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Report on
Preliminary Site Investigation for Contamination

Congo Site, Taronga Zoological Park
Bradleys Head Road, Mosman

Prepared for
Taronga Conservation Society Australia

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Executive Summary

This report presents the results of a preliminary site investigation for contamination and preliminary waste classification undertaken for the Congo Site project at Taronga Zoological Park (the Zoo) at Bradleys Head Road, Mosman. The investigation was commissioned in an email from Mr Andrew Chippindall of Taronga Conservation Society Australia and was undertaken in accordance with Douglas Partners' proposal SYD160400.P001.Rev0 dated 7 April 2016.

The aim of the investigation was to assess the subsurface soil conditions across the Congo Site Project area in order to provide:

- A preliminary assessment of the potential for contamination within the project area;
- A preliminary waste classification of the fill present within the project area; and
- Recommendations for additional investigations (if required).

The investigation included a limited assessment of site history, the drilling of 26 test bores within the project area, chemical analysis of selected soil samples for the potential contaminants of concern and preparation of this report.

The site has operated as the Zoo since 1916. Since the establishment of the Zoo there have been a number of new exhibits and zoo buildings redeveloped and refurbished. The potential for contamination at the investigation area was generally considered to be low, however, the presence of imported filling across the site (refer to Section 9) required further assessment.

Selected soil samples were analysed for the potential contaminants of concern comprising metals, TRH, BTEX, PAH, OCP, OPP, PCB, phenols and asbestos. The results of the soil analysis and the SAC are presented in Table E1, Appendix E.

The recorded concentrations of OCP, OPP, PCB, phenols and asbestos were below the laboratory practical quantitation limits (PQLs) and therefore below the site assessment criteria.

The recorded concentrations of TRH and BTEX in a limited number of samples were above the laboratory practical quantitation limits (PQLs) but below the site assessment criteria.

The recorded concentrations of heavy metals and PAH were generally low and within the site assessment criteria. However, it is noted that the following samples exceeded ecological investigation/screening levels. It is noted that the concentrations of the contaminants analysed were all within the adopted human health based investigation and screening levels.

Analyte	Sample Exceedance	Concentration	Guideline Exceeded
Zinc	C04/0.1	490 mg/kg	EIL (480 mg/kg)
	95% UCL	141.1 mg/kg	
Benzo(a)pyrene	C05/0.1	10 mg/kg	ESL (1.4 mg/kg)
	C08/1.4-1.6*	2.8 mg/kg	
	95 % UCL#	0.75 mg/kg	

Notes

ESL – Ecological Screening Level

EIL – Ecological Investigation Level

- * The replicate samples of C08/1.6-1.8 had significantly lower concentrations than the primary sample (BD3/170616 = <0.05 mg/kg and BD4/170616 = <0.5 mg/kg)
- # calculated excluding result from C05/0.1 (which is greater than 2.5 times the EIL)

Due to the presence of a limited number of EIL/ESL exceedances for nickel and benzo(a)pyrene the 95% upper confidence limit (UCL) has been determined (refer to Table 9). The exceedances of the EIL are only considered significant only if the 95% UCL also exceeds the EIL or the concentration in the individual sample is 2.5 times greater than the investigation level.

In each case the 95% UCL was within the adopted EIL. Therefore the EIL exceedances for zinc and benzo(a)pyrene are not considered to be significant.

However, the exceedance of the benzo(a)pyrene ESL in sample C1/0.1 is considered statistically significant as the concentrations reported are greater than 2.5 times the ESL. It is noted, however, that the sample was collected below an asphaltic concrete pavement in a layer of roadbase. It is therefore possible that the soil sample was cross-contaminated or otherwise impacted by the asphaltic materials noting the low leachability levels in the TCLP results (<0.001 mg/L, Table E2 in Appendix E). Furthermore there was no soil layer in this location; the asphaltic layer was underlain by roadbase then sandstone at 0.25 m bgl and therefore the impact on local ecology would be very limited. Therefore it is considered that the ESL exceedance in sample E05/0.1 is not significant and does not warrant management or remediation.

It is noted that while no asbestos was reported in the soil samples there were some precursor indicators of asbestos such as concrete present in some of the test bores. Therefore the possibility of asbestos being present cannot be entirely ruled out.

The fill as described in Section 9 in the project area is classified as General Solid Waste (non-putrescible). It is recommended that visual confirmation of the waste classification be conducted during excavation and load out of the material. If signs of significant contamination are observed during excavation such as building rubble (including asbestos), significant anthropogenic materials, odorous or discoloured soils or materials that vary from those described in this report then further *ex situ* waste classification should be undertaken on the impacted materials.

The preliminary assessment did not include chemical analysis of the underlying natural soils (due to limited returns of the underlying sandstone). It is recommended that following the removal of the overlying fill soils that further assessment of the natural soil/sandstone (at least near the interface between filling and in situ materials) be undertaken to determine if the natural soil will classify as virgin excavated natural soil (VENM) if off-site disposal of the natural soils is required

Based on the findings of the investigation it is considered that the potential contamination within the investigation area is low and that the levels of the contaminants of concern were generally within the adopted site assessment criteria.

It is recommended that a unexpected finds protocol (UFP) should be prepared which outlines the steps to be undertaken to identify, report and manage any signs of potential environmental concern encountered during earthworks/redevelopment works. These usually comprise notifying workers during the standard site induction of whom to report finds to, and then the protocol for isolating the find, organising investigation and management and notifying appropriate personnel/ organisations.

Table of Contents

	Page
1. Introduction	1
2. Scope of Works	1
3. Site Description	2
3.1 Site Identification	2
3.2 Site Description	2
3.3 Proposed Development	3
4. Regional Topography, Geology and Hydrogeology	3
4.1 Topography and Surface Water	3
4.2 Geology	3
4.3 Groundwater	4
5. Site History Assessment	4
5.1 Internet Search	4
5.2 Previous Investigations	5
5.3 Historical Aerial Photographs	5
5.4 Regulatory Notices Search	7
6. Preliminary Conceptual Site Model	7
6.1 Potential Contaminant Sources	8
6.2 Potential Receptors	8
6.3 Potential Pathways	9
6.4 Summary of CSM	9
7. Field Work Methods	10
7.1 Data Quality Objectives and Project Quality Procedures	10
7.2 Data Quality Indicators	10
7.3 Sampling Locations and Rationale	11
7.4 Test Bore Drilling Procedure and Soil Sampling Procedure	11
7.5 Analytical Rationale	11
7.6 Field Quality Assurance and Quality Control	11
7.7 Laboratory QA/QC	12
8. Site Assessment Criteria	12
8.1 Soils	12
8.1.1 Health Investigation and Screening Levels	12
8.1.2 Ecological Investigation Levels and Screening Levels	15

8.1.3	Management Limits – Petroleum Hydrocarbons.....	17
8.2	Asbestos in Soil	17
8.3	Waste Classification Guidelines	18
9.	Field Work Results	18
10.	Laboratory Testing	19
11.	Discussion	19
11.1	Preliminary Contamination Assessment.....	19
11.2	Preliminary Waste Classification	20
12.	Conclusion and Recommendations	22
13.	Limitations	22
Appendix A:	Drawing 1 and About This Report	
Appendix B:	Site Photographs	
Appendix C:	Site History Information	
Appendix D:	Test Bore Logs	
Appendix E	Table of Laboratory Results	
Appendix F:	Laboratory Certificates and Chain of Custody Information	
Appendix G:	Data Quality Assessment	

Report on Preliminary Site Investigation for Contamination

Congo Site, Taronga Zoological Park

Bradleys Head Road, Mosman

1. Introduction

This report presents the results of a preliminary site investigation for contamination and preliminary waste classification undertaken for the Congo Site project at Taronga Zoological Park (the Zoo) at Bradleys Head Road, Mosman. The investigation was commissioned in an email from Mr Andrew Chippindall of Taronga Conservation Society Australia and was undertaken in accordance with Douglas Partners' proposal SYD160400.P001.Rev0 dated 7 April 2016.

The aim of the investigation was to assess the subsurface soil conditions across the Congo Site Project area in order to provide:

- A preliminary assessment of the potential for contamination within the project area;
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The investigation included a limited assessment of site history, the drilling of 26 test bores within the project area, chemical analysis of selected soil samples for the potential contaminants of concern and preparation of this report.

2. Scope of Works

The scope of works comprised the following:

- A site walkover to observe situations that indicate a potential for contamination and identify environmental receptors;
- Review any relevant information provided by the Client, such as survey plans, proposed development plans, and records of previous land use, investigations or observations during previous works;
- Limited site history review including a review of historical and current aerial photographs and information available from online sources;
- Collection of soil samples at regular intervals from the 26 geotechnical investigation test bores undertaken as part of a concurrent investigation, based on field observations;
- Screening of all samples for volatile organic compounds using a photo-ionisation detector;
- Analysis at a NATA accredited laboratory of selected soil samples for the following potential contaminants;
 - o Heavy metals (total arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc);

- o Total recoverable hydrocarbons (TRH) as a screening test for total petroleum hydrocarbons (TPH);
- o Benzene, toluene, ethyl benzene and total xylenes (BTEX);
- o Polycyclic aromatic hydrocarbons (PAH);
- o Phenols;
- o Organochlorine pesticides (OCP);
- o Organophosphorus pesticides (OCP);
- o Polychlorinated biphenyls (PCB);
- o Asbestos;
- o Toxicity Characteristic Leaching Procedure testing (as required);
- o Quality control/quality assurance sampling and analysis, comprising:
 - 10% laboratory replicate sample;
 - Trip blank sample (BTEX) (one per batch);
 - Trip spike sample (BTEX) (one per batch); and
- Preparation of this report detailing the methodology and results of the assessment, and including comments on areas of contamination and a preliminary waste classification.

3. Site Description

3.1 Site Identification

The project area is identified as The Congo Site a 1.5 ha exhibit that is located in the central portion of the Zoo. The Site is part of Lot 22 in Deposited Plan 843294 on Bradleys Head Road, Mosman in the local government area of Mosman.

The site is presented on Drawing 1, Appendix A.

3.2 Site Description

The project area is occupied by a number of animal exhibits including bird aviaries, the wombat exhibit, the orang-utan office, the gorilla exhibit and Turner House. The exhibits include animal paddocks and indoor enclosures. A number of pedestrian pathways intersect the project area. A substation (Substation No. 7) and high powered power cables are present within the project area.

The project area slopes steeply to the south. A number of retaining structures are present within the project area where it is possible that fill soils have been placed to create level benches.

Selected site photographs are presented in Appendix B.

3.3 Proposed Development

We understand that redevelopment of the project area is being considered and that preliminary information is required for planning and preliminary design purposes. It is understood that the project area will continue to operate as part of the Zoo.

4. Regional Topography, Geology and Hydrogeology

4.1 Topography and Surface Water

The project area slopes from an elevation of approximately 64 m AHD in the northern portion of the project area to an elevation of approximately 46 m AHD in the southern portion of the project area as shown in Figure 1.

Based on the local topography it is assumed that the general direction of groundwater and surface water flow would be towards the south towards Sydney Harbour.



Figure 1 - Site Topography (2 m Contour Interval)

4.2 Geology

Reference to the Sydney 1:100 000 Geological Series Sheet indicates that the project area is underlain by Hawkesbury Sandstone, which consists of medium to coarse grained quartz sandstone

with very minor shale and laminite lenses. The presence of shallow sandstone was confirmed during the current investigation.

Based on the elevation of the project area and shallow sandstone observed the risk of acid sulfate soils being present at the Site is considered to be very low.

4.3 Groundwater

A search of the NSW Department of Primary Industries, Office of Water registered groundwater bore database on 12 July 2016 revealed no registered groundwater bores within 1 km of the site.

However, previous groundwater investigations undertaken by DP in the north western corner of the Zoo site (refer to Section 5.2) indicate that minor seepage flow is present in fractured sandstone bedrock at depths varying between 1.4 m below ground level (bgl) and 3.7 m bgl.

Groundwater at the project area is expected to generally flow to the south towards Sydney Harbour.

5. Site History Assessment

A limited site history assessment was undertaken including a review of the general historical information on the Zoo available from the Internet, a review of historical aerial photographs and a review of NSW EPA online databases. The results of the review are provided in the following sub-sections.

5.1 Internet Search

The Zoo was officially opened on October 7th, 1916. New exhibits and facilities were developed over time including:

- The Giraffe House which was completed in 1923;
- The Aquarium in 1927;
- Floral Clock in 1928;
- Tahr Mountain in 1932; and
- Tiger Pits in 1939.

In the 1940s to 1960s several new exhibits were built including those for larger cats, koalas, apes and gorillas. After 1967 several new exhibits were built starting with the Platypus and Nocturnal Houses, waterfowl ponds and walkthrough Rainforest Aviary. A Veterinary Quarantine Centre and an Education Centre were also built during this period. Previous attractions such as elephant rides, miniature trains, monkey circus and merry-go-round gave way to educational facilities such as Friendship Farm and Seal theatre¹.

¹ <https://taronga.org.au/about-us/history/taronga-zoo>

5.2 Previous Investigations

DP has undertaken a number of previous investigations at the Zoo in the vicinity of two underground storage tanks (USTs) located in the north western corner of the Zoo, (i.e. outside and to the north west of the current project area) adjacent to the Facilities Building.

The previous investigation in the vicinity of the USTs and groundwater seepage included the drilling of test bores and the installation of groundwater wells in the vicinity of the USTs (Report entitled *UST System Leakage and Contamination, Taronga Zoo, Mosman*, March 27 2007, reference 44703).

Significant hydrocarbon contamination was identified in the tank pit backfill soils, the groundwater within the tank pit and the seepage sample. Free product, several millimetres thick, was identified on the phreatic surface within the tank pit.

Following advice from DP on the contamination present within the tank pit and advice from Gilbarco on the standard of the UST installation, the Zoo management decided to replace the tanks with a modern underground petrol storage system, including fibre glass tanks. The old tanks and backfill sands were removed along with the surrounding impacted sand and rock. The excavated material was stockpiled within the Zoo property for remediation. It was noted during the tank removal works that a stormwater service line crossed the tank pit at the northern end and it is considered possible that this provides a migration pathway for down-gradient seepage.

DP conducted an inspection and validation of the tank pit following the removal of the pre-existing USTs. Samples were collected from the walls and base of the tank-pit for validation purposes. The samples were analysed for TPH, BTEX, PAH, phenols and heavy metals. The samples collected were generally within the adopted assessment criteria, however, significant hydrocarbon contamination was identified in one sample (sample V8) on the south-western side of the tank pit (the down-gradient side of the tank pit).

Following the replacement of the USTs DP has undertaken routine groundwater monitoring of four groundwater wells located hydraulically down-gradient of the USTs at six monthly intervals (project series 73545), including measurement of the groundwater levels and visual inspection of the water column. During the course of the monitoring there has been no evidence of petroleum hydrocarbon groundwater contamination in the vicinity of the USTs.

5.3 Historical Aerial Photographs

Historical aerial photographs from the years 1930, 1943, 1951, 1961, 2002, 2009 and 2016 were obtained from the NSW Department of Lands Office, NearMap and Google Earth websites. These photographs were reviewed in order to identify the likely past uses and changes to the site.

The findings are summarised below and copies of the aerial photographs are provided in Appendix C.

