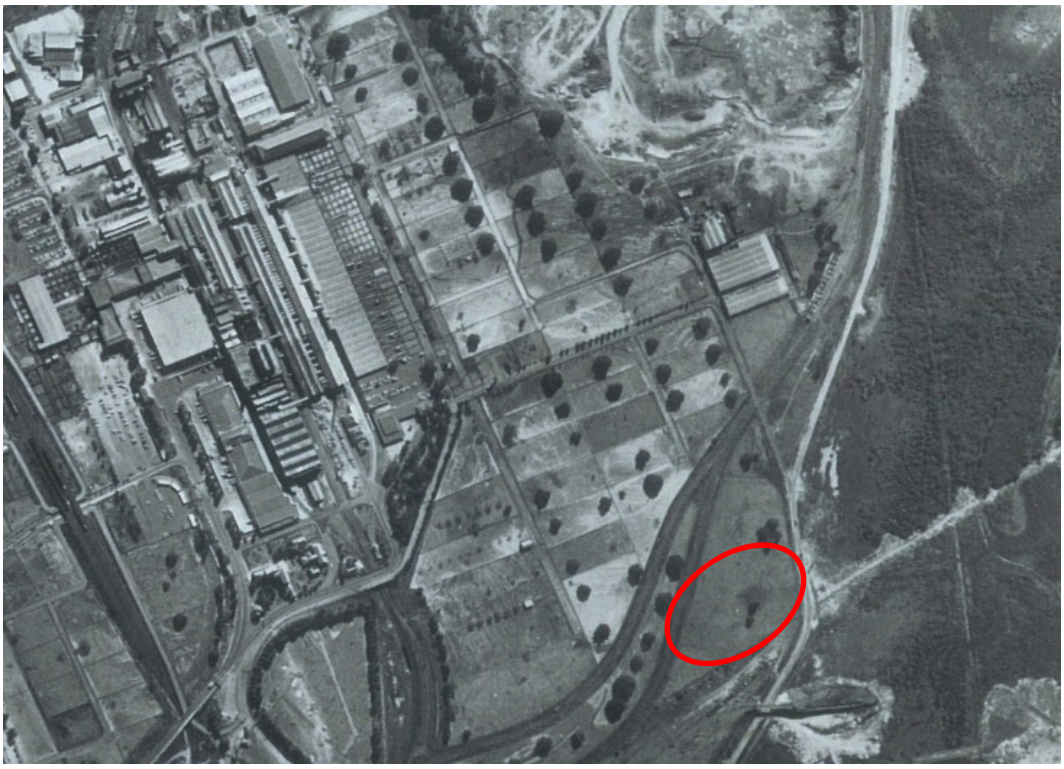


Photo 3: Aerial photo from 1970

Photo 4: Aerial photo from 1982

Douglas Partners Geotechnics / Environment / Groundwater	**Historical Photographs** **Site 68** **Sydney Olympic Park**	PROJECT: 73942 PLATE No: 2 REV: 0
	CLIENT: Ecove Group Pty Ltd	DATE: 11-Sep-14

Photo 5: Aerial photo from 1991

Photo 6: Aerial photo from 1998

Douglas Partners Geotechnics / Environment / Groundwater	**Historical Photographs** **Site 68** **Sydney Olympic Park**	PROJECT: 73942 PLATE No: 3 REV: 0
	CLIENT: Ecove Group Pty Ltd	DATE: 11-Sep-14

Photo 7: Aerial photo from 2009

Photo 8: Aerial photo from 2014

Douglas Partners Geotechnics / Environment / Groundwater	**Historical Photographs** **Site 68** **Sydney Olympic Park**	PROJECT: 73942 PLATE No: 4 REV: 0
	CLIENT: Ecove Group Pty Ltd	DATE: 11-Sep-14

Healthy Environment, Healthy Community, Healthy Business

Search results

Your search for:Suburb: Homebush Bay

Matched 39 notices relating to 7 sites.

Search Again

Refine Search

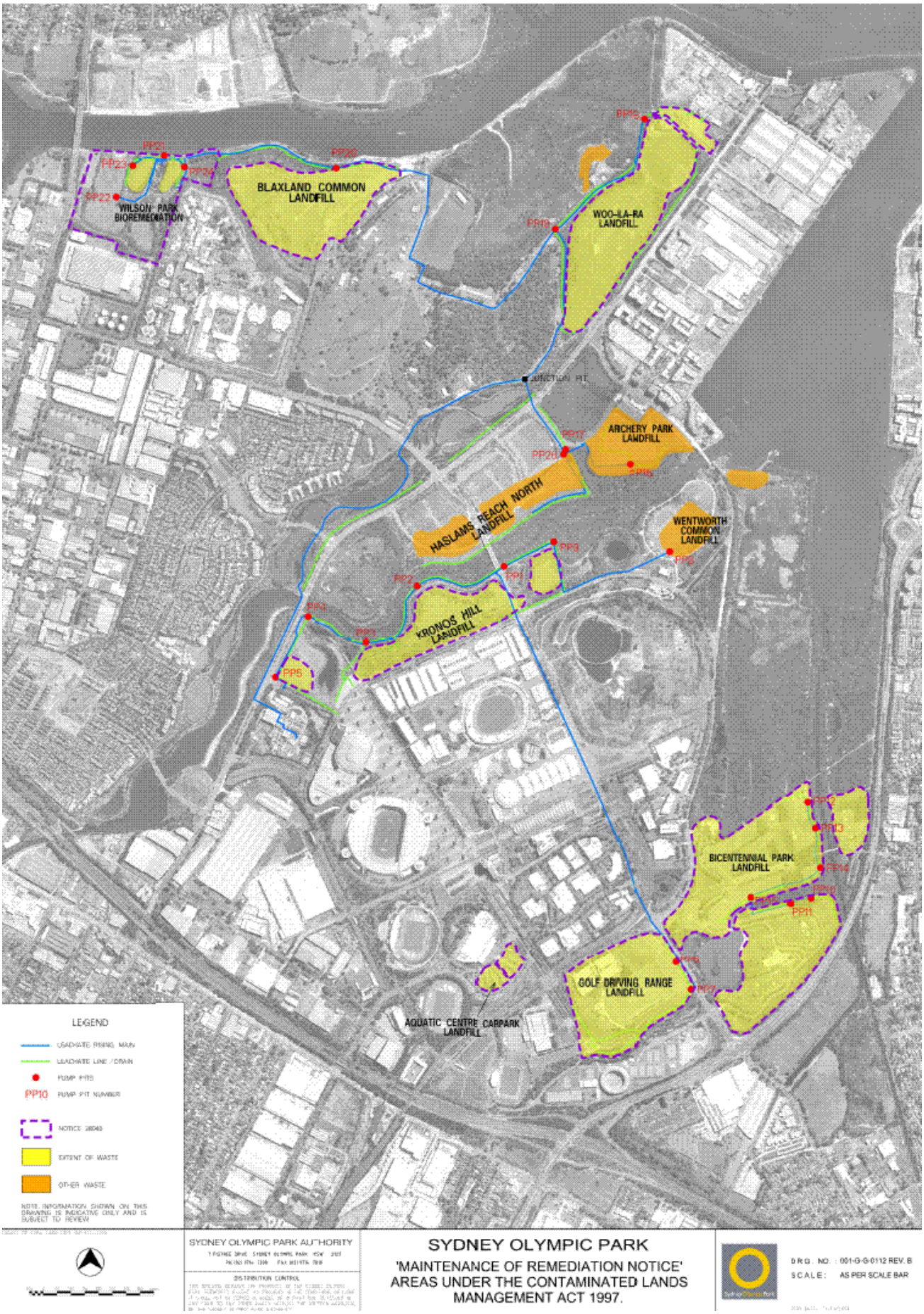
Suburb	Address	Site Name	Notices related to this site
Homebush Bay	Olympic Boulevard	Aquatic Centre Car Park	1 current and 8 former
Homebush Bay	Bennelong Road	Bicentennial Park	1 current and 2 former
Homebush Bay	Hill Road	Haslams Creek South Area 3	1 current and 3 former
Homebush Bay	Kevin Coombs Avenue	Haslams Creek South Areas 1 and 2	1 current and 13 former
Homebush Bay	No specific Street	Homebush Bay General Area	2 former
Homebush Bay	Australia Avenue	State Sports Centre	1 current and 6 former
Homebush Bay	25 Bennelong Road	Timber Treatment Plant	4 former

Page 1 of 1

11 September 2014

Connect Fee

Wet
Pub



SYDNEY OLYMPIC PARK AUTHORITY

DISTRIBUTION CONTROL

SYDNEY OLYMPIC PARK

'MAINTENANCE OF REMEDIATION NOTICE' AREAS UNDER THE CONTAMINATED LANDS MANAGEMENT ACT 1997.