Table 1: Summary of Historical Aerial Photographs

Year	Site Features	Surrounding Features
1930	The project area appears to form part of the Zoo. There appears to be a number of animal exhibits within the investigation area including a pond/water body in one of the exhibits near the existing Lemur exhibit and playground.	The areas to the north of the Zoo are residential while to south, east and west are vegetated headland areas of Sydney Harbour
1943	There appears that there may be some additional animal exhibits in the project area.	There is no significant change to the surrounding land use.
1951	There do not appear to be any significant changes to the site. It is possible that some of the animal exhibits have been changed / added to the project area.	There is no significant change to the surrounding land use.
1961	There do not appear to be any significant changes to the site. It is possible that some of the animal exhibits have been changed / added to the project area.	There is no significant change to the surrounding land use.
2002	There do not appear to be any significant changes to the site. It is possible that some of the animal exhibits have been changed / added to the study area.	There is no significant change to the surrounding land use.
2009	There do not appear to be any significant changes to the site. It is possible that some of the animal exhibits have been changed / added to the project area.	There is no significant change to the surrounding land use.
2016	There do not appear to be any significant changes to the site. The water body / pond near the current Lemur exhibit appears to have been backfilled and replaced with a playground	There is no significant change to the surrounding land use.

Based on the aerial photograph search the project area appears to have been part of the Zoo since at least 1930 and a number of site redevelopments within the park have been undertaken during its lifetime including some works within the project area. It is noted that the project area is covered with trees in a number of the aerial photographs which obscured the ground features. Therefore it is possible that other changes have taken place that could not be identified in the aerial photographs

5.4 Regulatory Notices Search

The EPA publishes records of contaminated sites under section 58 of the *Contaminated Land Management Act 1997* (CLM Act) on a public database accessed via the internet. The notices relate to investigation and/or remediation of sites considered to be significantly contaminated under the definition in the CLM Act. More specifically the notices cover the following:

- Actions taken by the EPA under sections 15, 17, 19, 21, 23, 26 or 28 of the CLM Act;
- Actions taken by the EPA under sections 35 or 36 of the Environmentally Hazardous Chemicals Act 1985; and
- Site audit statements provided to the EPA under section 52 of the CLM Act on sites subject to an in-force remediation order.

A search of the public database on 12 July 2016 indicated that the site was not listed (notified under the *Protection of the Environment Operations Act 1997* (POEO Act)). Furthermore no sites in Mosman were listed.

It should be noted that the EPA record of Notices for contaminated land does not provide a record of all contaminated land in NSW.

The NSW EPA also issues environmental protection licenses under section 308 of the POEO Act. The related register contains:

- Environmental protection licenses;
- Applications for new licenses and to transfer or vary existing licenses;
- Environment protection and noise control licenses;
- Convictions in prosecutions under the POEO Act;
- The result of civil proceedings;
- License review information;
- Exemptions from provisions of the POEO Act or Regulations;
- Approvals granted under Clause 9 of the POEO (Control of Burning) Regulation; and
- Approvals granted under Clause 7a of the POEO (Clean Air) Regulation.

A search of the public register on 12 July 2016 indicated that Environmental Protection Licences were issued to the site for sewage treatment.

A copy of the search records are provided in Appendix C.

6. Preliminary Conceptual Site Model

A conceptual site model (CSM) is a representation of site-related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM provides

the framework for identifying how the site became contaminated and how potential receptors may be exposed to contamination either in the present or the future i.e. it enables an assessment of the potential source – pathway – receptor linkages (complete pathways).

6.1 Potential Contaminant Sources

Based on the findings of the investigation, the following potential sources of contamination and associated contaminants of potential concern (COPC) have been identified.

S1 – Filling and Demolition Waste; Fill soils associated with site development works and demolition waste associated with previous structures from different stages of development and redevelopment of the Zoo including the possible back filling of ponds within the exhibits.

COPC include metals, total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, xylene (BTEX), polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), organochlorine pesticides (OCP), organophosphorous pesticides (OPP), phenols, and asbestos.

S2 – Substation and Electrical. A substation (Substation No 7) and high voltage power lines are present within the project area.

COPC include PCB and OCP, OPP.

S3 – Animal Exhibits. A number of animal exhibits are present within the project area.

COPC include biological contaminants and putrescible waste. However, the exhibits are regularly cleaned and are well maintained and therefore it is considered that the potential for significant animal waste is not considered likely and therefore not considered further, unless signs of buried waste are identified during intrusive works/excavations..

It is noted that two underground storage tanks are located in the north western part of the Zoo, however, given the distance from the project area these are not considered to be likely potential sources of contamination within the project area and therefore not considered further.

6.2 Potential Receptors

The potential receptors to contamination at the project include the following:

Human Health Receptors:

- R1 – Construction and maintenance workers;
- R2 – Current and future users (employees and visitors to the Zoo); and
- R3 – Adjacent users (residential).

Environmental Receptors

- R4 – Groundwater;

R5 – Surface water (Sydney Harbour); and

R6 – Terrestrial ecology (including zoo animals).

6.3 Potential Pathways

The potential pathways for the identified receptors are as follows:

P1 – Ingestion and dermal contact;

P2 – Inhalation of dust and/or vapours;

P3 – Leaching of contaminants and vertical mitigation into groundwater;

P4 – Surface water run-off;

P5 – Lateral migration of groundwater; and

P6 – Direct contact with terrestrial ecology.

6.4 Summary of CSM

A 'source–pathway–receptor' approach has been used to assess the potential risks of harm being caused to human, water or environmental receptors from contamination sources on or in the vicinity of the site, via exposure pathways (complete pathways). The possible pathways between the above sources (S1 to S3) and receptors (R1 to R6) are provided in Table.

Table 2: Summary of Potential Complete Pathways

Source	Transport Pathway	Receptor	Risk Management Action Recommended
S1 – Filling and Demolition Waste Metals, TPH, BTEX, PAH, OCP, OPP, PCB, phenols, and asbestos) S2 – Substation PCB and OCP, OPP S3 – Animal Exhibits (biological contaminants)	P1 – Ingestion and dermal contact P2 – Inhalation of dust and/or vapours	R1 – Construction and maintenance workers R2 – Current and future users (Workers and visitors to the Zoo);	The potential for contamination from the identified sources is generally considered to be low to moderate. A programme of test bores and soil analysis was undertaken as part of this investigation
	P2 – Inhalation of dust and/or vapours P3 – Leaching of contaminants and vertical mitigation into groundwater	R3 – Adjacent users (Residential) R4 – Groundwater	
	P4 – Surface water run-off P5 – Lateral migration of groundwater	R5 – Surface water	Testing of groundwater may be required if significant contamination is recorded. Biological testing may be required if signs of buried animal waste are observed.

Source	Transport Pathway	Receptor	Risk Management Action Recommended
	P6 – Direct contact with terrestrial ecology	R6 – Terrestrial ecology (including zoo animals)	

7. Field Work Methods

7.1 Data Quality Objectives and Project Quality Procedures

The PSI has been devised broadly in accordance with the seven step data quality objective (DQO) process which is provided in Appendix B, Schedule B2 of National Environment Protection Measure 1999 revised 2013, National Environment Protection Council (NEPC (2013). The DQO process is outlined as follows:

- Stating the Problem;
- Identifying the Decision;
- Identifying Inputs to the Decision;
- Defining the Boundary of the Assessment;
- Developing a Decision Rule;
- Specifying Acceptable Limits on Decision Errors; and
- Optimising the Design for Obtaining Data.

Referenced sections for the respective DQOs listed above are presented in Table Q1, Appendix G.

7.2 Data Quality Indicators

The performance of the assessment in achieving the DQO was assessed through the application of Data Quality Indicators (DQI), defined as follows:

- Precision:** A quantitative measure of the variability (or reproducibility) of data;
- Accuracy:** A quantitative measure of the closeness of reported data to the “true” value;
- Representativeness:** The confidence (expressed qualitatively) that data are representative of each media present on the site;
- Completeness:** A measure of the amount of useable data from a data collection activity; and
- Comparability:** The confidence (expressed qualitatively) that data can be considered equivalent for each sampling and analytical event.

Further comments on the DQIs are presented in Appendix G.

7.3 Sampling Locations and Rationale

The recommended minimum sampling density as stipulated in the NSW EPA Contaminated Sites: Sampling Design Guideline, 1995 for a 1.5 ha site is approximately 25 sampling points. In total 26 test bore locations were sampled across the site, exceeding the minimum requirement. The test bore locations are shown on Drawing 1, Appendix A. It is noted that due to site access restrictions related to the animal exhibits the test bores were not arranged on a grid-based pattern. Therefore a detailed site investigation (DSI) as defined in NEPC (2013) was not feasible.

7.4 Test Bore Drilling Procedure and Soil Sampling Procedure

The bores were drilled using a bobcat mounted drilling rig or hand tools depending on site access conditions. The test bores were drilled to depths of between 0.05 m and 1.6 m below the surface level. Soil samples were collected from solid flight augers.

All sampling data was recorded on DP's test bore logs with essential information included in the chain-of-custody sheets. The general sampling procedure adopted for the collection of environmental samples is summarised below:

- Collection of soil samples from the auger returns at discrete depth intervals;
- Transfer of samples into laboratory-prepared glass jars, filled to the top to minimise the headspace within the sample jar and capping immediately with a Teflon lined lid to minimise loss of volatiles;
- Labelling of sample containers with individual and unique identification, including project number, sample location and sample depth; and
- Placement of the glass jars into an ice cooled, insulated and sealed container for transport to the laboratory.

7.5 Analytical Rationale

The analytical scheme was designed to obtain an indication of the potential presence and possible distribution of contaminants that may be attributable to past and present activities, and features within the site, as discussed in Section 6.

7.6 Field Quality Assurance and Quality Control

The field QC procedures for sampling were undertaken in accordance with Douglas Partners' *Field Procedures Manual*. Field replicates were recovered and analysed for a limited suite of contaminants by means of intra-laboratory and inter-laboratory analysis. The results of the field QA programme are presented in Appendix G.

7.7 Laboratory QA/QC

The analytical laboratories, accredited by NATA, are required to conduct in-house QA/QC procedures. These are normally incorporated into every analytical run and include reagent blanks, spike recovery, surrogate recovery and duplicate samples. These results are included in the laboratory certificates in Appendix F.

The results of the DP assessment of laboratory QA/QC are shown in Appendix G with the laboratory certificates of analysis included in Appendix F.

8. Site Assessment Criteria

The site assessment criteria (SAC) applied in the current investigation are informed by the CSM which identified human and ecological receptors as potential receptors to contamination on the site (refer to Section 6). Analytical results were assessed (as a Tier 1 assessment) against the SAC comprising the investigation and screening levels of Schedule B1, NEPC (2013). The NEPC guidelines are endorsed by the NSW EPA under the CLM Act 1997.

The investigation and screening levels are applicable to generic land use settings and include consideration of, where relevant, the soil type and the depth of contamination. The investigation and screening levels are not intended to be used as clean up levels. Rather, they establish concentrations above which further appropriate investigation (e.g. Tier 2 assessment) should be undertaken. They are intentionally conservative and are based on a reasonable worst-case scenario.

The investigation and screening levels applied in the current investigation comprise levels adopted for commercial and industrial land-use.

8.1 Soils

8.1.1 Health Investigation and Screening Levels

The Health Investigation Levels (HIL) and Health Screening Levels (HSL) are scientifically-based, generic assessment criteria designed to be used in the first stage (Tier 1) of an assessment of potential human health risk from chronic exposure to contaminants.

HIL are applicable to assessing health risk arising via all relevant pathways of exposure for a range of metals and organic substances. The HIL are generic to all soil types and apply generally to a depth of 3 m below the surface for residential land.

HSL are applicable to selected petroleum compounds and fractions to assess the risk to human health via inhalation and direct contact pathways. HSL have been developed for different land uses, soil types and depths to contamination.

The generic HIL and HSL are considered to be appropriate for the assessment of contamination at the site. Given the proposed land use the adopted HIL and HSL are:

- **HIL-D** – commercial and industrial land-use;
- **HSL-D** – commercial and industrial land-use;
- For direct contact with petroleum hydrocarbons for maintenance workers the soil screening levels for direct contact (Table A4) from CRC Care Technical Report No. 10² have been adopted; and
- For direct contact with petroleum hydrocarbons for general site users the soil screening levels for HSL D (Table A4) from CRC Care Technical Report No. 10 have been adopted.

Table 3: Inputs to the Derivation of HSLs

Variable	Input	Rationale
Potential exposure pathway	Soil vapour intrusion (inhalation) / Direct contact *	The CSM has identified both potential exposure pathways.
Soil Type	Sand	Based on the presence of gravelly fill (Section 9) a soil type of sand has been adopted as a conservative measure.
Depth to contamination	0 m to <1 m 0 m to <2 m (intrusive maintenance worker)	Contamination from imported fill and/or industrial processes may impact near surface soils, therefore conservatively the 0 to <1 m depth range has been adopted.

*Developed by CRC CARE (2011)

The adopted soil HIL and HSL for the potential contaminants of concern are presented in Table 4.

Table 4: Health Investigation and Screening Levels (HIL and HSL) for proposed land uses in mg/kg unless otherwise indicated

Contaminants		HIL-D,	HSL-D (Vapour Intrusion)	HSL-D (Direct Contact) ⁴	HSL Maintenance Workers (Direct Contact) ⁴
Metals	Arsenic	3000	-	-	-
	Cadmium	900	-	-	-
	Chromium (VI)	3600	-	-	-
	Copper	240,000	-	-	-
	Lead	1500	-	-	-
	Mercury (inorganic)	730	-	-	-
	Nickel	6000	-	-	-
	Zinc	400,000	-	-	-

² E. Friebe and P. Nadebaum (2011). Health Screening Levels for Petroleum hydrocarbons in soil and groundwater

Contaminants		HIL-D,	HSL-D (Vapour Intrusion)	HSL-D (Direct Contact) ⁴	HSL Maintenance Workers (Direct Contact) ⁴
PAH	Benzo(a)pyrene TEQ ¹	40	-	-	-
	Naphthalene	-	NL	11,000	29,000
	Total PAH	4000	-	-	-
TRH	C6 – C10 (less BTEX) [F1]	-	260	26,000	82,000
	>C10-C16 (less Naphthalene) [F2]	-	NL	20,000	62,000
	>C16-C34 [F3]	-	-	27,000	85,000
	>C34-C40 [F4]	-	-	38,000	120,000
BTEX	Benzene	-	3	430	1,100
	Toluene	-	NL	99,000	120,000
	Ethylbenzene	-	NL	27,000	85,000
	Xylenes	-	230	81,000	130,000
Phenol	Pentachlorophenol (used as an initial screen)	660	-	-	-
OPP	Chlorpyrifos	2000	-	-	-
OCP	Aldrin + Dieldrin	45	-	-	-
	Chlordane	530	-	-	-
	DDT+DDE+DDD	3600	-	-	-
	Endosulfan	2000	-	-	-
	Endrin	100	-	-	-
	Heptachlor	50	-	-	-
	HCB	80	-	-	-
	Methoxychlor	2500	-	-	-
PCB ²		7	-	-	-

Notes:

- 1 *sum of carcinogenic PAH*
- 2 *non dioxin-like PCBs only.*
- 3 *NL Not Limiting*
- 4 *HSL for Direct Contact CRC CARE Technical Report No. 10*

For those analytes which do not have HILs or HSLs for soil published in NEPC (2013) the laboratory reporting limits are adopted as an initial screen. Should any concentrations be reported above the

reporting limits then further investigation into the development of appropriate screening criteria will be undertaken.