DRG. NO. : 001-G-G-0112 REV. B
SCALE: AS PER SCALE BAR

Appendix D

Geotechnical Field Work Results

BOREHOLE LOG

CLIENT: Ecove Group Pty Ltd
PROJECT: Site 68 Geotechnical Investigation
LOCATION: Sydney Olympic Park

SURFACE LEVEL: 8.5 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH1
PROJECT No: 73942
DATE: 5/5/2014
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	0.05	ASPHALT							A			
	0.3	ROADBASE GRAVEL							A			
		FILLING - orange-brown, silty clay filling, humid										
	0.8	FILLING - apparently moderately compacted, light grey and orange-brown, silty clay filling with some ironstone gravel, moist							A			7,8,9 N = 17
									E/S			
	1.6	FILLING - apparently moderately compacted, orange-brown, clay filling with some ironstone gravel and ripped shale fragments, moist							E/S			3,9,10 N = 19
	3.3	SILTY CLAY - firm to stiff, orange-brown and red-brown, silty clay, moist							S			4,5,3 N = 8
	5.5	SILTY CLAY - hard, light grey and orange-brown, silty clay with some ironstone bands, moist							S			12,16,25 N = 41
	6.9	SHALE - extremely low strength, grey shale						Note: Unless otherwise stated, all defects are bedding planes dipping 0°- 10°	S			25/100mm refusal
	7.7	SHALE - low strength, moderately and highly weathered, fractured and fragmented, grey and brown shale						7.74m: B0°, cly, 8mm 7.8m: B0°, cly, 3mm 7.82m: J60°, pl, st, fe 7.96m: B0°, cly, 2mm, fe 8.0-8.03m: fg 8.04-8.28m: B (x4) 0°, fe 8.21m: J70°, pl, he, fe 8.29m: J50°, pl, sm, cly vn 8.36m: J50°, pl, he, fe 8.39-8.5m: B (x4) 5°-10°, fe 8.54m: J80°, pl, he, fe 8.59-8.76m: B (x4) 0°-5°, cly vn, fe 8.8m: J60°, pl, he, fe	C	100	0	PL(A) = 0.1
		9.28-9.34m: extremely low strength, extremely weathered band							C	90	11	PL(A) = 0.1
	9.41											
	9.48	SHALE - low then medium strength, moderately weathered, highly fractured, grey and brown shale							C	100	96	PL(A) = 0.5
	9.63											

RIG: DT100 **DRILLER:** SS **LOGGED:** JH **CASING:** HW to 2.5m; HQ to 7.0m

TYPE OF BORING: Solid flight auger to 2.5m; Rotary to 7.7m; NMLC-Coring to 12.72m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: 80% water loss in filling, 20% water loss from 8.1m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Ecove Group Pty Ltd
PROJECT: Site 68 Geotechnical Investigation
LOCATION: Sydney Olympic Park

SURFACE LEVEL: 8.5 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH1
PROJECT No: 73942
DATE: 5/5/2014
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-2	11	9.62-9.63m: extremely low strength, extremely weathered band SHALE - medium then medium to high and high strength, fresh, slightly fractured then unbroken, light grey and grey shale with approximately 10% fine grained sandstone laminations *(continued)*						8.83m: B5°, cly vn, fe 8.85m: J40°, pl, sm, fe 8.91-9.14m: B (x5), fe 9.23-9.28m: fg 9.28-9.34m: Ds 9.34-9.41m: fg 9.41m: CORE LOSS: 70mm 9.48-9.62m: fg 9.62m: B0°, cly, 10mm 9.9m: J50°, un, sm, cln				PL(A) = 1
-3	12	11.64-11.71m: fractured						11.64-11.71m: B0°, cly vn	C	100	96	PL(A) = 1.1
-4	12.72	Bore discontinued at 12.72m - target depth reached										PL(A) = 1
-5	13											
-6	14											
-7	15											
-8	16											
-9	17											
-10	18											
-11	19											

RIG: DT100 **DRILLER:** SS **LOGGED:** JH **CASING:** HW to 2.5m; HQ to 7.0m

TYPE OF BORING: Solid flight auger to 2.5m; Rotary to 7.7m; NMLC-Coring to 12.72m

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SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Ecove Group Pty Ltd
PROJECT: Site 68 Geotechnical Investigation
LOCATION: Sydney Olympic Park

SURFACE LEVEL: 8.6 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH2
PROJECT No: 73942
DATE: 7/5/2014
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	0.1	TOPSOIL - brown silt topsoil, humid							A			
		FILLING - poorly compacted, dark brown, silty clay filling with some gravel and traces of brick, metal, wood and charcoal, damp							A			
									A			
									S			1,2,2 N = 4
									E			
	2.0	FILLING - variably compacted, dark brown, clay filling with basalt gravel and traces of glass, rubber tyres, ripped sandstone gravel, wood, steel and charcoal, damp							S			10,18,12 N = 30
									E			
									S			2,3,4 N = 7
	5.0	FILLING - dark grey, gravelly clay filling with traces of grease, wire and steel, wet										
	5.5	- faint hydrocarbon odour							E			
		SILTY CLAY - very stiff, red-brown mottled light grey, silty clay with some ironstone gravel, damp						Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°	S			4,9,11 N = 20
	7.0	SHALE - extremely low strength, extremely weathered, light grey-brown shale with a trace of ironstone							S			25/100mm refusal
								7.4m: B0°, fe, cly	C	100	0	
									C	90	0	
	8.66	SHALE - medium strength, slightly weathered, fragmented to fractured, grey-brown shale with a trace of fine sandstone laminations						8.58m: CORE LOSS: 80mm 8.66-8.87m: B (x5) 0°, fe 8.87-8.97m: fg, fe 9.0-9.48m: Ds, fe	C	100	20	PL(A) = 0.5
								9.55-9.65m: B (x3) 0°, fe, cly 9.75m: B0°, cly				PL(A) = 0.6
	9.75	SHALE - see next page										

RIG: DT100 **DRILLER:** SS **LOGGED:** JH/SI **CASING:** HQ to 5.5m

TYPE OF BORING: Solid flight auger to 5.5m; Rotary to 7.1m; NMLC-Coring to 12.95m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Standpipe installed to 12.9m (Screen 6.95-12.95m; Gravel 4.0-12.95m; Bentonite 1.0-4.0m; Backfill to Ground Level with Gatic Cover)

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Ecove Group Pty Ltd
PROJECT: Site 68 Geotechnical Investigation
LOCATION: Sydney Olympic Park

SURFACE LEVEL: 8.6 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH2
PROJECT No: 73942
DATE: 7/5/2014
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-2	11	SHALE - medium strength, fresh, unbroken, grey shale with approximately 15% fine grained sandstone laminations *(continued)*										PL(A) = 0.9
-3	12	11.9-12.0m: very high strength siderite band						11.93m: J90°, un, ro, cln	C	100	100	PL(A) = 0.7
-4	13	12.95 Bore discontinued at 12.95m										PL(A) = 0.7
-5	14											
-6	15											
-7	16											
-8	17											
-9	18											
-10	19											
-11												

RIG: DT100 **DRILLER:** SS **LOGGED:** JH/SI **CASING:** HQ to 5.5m

TYPE OF BORING: Solid flight auger to 5.5m; Rotary to 7.1m; NMLC-Coring to 12.95m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Standpipe installed to 12.9m (Screen 6.95-12.95m; Gravel 4.0-12.95m; Bentonite 1.0-4.0m; Backfill to Ground Level with Gatic Cover)

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Ecove Group Pty Ltd
PROJECT: Site 68 Geotechnical Investigation
LOCATION: Sydney Olympic Park

SURFACE LEVEL: 9.5 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH3
PROJECT No: 73942
DATE: 6/5/2014
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		FILLING - brown, clayey silt filling with gravel and traces of concrete, plastic and metal, humid							A			
									A			
	1.0	FILLING - apparently moderately compacted, dark brown, sandy and gravelly clay filling with traces of plastic, concrete and brick, damp							A S			6,10,9 N = 19
	2.1	FILLING - brown, sandy basaltic gravel filling with traces of coal and glass, damp							A			
	5.3	SILTY CLAY - apparently very stiff, red-brown and light grey, silty clay, moist										
	6.7	SILTY CLAY - apparently very stiff, red-brown and light grey, silty clay with some ironstone gravel layers, moist						Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°	S			5,12,25/130mm refusal
	7.3	SHALE - extremely low strength, grey and brown shale										
	8.0	SHALE - extremely low to very low strength, extremely to highly weathered, light grey-brown to grey, shale some low to medium strength ironstone bands						8m: CORE LOSS: 200mm 8.3-8.4m: Ds 8.4-8.5m: fg, fe 8.5m: CORE LOSS: 240mm 8.74-8.92m: Ds 8.92m: B10°, cly 9.05-9.15m: Ds 9.21m: B0°, fe 9.41m: B0°, fe, cly 9.46m: CORE LOSS: 60mm 9.6m: J30°, pl, ro, fe	C	73	16	PL(A) = 0.3 PL(A) = 0.4
	8.74											
	9.15	SHALE - medium and low to medium strength, slightly weathered, fragmented to fractured, grey-brown shale with a trace of fine sandstone laminations										
	9.52											

RIG: DT100 **DRILLER:** SS **LOGGED:** JH/SI **CASING:** HQ to 5.5m

TYPE OF BORING: Solid flight auger to 5.5m; Rotary to 8.0m; NMLC-Coring to 13.7m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: 100% water loss at 13.5m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Ecove Group Pty Ltd
PROJECT: Site 68 Geotechnical Investigation
LOCATION: Sydney Olympic Park