8.1.2 Ecological Investigation Levels and Screening Levels

Ecological Investigation Levels (EIL) have been derived for selected metals and organic compounds and are applicable for assessing risk to terrestrial ecosystems (NEPC, 2013). EIL depend on specific soil physiochemical properties and land use scenarios and generally apply to the top 2 m of soil, which corresponds to the root zone and habitation zone of many species. The EIL is determined for a contaminant based on the sum of the ambient background concentration (ABC) and an added contaminant limit (ACL). The ABC of a contaminant is the soil concentration in a specific locality that is the sum of naturally occurring background levels and the contaminants levels that have been introduced from diffuse or non-point sources (e.g. motor vehicle emissions). The ACL is the added concentration (above the ABC) of a contaminant above which further appropriate investigation and evaluation of the impact on ecological values is required.

The EIL is calculated using the following formula:

$$\text{EIL} = \text{ABC} + \text{ACL},$$

The ABC is determined through direct measurement at an appropriate reference site (preferred) or through the use of methods defined by Olszowy et al *Trace element concentrations in soils from rural and urban areas of Australia*, Contaminated Sites monograph no. 4, South Australian Health Commission, Adelaide, Australia 1995 (Olszowy, 1995) or Hamon et al, *Geochemical indices allow estimation of heavy metal background concentrations in soils*, Global Biogeochemical Cycles, vol. 18, GB1014, (Hamon, 2004). ACL is based on the soil characteristics of pH, CEC and clay content.

EIL (and ACLs where appropriate) have been derived in NEPC (2013) for only a short list of contaminants comprising As, Cu, Cr (III), DDT, naphthalene, Ni, Pb and Zn. An *Interactive (Excel) Calculation Spreadsheet* may be used for calculating site-specific EIL for these contaminants, and has been provided in the ASC NEPM Toolbox available on the SCEW (Standing Council on Environment and Water) website (<http://www.scew.gov.au/node/941>).

The adopted EIL, derived from the *Interactive (Excel) Calculation Spreadsheet* are shown in the following Table 5. The following site specific data and assumptions have been used to determine the EILs:

- A protection level of 60% has been adopted;
- The EIL will apply to the top 2 m of soil;
- EIL for commercial and industrial land will apply;
- Given the likely source of soil contaminants (i.e. historical site use/fill) the contamination is considered as “aged” (>2 years);
- ABCs have been derived using the *Interactive (Excel) Calculation Spreadsheet* using input parameters in Table 5 for the State of NSW, and high traffic volumes; and
- Based on average pH (from site data) and CEC values for soil types collected across the site, the soil profile (in the upper layers) has a median pH of 8.1 (site data) and CEC of 5 cmol_e/kg (based on assumptions in the absence of site data using the most conservative figures in Table 1b(3) of NEPC (2013).

Table 5: Ecological Investigation Levels (EIL) in mg/kg

Analyte		EIL	Comments
Metals	Arsenic	160	Adopted pH of 8.1 and CEC of 5 cmol _c /kg; assumed clay content [1% - conservative based on assumptions in absence of site data]
	Copper	160	
	Nickel	60	
	Chromium III	320	
	Lead	1800	
	Zinc	480	
PAH	Naphthalene	370	
OCP	DDT	640	

Ecological Screening Levels (ESL) are used to assess the risk of selected petroleum hydrocarbon compounds, BTEX and benzo(a)pyrene to terrestrial ecosystems. ESL apply to the top 2 m of the soil profile as for EIL.

ESL have been derived in NEPC (2013) for petroleum fractions F1 to F4 as well as BTEX and benzo(a)pyrene. Site specific data and assumptions as summarised in Table 6 have been used to determine the ESL. The adopted ESL, from Table 1B(6), Schedule B1 of NEPC (2013) are shown in Table 7.

Table 6: Inputs to the Derivation of ESL

Variable	Input	Rationale
Depth of ESL application	Top 2 m of the soil profile	The top 2 m depth below ground level corresponds to the root zone and habitation zone of many species.
Land use	Commercial and Industrial	Proposed development is commercial (zoo)
Soil Texture	Coarse	Based on gravelly fill soils being observed (Section 9).

Table 7: Ecological Screening Levels (ESL) in mg/kg

Analyte		ESL	Comments
TRH	C6 – C10 (less BTEX) [F1]	215*	All ESLs are low reliability apart from those marked with * which are moderate reliability
	>C10-C16 (less Naphthalene) [F2]	170*	
	>C16-C34 [F3]	1700	
	>C34-C40 [F4]	3300	
BTEX	Benzene	75	

Analyte		ESL	Comments
	Toluene	135	
	Ethylbenzene	165	
	Xylenes	180	
PAH	Benzo(a)pyrene	1.4	

8.1.3 Management Limits – Petroleum Hydrocarbons

In addition to appropriate consideration and application of the HSL and ESL, there are additional considerations which reflect the nature and properties of petroleum hydrocarbons, including:

- Formation of observable light non-aqueous phase liquids (LNAPL);
- Fire and explosion hazards; and
- Effects on buried infrastructure e.g. penetration of, or damage to, in-ground services.

Management Limits to avoid or minimise these potential effects have been adopted in NEPC (2013) as interim Tier 1 guidance. Management Limits have been derived in NEPC (2013) for the same four petroleum fractions as the HSL (F1 to F4). The adopted Management Limits, from Table 1B(7), Schedule B1 of NEPC (2013) are shown in the following Table 8. The following site specific data and assumptions have been used to determine the Management Limits:

- The Management Limits will apply to any depth within the soil profile;
- The Management Limits for commercial and industrial land apply; and
- A “coarse” soil texture has been adopted, based on gravelly fill soil type observed (Section 9).

Table 8: Management Limits in mg/kg

Analyte		Management Limit
TRH	C ₆ – C ₁₀ (F1) [#]	700
	>C ₁₀ -C ₁₆ (F2) [#]	1000
	>C ₁₆ -C ₃₄ (F3)	3500
	>C ₃₄ -C ₄₀ (F4)	10000

[#] Separate management limits for BTEX and naphthalene are not available hence these have not been subtracted from the relevant fractions to obtain F1 and F2
 Management limits are applied after consideration of relevant ESLs and HSLs

8.2 Asbestos in Soil

Bonded asbestos-containing material (ACM) is the most common form of asbestos contamination across Australia, generally arising from:

- Inadequate removal and disposal practices during demolition of buildings containing asbestos products;

- Widespread dumping of asbestos products and asbestos containing fill on vacant land and development sites; and
- Commonly occurring in historical fill containing unsorted demolition materials.

Mining, manufacturing or distribution of asbestos products may result in sites being contaminated by friable asbestos including free fibres. Severe weathering or damage to bonded ACM may also result in the formation of friable asbestos comprising fibrous asbestos (FA) and/or asbestos fines (AF).

Asbestos only poses a risk to human health when asbestos fibres are made airborne and inhaled. If asbestos is bound in a matrix such as cement or resin, it is not readily made airborne except through substantial physical damage. Bonded ACM in sound condition represents a low human health risk, whilst both FA and AF materials have the potential to generate, or be associated with, free asbestos fibres. Consequently, FA and AF must be carefully managed to prevent the release of asbestos fibres into the air.

A detailed asbestos assessment as outlined in NEPC (2013) was not undertaken. As such, asbestos was screened from jar samples taken for general analysis of contaminants. Therefore the presence or absence of asbestos at a limit of reporting of 0.1 g/kg has been adopted for this assessment as an initial screen.

8.3 Waste Classification Guidelines

The results of the soil analysis were compared to the waste classification criteria in the NSW EPA *Waste Classification Guidelines* 2014 (EPA, 2014).

9. Field Work Results

Detailed descriptions of the conditions encountered in each of the test bores are provided in the test bore logs in Appendix D.

Fill soils and/or topsoil filling was encountered in the test bores to depths of between 0.25 m and 1.6 m bgl, although it is noted that the depth of fill in bore C17, which refused on a tree root, may extend to a depth greater than 2.4 m bgl, based on the dynamic cone penetration (DCP) test. The fill typically comprised grey silty sand, and brown and grey sand. Inclusions of igneous gravel, crushed sandstone and grey crushed shells were observed in some locations.

Concrete cobbles were encountered in bore C03, shallow refusal on concrete was recorded in test bore C06 (at 0.05 m bgl) and traces of plastic were observed in test bores C15 and C20. A organic odour was noted in test bores C01, C03 and C19.

The fill soil was underlain by low to medium strength sandstone.

Groundwater: Groundwater was not encountered in the test bores. It is noted however that groundwater wells have been previously installed at the Zoo (refer to Section 5.2) and groundwater seepage was encountered in the fractured bedrock at depths of between 1.4 m and 3.7 m bgl. It should be noted that groundwater can vary according to season and rainfall infiltration.

The PID readings in each sample were all below 1 ppm suggesting that the potential for organic contaminants was low.

10. Laboratory Testing

The results of the laboratory analysis are summarised in Appendix E. Table E1 presents the laboratory results in comparison to the site assessment criteria and Table E2 presents the results in comparison to the waste classification criteria. The laboratory certificates and chain of custody information are presented in Appendix F.

11. Discussion

11.1 Preliminary Contamination Assessment

The site has operated as the Zoo since 1916. Since the establishment of the Zoo there have been a number of new exhibits and zoo buildings redeveloped and refurbished. The potential for contamination at int the investigation area was generally considered to be low, however, the presence of imported filling across the site (refer to Section 9) required further assessment.

Selected soil samples were analysed for the potential contaminants of concern comprising metals, TRH, BTEX, PAH, OCP, OPP, PCB, phenols and asbestos. The results of the soil analysis and the SAC are presented in Table E1, Appendix E.

The recorded concentrations of OCP, OPP, PCB, phenols and asbestos were below the laboratory practical quantitation limits (PQLs) and therefore below the site assessment criteria.

The recorded concentrations of TRH and BTEX in a limited number of samples were above the laboratory practical quantitation limits (PQLs) but below the site assessment criteria.

The recorded concentrations of heavy metals and PAH were generally low and within the site assessment criteria. However, it is noted that the following samples exceeded ecological investigation/screening levels as summarised in Table E1. It is noted that the concentrations of the contaminants analysed were all within the adopted human health based investigation and screening levels.

Table 9: SAC Exceedances

Analyte	Sample Exceedance	Concentration	Guideline Exceeded
Zinc	C04/0.1	490 mg/kg	EIL (480 mg/kg)
	95% UCL	141.1 mg/kg	
Benzo(a)pyrene	C05/0.1	10 mg/kg	ESL (1.4 mg/kg)
	C08/1.4-1.6*	2.8 mg/kg	
	95 % UCL#	0.75 mg/kg	

Notes

ESL – Ecological Screening Level

EIL – Ecological Investigation Level

* The replicate samples of C08/1.6-1.8 had significantly lower concentrations than the primary sample (BD3/170616 = <0.05 mg/kg and BD4/170616 = <0.5 mg/kg)

calculated excluding result from C05/0.1 (which is greater than 2.5 times the EIL)

Due to the presence of a limited number of EIL/ESL exceedances for nickel and benzo(a)pyrene the 95% upper confidence limit (UCL) has been determined (refer to Table 9). The exceedances of the EIL are only considered significant only if the 95% UCL also exceeds the EIL or the concentration in the individual sample is 2.5 times greater than the investigation level.

In each case the 95% UCL was within the adopted EIL. Therefore the EIL exceedances for zinc and benzo(a)pyrene are not considered to be significant.

However, the exceedance of the benzo(a)pyrene ESL in sample C1/0.1 is considered statistically significant as the concentrations reported are greater than 2.5 times the ESL. It is noted, however, that the sample was collected below an asphaltic concrete pavement in a layer of roadbase. It is therefore possible that the soil sample was cross-contaminated or otherwise impacted by the asphaltic materials noting the low leachability levels in the TCLP results (<0.001 mg/L, Table E2 in Appendix E). Furthermore there was no soil layer in this location; the asphaltic layer was underlain by roadbase then sandstone at 0.25 m bgl and therefore the impact on local ecology would be very limited. Therefore it is considered that the ESL exceedance in sample E05/0.1 is not significant and does not warrant management or remediation.

It is noted that while no asbestos was reported in the soil samples there were some precursor indicators of asbestos such as concrete present in some of the test bores. Therefore the possibility of asbestos being present cannot be entirely ruled out.

11.2 Preliminary Waste Classification

Table 10 presents the results of the six step procedure outlined in EPA (2014) for determining the type of waste and the waste classification. This process applies to the materials tested and described as filling and which does not therefore meet the definition of VENM.

Table 10: Six Step Classification Procedure

Step	Comments	Rationale
1. Is the waste special waste?	No	No asbestos-containing materials (ACM), clinical or related waste, or waste tyres were observed in the test pits; Asbestos was not detected by the analytical laboratory.
2. Is the waste liquid waste?	No	The filling comprised a soil matrix.
3. Is the waste "pre-classified"?	No	The filling material is not pre-classified with reference to EPA (2014).
4. Does the waste possess hazardous waste characteristics?	No	The waste was not observed to contain or considered at risk to contain explosives, gases, flammable solids, oxidising agents, organic peroxides, toxic substances, corrosive substances, coal tar, batteries, lead paint or dangerous goods containers.
5. Determining a wastes classification using chemical assessment	Conducted	Refer to Table E2 (attached).
6. Is the waste putrescible or non-putrescible?	No	The filling does not contain materials considered to be putrescible ^a .

NOTE: a wastes that are generally not classified as putrescible include; soils, timber, garden trimmings, agricultural, forest and crop materials, and natural fibrous organic and vegetative materials (EPA, 2014).

The analytical data are presented in the attached laboratory certificates and are summarised in Table E2 with reference to the waste classification guidelines.

- The concentrations of TRH, BTEX, OCP, OPP, PCB and phenols, were all within the thresholds for General Solid Waste;
- The concentrations of lead and PAH were generally within the thresholds for General Solid Waste without toxicity characteristic leaching procedure (TCLP) results, however, there were a couple of samples that exceeded this criteria as follows:
 - o Lead: C08/1;
 - o Benzo(a)pyrene: C05/1, C07/1, C08/1.4-1.6 and C18/0.1-0.2;
- Therefore TCLP analysis was conducted for lead and PAH. The total and leachable concentrations of lead and PAH were within the SCC1 (total concentration with TCLP) and TCLP1 (leachable concentration) for general solid waste; and
- No asbestos was reported above the limit of reporting in any of the samples analysed.

Therefore based on the above considerations the fill as described in Section 9 in the project area is classified as **General Solid Waste (non-putrescible)**.

It is recommended that visual confirmation of the waste classification be conducted during excavation and load out of the material. If signs of significant contamination are observed during excavation such as building rubble (including asbestos), significant anthropogenic materials, odorous or discoloured soils or materials that vary from those described in this report then further *ex situ* waste classification should be undertaken on the impacted materials.

The preliminary assessment did not include chemical analysis of the underlying natural soils (due to limited returns of the underlying sandstone). It is recommended that following the removal of the overlying fill soils that further assessment of the natural soil/sandstone (at least near the interface between filling and in situ materials) be undertaken to determine if the natural soil will classify as virgin excavated natural soil (VENM) if off-site disposal of the natural soils is required.