SURFACE LEVEL: 9.5 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH3
PROJECT No: 73942
DATE: 6/5/2014
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-1	10.16	SHALE - medium and low to medium strength, slightly weathered, fragmented to fractured, grey-brown shale with a trace of fine sandstone laminations *(continued)*						9.63m: J70°, un, ro, cly 9.73m: J70°, un, ro, fe 9.85-9.88m: Ds 9.9m: CORE LOSS: 260mm 10.16-10.75m: fg, fe				
	11	9.15-10.0m: some very low strength bands						10.75-11.0m: J85°, he, fe	C	84	27	PL(A) = 0.3
-2	11.2	SHALE - medium strength, fresh stained, fractured, grey shale with approximately 10% fine sandstone laminations						11.08m: B5°, fe & J45°, pl, ro, fe 11.25-11.37m: J80°, un, ro, cln				PL(A) = 0.5
	12	11.6m: very high strength siderite band						11.47m: J30°, pl, sm, fe, Cz, 10mm				PL(A) = 4.5
-3	12.0	SHALE - medium to high then medium strength, fresh, slightly fractured and unbroken, grey shale with approximately 15% fine grained sandstone laminations						11.65 & 11.75m: J70°-80°, un, ro, fe 11.8m: J45°, pl, ro, fe 11.92m: J30°, pl, ro, fe 12.28m: B0°, fe				PL(A) = 1
	13								C	100	82	
-4								13.39-13.5m: J90° & 45°, st, ro, cln 13.53m: J30°, pl, sm, cln				PL(A) = 0.5
	13.7	Bore discontinued at 13.7m										
	14											
-5												
	15											
-6												
	16											
-7												
	17											
-8												
	18											
-9												
	19											
-10												

RIG: DT100 **DRILLER:** SS **LOGGED:** JH/SI **CASING:** HQ to 5.5m

TYPE OF BORING: Solid flight auger to 5.5m; Rotary to 8.0m; NMLC-Coring to 13.7m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: 100% water loss at 13.5m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Ecove Group Pty Ltd
PROJECT: Site 68 Geotechnical Investigation
LOCATION: Sydney Olympic Park

SURFACE LEVEL: 10.2 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH4
PROJECT No: 73942
DATE: 8/5/2014
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
10	0.4	FILLING - brown, sandy gravel filling, humid							A			
		FILLING - generally loose, grey-brown, silty sand filling with gravel, damp							A			
9	1.2	FILLING - dark grey, silty clay filling with sand and traces of brick and gravel, damp							A			
									S			6,4,5 N = 9
		- slight hydrocarbon odour from approximately 2.0m							E			
8	3.1	FILLING - dark grey, clay filling with traces of glass, brick, gravel and wood, moist, slight hydrocarbon odour							S			4,3,3 N = 6
		- wet from approximately 4.0m				▷			S			1,2,3 N = 5
7	5.7	SILTY CLAY - stiff, red-brown and grey then orange-brown and light grey, silty clay, moist						Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°	E			
									S			3,3,6 N = 9
6	7.3	SILTSTONE - extremely low strength, light grey and orange-brown, siltstone with some ironstone gravel bands							S			8,13,23 N = 36
	7.5 7.68							7.5m: CORE LOSS: 180mm 7.68-8.05m: Ds				
5		SHALE - extremely low strength, extremely weathered, slightly fractured, light grey-brown, shale with some ironstone bands						8.05-8.7m: B (x5) fe, cly	C	89	0	
	9.15	SHALE - low to medium then medium strength, slightly weathered, fragmented to fractured and slightly fractured, grey-brown shale with some fine sandstone laminations						8.9m: B5°, fe 9.2-9.36m: fg, fe 9.41m: B5°, fe 9.54m: J25°, pl, ro, fe 9.6m: B0°, fe, cly, 5mm 9.7-10.2m: fg, fe	C	100	40	PL(A) = 0.3

RIG: DT100 **DRILLER:** SS **LOGGED:** JH/SI **CASING:** HQ to 5.5m

TYPE OF BORING: Solid flight auger to 5.5m; Rotary to 7.5m; NMLC-Coring to 13.0m

WATER OBSERVATIONS: Seepage from approximately 4.0m

REMARKS: 100% water loss at 10.1m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Ecove Group Pty Ltd
PROJECT: Site 68 Geotechnical Investigation
LOCATION: Sydney Olympic Park

SURFACE LEVEL: 10.2 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH4
PROJECT No: 73942
DATE: 8/5/2014
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
0	11	SHALE - low to medium then medium strength, slightly weathered, fragmented to fractured and slightly fractured, grey-brown shale with some fine sandstone laminations *(continued)*						10.26m: J30°, pl, sm, fe 10.32m: J70°, cu, ro, fe 10.6-10.9m: B (x3) 0°-5°, fe 11m: CORE LOSS: 60mm 11.2m: J35°, pl, ro, fe 11.36m: J30°, pl, sm, fe 11.4m: J85°, pl, ro, fe 11.45-11.7m: B (x5) 0°, fe	C	100	40	PL(A) = 0.4
-1	11.06											
	11.7	SHALE - medium to high strength, fresh, unbroken, grey shale with approximately 10% fine sandstone laminations							C	96	67	PL(A) = 1
-2	12											
-3	13	13.0 Bore discontinued at 13.0m										
-4	14											
-5	15											
-6	16											
-7	17											
-8	18											
-9	19											

RIG: DT100 **DRILLER:** SS **LOGGED:** JH/SI **CASING:** HQ to 5.5m

TYPE OF BORING: Solid flight auger to 5.5m; Rotary to 7.5m; NMLC-Coring to 13.0m

WATER OBSERVATIONS: Seepage from approximately 4.0m

REMARKS: 100% water loss at 10.1m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Ecove Group Pty Ltd
PROJECT: Site 68 Geotechnical Investigation
LOCATION: Sydney Olympic Park

SURFACE LEVEL: 12.8 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH5
PROJECT No: 73942
DATE: 9/5/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
12.75	0.05	WOOD CHIPS (garden mulch)		A	0.1				
		FILLING - grey and brown, silty clay filling with gravel and some sand, damp		A	0.5				
12.1	0.7	FILLING - dark grey, sandy gravel filling with some clay							
	1	0.95-1.0m: wood		A	1.0				1
				S	1.45		10,6,10 N = 16		
		1.5m: traces of asbestos (fibro board)							
11	1.8	FILLING - loose, gravel filling with traces of sand, wire, slag and charcoal		A	2.0				2
	2	2.0m: traces of asbestos (fibro board)							
		2.4-2.5m: steel wire		E	2.5				
10.3	2.5	FILLING - dark grey, clayey sand filling with slag, wire, charcoal, ripped sandstone gravel and steel		S	2.85		4,9,10/50mm refusal Bouncing		
	3								3
9.4	3.4	Bore discontinued at 3.4m - auger refusal on steel							
	4								4
	5								5
	6								6
	7								7
	8								8
	9								9

RIG: DT100 **DRILLER:** SS **LOGGED:** JH **CASING:** Uncased

TYPE OF BORING: Solid flight auger to 3.4m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Water added to hole from 1.5m due to asbestos hazard

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Ecove Group Pty Ltd
PROJECT: Site 68 Geotechnical Investigation
LOCATION: Sydney Olympic Park

SURFACE LEVEL: 8.8 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH6
PROJECT No: 73942
DATE: 9/5/2014
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	0.08	PAVERS							A			
		FILLING - roadbase gravel filling										
	0.5	FILLING - light grey-brown to red-brown, sandy clay and crushed shale filling, damp							A			
	1.1	FILLING - variably compacted, light brown to red-brown, clayey sand and crushed sandstone filling, damp							A			
									S			2,5,8 N = 13
									S			6,15,12 N = 27
	3.5	FILLING - variably compacted, brown, sandy clay filling, moist							S			13,16,12 N = 28
									S			2,6,13 N = 19
	6.1	FILLING - moderately compacted, light grey-brown, coarse sand and quartz gravel filling							S			8,12,13 N = 25
	7.1	FILLING - dark grey and red-brown, gravelly clay filling, moist							S			4,8,5 N = 13
	9.4	CLAY - very stiff, light brown clay with ironstone gravel, moist										

RIG: DT100 **DRILLER:** SS **LOGGED:** SI **CASING:** HW to 7.0m

TYPE OF BORING: Solid flight auger to 5.5m; Rotary to 11.4m; NMLC-Coring to 14.7m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Ecove Group Pty Ltd
PROJECT: Site 68 Geotechnical Investigation
LOCATION: Sydney Olympic Park

SURFACE LEVEL: 8.8 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH6
PROJECT No: 73942
DATE: 9/5/2014
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-2	11 11.0	CLAY - very stiff, light brown clay with ironstone gravel, moist *(continued)*						Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°	S			5,10,13 N = 23
		SHALE - very low to low strength, grey-brown shale										
-3	11.4 12	SHALE - medium and low to medium strength, slightly weathered, fragmented to fractured, grey-brown shale						11.4-11.5m: fg, fe 11.5-11.52m: Ds 11.6m: J30°, pl, ro, fe 11.62-11.7m: fg, fe 11.8m: J45° &P 85°, st, ro, fe 11.85-11.98m: B (x3) 0°, cly 12.21m: J45°, pl, sm, cln 12.35m: J35°, pl, sm, cln 12.45-12.53m: fg, fe, cly 12.65m: J30°, pl, sm, cln 12.7 & 12.8m: B0°, cly	C	100	40	PL(A) = 0.3 PL(A) = 0.4
-4	12.8 13	SHALE - medium strength, fresh, unbroken, grey shale							C	100	100	PL(A) = 0.5 PL(A) = 0.8
-5	14											
-6	14.7 15	Bore discontinued at 14.7m										PL(A) = 0.8
-7	16											
-8	17											
-9	18											
-10	19											
-11												

RIG: DT100 **DRILLER:** SS **LOGGED:** SI **CASING:** HW to 7.0m

TYPE OF BORING: Solid flight auger to 5.5m; Rotary to 11.4m; NMLC-Coring to 14.7m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Ecove Group Pty Ltd
PROJECT: Site 68 Geotechnical Investigation
LOCATION: Sydney Olympic Park

SURFACE LEVEL: 13.9 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH101
PROJECT No: 73942
DATE: 4/9/2014
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
13	0.13	CONCRETE							A			
		FILLING - grey-brown, gravelly (roadbase) clayey sand filling, medium to coarse, angular, moist							A			
	0.9	FILLING - variably compacted, grey-brown, clayey sand filling with some crushed sandstone gravel, moist							A S			4,4,5 N = 9
12	2.0	FILLING - light grey-brown, crushed sandstone filling with a trace of slag							S			6,8,8 N = 16
11	4.0	CLAY - stiff, light brown clay with some ironstone gravel, moist							S			9,5,6 N = 11
10	5.5	SILTY CLAY - stiff, light grey and red-brown, silty clay with ironstone bands						Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°	S			2,4,6 N = 10
9	6.5	SHALE - extremely low strength, light grey-brown shale										
8	6.9	SHALE - medium strength, highly weathered, highly fractured, red-brown shale						7m: B5°, cly, 20mm 7.07m: CORE LOSS: 230mm	C	55	0	PL(A) = 0.9
7	7.3	SHALE - low to medium strength, extremely to highly weathered, highly fractured, brown-grey shale						7.37m: J90°, un, ro 7.53m: B0°, cly, 20mm 7.62m: J90°, un, ro 7.94m: B5°, cly, fe 8m: B0°, cly, 10mm, fe 8.05m: B0°, cly, 10mm, fe 8.06m: J90°, un, ro, fe 8.11m: B0°, fe, cly, 40mm 8.17m: B0°, cly, 30mm	C	72	0	
6	8.36	SHALE - low to medium strength, moderately weathered, fractured, brown-grey shale						8.2m: J90°, pl, ro, fe 8.25m: B5°, 30mm, fe 8.35m: J90°, pl, ro, fe 8.45m: J90°, un, ro 8.52m: CORE LOSS: 480mm 9.05m: J90°, cu, ro, fe	C	81	0	PL(A) = 0.4
5	9.0											
4												

RIG: DT100 **DRILLER:** SM **LOGGED:** IW **CASING:** HW to 4.0m

TYPE OF BORING: Diatube to 0.13m; Solid flight auger to 4.0m; Rotary to 6.9m; NMLC-Coring to 12.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Ecove Group Pty Ltd
PROJECT: Site 68 Geotechnical Investigation
LOCATION: Sydney Olympic Park

SURFACE LEVEL: 13.9 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH101
PROJECT No: 73942
DATE: 4/9/2014
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
3	10.22	SHALE - low to medium strength, moderately weathered, fractured, brown-grey shale *(continued)*						9.15m: J30°, pl, ro, fe 9.23m: B0°, cly, 30mm, fe 9.26m: J70°, cu, ro, fe 9.34m: B6°, fe, cly, 10mm 9.46m: J80°, pl, sm 9.84m: CORE LOSS: 380mm 10.56m: J90°, un, ro, fe 10.7m: J70°, st, ro, fe 10.72m: J70°, pl, ro, fe 11m: J50°, pl, sm	C	91	66	PL(A) = 0.9 PL(A) = 0.7
2	10.8	SHALE - medium strength, fresh, slightly fractured, grey shale										
1	12.0	Bore discontinued at 12.0m										
0												
-1												
-2												
-3												
-4												
-5												
-6												

RIG: DT100 **DRILLER:** SM **LOGGED:** IW **CASING:** HW to 4.0m

TYPE OF BORING: Diatube to 0.13m; Solid flight auger to 4.0m; Rotary to 6.9m; NMLC-Coring to 12.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Ecove Group Pty Ltd
PROJECT: Site 68 Geotechnical Investigation
LOCATION: Sydney Olympic Park

SURFACE LEVEL: 9.6 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH102
PROJECT No: 73942
DATE: 2/9/2014
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		FILLING - grey-brown, clayey sand and crushed sandstone gravel filling, moist							A			
									A			
	1.0	FILLING - grey to grey-brown, silty/sandy clay filling with some crushed shale fragments, moist							A			
									S			
								Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°				
	2.3	SHALE - extremely low strength, light grey-brown shale							S			12,25/80mm refusal
	2.75	SHALE - extremely low then extremely low to very low strength, extremely to highly weathered, slightly fractured, light grey-brown, shale with some medium strength bands						2.75-3.73m: B's 0°- 5°, fe, cly	C	100	0	PL(A) = 0.4
								3.81m: J40°, pl, ro, cly				
	4.25	SHALE - low to medium strength, highly to moderately then moderately weathered, fragmented to fractured, grey-brown shale						4.1m: CORE LOSS: 150mm 4.25-4.4m: fg, cly 4.4-4.63m: fg, fe, cly 4.63-4.73m: J70°, un, ro, fe 4.9m: J40°, pl, ro, fe				PL(A) = 0.5
	5.2							5.1m: CORE LOSS: 100mm 5.2-5.9m: B's 0°- 5°, fe, cly co, 2-5mm 5.25-5.27m: Cz, cly	C	92	15	PL(A) = 0.7
	5.9	SHALE - medium strength, slightly weathered then fresh, slightly fractured and unbroken, grey shale						5.9-6.25m: B0°, cly co				PL(A) = 0.9
								6.4m: J35°, pl, sm, cly 6.41-6.46m: Sz 6.46m: J45°, pl, ro, cly				
												PL(A) = 0.5
								7.9m: J45°, pl, sm, cln &P J80°, pl, ro, cln 8.12m: B0°, cly, 3mm 8.21m: J30°, pl, sm, cln 8.25-8.38m: J90°, he	C	100	94	PL(A) = 0.4 PL(A) = 2.5
								8.87m: J60° & 80°, st, ro, cln 9.15m: J75°, pl, ro, ci				
									C	100	100	PL(A) = 0.7

RIG: DT100 **DRILLER:** SM **LOGGED:** SI **CASING:** HW to 2.5m

TYPE OF BORING: Solid flight auger to 2.5m; Rotary to 2.75m; NMLC-Coring to 12.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Water loss from approximately 8.4m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Ecove Group Pty Ltd
PROJECT: Site 68 Geotechnical Investigation
LOCATION: Sydney Olympic Park

SURFACE LEVEL: 9.6 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH102
PROJECT No: 73942
DATE: 2/9/2014
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-1	11	SHALE - medium strength, slightly weathered then fresh, slightly fractured and unbroken, grey shale *(continued)*							C	100	100	PL(A) = 0.7
-2	12							11.4 & 11.5m: B0°, cly, ca	C			PL(A) = 0.8
	12.0	Bore discontinued at 12.0m										
-3	13											
-4	14											
-5	15											
-6	16											
-7	17											
-8	18											
-9	19											
-10												

RIG: DT100 **DRILLER:** SM **LOGGED:** SI **CASING:** HW to 2.5m

TYPE OF BORING: Solid flight auger to 2.5m; Rotary to 2.75m; NMLC-Coring to 12.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Water loss from approximately 8.4m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Ecove Group Pty Ltd
PROJECT: Site 68 Geotechnical Investigation
LOCATION: Sydney Olympic Park

SURFACE LEVEL: 9.1 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH103
PROJECT No: 73942
DATE: 1/9/2014
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
9	0.2	FILLING - brown sand and crushed sandstone filling, humid							A			
		FILLING - variably compacted, grey then brown, clay and crushed shale filling, damp							A			
8	1								A			
									S			3,4,5 N = 9
7	2											
	2.5	SILTY CLAY - very stiff, brown, silty clay with a trace of ironstone gravel, damp						Note: Unless otherwise stated, all defects are bedding planes dipping 0°- 10°	S			5,10,14 N = 24
6	3											
	3.3								S			25/10mm refusal
	3.4	SHALE - extremely low strength, light grey-brown shale							C	100	0	
		SHALE - medium strength with extremely low to very low strength clay bands, highly to extremely weathered, highly fractured, brown shale										PL(A) = 0.3
5	4							4.06m: J80°, un, ro, cly, fe 4.17m: JJ40°, he, cly 4.34m: B0°, cly, fe, 30mm 4.52m: B0°, cly, fe, 30mm	C	94	9	
4	5							4.52m: B0°, cly, 10mm 4.59m: J40°, pl, ro, fe 4.63m: B0°, cly, 20mm 4.93m: CORE LOSS: 70mm 5.05m: B0°, cly, 5mm 5.09m: B0°, cly, 10mm 5.2m: B0°, cly, 10mm	C	96	0	PL(A) = 0.7
	5.75											
3	6											
	6.26 6.27	SHALE - medium strength, moderately weathered, highly fractured, grey-brown shale						5.25m: B0°, cly, fe, 10mm 5.3m: B0°, cly, fe, 20mm 5.44m: B0°, cly, fe, 10mm 5.69m: CORE LOSS: 60mm 6.1m: CORE LOSS: 160mm 6.23m: B0°, cly, fe, 10mm 6.55m: J50°, pl, ro 6.63m: J50°, pl, ro 7.59m: J80°, st, ro	C	93	22	PL(A) = 0.3 PL(A) = 0.3
2	7											
	7.98	SHALE - medium strength, fresh, slightly fractured, grey shale										PL(A) = 0.3
1	8							8.66m: J90°, pl, ro	C	100	97	PL(A) = 0.6
0	9							9.67m: J60°, un, ro 9.97m: J30°, pl, ro				