12. Conclusion and Recommendations

Based on the findings of the investigation it is considered that the potential contamination within the investigation area is low and that the levels of the contaminants of concern were generally within the adopted site assessment criteria.

The fill as described in Section 9 in the project area is classified as General Solid Waste (non-putrescible). It is recommended however that visual confirmation of the the waste classification be conducted during excavation and load out of the material. Further assessment of the underlying natural material is recommended if the natural soils/rock requires off-site disposal.

It is recommended that a unexpected finds protocol (UFP) should be prepared which outlines the steps to be undertaken to identify, report and manage any signs of potential environmental concern encountered during earthworks/redevelopment works. These usually comprise notifying workers during the standard site induction of whom to report finds to, and then the protocol for isolating the find, organising investigation and management and notifying appropriate personnel/ organisations.

13. Limitations

Douglas Partners (DP) has prepared this report for this project at Taronga Zoological Park, Mosman in accordance with DP's proposal dated 7 April 2016 and acceptance received from Mr Andrew Chippindall of Taronga Conservation Society Australia. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Taronga Conservation Society Australia for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the

work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human 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 affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

Asbestos has not been detected by observation or by laboratory analysis, either on the surface of the site, or in filling materials at the test locations sampled and analysed. Building demolition materials, such as concrete and glass were, however, located in below-ground filling and these are considered as indicative of the possible presence of hazardous building materials (HBM), including asbestos.

Although the sampling plan adopted for this investigation is considered appropriate to achieve the stated project objectives, there are necessarily parts of the site that have not been sampled and analysed. This is either due to undetected variations in ground conditions or to budget constraints (as discussed above), or to parts of the site being inaccessible and not available for inspection/sampling, or to vegetation preventing visual inspection and reasonable access. It is therefore considered possible that HBM, including asbestos, may be present in unobserved or untested parts of the site, between and beyond sampling locations, and hence no warranty can be given that asbestos is not present.

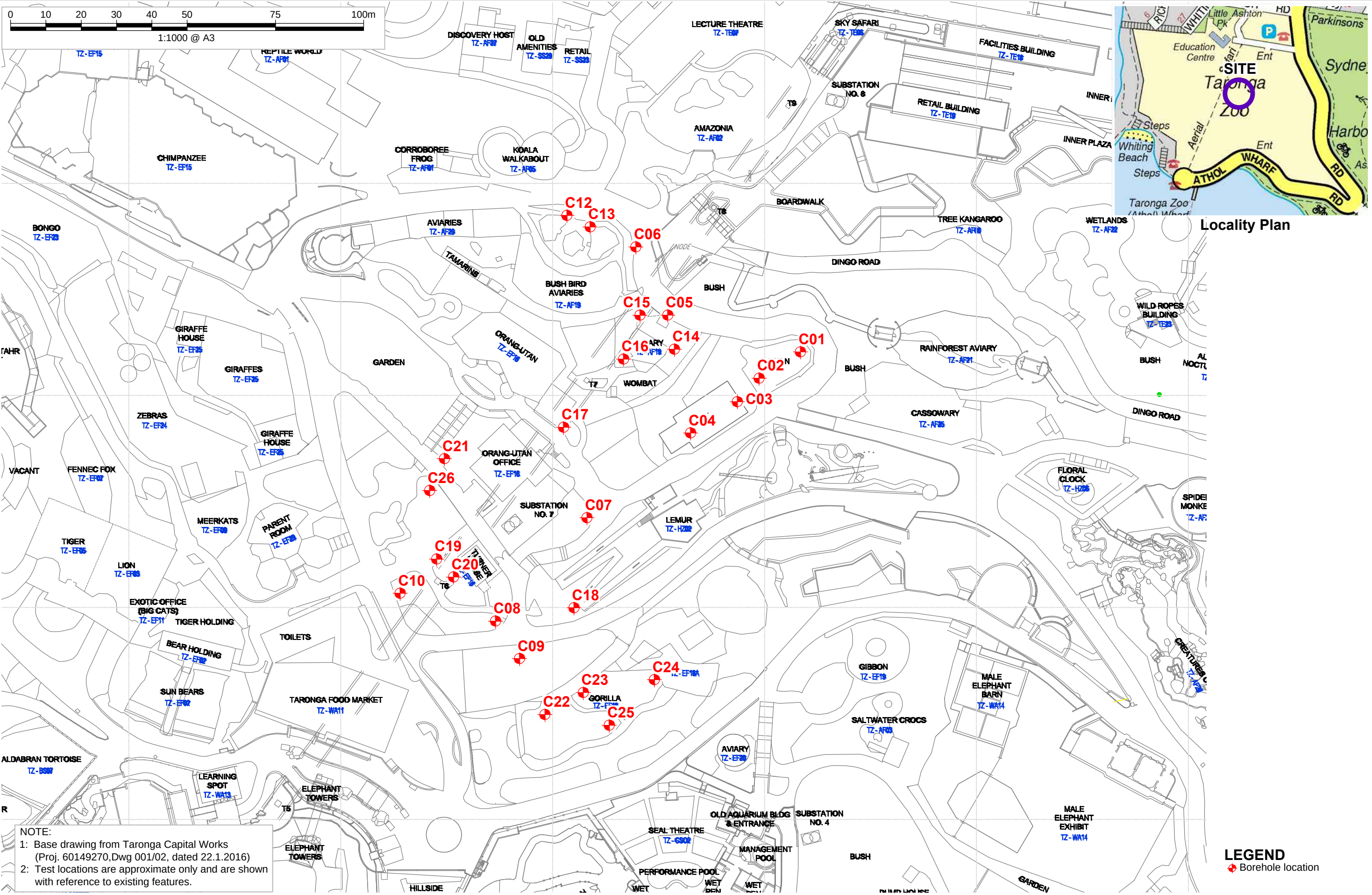
This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation,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

Douglas Partners Pty Ltd

Appendix A

Drawing 1 and 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

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

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.

Appendix B

Site Photographs



Photo 1 - Lemur Park



Photo 2 - Lemur Park and footpath



Site Photographs

Congo Site

Bradleys Head Road, Mosman

CLIENT: Taronga Conservation Society
Australia

PROJECT: 85538.01

PLATE No: 1

REV: A

DATE: 1-Jul-16



Photo 3 - Pedestrian Path

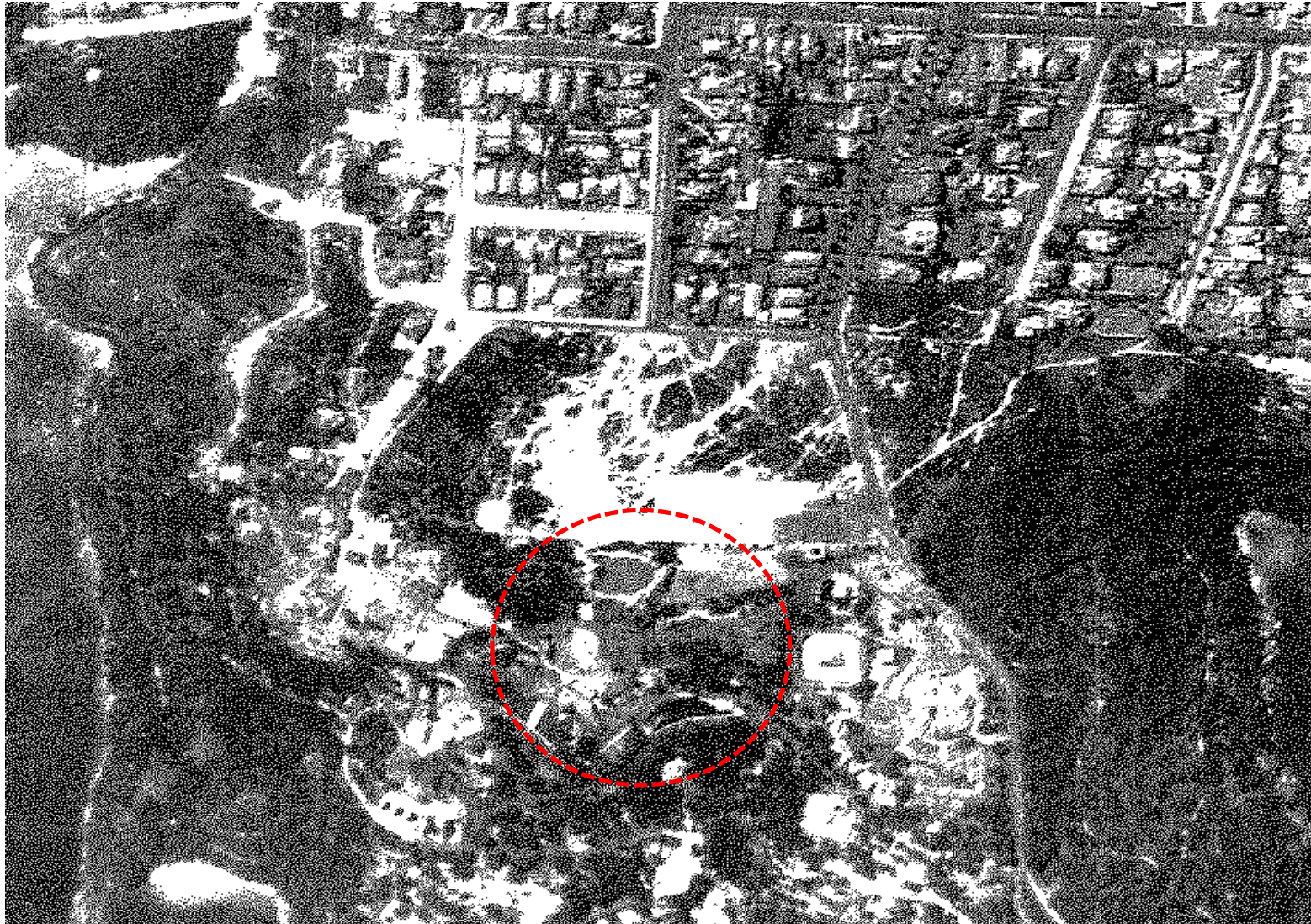


Photo 4 - Gorilla Enclosure

 Douglas Partners Geotechnics Environment Groundwater	Site Photographs		PROJECT: 85538.01
	Congo Site		PLATE No: 2
	Bradleys Head Road, Mosman		REV: A
	CLIENT: Taronga Conservation Society Australia		DATE: 1-Jul-16

Appendix C

Site History Information



CLIENT: Taronga Conservation Society
Australia

OFFICE: Sydney

DATE: 22 Jul 2016

1930 Aerial Photograph

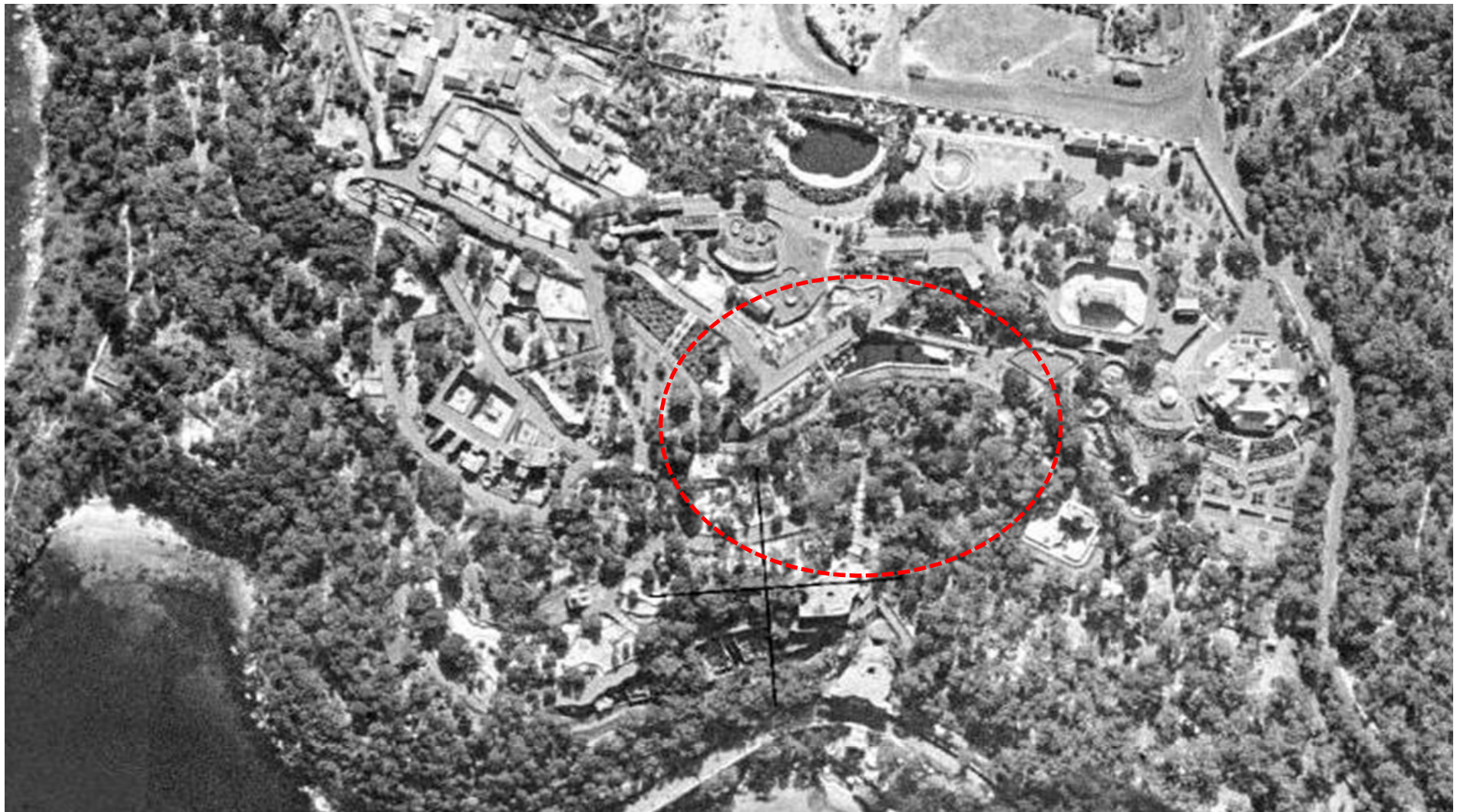
Congo Site

Bradleys Head Road, Mosman

PROJECT No: 85538.01

PLATE No: 1

REVISION: A



CLIENT: Taronga Conservation Society
Australia

OFFICE: Sydney

DATE: 22 Jul 2016

1943 Aerial Photograph

Congo Site

Bradleys Head Road, Mosman

PROJECT No: 85538.01

PLATE No: 2

REVISION: A



CLIENT: Taronga Conservation Society
Australia

OFFICE: Sydney

DATE: 22 Jul 2016

1951 Aerial Photograph

Congo Site

Bradleys Head Road, Mosman

PROJECT No: 85538.01

PLATE No: 3

REVISION: A



CLIENT: Taronga Conservation Society
Australia

OFFICE: Sydney

DATE: 22 Jul 2016

1961 Aerial Photograph

Congo Site

Bradleys Head Road, Mosman

PROJECT No: 85538.01

PLATE No: 4

REVISION: A



CLIENT: Taronga Conservation Society
Australia

OFFICE: Sydney

DATE: 22 Jul 2016

2002 Aerial Photograph

Congo Site

Bradleys Head Road, Mosman

PROJECT No: 85538.01

PLATE No: 5

REVISION: A



CLIENT: Taronga Conservation Society
Australia

OFFICE: Sydney

DATE: 22 Jul 2016

2009 Aerial Photograph

Congo Site

Bradleys Head Road, Mosman

PROJECT No: 85538.01

PLATE No: 6

REVISION: A



CLIENT: Taronga Conservation Society
Australia

OFFICE: Sydney

DATE: 22 Jul 2016

2016 Aerial Photograph

Congo Site

Bradleys Head Road, Mosman

PROJECT No: 85538.01

PLATE No: 7

REVISION: A



[Home](#) [Contaminated land](#) [Record of notices](#)

Search results

Your search for: Suburb: MOSMAN

did not find any records in our database.