RIG: DT100 **DRILLER:** SM **LOGGED:** IW **CASING:** HW to 2.5m

TYPE OF BORING: Solid flight auger to 2.5m; Rotary to 3.4m; NMLC-Coring to 12.1m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Ecove Group Pty Ltd
PROJECT: Site 68 Geotechnical Investigation
LOCATION: Sydney Olympic Park

SURFACE LEVEL: 9.1 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH103
PROJECT No: 73942
DATE: 1/9/2014
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-1	11	SHALE - medium strength, fresh, slightly fractured, grey shale *(continued)*						10.2m: B0°, cly, fe, 10mm 10.64m: J70°, pl, ro 10.72m: J20°, pl, ro	C	100	97	PL(A) = 0.4 PL(A) = 1
-2									C	100	100	
-3	12											
	12.1	Bore discontinued at 12.1m										
-4	13											
-5	14											
-6	15											
-7	16											
-8	17											
-9	18											
-10	19											

RIG: DT100 **DRILLER:** SM **LOGGED:** IW **CASING:** HW to 2.5m

TYPE OF BORING: Solid flight auger to 2.5m; Rotary to 3.4m; NMLC-Coring to 12.1m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Ecove Group Pty Ltd
PROJECT: Site 68 Geotechnical Investigation
LOCATION: Sydney Olympic Park

SURFACE LEVEL: 3.3 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH104
PROJECT No: 73942
DATE: 3/9/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	0.05	ASPHALT										
	0.25	ROADBASE GRAVEL										
		FILLING - sand filling										
	0.7	Bore discontinued at 0.7m - refusal on buried services										

RIG: DT100 **DRILLER:** SM **LOGGED:** SI **CASING:**

TYPE OF BORING: Solid flight auger to 0.7m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Ecove Group Pty Ltd
PROJECT: Site 68 Geotechnical Investigation
LOCATION: Sydney Olympic Park

SURFACE LEVEL: 3.6 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH105
PROJECT No: 73942
DATE: 3/9/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
3	0.0	FILLING - grey, sandy clay filling with some roadbase gravel and a trace of grass roots, moist							A			
2	0.5	FILLING - apparently very poorly compacted, grey, sandy gravelly clay filling, wet							A			
1	1.0	CLAY - stiff, light grey-brown clay with a trace of silt, moist to wet				▼			A			
0	2.0	SHALY CLAY - very stiff, light brown to red-brown, shaly clay with ironstone bands						Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°	S			2,4,7 N = 11
-1	3.8								S			8,10,11 N = 21
-2	4.18	SHALE - low to medium and medium strength, highly to moderately and slightly weathered, fragmented to fractured, grey-brown shale with some very low to low strength bands						3.8m: CORE LOSS: 380mm 4.18-4.45m: fg 4.45-4.52m: cly 4.55-4.95m: B's 0°- 5°, fe, cly 4.95-5.14m: fg 5.2m: J35°, pl, ro, cly 5.21-5.3m: Cz, cly 5.35m: CORE LOSS: 200mm 5.6m: J30°, un, ro, cln	C	75	0	PL(A) = 0.3
-3	5.55								C	69	26	PL(A) = 0.4
-4	6.0	Bore discontinued at 6.0m										

RIG: DT100 **DRILLER:** SM **LOGGED:** SI **CASING:** HW to 2.5m

TYPE OF BORING: Solid flight auger to 2.5m; Rotary to 3.8m; NMLC-Coring to 6.0m

WATER OBSERVATIONS: Free groundwater observed at 1.5m whilst augering

REMARKS: Standpipe installed to 6.0m (screen 3.0-6.0m; gravel 3.0-6.0m; bentonite 2.5-3.0m; backfill to ground level with gatic lid)

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Ecove Group Pty Ltd
PROJECT: Site 68 Geotechnical Investigation
LOCATION: Sydney Olympic Park

SURFACE LEVEL: 3.8 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH106
PROJECT No: 73942
DATE: 3/9/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
	0.3	TOPSOIL - grey-brown, silty clay topsoil with some fine sand and gravel and a trace of grass roots, moist							A			
		CLAY - stiff to very stiff, light grey and red-brown clay, slightly silty, moist							A			
	1.5	SHALY CLAY - very stiff, light grey, shaly clay with ironstone bands							A			
									S			4,7,8 N = 15
	2.5	SHALE - extremely low strength, light grey-brown shale						Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°	S			7,13,20 N = 33
	3.2	SHALE - very low to low and low strength, highly to moderately weathered, highly fractured to fractured, grey-brown shale with medium strength band						3.2m: B0°, cly 3.25-3.38m: B (x5) 0°-10°, cly co 3.5-3.63m: J's 35°- 40°, pl, ro, cly 3.77m: J60°, un, ro, cly 4m: CORE LOSS: 170mm 4.17-4.32m: B0°, cly 4.32m: J55°, un, ro, cly 4.45m: J40°, pl, ro, cly 4.5-4.6m: B's 0°, cly co, 1-5mm 4.6m: J45°, pl, sm, cln 4.7-4.95m: B's 0°, fe, cly 5.15-5.3m: J80°, pl, ro, cln	C	100	0	PL(A) = 0.2
	4.17								C	87	20	
	4.97	SHALE - medium strength, fresh, slightly fractured, grey shale							C	100	60	PL(A) = 0.4
	6.0	Bore discontinued at 6.0m							C	100	100	PL(A) = 0.7

RIG: DT100 **DRILLER:** SM **LOGGED:** SI **CASING:** HW to 2.5m

TYPE OF BORING: Solid flight auger to 2.5m; Rotary to 3.0m; NMLC-Coring to 6.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Standpipe installed to 6.0m (screen 3.0-6.0m; gravel 3.0-6.0m; bentonite 2.5-3.0m; backfill to ground level with gatic lid)

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

Appendix E

Laboratory Test Results

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 109741

Client:
Douglas Partners Pty Ltd
96 Hermitage Rd
West Ryde
NSW 2114

Attention: Peter Oitmaa

Sample log in details:

Your Reference:	**73942, Sydney Olympic Park**
No. of samples:	9 soils, 1 material
Date samples received / completed instructions received	14/05/14 / 14/05/14

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

Report Details:

Date results requested by: / Issue Date:	21/05/14 / 21/05/14
Date of Preliminary Report:	Not Issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	109741-1	109741-2	109741-3	109741-4	109741-5
Your Reference	----------	BH1	BH1	BH2	BH2	BH2
Depth	----------	1-1.45	2.5-2.95	1.7	4.0	5.5
Date Sampled		02/05/2014	02/05/2014	07/05/2014	07/05/2014	07/05/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Date analysed	-	17/05/2014	17/05/2014	17/05/2014	17/05/2014	17/05/2014
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	99	100	96	99	98

vTRH(C6-C10)/BTEXN in Soil					
Our Reference:	UNITS	109741-6	109741-7	109741-8	109741-9
Your Reference	----------	BH4	BH4	BH4	BH5
Depth	----------	1.9	5.0	5.5	2.5
Date Sampled		08/05/2014	08/05/2014	08/05/2014	09/05/2014
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Date analysed	-	17/05/2014	17/05/2014	17/05/2014	17/05/2014
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	100	96	102	94

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	109741-1	109741-2	109741-3	109741-4	109741-5
Your Reference	----------	BH1	BH1	BH2	BH2	BH2
Depth	----------	1-1.45	2.5-2.95	1.7	4.0	5.5
Date Sampled		02/05/2014	02/05/2014	07/05/2014	07/05/2014	07/05/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Date analysed	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014	15/05/2014
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100	<100	590	940
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	<100	<100	580	2,300
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50	52	65
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50	52	65
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	<100	<100	990	2,700
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	<100	<100	370	1,500
Surrogate o-Terphenyl	%	80	75	85	97	105

svTRH (C10-C40) in Soil					
Our Reference:	UNITS	109741-6	109741-7	109741-8	109741-9
Your Reference	----------	BH4	BH4	BH4	BH5
Depth	----------	1.9	5.0	5.5	2.5
Date Sampled		08/05/2014	08/05/2014	08/05/2014	09/05/2014
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Date analysed	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	100	420	390	140
TRHC$_{29}$ - C$_{36}$	mg/kg	190	610	570	190
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	240	850	810	280
TRH>C$_{34}$-C$_{40}$	mg/kg	110	510	460	110
Surrogate o-Terphenyl	%	91	95	91	83