If a site does not appear on the record it may still be affected by contamination. For example:

- Contamination may be present but the site has not been regulated by the EPA under the Contaminated Land Management Act 1997 or the Environmentally Hazardous Chemicals Act 1985.
- The EPA may be regulating contamination at the site through a licence or notice under the Protection of the Environment Operations Act 1997 (POEO Act).
- Contamination at the site may be being managed under the [planning process](#).

More information about particular sites may be available from:

- The [POEO public register](#)
- The appropriate planning authority: for example, on a planning certificate issued by the local council under [section 149 of the Environmental Planning and Assessment Act](#).

See [What's in the record and What's not in the record](#).

If you want to know whether a specific site has been the subject of notices issued by the EPA under the CLM Act, we suggest that you search by Local Government Area only and carefully review the sites that are listed.

This public record provides information about sites regulated by the EPA under the Contaminated Land Management Act 1997, including sites currently and previously regulated under the Environmentally Hazardous Chemicals Act 1985. Your inquiry using the above search criteria has not matched any record of current or former regulation. You should consider searching again using different criteria. The fact that a site does not appear on the record does not necessarily mean that it is not affected by contamination. The site may have been notified to the EPA but not yet assessed, or contamination may be present but the site is not yet being regulated by the EPA. Further information about particular sites may be available from the appropriate planning authority, for example, on a planning certificate issued by the local council under section 149 of the Environmental Planning and Assessment Act. In addition the EPA may be regulating contamination at the site through a licence under the Protection of the Environment Operations Act 1997. You may wish to search the POEO public register. [POEO public register](#)

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Search TIP

To search for a specific site, search by LGA (local government area) and carefully review all sites listed.

... [more search tips](#)

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Healthy Environment, Healthy Community, Healthy Business

[Home](#) > [Environment protection licences](#) > [POEO Public Register](#) >
[Search for licences, applications and notices](#)

Search results

Your search for: **General Search** with the following criteria

Name - zoological

returned 3 results

[Export to excel](#)

1 of 1 Pages

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Number	Name	Location	Type	Status	Issued date
1677	ZOOLOGICAL PARKS BOARD OF NSW	BRADLEYS HEAD ROAD, MOSMAN, NSW 2088	POEO licence	Issued	26 Sep 2000
1512309	ZOOLOGICAL PARKS BOARD OF NSW	BRADLEYS HEAD ROAD, MOSMAN, NSW 2088	Compliance Audit	Complete	21 Feb 2013
1522383	ZOOLOGICAL PARKS BOARD OF NSW	BRADLEYS HEAD ROAD, MOSMAN, NSW 2088	s.58 Licence Variation	Issued	09 Jul 2015

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Environment Protection Licence



Licence - 1677

Licence Details	
Number:	1677
Anniversary Date:	01-May

Licensee
ZOOLOGICAL PARKS BOARD OF NSW
PO BOX 20
MOSMAN NSW 2088

Premises
TARONGA ZOO (INCLUDES AREAS OUTSIDE FENCED COMPOUND)
BRADLEYS HEAD ROAD
MOSMAN NSW 2088

Scheduled Activity
Sewage Treatment

Fee Based Activity	Scale
Sewage treatment processing by small plants	0-20 ML discharged

Region
Metropolitan Infrastructure
Level 13, 10 Valentine Ave
PARRAMATTA NSW 2150
Phone: (02) 9995 5000
Fax: (02) 9995 6900
PO Box 668 PARRAMATTA
NSW 2124

Environment Protection Licence



Licence - 1677

INFORMATION ABOUT THIS LICENCE	4
Dictionary	4
Responsibilities of licensee	4
Variation of licence conditions	4
Duration of licence	4
Licence review	4
Fees and annual return to be sent to the EPA	4
Transfer of licence	5
Public register and access to monitoring data	5
1 ADMINISTRATIVE CONDITIONS	6
A1 What the licence authorises and regulates	6
A2 Premises or plant to which this licence applies	6
A3 Information supplied to the EPA	6
2 DISCHARGES TO AIR AND WATER AND APPLICATIONS TO LAND	7
P1 Location of monitoring/discharge points and areas	7
3 LIMIT CONDITIONS	8
L1 Pollution of waters	8
L2 Concentration limits	8
L3 Volume and mass limits	9
4 OPERATING CONDITIONS	10
O1 Activities must be carried out in a competent manner	10
O2 Maintenance of plant and equipment	10
5 MONITORING AND RECORDING CONDITIONS	10
M1 Monitoring records	10
M2 Requirement to monitor concentration of pollutants discharged	10
M3 Testing methods - concentration limits	12
M4 Recording of pollution complaints	12
M5 Telephone complaints line	12
M6 Requirement to monitor volume or mass	13
M7 Other monitoring and recording conditions	13
6 REPORTING CONDITIONS	14
R1 Annual return documents	14
R2 Notification of environmental harm	15
R3 Written report	15

Environment Protection Licence

Licence - 1677



R4	Other reporting conditions	16
7	GENERAL CONDITIONS	17
G1	Copy of licence kept at the premises or plant	17
G2	Other general conditions	17
	DICTIONARY	19
	General Dictionary	19

Environment Protection Licence

Licence - 1677



Information about this licence

Dictionary

A definition of terms used in the licence can be found in the dictionary at the end of this licence.

Responsibilities of licensee

Separate to the requirements of this licence, general obligations of licensees are set out in the Protection of the Environment Operations Act 1997 ("the Act") and the Regulations made under the Act. These include obligations to:

- ensure persons associated with you comply with this licence, as set out in section 64 of the Act;
- control the pollution of waters and the pollution of air (see for example sections 120 - 132 of the Act);
- report incidents causing or threatening material environmental harm to the environment, as set out in Part 5.7 of the Act.

Variation of licence conditions

The licence holder can apply to vary the conditions of this licence. An application form for this purpose is available from the EPA.

The EPA may also vary the conditions of the licence at any time by written notice without an application being made.

Where a licence has been granted in relation to development which was assessed under the Environmental Planning and Assessment Act 1979 in accordance with the procedures applying to integrated development, the EPA may not impose conditions which are inconsistent with the development consent conditions until the licence is first reviewed under Part 3.6 of the Act.

Duration of licence

This licence will remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

Licence review

The Act requires that the EPA review your licence at least every 5 years after the issue of the licence, as set out in Part 3.6 and Schedule 5 of the Act. You will receive advance notice of the licence review.

Fees and annual return to be sent to the EPA

For each licence fee period you must pay:

- an administrative fee; and
- a load-based fee (if applicable).

Environment Protection Licence



Licence - 1677

The EPA publication “A Guide to Licensing” contains information about how to calculate your licence fees. The licence requires that an Annual Return, comprising a Statement of Compliance and a summary of any monitoring required by the licence (including the recording of complaints), be submitted to the EPA. The Annual Return must be submitted within 60 days after the end of each reporting period. See condition R1 regarding the Annual Return reporting requirements.

Usually the licence fee period is the same as the reporting period.

Transfer of licence

The licence holder can apply to transfer the licence to another person. An application form for this purpose is available from the EPA.

Public register and access to monitoring data

Part 9.5 of the Act requires the EPA to keep a public register of details and decisions of the EPA in relation to, for example:

- licence applications;
- licence conditions and variations;
- statements of compliance;
- load based licensing information; and
- load reduction agreements.

Under s320 of the Act application can be made to the EPA for access to monitoring data which has been submitted to the EPA by licensees.

This licence is issued to:

ZOOLOGICAL PARKS BOARD OF NSW
PO BOX 20
MOSMAN NSW 2088

subject to the conditions which follow.

Environment Protection Licence

Licence - 1677



1 Administrative Conditions

A1 What the licence authorises and regulates

- A1.1 This licence regulates water pollution resulting from the activity/ies specified below carried out at the premises specified in A2.

Fee Based Activity	Scale
Sewage treatment processing by small plants	0.00-20.00 ML discharged

- A1.2 This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation.

Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.

Scheduled Activity	Fee Based Activity	Scale
Sewage Treatment	Sewage treatment processing by small plants	0 - 20 ML discharged

A2 Premises or plant to which this licence applies

- A2.1 The licence applies to the following premises:

Premises Details
TARONGA ZOO (INCLUDES AREAS OUTSIDE FENCED COMPOUND)
BRADLEYS HEAD ROAD
MOSMAN
NSW 2088
LOT 22 DP 843294

A3 Information supplied to the EPA

- A3.1 Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence.

In this condition the reference to "the licence application" includes a reference to:

- the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and
- the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.

- A3.2 **Excludes EMS and EMPs and the Like**

Environment Protection Licence

Licence - 1677



Information supplied to the EPA in the nature of an Environmental Management System or Environmental Management Plans is deemed not to form part of the licence application or any application to vary the licence.

2 Discharges to Air and Water and Applications to Land

P1 Location of monitoring/discharge points and areas

P1.1 The following utilisation areas referred to in the table below are identified in this licence for the purposes of the monitoring and/or the setting of limits for any application of solids or liquids to the utilisation area.

P1.2 The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.

Water and land

EPA Identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description
1		Outlet of 900 mm diameter UPVC within a concrete culvert surrounding by mortared rock work	located between the western end of Athol Bay beach and the seawater abstraction pier.
2	Water quality monitoring and deemed discharge point - access pit covered by a circular 'gatic' cover located at the foot of a retaining wall on which the term 'POINT 2' is displayed on a sign fixed above the pit.	Water quality monitoring and deemed discharge point - access pit covered by a circular 'gatic' cover located at the foot of a retaining wall on which the term 'POINT 2' is displayed on a sign fixed above the pit.	located within a paved ramp opposite the southern entrance to the Zoo and 15 metres east of where the Bradleys Head to Chowder Bay walk grade separates from Athol Wharf Road footpath.
3		Submarine outlet of 225 mm diameter UPVC pipe in Little Sirius Cove.	Western end of submarine pipeline located on the eastern side of Little Sirius Cove as shown in the 'Little Sirius Cove Bathymetry' inset on survey drawing number 57334 revision A prepared by NSW Public Works on 19 June 2015.
4	Water quality monitoring and deemed discharge point.	Water quality monitoring and deemed discharge point.	Sample collection point (in UPVC pipeline fixed along the southern wall of the water recycling plant filtration and UV sterilisation building overlooking Little Sirius Cove) marked by a sign displaying the expression 'POINT 4'

Environment Protection Licence

Licence - 1677



5	Volume monitoring	Meter located within water recycling plant filtration and UV sterilisation building marked by a sign displaying the expression "Point 5"
---	-------------------	--

P1.3 For the avoidance of doubt in regard to the Table to condition P1.2, the results of analysis of any sample taken from :

- (a) point 2 is deemed to be satisfactory for the purpose of determining compliance with licence concentration limits applicable to discharge point 1; and
- (b) point 4 is deemed to be satisfactory for the purpose of determining compliance with licence concentration limits applicable to discharge point 3.

P1.4 Discharge and monitoring point identification

The licensee must erect and maintain signs to clearly identify the location of monitoring points 2, 4 and 5 referred to in the Table to condition P1.1.

Each sign required by this condition must:

- (a) be displayed in a location readily visible to casual observer and as close as practicable to the point concerned;
- (b) be not less than 150 millimetres square with a white background and green lettering and numerals; and
- (c) display the word 'POINT' in uppercase lettering followed by the point number.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

- L2.1 For each monitoring/discharge point or utilisation area specified in the table\ below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.
- L2.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.
- L2.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\.

Environment Protection Licence



Licence - 1677

L2.4 Water and/or Land Concentration Limits

POINT 1,2

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
BOD	milligrams per litre	-	-	-	20
pH	pH				6.5-8.5
TSS	milligrams per litre				50

POINT 3,4

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
BOD	milligrams per litre				15
Enterococci	colony forming units per 100 millilitres				40
pH	pH				6.5-8.5
TSS	milligrams per litre				20

L3 Volume and mass limits

L3.1 For each discharge point or utilisation area specified below (by a point number), the volume/mass of:
a) liquids discharged to water; or;
b) solids or liquids applied to the area;
must not exceed the volume/mass limit specified for that discharge point or area.

Point	Unit of Measure	Volume/Mass Limit
5	kilolitres per day	2000

4 Operating Conditions

Environment Protection Licence

Licence - 1677



O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.

This includes:

- a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
- b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:

- a) must be maintained in a proper and efficient condition; and
- b) must be operated in a proper and efficient manner.

5 Monitoring and Recording Conditions

M1 Monitoring records

M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.

M1.2 All records required to be kept by this licence must be:

- a) in a legible form, or in a form that can readily be reduced to a legible form;
- b) kept for at least 4 years after the monitoring or event to which they relate took place; and
- c) produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:

- a) the date(s) on which the sample was taken;
- b) the time(s) at which the sample was collected;
- c) the point at which the sample was taken; and
- d) the name of the person who collected the sample.

M1.4 Notwithstanding condition M1.3, the licensee must record and retain, in accordance with condition M1.2, the reports required to be prepared by conditions R4.1, R5.1 and R5.2.

M2 Requirement to monitor concentration of pollutants discharged

M2.1 For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:

M2.2 Water and/ or Land Monitoring Requirements

Environment Protection Licence

Licence - 1677



POINT 2

Pollutant	Units of measure	Frequency	Sampling Method
BOD	milligrams per litre	Special Frequency 1	Grab sample
pH	pH	Special Frequency 1	Grab sample
TSS	milligrams per litre	Special Frequency 1	Grab sample

POINT 4

Pollutant	Units of measure	Frequency	Sampling Method
BOD	milligrams per litre	Special Frequency 2	Grab sample
Enterococci	colony forming units per 100 millilitres	Special Frequency 2	Grab sample
pH	pH	Special Frequency 2	Grab sample
TSS	milligrams per litre	Special Frequency 2	Grab sample

POINT 5

Pollutant	Units of measure	Frequency	Sampling Method
Volume	kilolitres per day	Continuous during discharge	Flow meter and continuous logger

M2.3 Special Monitoring Frequency 1

For the purposes of condition M2.1, 'Special frequency 1' means on each occasion during which there is a discharge at point 2, excepting that where there is more than one discharge during any calendar month only twice during that month (and not more than once during any continuous period of 14 days).

The licensee must take monitoring samples at point 2 at those times that ensure that the samples are representative of pollutant concentrations and pH quality prescribed in the Table to condition L3.1, by co-ordinating sample taking with discharges from the pools and water treatment systems comprising the Great Southern Ocean exhibits, including discharges during -

- (a) filter backwash operations,
- (b) protein fractionator rinse times, and
- (c) pool drop and fill operations.