PAHs in Soil						
Our Reference:	UNITS	109741-1	109741-2	109741-3	109741-4	109741-5
Your Reference	----------	BH1	BH1	BH2	BH2	BH2
Depth	----------	1-1.45	2.5-2.95	1.7	4.0	5.5
Date Sampled		02/05/2014	02/05/2014	07/05/2014	07/05/2014	07/05/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Date analysed	-	16/05/2014	16/05/2014	16/05/2014	16/05/2014	16/05/2014
Naphthalene	mg/kg	<0.1	<0.1	<0.1	0.2	0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	0.3	0.2
Phenanthrene	mg/kg	<0.1	<0.1	0.5	1.8	1.1
Anthracene	mg/kg	<0.1	<0.1	0.1	0.4	0.2
Fluoranthene	mg/kg	<0.1	<0.1	0.9	2.0	1.0
Pyrene	mg/kg	<0.1	<0.1	0.9	2.0	1.0
Benzo(a)anthracene	mg/kg	<0.1	<0.1	0.5	0.9	0.5
Chrysene	mg/kg	<0.1	<0.1	0.5	0.9	0.6
Benzo(b+k)fluoranthene	mg/kg	<0.2	<0.2	0.8	1.3	0.8
Benzo(a)pyrene	mg/kg	<0.05	<0.05	0.45	0.69	0.41
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	0.3	0.3	0.2
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	0.3	0.4	0.3
Benzo(a)pyrene TEQ NEPM B1	mg/kg	<0.5	<0.5	1.0	1.0	1.0
Total +ve PAH's	mg/kg	NIL (+)VE	NIL (+)VE	5.4	11	6.4
Surrogate p-Terphenyl-d14	%	104	104	100	96	96

PAHs in Soil					
Our Reference:	UNITS	109741-6	109741-7	109741-8	109741-9
Your Reference	----------	BH4	BH4	BH4	BH5
Depth	----------	1.9	5.0	5.5	2.5
Date Sampled		08/05/2014	08/05/2014	08/05/2014	09/05/2014
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Date analysed	-	16/05/2014	16/05/2014	16/05/2014	16/05/2014
Naphthalene	mg/kg	0.2	0.1	0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.7	0.4	0.5	0.7
Anthracene	mg/kg	0.1	0.1	0.1	0.2
Fluoranthene	mg/kg	0.9	0.6	0.7	1.0
Pyrene	mg/kg	0.8	0.5	0.7	1.0
Benzo(a)anthracene	mg/kg	0.4	0.3	0.3	0.5
Chrysene	mg/kg	0.5	0.3	0.4	0.4
Benzo(b+k)fluoranthene	mg/kg	0.8	0.5	0.6	0.7
Benzo(a)pyrene	mg/kg	0.39	0.25	0.30	0.39
Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	0.2	0.2	0.2
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.2	0.2	0.2	0.2
Benzo(a)pyrene TEQ NEPM B1	mg/kg	1.0	<0.5	<0.5	1.0
Total +ve PAH's	mg/kg	5.3	3.4	4.0	5.3
Surrogate p-Terphenyl-d14	%	102	98	104	101

Organochlorine Pesticides in soil						
Our Reference:	UNITS	109741-1	109741-2	109741-3	109741-4	109741-5
Your Reference	----------	BH1	BH1	BH2	BH2	BH2
Depth	----------	1-1.45	2.5-2.95	1.7	4.0	5.5
Date Sampled		02/05/2014	02/05/2014	07/05/2014	07/05/2014	07/05/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Date analysed	-	16/05/2014	16/05/2014	16/05/2014	16/05/2014	16/05/2014
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	88	97	87	83	89

Organochlorine Pesticides in soil					
Our Reference:	UNITS	109741-6	109741-7	109741-8	109741-9
Your Reference	----------	BH4	BH4	BH4	BH5
Depth	----------	1.9	5.0	5.5	2.5
Date Sampled		08/05/2014	08/05/2014	08/05/2014	09/05/2014
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Date analysed	-	16/05/2014	16/05/2014	16/05/2014	16/05/2014
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	91	87	82	86

Organophosphorus Pesticides						
Our Reference:	UNITS	109741-1	109741-2	109741-3	109741-4	109741-5
Your Reference	----------	BH1	BH1	BH2	BH2	BH2
Depth	----------	1-1.45	2.5-2.95	1.7	4.0	5.5
Date Sampled		02/05/2014	02/05/2014	07/05/2014	07/05/2014	07/05/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Date analysed	-	16/05/2014	16/05/2014	16/05/2014	16/05/2014	16/05/2014
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	88	97	87	83	89

Organophosphorus Pesticides					
Our Reference:	UNITS	109741-6	109741-7	109741-8	109741-9
Your Reference	----------	BH4	BH4	BH4	BH5
Depth	----------	1.9	5.0	5.5	2.5
Date Sampled		08/05/2014	08/05/2014	08/05/2014	09/05/2014
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Date analysed	-	16/05/2014	16/05/2014	16/05/2014	16/05/2014
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	91	87	82	86

PCBs in Soil						
Our Reference:	UNITS	109741-1	109741-2	109741-3	109741-4	109741-5
Your Reference	----------	BH1	BH1	BH2	BH2	BH2
Depth	----------	1-1.45	2.5-2.95	1.7	4.0	5.5
Date Sampled		02/05/2014	02/05/2014	07/05/2014	07/05/2014	07/05/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Date analysed	-	16/05/2014	16/05/2014	16/05/2014	16/05/2014	16/05/2014
Arochlor 1016	mg/kg	<0.1	<0.1	<0.1	<0.2	<0.1
Arochlor 1221	mg/kg	<0.1	<0.1	<0.1	<0.2	<0.1
Arochlor 1232	mg/kg	<0.1	<0.1	<0.1	<0.2	<0.1
Arochlor 1242	mg/kg	<0.1	<0.1	<0.1	<0.2	<0.1
Arochlor 1248	mg/kg	<0.1	<0.1	<0.1	<0.2	<0.1
Arochlor 1254	mg/kg	<0.1	<0.1	<0.1	<0.2	<0.1
Arochlor 1260	mg/kg	<0.1	<0.1	<0.1	<0.2	<0.1
Surrogate TCLMX	%	88	97	87	99	89

PCBs in Soil					
Our Reference:	UNITS	109741-6	109741-7	109741-8	109741-9
Your Reference	----------	BH4	BH4	BH4	BH5
Depth	----------	1.9	5.0	5.5	2.5
Date Sampled		08/05/2014	08/05/2014	08/05/2014	09/05/2014
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Date analysed	-	16/05/2014	16/05/2014	16/05/2014	16/05/2014
Arochlor 1016	mg/kg	<0.2	<0.2	<0.1	<0.2
Arochlor 1221	mg/kg	<0.2	<0.2	<0.1	<0.2
Arochlor 1232	mg/kg	<0.2	<0.2	<0.1	<0.2
Arochlor 1242	mg/kg	<0.2	<0.2	<0.1	<0.2
Arochlor 1248	mg/kg	<0.2	<0.2	<0.1	<0.2
Arochlor 1254	mg/kg	<0.2	<0.2	<0.1	<0.2
Arochlor 1260	mg/kg	<0.2	<0.2	<0.1	<0.2
Surrogate TCLMX	%	103	100	82	94

Total Phenolics in Soil						
Our Reference:	UNITS	109741-1	109741-2	109741-3	109741-4	109741-5
Your Reference	----------	BH1	BH1	BH2	BH2	BH2
Depth	----------	1-1.45	2.5-2.95	1.7	4.0	5.5
Date Sampled		02/05/2014	02/05/2014	07/05/2014	07/05/2014	07/05/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Date analysed	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Total Phenolics in Soil					
Our Reference:	UNITS	109741-6	109741-7	109741-8	109741-9
Your Reference	----------	BH4	BH4	BH4	BH5
Depth	----------	1.9	5.0	5.5	2.5
Date Sampled		08/05/2014	08/05/2014	08/05/2014	09/05/2014
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Date analysed	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	14

Acid Extractable metals in soil						
Our Reference:	UNITS	109741-1	109741-2	109741-3	109741-4	109741-5
Your Reference	----------	BH1	BH1	BH2	BH2	BH2
Depth	----------	1-1.45	2.5-2.95	1.7	4.0	5.5
Date Sampled		02/05/2014	02/05/2014	07/05/2014	07/05/2014	07/05/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date digested	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Date analysed	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Arsenic	mg/kg	5	7	30	20	20
Cadmium	mg/kg	<0.4	<0.4	6.4	4.9	3
Chromium	mg/kg	12	13	30	36	37
Copper	mg/kg	17	19	270	700	470
Lead	mg/kg	16	16	220	360	240
Mercury	mg/kg	<0.1	<0.1	0.2	0.3	0.2
Nickel	mg/kg	2	1	27	29	34
Zinc	mg/kg	8	7	310	450	370

Acid Extractable metals in soil					
Our Reference:	UNITS	109741-6	109741-7	109741-8	109741-9
Your Reference	----------	BH4	BH4	BH4	BH5
Depth	----------	1.9	5.0	5.5	2.5
Date Sampled		08/05/2014	08/05/2014	08/05/2014	09/05/2014
Type of sample		Soil	Soil	Soil	Soil
Date digested	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Date analysed	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Arsenic	mg/kg	20	30	40	20
Cadmium	mg/kg	2	0.8	1	2
Chromium	mg/kg	15	21	25	46
Copper	mg/kg	160	160	200	710
Lead	mg/kg	180	190	190	510
Mercury	mg/kg	0.1	0.3	0.3	0.4
Nickel	mg/kg	16	13	15	48
Zinc	mg/kg	560	210	280	700

Moisture						
Our Reference:	UNITS	109741-1	109741-2	109741-3	109741-4	109741-5
Your Reference	----------	BH1	BH1	BH2	BH2	BH2
Depth	----------	1-1.45	2.5-2.95	1.7	4.0	5.5
Date Sampled		02/05/2014	02/05/2014	07/05/2014	07/05/2014	07/05/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Date analysed	-	16/05/2014	16/05/2014	16/05/2014	16/05/2014	16/05/2014
Moisture	%	17	17	15	17	17

Moisture					
Our Reference:	UNITS	109741-6	109741-7	109741-8	109741-9
Your Reference	----------	BH4	BH4	BH4	BH5
Depth	----------	1.9	5.0	5.5	2.5
Date Sampled		08/05/2014	08/05/2014	08/05/2014	09/05/2014
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	15/05/2014	15/05/2014	15/05/2014	15/05/2014
Date analysed	-	16/05/2014	16/05/2014	16/05/2014	16/05/2014
Moisture	%	10	18	18	25

Asbestos ID - soils						
Our Reference:	UNITS	109741-1	109741-2	109741-3	109741-4	109741-5
Your Reference	----------	BH1	BH1	BH2	BH2	BH2
Depth	----------	1-1.45	2.5-2.95	1.7	4.0	5.5
Date Sampled		02/05/2014	02/05/2014	07/05/2014	07/05/2014	07/05/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	21/05/2014	21/05/2014	21/05/2014	21/05/2014	21/05/2014
Sample mass tested	g	Approx 35g	Approx 35g	34.80g	Approx 30g	34.85g
Sample Description	-	Brown coarse-grained soil	Brown coarse-grained soil	Dark brown coarse-grained soil	Dark brown coarse-grained soil	Dark brown coarse-grained soil
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg	Chrysotile asbestos detected
Trace Analysis	-	No respirable fibres detected	No respirable fibres detected	No respirable fibres detected	No respirable fibres detected	No respirable fibres detected

Asbestos ID - soils					
Our Reference:	UNITS	109741-6	109741-7	109741-8	109741-9
Your Reference	----------	BH4	BH4	BH4	BH5
Depth	----------	1.9	5.0	5.5	2.5
Date Sampled		08/05/2014	08/05/2014	08/05/2014	09/05/2014
Type of sample		Soil	Soil	Soil	Soil
Date analysed	-	21/05/2014	21/05/2014	21/05/2014	21/05/2014
Sample mass tested	g	Approx 35g	Approx 35g	Approx 35g	30.25g
Sample Description	-	Dark brown coarse-grained soil	Dark brown coarse-grained soil	Dark brown coarse-grained soil	Dark brown coarse-grained soil
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg
Trace Analysis	-	No respirable fibres detected	No respirable fibres detected	No respirable fibres detected	No respirable fibres detected

Asbestos ID - materials		
Our Reference:	UNITS	109741-10
Your Reference	----------	BH5
Depth	----------	2.0
Date Sampled		09/05/2014
Type of sample		material
Date analysed	-	16/05/2014
Mass / Dimension of Sample	-	45x30x4mm
Sample Description	-	Grey compressed fibre cement material
Asbestos ID in materials	-	Chrysotile asbestos detected

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-012 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-008	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Inorg-008	Moisture content determined by heating at 105+/-5 deg C for a minimum of 12 hours.
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			15/05/2014	[NT]	[NT]	LCS-5	15/05/2014
Date analysed	-			17/05/2014	[NT]	[NT]	LCS-5	17/05/2014
TRHC$_6$ - C$_9$	mg/kg	25	Org-016	<25	[NT]	[NT]	LCS-5	111%
TRHC$_6$ - C$_{10}$	mg/kg	25	Org-016	<25	[NT]	[NT]	LCS-5	111%
Benzene	mg/kg	0.2	Org-016	<0.2	[NT]	[NT]	LCS-5	108%
Toluene	mg/kg	0.5	Org-016	<0.5	[NT]	[NT]	LCS-5	114%
Ethylbenzene	mg/kg	1	Org-016	<1	[NT]	[NT]	LCS-5	111%
m+p-xylene	mg/kg	2	Org-016	<2	[NT]	[NT]	LCS-5	110%
o-Xylene	mg/kg	1	Org-016	<1	[NT]	[NT]	LCS-5	113%
naphthalene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	107	[NT]	[NT]	LCS-5	108%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			15/05/2014	[NT]	[NT]	LCS-4	15/05/2014
Date analysed	-			15/05/2014	[NT]	[NT]	LCS-4	15/05/2014
TRHC$_{10}$ - C$_{14}$	mg/kg	50	Org-003	<50	[NT]	[NT]	LCS-4	95%
TRHC$_{15}$ - C$_{28}$	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-4	103%
TRHC$_{29}$ - C$_{36}$	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-4	104%
TRH>C$_{10}$-C$_{16}$	mg/kg	50	Org-003	<50	[NT]	[NT]	LCS-4	95%
TRH>C$_{16}$-C$_{34}$	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-4	103%
TRH>C$_{34}$-C$_{40}$	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-4	104%
Surrogate o-Terphenyl	%		Org-003	81	[NT]	[NT]	LCS-4	88%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			15/05/2014	[NT]	[NT]	LCS-4	15/05/2014
Date analysed	-			16/05/2014	[NT]	[NT]	LCS-4	16/05/2014
Naphthalene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-4	94%
Acenaphthylene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-4	99%
Phenanthrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-4	92%
Anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-4	90%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Pyrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-4	92%
Benzo(a)anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-4	85%
Benzo(b+k)fluoranthene	mg/kg	0.2	Org-012 subset	<0.2	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	mg/kg	0.05	Org-012 subset	<0.05	[NT]	[NT]	LCS-4	95%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012 subset	96	[NT]	[NT]	LCS-4	99%
QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			15/05/2014	[NT]	[NT]	LCS-5	15/05/2014
Date analysed	-			16/05/2014	[NT]	[NT]	LCS-5	16/05/2014
HCB	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	86%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	92%
Heptachlor	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	90%
delta-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	89%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	93%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	92%
Dieldrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	92%
Endrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	91%
pp-DDD	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	110%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-5	93%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate TCMX	%		Org-005	92	[NT]	[NT]	LCS-5	89%

QUALITY CONTROL Organophosphorus Pesticides	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			15/05/2014	[NT]	[NT]	LCS-5	15/05/2014
Date analysed	-			16/05/2014	[NT]	[NT]	LCS-5	16/05/2014
Diazinon	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Dimethoate	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Ronnel	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-5	106%
Fenitrothion	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-5	83%
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Ethion	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-5	93%
Surrogate TCMX	%		Org-008	92	[NT]	[NT]	LCS-5	105%
QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			15/05/2014	[NT]	[NT]	LCS-5	15/05/2014
Date analysed	-			16/05/2014	[NT]	[NT]	LCS-5	16/05/2014
Arochlor 1016	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1221	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1232	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1242	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1248	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1254	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	LCS-5	116%
Arochlor 1260	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%		Org-006	92	[NT]	[NT]	LCS-5	101%
QUALITY CONTROL Total Phenolics in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			15/05/2014	109741-1	15/05/2014 || 15/05/2014	LCS-1	15/05/2014
Date analysed	-			15/05/2014	109741-1	15/05/2014 || 15/05/2014	LCS-1	15/05/2014
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	109741-1	<5 || <5	LCS-1	101%
QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date digested	-			15/05/2014	[NT]	[NT]	LCS-6	15/05/2014
Date analysed	-			15/05/2014	[NT]	[NT]	LCS-6	15/05/2014
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	[NT]	[NT]	LCS-6	92%
Cadmium	mg/kg	0.4	Metals-020 ICP-AES	<0.4	[NT]	[NT]	LCS-6	99%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-6	97%
Copper	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-6	97%
Lead	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-6	95%
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	[NT]	[NT]	LCS-6	89%
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-6	98%
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-6	96%

QUALITY CONTROL Moisture	UNITS	PQL	METHOD	Blank
Date prepared	-			[NT]
Date analysed	-			[NT]
Moisture	%	0.1	Inorg-008	[NT]

QUALITY CONTROL Asbestos ID - soils	UNITS	PQL	METHOD	Blank
Date analysed	-			[NT]

QUALITY CONTROL Asbestos ID - materials	UNITS	PQL	METHOD	Blank
Date analysed	-			[NT]

QUALITY CONTROL Total Phenolics in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	109741-2	15/05/2014
Date analysed	-	[NT]	[NT]	109741-2	15/05/2014
Total Phenolics (as Phenol)	mg/kg	[NT]	[NT]	109741-2	102%

Report Comments:

PCB's in soil:PQL has been raised due to interference from analytes(other than those being tested) in the sample/s.