M2.4 Special Monitoring Frequency 2

For the purposes of condition M2.1, 'Special frequency 2' means on each occasion during which there is a discharge at point 4, excepting that:

Environment Protection Licence

Licence - 1677



- (a) where there is more than one discharge during any calendar month only once during that month; and
- (b) not more than once during any continuous period of 14 days.

For the avoidance of doubt, where there has been no discharge at point 4 during a calendar month the licensee is not required to carry out monitoring at point 4 during that month but instead to undertake monitoring as soon as practicable during the next month during which there is a discharge at point 4.

M3 Testing methods - concentration limits

- M3.1 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.

M4 Recording of pollution complaints

- M4.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.
- M4.2 The record must include details of the following:
 - a) the date and time of the complaint;
 - b) the method by which the complaint was made;
 - c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
 - d) the nature of the complaint;
 - e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
 - f) if no action was taken by the licensee, the reasons why no action was taken.
- M4.3 The record of a complaint must be kept for at least 4 years after the complaint was made.
- M4.4 The record must be produced to any authorised officer of the EPA who asks to see them.

M5 Telephone complaints line

- M5.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.
- M5.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

Environment Protection Licence

Licence - 1677



M5.3 The preceding two conditions do not apply until 3 months after: the date of the issue of this licence.

M6 Requirement to monitor volume or mass

M6.1 For each discharge point or utilisation area specified below, the licensee must monitor:

- a) the volume of liquids discharged to water or applied to the area;
 - b) the mass of solids applied to the area;
 - c) the mass of pollutants emitted to the air;
- at the frequency and using the method and units of measure, specified below.

POINT 5

Frequency	Unit of Measure	Sampling Method
Daily	kilolitres per day	Flow meter and continuous logger

M6.2 Continuous logger not operating

In the event that the continuous logger referred to in the Table to condition M6.1 is not operating, the licensee must instead manually record the daily volume discharged via licence point 5.

M7 Other monitoring and recording conditions

M7.1 Logging maintenance of control equipment

- (1) The licensee must legibly record in a log book or the like:
- (a) the time and date maintenance, repair or replacement of control equipment was undertaken and by whom that maintenance, repair or replacement was undertaken; and
 - (b) details of every failure of control equipment, including -
 - (i) when the equipment failed,
 - (ii) when the equipment was repaired or replaced,
 - (iii) the duration the equipment was inoperative, and
 - (iv) the reasons why the equipment failed or was likely to have failed.
- (2) The licensee must make any record required to be made by this condition available for inspection on request by an authorised officer of the EPA.

'Control equipment' has the same meaning as in the Protection of the Environment Operations Act 1997.

Environment Protection Licence

Licence - 1677



M7.2 Logging discharges

- (1) The licensee must legibly record in a log book or the like the time, date and volume of each discharge via the point that is -
 - (a) described as point 2 in the table to condition P1.2, and
 - (b) described as point 4 in the table to condition P1.2.
- (2) The licensee must make any record required to be made by this condition available for inspection on request by an authorised officer of the EPA.
- (3) notwithstanding the requirements of sub-condition (1), where the monitoring equipment is unable to log each discharge, the licensee must -
 - (a) instead record the daily discharge at the points prescribed in sub-condition 1, and
 - (b) as soon as practicable after becoming aware that that monitoring equipment is unable to record each discharge undertake all such action as may be necessary to ensure each discharge is logged.

6 Reporting Conditions

R1 Annual return documents

- R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:
- a) a Statement of Compliance; and
 - b) a Monitoring and Complaints Summary.
- At the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.
- R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.
- R1.3 Where this licence is transferred from the licensee to a new licensee:
- a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
 - b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.
- R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:
- a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
 - b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.

Environment Protection Licence

Licence - 1677



- R1.5 The Annual Return for the reporting period must be supplied to the EPA by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').
- R1.6 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.
- R1.7 Within the Annual Return, the Statement of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:
- a) the licence holder; or
 - b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

R2 Notification of environmental harm

- R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.
- R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

R3 Written report

- R3.1 Where an authorised officer of the EPA suspects on reasonable grounds that:
- a) where this licence applies to premises, an event has occurred at the premises; or
 - b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence,
- and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.
- R3.2 The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.
- R3.3 The request may require a report which includes any or all of the following information:
- a) the cause, time and duration of the event;
 - b) the type, volume and concentration of every pollutant discharged as a result of the event;
 - c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;
 - d) the name, address and business hours telephone number of every other person (of whom the licensee

Environment Protection Licence

Licence - 1677



is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;

e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;

f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and

g) any other relevant matters.

R3.4 The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

R4 Other reporting conditions

R4.1

Analytical reports

(1) The licensee must prepare a written report detailing the results of analysis of samples required to be taken by a condition of this licence. The reports required by this condition must include –

- (a) the time and date each sample was taken (and by whom),
- (b) the EPA identification number of the monitoring or discharge point from which the sample was taken,
- (c) the licence condition pursuant to which the sample was taken,
- (d) the sample preservation measures adopted between the taking of the sample and delivery of the sample to the analytical laboratory,
- (e) the approved methods used to undertake each of the analyses,
- (f) where symbols or abbreviations are used in analytical reports an explicit statement of the meaning of those symbols and abbreviations, other than an abbreviation used in the EPA's "Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales", and
- (g) a copy of the relevant certificate of analysis from the laboratory that undertook that analysis.

(2) the licensee must make any report required by condition R4.1 (1) available for inspection on request by an authorised officer of the EPA.

(3) For the avoidance of doubt, the licensee is not required to supply the EPA with a copy of any report required by condition R4.1 (1) unless requested to do so by an authorised officer of the EPA or elsewhere in this licence.

Environment Protection Licence

Licence - 1677



- (4) if an authorised officer of the EPA requests the licensee to supply a copy of any report required by condition R4.1 (1), the licensee must supply a copy of that report to the EPA within 24 hours of receiving such a request.

7 General Conditions

G1 Copy of licence kept at the premises or plant

- G1.1 A copy of this licence must be kept at the premises to which the licence applies.
- G1.2 The licence must be produced to any authorised officer of the EPA who asks to see it.
- G1.3 The licence must be available for inspection by any employee or agent of the licensee working at the premises.

G2 Other general conditions

G2.1 Authorised representatives

The licensee must ensure that at least two representatives, duly appointed by the licensee as its authorised representatives, are available for contact by the EPA at all times.

- (1) the licensee must provide the EPA with up to date details of natural persons authorised to represent the licensee in respect of –
- (a) answering general enquiries made by the EPA or its authorised officers,
 - (b) speaking on behalf of the licensee,
 - (c) signing on behalf of the licensee, and
 - (d) acting as the licensee's 'out of hours' contact with authority to direct the licensee's employees, agents and contractors to undertake such action as may be necessary to ensure that all activities on the premises comply with the requirements of environment protection legislation and this licence.
- (2) The details required by condition G2.1 (1) must include –
- (a) the full name of each authorised representative and the scope of their authority to represent the licensee,
 - (b) the role of each authorised representative within the licensee organisation, and

Environment Protection Licence

Licence - 1677



- (c) the direct landline telephone number, mobile telephone number, fax number, email address and postal address of each authorised representative.

Environment Protection Licence

Licence - 1677



Dictionary

General Dictionary

3DGM [in relation to a concentration limit]	Means the three day geometric mean, which is calculated by multiplying the results of the analysis of three samples collected on consecutive days and then taking the cubed root of that amount. Where one or more of the samples is zero or below the detection limit for the analysis, then 1 or the detection limit respectively should be used in place of those samples
Act	Means the Protection of the Environment Operations Act 1997
activity	Means a scheduled or non-scheduled activity within the meaning of the Protection of the Environment Operations Act 1997
actual load	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
AM	Together with a number, means an ambient air monitoring method of that number prescribed by the <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> .
AMG	Australian Map Grid
anniversary date	The anniversary date is the anniversary each year of the date of issue of the licence. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
annual return	Is defined in R1.1
Approved Methods Publication	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
assessable pollutants	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
BOD	Means biochemical oxygen demand
CEM	Together with a number, means a continuous emission monitoring method of that number prescribed by the <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> .
COD	Means chemical oxygen demand
composite sample	Unless otherwise specifically approved in writing by the EPA, a sample consisting of 24 individual samples collected at hourly intervals and each having an equivalent volume.
cond.	Means conductivity
environment	Has the same meaning as in the Protection of the Environment Operations Act 1997
environment protection legislation	Has the same meaning as in the Protection of the Environment Administration Act 1991
EPA	Means Environment Protection Authority of New South Wales.
fee-based activity classification	Means the numbered short descriptions in Schedule 1 of the Protection of the Environment Operations (General) Regulation 2009.
general solid waste (non-putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997

Environment Protection Licence

Licence - 1677



flow weighted composite sample	Means a sample whose composites are sized in proportion to the flow at each composites time of collection.
general solid waste (putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
grab sample	Means a single sample taken at a point at a single time
hazardous waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
licensee	Means the licence holder described at the front of this licence
load calculation protocol	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
local authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
material harm	Has the same meaning as in section 147 Protection of the Environment Operations Act 1997
MBAS	Means methylene blue active substances
Minister	Means the Minister administering the Protection of the Environment Operations Act 1997
mobile plant	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
motor vehicle	Has the same meaning as in the Protection of the Environment Operations Act 1997
O&G	Means oil and grease
percentile [in relation to a concentration limit of a sample]	Means that percentage [eg.50%] of the number of samples taken that must meet the concentration limit specified in the licence for that pollutant over a specified period of time. In this licence, the specified period of time is the Reporting Period unless otherwise stated in this licence.
plant	Includes all plant within the meaning of the Protection of the Environment Operations Act 1997 as well as motor vehicles.
pollution of waters [or water pollution]	Has the same meaning as in the Protection of the Environment Operations Act 1997
premises	Means the premises described in condition A2.1
public authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
regional office	Means the relevant EPA office referred to in the Contacting the EPA document accompanying this licence
reporting period	For the purposes of this licence, the reporting period means the period of 12 months after the issue of the licence, and each subsequent period of 12 months. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
restricted solid waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
scheduled activity	Means an activity listed in Schedule 1 of the Protection of the Environment Operations Act 1997
special waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
TM	Together with a number, means a test method of that number prescribed by the <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> .

Environment Protection Licence



Licence - 1677

TSP	Means total suspended particles
TSS	Means total suspended solids
Type 1 substance	Means the elements antimony, arsenic, cadmium, lead or mercury or any compound containing one or more of those elements
Type 2 substance	Means the elements beryllium, chromium, cobalt, manganese, nickel, selenium, tin or vanadium or any compound containing one or more of those elements
utilisation area	Means any area shown as a utilisation area on a map submitted with the application for this licence
waste	Has the same meaning as in the Protection of the Environment Operations Act 1997
waste type	Means liquid, restricted solid waste, general solid waste (putrescible), general solid waste (non - putrescible), special waste or hazardous waste

Mr Kieran Horkan

Environment Protection Authority

(By Delegation)

Date of this edition: 26-September-2000

End Notes	
1	Condition A1.3 Not applicable varied by notice issued on <issue date> which came into effect on <effective date>
2	Licence varied by notice 1522383 issued on 09-Jul-2015

Licence Variation

Licence - 1677



ZOOLOGICAL PARKS BOARD OF NSW
Trading as Taronga Conservation Society Australia
ABN 41 733 619 876
PO BOX 20
MOSMAN NSW 2088

Attention: Mr Tim Bain

Notice Number 1522383
File Number EF13/3893
Date 09-Jul-2015

NOTICE OF VARIATION OF LICENCE NO. 1677

BACKGROUND

- A. ZOOLOGICAL PARKS BOARD OF NSW Trading as Taronga Conservation Society Australia ("the licensee") is the holder of Environment Protection Licence No. 1677 ("the licence") issued under the *Protection of the Environment Operations Act 1997* ("the Act"). The licence authorises the carrying out of activities at BRADLEYS HEAD ROAD, MOSMAN, NSW, 2088 ("the premises").
- B. The Environment Protection Authority (EPA) has reviewed the licence to take into account -
- (a) the efficiency of administration of environment protection legislation,
 - (b) safe access to discharge points,
 - (c) water quality objectives for Sydney Harbour,
 - (d) re-development of zoo exhibits (especially the great southern ocean exhibits) and associated infrastructure, and
 - (e) upgrading of environmental controls undertaken voluntarily by the licensee.

VARIATION OF LICENCE NO. 1677

1. By this notice the EPA varies licence No. 1677. The attached licence document contains all variations that are made to the licence by this notice.
2. The following variations have been made to the licence:
 - amended condition A2.1 - updated premises description;
 - new condition A3.2 - environmental management plans not part of the licence;
 - amended Table to condition P1.2;

Licence Variation



- new conditions P1.3 and P1.4;
- amended tables to conditions L2.1 and L2.2;
- amended table to condition L3.1;
- amended tables to condition M2.1;
- amended condition M2.3 - special monitoring frequency
- new condition M2.4 - special monitoring frequency;
- new condition M6.2 - continuous logger not operating;
- new conditions M7.1 and M7.2 - logging maintenance and discharges;
- new condition R4.1 - analytical reports;
- new condition G2.1 - authorised representatives; and
- deleted condition E1.1 - superfluous.

.....

Frank Garofalow

Manager

Metropolitan Infrastructure

(by Delegation)

INFORMATION ABOUT THIS NOTICE

- This notice is issued under section 58(5) of the Act.
- Details provided in this notice, along with an updated version of the licence, will be available on the EPA's Public Register (<http://www.epa.nsw.gov.au/prpoeo/index.htm>) in accordance with section 308 of the Act.

Appeals against this decision

- You can appeal to the Land and Environment Court against this decision. The deadline for lodging the appeal is 21 days after you were given notice of this decision.

When this notice begins to operate

- The variations to the licence specified in this notice begin to operate immediately from the date of this notice, unless another date is specified in this notice.
- If an appeal is made against this decision to vary the licence and the Land and Environment Court directs that the decision is stayed the decision does not operate until the stay ceases to have effect or

Licence Variation



the Land and Environment Court confirms the decision or the appeal is withdrawn (whichever occurs first).

Environment Protection Licence



Licence - 1677

Licence Details	
Number:	1677
Anniversary Date:	01-May

Licensee
ZOOLOGICAL PARKS BOARD OF NSW
PO BOX 20
MOSMAN NSW 2088

Premises
TARONGA ZOO (INCLUDES AREAS OUTSIDE FENCED COMPOUND)
BRADLEYS HEAD ROAD
MOSMAN NSW 2088

Scheduled Activity
Sewage Treatment

Fee Based Activity	Scale
Sewage treatment processing by small plants	0-20 ML discharged

Region
Metropolitan Infrastructure
Level 13, 10 Valentine Ave
PARRAMATTA NSW 2150
Phone: (02) 9995 5000
Fax: (02) 9995 6900
PO Box 668 PARRAMATTA
NSW 2124

Environment Protection Licence



Licence - 1677

INFORMATION ABOUT THIS LICENCE	4
Dictionary	4
Responsibilities of licensee	4
Variation of licence conditions	4
Duration of licence	4
Licence review	4
Fees and annual return to be sent to the EPA	4
Transfer of licence	5
Public register and access to monitoring data	5
1 ADMINISTRATIVE CONDITIONS	6
A1 What the licence authorises and regulates	6
A2 Premises or plant to which this licence applies	6
A3 Information supplied to the EPA	6
2 DISCHARGES TO AIR AND WATER AND APPLICATIONS TO LAND	7
P1 Location of monitoring/discharge points and areas	7
3 LIMIT CONDITIONS	8
L1 Pollution of waters	8
L2 Concentration limits	8
L3 Volume and mass limits	9
4 OPERATING CONDITIONS	10
O1 Activities must be carried out in a competent manner	10
O2 Maintenance of plant and equipment	10
5 MONITORING AND RECORDING CONDITIONS	10
M1 Monitoring records	10
M2 Requirement to monitor concentration of pollutants discharged	10
M3 Testing methods - concentration limits	12
M4 Recording of pollution complaints	12
M5 Telephone complaints line	12
M6 Requirement to monitor volume or mass	13
M7 Other monitoring and recording conditions	13
6 REPORTING CONDITIONS	14
R1 Annual return documents	14
R2 Notification of environmental harm	15
R3 Written report	15

Environment Protection Licence

Licence - 1677



R4	Other reporting conditions	16
7	GENERAL CONDITIONS	17
G1	Copy of licence kept at the premises or plant	17
G2	Other general conditions	17
	DICTIONARY	19
	General Dictionary	19

Environment Protection Licence

Licence - 1677



Information about this licence

Dictionary

A definition of terms used in the licence can be found in the dictionary at the end of this licence.

Responsibilities of licensee

Separate to the requirements of this licence, general obligations of licensees are set out in the Protection of the Environment Operations Act 1997 ("the Act") and the Regulations made under the Act. These include obligations to:

- ensure persons associated with you comply with this licence, as set out in section 64 of the Act;
- control the pollution of waters and the pollution of air (see for example sections 120 - 132 of the Act);
- report incidents causing or threatening material environmental harm to the environment, as set out in Part 5.7 of the Act.

Variation of licence conditions

The licence holder can apply to vary the conditions of this licence. An application form for this purpose is available from the EPA.

The EPA may also vary the conditions of the licence at any time by written notice without an application being made.

Where a licence has been granted in relation to development which was assessed under the Environmental Planning and Assessment Act 1979 in accordance with the procedures applying to integrated development, the EPA may not impose conditions which are inconsistent with the development consent conditions until the licence is first reviewed under Part 3.6 of the Act.

Duration of licence

This licence will remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

Licence review

The Act requires that the EPA review your licence at least every 5 years after the issue of the licence, as set out in Part 3.6 and Schedule 5 of the Act. You will receive advance notice of the licence review.

Fees and annual return to be sent to the EPA

For each licence fee period you must pay:

- an administrative fee; and
- a load-based fee (if applicable).

Environment Protection Licence

Licence - 1677



The EPA publication “A Guide to Licensing” contains information about how to calculate your licence fees. The licence requires that an Annual Return, comprising a Statement of Compliance and a summary of any monitoring required by the licence (including the recording of complaints), be submitted to the EPA. The Annual Return must be submitted within 60 days after the end of each reporting period. See condition R1 regarding the Annual Return reporting requirements.

Usually the licence fee period is the same as the reporting period.

Transfer of licence

The licence holder can apply to transfer the licence to another person. An application form for this purpose is available from the EPA.

Public register and access to monitoring data

Part 9.5 of the Act requires the EPA to keep a public register of details and decisions of the EPA in relation to, for example:

- licence applications;
- licence conditions and variations;
- statements of compliance;
- load based licensing information; and
- load reduction agreements.

Under s320 of the Act application can be made to the EPA for access to monitoring data which has been submitted to the EPA by licensees.

This licence is issued to:

ZOOLOGICAL PARKS BOARD OF NSW
PO BOX 20
MOSMAN NSW 2088

subject to the conditions which follow.

Environment Protection Licence

Licence - 1677



1 Administrative Conditions

A1 What the licence authorises and regulates

- A1.1 This licence regulates water pollution resulting from the activity/ies specified below carried out at the premises specified in A2.

Fee Based Activity	Scale
Sewage treatment processing by small plants	0.00-20.00 ML discharged

- A1.2 This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation.

Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.

Scheduled Activity	Fee Based Activity	Scale
Sewage Treatment	Sewage treatment processing by small plants	0 - 20 ML discharged

A2 Premises or plant to which this licence applies

- A2.1 The licence applies to the following premises:

Premises Details
TARONGA ZOO (INCLUDES AREAS OUTSIDE FENCED COMPOUND)
BRADLEYS HEAD ROAD
MOSMAN
NSW 2088
LOT 22 DP 843294

A3 Information supplied to the EPA

- A3.1 Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence.

In this condition the reference to "the licence application" includes a reference to:

- the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and
- the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.

- A3.2 **Excludes EMS and EMPs and the Like**

Environment Protection Licence

Licence - 1677



Information supplied to the EPA in the nature of an Environmental Management System or Environmental Management Plans is deemed not to form part of the licence application or any application to vary the licence.

2 Discharges to Air and Water and Applications to Land

P1 Location of monitoring/discharge points and areas

P1.1 The following utilisation areas referred to in the table below are identified in this licence for the purposes of the monitoring and/or the setting of limits for any application of solids or liquids to the utilisation area.

P1.2 The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.

Water and land

EPA Identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description
1		Outlet of 900 mm diameter UPVC within a concrete culvert surrounding by mortared rock work	located between the western end of Athol Bay beach and the seawater abstraction pier.
2	Water quality monitoring and deemed discharge point - access pit covered by a circular 'gatic' cover located at the foot of a retaining wall on which the term 'POINT 2' is displayed on a sign fixed above the pit.	Water quality monitoring and deemed discharge point - access pit covered by a circular 'gatic' cover located at the foot of a retaining wall on which the term 'POINT 2' is displayed on a sign fixed above the pit.	located within a paved ramp opposite the southern entrance to the Zoo and 15 metres east of where the Bradleys Head to Chowder Bay walk grade separates from Athol Wharf Road footpath.
3		Submarine outlet of 225 mm diameter UPVC pipe in Little Sirius Cove.	Western end of submarine pipeline located on the eastern side of Little Sirius Cove as shown in the 'Little Sirius Cove Bathymetry' inset on survey drawing number 57334 revision A prepared by NSW Public Works on 19 June 2015.
4	Water quality monitoring and deemed discharge point.	Water quality monitoring and deemed discharge point.	Sample collection point (in UPVC pipeline fixed along the southern wall of the water recycling plant filtration and UV sterilisation building overlooking Little Sirius Cove) marked by a sign displaying the expression 'POINT 4'

Environment Protection Licence

Licence - 1677



5	Volume monitoring	Meter located within water recycling plant filtration and UV sterilisation building marked by a sign displaying the expression "Point 5"
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P1.3 For the avoidance of doubt in regard to the Table to condition P1.2, the results of analysis of any sample taken from :

- (a) point 2 is deemed to be satisfactory for the purpose of determining compliance with licence concentration limits applicable to discharge point 1; and
- (b) point 4 is deemed to be satisfactory for the purpose of determining compliance with licence concentration limits applicable to discharge point 3.

P1.4 Discharge and monitoring point identification

The licensee must erect and maintain signs to clearly identify the location of monitoring points 2, 4 and 5 referred to in the Table to condition P1.1.

Each sign required by this condition must:

- (a) be displayed in a location readily visible to casual observer and as close as practicable to the point concerned;
- (b) be not less than 150 millimetres square with a white background and green lettering and numerals; and
- (c) display the word 'POINT' in uppercase lettering followed by the point number.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

- L2.1 For each monitoring/discharge point or utilisation area specified in the table\ below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.
- L2.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.
- L2.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\.

Environment Protection Licence



Licence - 1677

L2.4 Water and/or Land Concentration Limits

POINT 1,2

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
BOD	milligrams per litre	-	-	-	20
pH	pH				6.5-8.5
TSS	milligrams per litre				50

POINT 3,4

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
BOD	milligrams per litre				15
Enterococci	colony forming units per 100 millilitres				40
pH	pH				6.5-8.5
TSS	milligrams per litre				20

L3 Volume and mass limits

L3.1 For each discharge point or utilisation area specified below (by a point number), the volume/mass of:
a) liquids discharged to water; or;
b) solids or liquids applied to the area;
must not exceed the volume/mass limit specified for that discharge point or area.

Point	Unit of Measure	Volume/Mass Limit
5	kilolitres per day	2000

4 Operating Conditions

Environment Protection Licence

Licence - 1677



O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.

This includes:

- a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
- b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:

- a) must be maintained in a proper and efficient condition; and
- b) must be operated in a proper and efficient manner.

5 Monitoring and Recording Conditions

M1 Monitoring records

M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.

M1.2 All records required to be kept by this licence must be:

- a) in a legible form, or in a form that can readily be reduced to a legible form;
- b) kept for at least 4 years after the monitoring or event to which they relate took place; and
- c) produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:

- a) the date(s) on which the sample was taken;
- b) the time(s) at which the sample was collected;
- c) the point at which the sample was taken; and
- d) the name of the person who collected the sample.

M1.4 Notwithstanding condition M1.3, the licensee must record and retain, in accordance with condition M1.2, the reports required to be prepared by conditions R4.1, R5.1 and R5.2.

M2 Requirement to monitor concentration of pollutants discharged

M2.1 For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:

M2.2 Water and/ or Land Monitoring Requirements

Environment Protection Licence

Licence - 1677



POINT 2

Pollutant	Units of measure	Frequency	Sampling Method
BOD	milligrams per litre	Special Frequency 1	Grab sample
pH	pH	Special Frequency 1	Grab sample
TSS	milligrams per litre	Special Frequency 1	Grab sample

POINT 4

Pollutant	Units of measure	Frequency	Sampling Method
BOD	milligrams per litre	Special Frequency 2	Grab sample
Enterococci	colony forming units per 100 millilitres	Special Frequency 2	Grab sample
pH	pH	Special Frequency 2	Grab sample
TSS	milligrams per litre	Special Frequency 2	Grab sample

POINT 5

Pollutant	Units of measure	Frequency	Sampling Method
Volume	kilolitres per day	Continuous during discharge	Flow meter and continuous logger

M2.3 Special Monitoring Frequency 1

For the purposes of condition M2.1, 'Special frequency 1' means on each occasion during which there is a discharge at point 2, excepting that where there is more than one discharge during any calendar month only twice during that month (and not more than once during any continuous period of 14 days).

The licensee must take monitoring samples at point 2 at those times that ensure that the samples are representative of pollutant concentrations and pH quality prescribed in the Table to condition L3.1, by co-ordinating sample taking with discharges from the pools and water treatment systems comprising the Great Southern Ocean exhibits, including discharges during -

- (a) filter backwash operations,
- (b) protein fractionator rinse times, and
- (c) pool drop and fill operations.

M2.4 Special Monitoring Frequency 2

For the purposes of condition M2.1, 'Special frequency 2' means on each occasion during which there is a discharge at point 4, excepting that:

Environment Protection Licence

Licence - 1677



- (a) where there is more than one discharge during any calendar month only once during that month; and
- (b) not more than once during any continuous period of 14 days.

For the avoidance of doubt, where there has been no discharge at point 4 during a calendar month the licensee is not required to carry out monitoring at point 4 during that month but instead to undertake monitoring as soon as practicable during the next month during which there is a discharge at point 4.

M3 Testing methods - concentration limits

- M3.1 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.

M4 Recording of pollution complaints

- M4.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.
- M4.2 The record must include details of the following:
 - a) the date and time of the complaint;
 - b) the method by which the complaint was made;
 - c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
 - d) the nature of the complaint;
 - e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
 - f) if no action was taken by the licensee, the reasons why no action was taken.
- M4.3 The record of a complaint must be kept for at least 4 years after the complaint was made.
- M4.4 The record must be produced to any authorised officer of the EPA who asks to see them.

M5 Telephone complaints line

- M5.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.
- M5.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

Environment Protection Licence

Licence - 1677



M5.3 The preceding two conditions do not apply until 3 months after: the date of the issue of this licence.

M6 Requirement to monitor volume or mass

M6.1 For each discharge point or utilisation area specified below, the licensee must monitor:

- a) the volume of liquids discharged to water or applied to the area;
 - b) the mass of solids applied to the area;
 - c) the mass of pollutants emitted to the air;
- at the frequency and using the method and units of measure, specified below.

POINT 5

Frequency	Unit of Measure	Sampling Method
Daily	kilolitres per day	Flow meter and continuous logger

M6.2 Continuous logger not operating

In the event that the continuous logger referred to in the Table to condition M6.1 is not operating, the licensee must instead manually record the daily volume discharged via licence point 5.

M7 Other monitoring and recording conditions

M7.1 Logging maintenance of control equipment

- (1) The licensee must legibly record in a log book or the like:
- (a) the time and date maintenance, repair or replacement of control equipment was undertaken and by whom that maintenance, repair or replacement was undertaken; and
 - (b) details of every failure of control equipment, including -
 - (i) when the equipment failed,
 - (ii) when the equipment was repaired or replaced,
 - (iii) the duration the equipment was inoperative, and
 - (iv) the reasons why the equipment failed or was likely to have failed.
- (2) The licensee must make any record required to be made by this condition available for inspection on request by an authorised officer of the EPA.

'Control equipment' has the same meaning as in the Protection of the Environment Operations Act 1997.

Environment Protection Licence

Licence - 1677



M7.2 Logging discharges

- (1) The licensee must legibly record in a log book or the like the time, date and volume of each discharge via the point that is -
 - (a) described as point 2 in the table to condition P1.2, and
 - (b) described as point 4 in the table to condition P1.2.
- (2) The licensee must make any record required to be made by this condition available for inspection on request by an authorised officer of the EPA.
- (3) notwithstanding the requirements of sub-condition (1), where the monitoring equipment is unable to log each discharge, the licensee must -
 - (a) instead record the daily discharge at the points prescribed in sub-condition 1, and
 - (b) as soon as practicable after becoming aware that that monitoring equipment is unable to record each discharge undertake all such action as may be necessary to ensure each discharge is logged.

6 Reporting Conditions

R1 Annual return documents

- R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:
a) a Statement of Compliance; and
b) a Monitoring and Complaints Summary.
At the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.
- R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.
- R1.3 Where this licence is transferred from the licensee to a new licensee:
a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.
- R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:
a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.

Environment Protection Licence

Licence - 1677



- R1.5 The Annual Return for the reporting period must be supplied to the EPA by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').
- R1.6 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.
- R1.7 Within the Annual Return, the Statement of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:
- a) the licence holder; or
 - b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

R2 Notification of environmental harm

- R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.
- R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

R3 Written report

- R3.1 Where an authorised officer of the EPA suspects on reasonable grounds that:
- a) where this licence applies to premises, an event has occurred at the premises; or
 - b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence,
- and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.
- R3.2 The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.
- R3.3 The request may require a report which includes any or all of the following information:
- a) the cause, time and duration of the event;
 - b) the type, volume and concentration of every pollutant discharged as a result of the event;
 - c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;
 - d) the name, address and business hours telephone number of every other person (of whom the licensee

Environment Protection Licence

Licence - 1677



is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;

e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;

f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and

g) any other relevant matters.