Asbestos-ID in soil: A portion of each of the supplied samples were sub-sampled for asbestos analysis according to Envirolab procedures.
We cannot guarantee that these sub-samples are indicative of the entire samples. Envirolab recommends supplying 40-50g of sample in its own container.

Sample 109741-3; Chrysotile asbestos identified embedded in several fragments of fibre cement (total weight 0.0044g). It is estimated that the fibre cement contains up to 60% asbestos fibres by weight. This calculates to 0.0026g of asbestos fibres, which in 34.80g of soil is 0.08g/kg (i.e. < reporting limit for the method of 0.1g/kg).

Sample 109741-5; Loose fibre bundles of chrysotile asbestos identified within the sample (total weight 0.0042g). This is 90% asbestos fibres by weight, which in 34.85g of soil is 0.11g/kg (i.e. > reporting limit for the method of 0.1g/kg).

Sample 109741-9; Chrysotile asbestos identified embedded in several fragments of fibre cement (total weight 0.1677g). It is estimated that the fibre cement contains up to 1% asbestos fibres by weight. This calculates to 0.0017g of asbestos fibres, which in 30.25g of soil is 0.06g/kg (i.e. < reporting limit for the method of 0.1g/kg).

Asbestos ID was analysed by Approved Identifier: Paul Ching
Asbestos ID was authorised by Approved Signatory: Paul Ching

INS: Insufficient sample for this test
NA: Test not required
<: Less than

PQL: Practical Quantitation Limit
RPD: Relative Percent Difference
>: Greater than

NT: Not tested
NA: Test not required
LCS: Laboratory Control Sample

Quality Control Definitions

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

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

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

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

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Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
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When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

SAMPLE RECEIPT ADVICE

Client:

Douglas Partners Pty Ltd
96 Hermitage Rd
West Ryde NSW 2114

ph: 02 9809 0666
Fax: 02 9809 4095

Attention: Peter Oitmaa

Sample log in details:

Your reference:	**73942, Sydney Olympic Park**
Envirolab Reference:	**109741**
Date received:	14/05/14
Date results expected to be reported:	**21/05/14**

Samples received in appropriate condition for analysis:	YES
No. of samples provided	9 soils, 1 material
Turnaround time requested:	Standard
Temperature on receipt (°C)	11.8
Cooling Method:	Ice
Sampling Date Provided:	YES

Comments:

If there is sufficient sample after testing, samples will be held for the following time frames from date of receipt of samples:
Water samples - 1 month
Soil and other solid samples - 2 months
Samples collected in canisters - 1 week. Canisters will then be cleaned.
All other samples are not retained after analysis
If you require samples to be retained for longer periods then retention fees will apply as per our pricelist.

Contact details:

Please direct any queries to Aileen Hie or Jacinta Hurst
ph: 02 9910 6200 fax: 02 9910 6201
email: ahie@envirolabservices.com.au or jhurst@envirolabservices.com.au

Douglas Partners
Geotechnics · Environment · Groundwater

CHAIN OF CUSTODY

Project Name: Sydney Olympic Park
Project No: 73942 Sampler: JH
Project Mgr: Peter Oitmaa Mob. Phone: 0412 574 518
Email: peter.oitmaa@douglaspartners.com.au
Date Required: Std Lab Quote No.

To: Envirolab Services
12 Ashley Street, Chatswood NSW 2067
Attn: Tania Notaras
Phone: 02 9910 6200 Fax: 02 9910 6201
Email: tnotaras@envirolabservices.com.au

Sample ID	Sample Depth	Lab ID	Sampling Date	Sample Type S - soil W - water	Container type	Analytes: 8 Heavy Metal	TRH BTEX	PAH	OCP OPP	PCB	Phenol	Asbestos		Notes
BH1	1-1.45	1	2/5	S	Jar									
BH1	2.5-2.95	2	"											
BH2	1.7	3	7/5											
BH2	4.0	4	"											
BH2	~~4.5~~ 5.5	5	"											
BH4	1.9	6	8/5											
BH4	5.0	7	"											
BH4	5.5	8	"											
BH5	2.5	9	9/5											
BH5	2.0	10	"	Material	Bag							✓		

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 109741
Date Received: 14/5/14
Time Received: 11:00
Received by: JH
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Lab Report No.
Send Results to: Douglas Partners Address: 96 Hermitage Road, West Ryde 2114 Phone: (02) 9809 0666 Fax: (02) 9809 4095

Relinquished by: P. Oitmaa	Signed:	Date & Time: 14/5 0930	Received By:	Date & Time: 14/5/14 1100
Relinquished by:	Signed:	Date & Time:	Received By:	Date & Time:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 109741-A

Client:
Douglas Partners Pty Ltd
96 Hermitage Rd
West Ryde
NSW 2114

Attention: Peter Oitmaa

Sample log in details:

Your Reference:	**73942, Sydney Olympic Park**
No. of samples:	Additional testing on soils
Date samples received / completed instructions received	14/05/14 / 23/05/14

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

Report Details:

Date results requested by: / Issue Date:	30/05/14 / 27/05/14
Date of Preliminary Report:	Not Issued

NATA accreditation number 2901. This document shall not be reproduced except in full.
Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

Metals in TCLP USEPA1311						
Our Reference:	UNITS	109741-A-3	109741-A-4	109741-A-5	109741-A-6	109741-A-7
Your Reference	----------	BH2	BH2	BH2	BH4	BH4
Depth	----------	1.7	4.0	5.5	1.9	5.0
Date Sampled		07/05/2014	07/05/2014	07/05/2014	08/05/2014	08/05/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	26/05/2014	26/05/2014	26/05/2014	26/05/2014	26/05/2014
Date analysed	-	26/05/2014	26/05/2014	26/05/2014	26/05/2014	26/05/2014
pH of soil for fluid# determ.	pH units	8.1	8.6	8.9	8.5	8.7
pH of soil for fluid # determ. (acid)	pH units	1.7	1.4	1.4	1.2	1.3
Extraction fluid used	-	1	1	1	1	1
pH of final Leachate	pH units	4.6	4.6	4.7	4.8	4.7
Lead in TCLP	mg/L	0.3	5.9	0.5	0.2	0.5

Metals in TCLP USEPA1311			
Our Reference:	UNITS	109741-A-8	109741-A-9
Your Reference	----------	BH4	BH5
Depth	----------	5.5	2.5
Date Sampled		08/05/2014	09/05/2014
Type of sample		Soil	Soil
Date extracted	-	26/05/2014	26/05/2014
Date analysed	-	26/05/2014	26/05/2014
pH of soil for fluid# determ.	pH units	8.8	8.4
pH of soil for fluid # determ. (acid)	pH units	1.9	0.8
Extraction fluid used	-	1	1
pH of final Leachate	pH units	4.8	4.9
Lead in TCLP	mg/L	0.4	0.3

Method ID	Methodology Summary
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using AS 4439 and USEPA 1311 and in house method INORG-004.
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP).
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.

QUALITY CONTROL Metals in TCLP USEPA1311	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			26/05/2014	109741-A-3	26/05/2014 || 26/05/2014	LCS-W1	26/05/2014
Date analysed	-			26/05/2014	109741-A-3	26/05/2014 || 26/05/2014	LCS-W1	26/05/2014
Lead in TCLP	mg/L	0.03	Metals-020 ICP-AES	<0.03	109741-A-3	0.3 || 0.3 || RPD: 0	LCS-W1	85%

QUALITY CONTROL Metals in TCLP USEPA1311	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	109741-A-4	26/05/2014
Date analysed	-	[NT]	[NT]	109741-A-4	26/05/2014
Lead in TCLP	mg/L	[NT]	[NT]	109741-A-4	81%

Report Comments:

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

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

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

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

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

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

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Aileen Hie

From: Peter Oitmaa [Peter.Oitmaa@douglaspartners.com.au]
Sent: Friday, 23 May 2014 1:44 PM
To: Aileen Hie
Subject: RE: Results for registration '109741 - 73942, Sydney Olympic Park'

Hi Aileen,

Can you please arrange TCLP testing as follows:

Lead: ELS sample no.s 109741-3, 4, 5, 6, 7, 8, 9.

Order attached.

109741 A
std T/A
due 30/5

Regards,

Peter Oitmaa | Senior Associate
Douglas Partners Pty Ltd | ABN 75 053 980 117 | www.douglaspartners.com.au
96 Hermitage Road West Ryde NSW 2114 | PO Box 472 West Ryde NSW 1685
P: 02 9809 0666 | F: 02 9809 4095 | M: 0412 574 518 | E: Peter.Oitmaa@douglaspartners.com.au

-----Original Message-----
From: Results [mailto:Results@envirolab.com.au]
Sent: Wednesday, 21 May 2014 4:07 PM
To: Peter Oitmaa; Rob Dobinson
Subject: Results for registration '109741 - 73942, Sydney Olympic Park'

Please refer to attached for:
a copy of the Certificate of Analysis
a copy of the COC
an excel file containing the results

Please note that a hard copy will not be posted.

Enquiries should be made directly to:
Jacinta Hurst on jhurst@envirolabservices.com.au or David Springer on dspringer@envirolabservices.com.au
or
Tania Notaras on tnotaras@envirolabservices.com.au

Regards

Envirolab Services
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
www.envirolabservices.com.au

Regards,