R3.4 The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

R4 Other reporting conditions

R4.1

Analytical reports

(1) The licensee must prepare a written report detailing the results of analysis of samples required to be taken by a condition of this licence. The reports required by this condition must include –

- (a) the time and date each sample was taken (and by whom),
- (b) the EPA identification number of the monitoring or discharge point from which the sample was taken,
- (c) the licence condition pursuant to which the sample was taken,
- (d) the sample preservation measures adopted between the taking of the sample and delivery of the sample to the analytical laboratory,
- (e) the approved methods used to undertake each of the analyses,
- (f) where symbols or abbreviations are used in analytical reports an explicit statement of the meaning of those symbols and abbreviations, other than an abbreviation used in the EPA's "Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales", and
- (g) a copy of the relevant certificate of analysis from the laboratory that undertook that analysis.

(2) the licensee must make any report required by condition R4.1 (1) available for inspection on request by an authorised officer of the EPA.

(3) For the avoidance of doubt, the licensee is not required to supply the EPA with a copy of any report required by condition R4.1 (1) unless requested to do so by an authorised officer of the EPA or elsewhere in this licence.

Environment Protection Licence

Licence - 1677



- (4) if an authorised officer of the EPA requests the licensee to supply a copy of any report required by condition R4.1 (1), the licensee must supply a copy of that report to the EPA within 24 hours of receiving such a request.

7 General Conditions

G1 Copy of licence kept at the premises or plant

- G1.1 A copy of this licence must be kept at the premises to which the licence applies.
- G1.2 The licence must be produced to any authorised officer of the EPA who asks to see it.
- G1.3 The licence must be available for inspection by any employee or agent of the licensee working at the premises.

G2 Other general conditions

G2.1 Authorised representatives

The licensee must ensure that at least two representatives, duly appointed by the licensee as its authorised representatives, are available for contact by the EPA at all times.

- (1) the licensee must provide the EPA with up to date details of natural persons authorised to represent the licensee in respect of –
- (a) answering general enquiries made by the EPA or its authorised officers,
 - (b) speaking on behalf of the licensee,
 - (c) signing on behalf of the licensee, and
 - (d) acting as the licensee's 'out of hours' contact with authority to direct the licensee's employees, agents and contractors to undertake such action as may be necessary to ensure that all activities on the premises comply with the requirements of environment protection legislation and this licence.
- (2) The details required by condition G2.1 (1) must include –
- (a) the full name of each authorised representative and the scope of their authority to represent the licensee,
 - (b) the role of each authorised representative within the licensee organisation, and

Environment Protection Licence

Licence - 1677



- (c) the direct landline telephone number, mobile telephone number, fax number, email address and postal address of each authorised representative.

Environment Protection Licence

Licence - 1677



Dictionary

General Dictionary

3DGM [in relation to a concentration limit]	Means the three day geometric mean, which is calculated by multiplying the results of the analysis of three samples collected on consecutive days and then taking the cubed root of that amount. Where one or more of the samples is zero or below the detection limit for the analysis, then 1 or the detection limit respectively should be used in place of those samples
Act	Means the Protection of the Environment Operations Act 1997
activity	Means a scheduled or non-scheduled activity within the meaning of the Protection of the Environment Operations Act 1997
actual load	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
AM	Together with a number, means an ambient air monitoring method of that number prescribed by the <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> .
AMG	Australian Map Grid
anniversary date	The anniversary date is the anniversary each year of the date of issue of the licence. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
annual return	Is defined in R1.1
Approved Methods Publication	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
assessable pollutants	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
BOD	Means biochemical oxygen demand
CEM	Together with a number, means a continuous emission monitoring method of that number prescribed by the <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> .
COD	Means chemical oxygen demand
composite sample	Unless otherwise specifically approved in writing by the EPA, a sample consisting of 24 individual samples collected at hourly intervals and each having an equivalent volume.
cond.	Means conductivity
environment	Has the same meaning as in the Protection of the Environment Operations Act 1997
environment protection legislation	Has the same meaning as in the Protection of the Environment Administration Act 1991
EPA	Means Environment Protection Authority of New South Wales.
fee-based activity classification	Means the numbered short descriptions in Schedule 1 of the Protection of the Environment Operations (General) Regulation 2009.
general solid waste (non-putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997

Environment Protection Licence

Licence - 1677



flow weighted composite sample	Means a sample whose composites are sized in proportion to the flow at each composites time of collection.
general solid waste (putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
grab sample	Means a single sample taken at a point at a single time
hazardous waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
licensee	Means the licence holder described at the front of this licence
load calculation protocol	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
local authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
material harm	Has the same meaning as in section 147 Protection of the Environment Operations Act 1997
MBAS	Means methylene blue active substances
Minister	Means the Minister administering the Protection of the Environment Operations Act 1997
mobile plant	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
motor vehicle	Has the same meaning as in the Protection of the Environment Operations Act 1997
O&G	Means oil and grease
percentile [in relation to a concentration limit of a sample]	Means that percentage [eg.50%] of the number of samples taken that must meet the concentration limit specified in the licence for that pollutant over a specified period of time. In this licence, the specified period of time is the Reporting Period unless otherwise stated in this licence.
plant	Includes all plant within the meaning of the Protection of the Environment Operations Act 1997 as well as motor vehicles.
pollution of waters [or water pollution]	Has the same meaning as in the Protection of the Environment Operations Act 1997
premises	Means the premises described in condition A2.1
public authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
regional office	Means the relevant EPA office referred to in the Contacting the EPA document accompanying this licence
reporting period	For the purposes of this licence, the reporting period means the period of 12 months after the issue of the licence, and each subsequent period of 12 months. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
restricted solid waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
scheduled activity	Means an activity listed in Schedule 1 of the Protection of the Environment Operations Act 1997
special waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
TM	Together with a number, means a test method of that number prescribed by the <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> .

Environment Protection Licence



Licence - 1677

TSP	Means total suspended particles
TSS	Means total suspended solids
Type 1 substance	Means the elements antimony, arsenic, cadmium, lead or mercury or any compound containing one or more of those elements
Type 2 substance	Means the elements beryllium, chromium, cobalt, manganese, nickel, selenium, tin or vanadium or any compound containing one or more of those elements
utilisation area	Means any area shown as a utilisation area on a map submitted with the application for this licence
waste	Has the same meaning as in the Protection of the Environment Operations Act 1997
waste type	Means liquid, restricted solid waste, general solid waste (putrescible), general solid waste (non - putrescible), special waste or hazardous waste

Mr Kieran Horkan

Environment Protection Authority

(By Delegation)

Date of this edition: 26-September-2000

End Notes
1 Condition A1.3 Not applicable varied by notice issued on <issue date> which came into effect on <effective date>

Appendix D

Test Bore Logs



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

Sampling Methods

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.



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 longer 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:

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

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

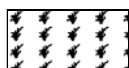


Filling

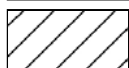
Soils



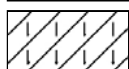
Topsoil



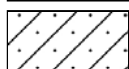
Peat



Clay



Silty clay



Sandy clay



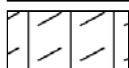
Gravelly clay



Shaly clay



Silt



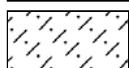
Clayey silt



Sandy silt



Sand



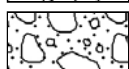
Clayey sand



Silty sand



Gravel



Sandy gravel



Cobbles, boulders



Talus

Sedimentary Rocks



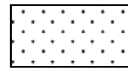
Boulder conglomerate



Conglomerate



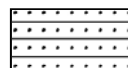
Conglomeratic sandstone



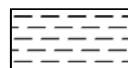
Sandstone



Siltstone



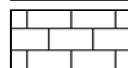
Laminite



Mudstone, claystone, shale

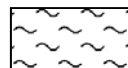


Coal

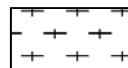


Limestone

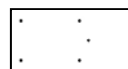
Metamorphic Rocks



Slate, phyllite, schist

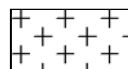


Gneiss

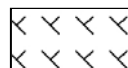


Quartzite

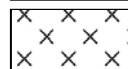
Igneous Rocks



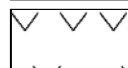
Granite



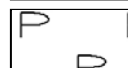
Dolerite, basalt, andesite



Dacite, epidote



Tuff, breccia



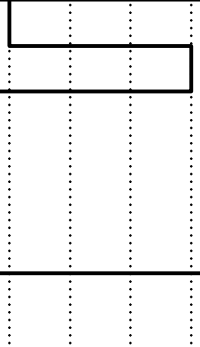
Porphyry

BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 59.3 AHD
EASTING: 337349
NORTHING: 6253836
DIP/AZIMUTH: 90°/--

BORE No: C01
PROJECT No: 85538.00
DATE: 17/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
59	0.3	FILLING - moderately compacted, dark grey silty sand filling, traces of rootlets, organic odour (topsoil)		A/E	0.1	Dup1			
				0.2					
		FILLING - variably compacted, dark grey filling with crushed shell and sand filling, organic odour		A/E	0.5				
					0.6				
1	1.0	FILLING - variably compacted, light brown-grey medium sand filling with traces of silt and rootlets		A/E	1.0				
58	1.15	Bore discontinued at 1.15m - target depth reached							

RIG: Bobcat

DRILLER: GM

LOGGED: AT

CASING: Uncased

TYPE OF BORING: 100mm diameter solid flight auger to 1.15m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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



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BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 58.9 AHD
EASTING: 337344
NORTHING: 6253838
DIP/AZIMUTH: 90°/--

BORE No: C02
PROJECT No: 85538.00
DATE: 17/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		FILLING - apparently poorly to moderately compacted, dark grey sandy silt filling with traces of rootlets, crushed sandstone gravel, organic odour (topsoil) 0.2m: becoming silty sand		A/E	0.1							
	0.55	FILLING - apparently poorly to moderately compacted, brown-pale grey silty clay filling with traces of fine sand and rootlets		A/E	0.5							
	0.9	Bore discontinued at 0.9m - target depth reached		A/E	0.9							
58	1											
57	2											
56	3											
55	4											
54												

RIG: Bobcat

DRILLER: GM

LOGGED: AT

CASING: Uncased

TYPE OF BORING: 100mm diameter solid flight auger to 0.9m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 58.5 AHD
EASTING: 337333
NORTHING: 6253823
DIP/AZIMUTH: 90°/--

BORE No: C03
PROJECT No: 85538.00
DATE: 17/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.25	FILLING - apparently moderately compacted, dark brown silty sand filling with traces of fine sand and rootlets (topsoil)		A/E	0.1				5
		FILLING - apparently moderately compacted, dark brown-grey sandy igneous gravel filling (possible coal?) with traces of brown clay		A/E	0.5				10
	0.75	FILLING - variably compacted, pale grey medium sand filling with some concrete cobbles, some brown sand, moist		A/E	1.0	Dup2			15
	1.6	Bore discontinued at 1.6m - target depth reached		A/E	1.5				20
	2								
	3								
	4								

RIG: Bobcat

DRILLER: GM

LOGGED: AT

CASING: Uncased

TYPE OF BORING: 100mm diameter solid flight auger to 1.6m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 58.0 AHD
EASTING: 337325
NORTHING: 6253820
DIP/AZIMUTH: 90°/--

BORE No: C04
PROJECT No: 85538.00
DATE: 17/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
58		FILLING - variably compacted, brown sandy silt filling with traces of rootlets and sandstone gravel (topsoil)		A/E	0.1							
	0.2	FILLING - moderately compacted, brown-grey silty sand filling with some crushed sandstone gravel, fine shale gravel										
	0.5	Bore discontinued at 0.5m - target depth reached		A/E	0.45							
57	1											
56	2											
55	3											
54	4											

RIG: Bobcat

DRILLER: GM

LOGGED: AT

CASING: Uncased

TYPE OF BORING: 100mm diameter solid flight auger to 0.5m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)



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BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 63.8 AHD
EASTING: 337312
NORTHING: 6253853
DIP/AZIMUTH: 90°/--

BORE No: C05
PROJECT No: 85538.00
DATE: 17/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.06	ASPHALTIC CONCRETE		A/E	0.1							
	0.1	ROADBASE GRAVEL - igneous fine to medium gravel with some brown fine sand		A/E	0.25							
	0.25	SANDSTONE - very low strength, moderately weathered, brown sandstone Bore discontinued at 0.25m - target depth reached										
63	1											
62	2											
61	3											
60	4											
59												

RIG: Bobcat

DRILLER: GM

LOGGED: AT

CASING: Uncased

TYPE OF BORING: 100mm diameter solid flight auger to 0.25m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PLD	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	W _s	Water seep	S	Standard penetration test
E	Environmental sample	W _l	Water level	V	Shear vane (kPa)

BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 65.6 AHD
EASTING: 337305
NORTHING: 6253873
DIP/AZIMUTH: 90°/--

BORE No: C06
PROJECT No: 85538.00
DATE: 17/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing			Water	Well Construction Details	
				Type	Depth	Sample		Results & Comments	
	0.05	ASPHALTIC CONCRETE Bore discontinued at 0.05m - refusal on concrete		A/E	0.1				
	65								
	1							1	
	64								
	2							2	
	63								
	3							3	
	62								
	4							4	
	61								

RIG: Bobcat

DRILLER: GM

LOGGED: AT

CASING: Uncased

TYPE OF BORING: 100mm diameter solid flight auger to 0.05m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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



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BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 57.1 AHD
EASTING: 337291
NORTHING: 6253799
DIP/AZIMUTH: 90°/--

BORE No: C07
PROJECT No: 85538.00
DATE: 17/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
57.1		FILLING - apparently loosely compacted, dark brown-grey sandy silt filling, organic odour, traces of rootlets (topsoil)		A/E	0.1							
0.35		ASPHALTIC CONCRETE										
0.4		ROADBASE GRAVEL - igneous gravel and some grey sand		A/E	0.5							
0.45		SANDSTONE - very low strength, moderately weathered, orange-brown medium grained sandstone		A/E	0.8							
0.9		Bore discontinued at 0.9m - target depth reached										
1												
56												
2												
55												
3												
54												
4												
53												

RIG: Bobcat

DRILLER: GM

LOGGED: AT

CASING: Uncased

TYPE OF BORING: 100mm diameter solid flight auger to 0.9m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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	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)

BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 51.1 AHD
EASTING: 337251
NORTHING: 6253759
DIP/AZIMUTH: 90°/--

BORE No: C08
PROJECT No: 85538.00
DATE: 17/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
51	0.1	FILLING - apparently loosely compacted, dark grey-brown sandy silt filling with traces of sandstone gravel and some rootlets, organic odour (topsoil)		A/E	0.1				
	0.4	FILLING - apparently loosely compacted, dark grey-brown silty sand filling with some medium sand, tree bark		A/E	0.5				
	0.8m	traces of broken glass							
1	1.0			A/E	1.0				
50	1.2	FILLING - dark grey sand filling and some rootlets and tree bark			1.4				
	1.5	CLAYEY SAND - brown clayey sand, possible weathered sandstone		A/E*	1.6				
	1.7	Bore discontinued at 1.7m - target depth reached		A/E	1.7				
2									
49									
3									
48									
4									
47									

RIG: Bobcat

DRILLER: GM

LOGGED: AT

CASING: Uncased

TYPE OF BORING: 100mm diameter solid flight auger to 1.7m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *BD3-170616 and BD4-170616 collected at 1.4m to 1.6m

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)



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BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 49.3 AHD
EASTING: 337274
NORTHING: 6253758
DIP/AZIMUTH: 90°/--

BORE No: C09
PROJECT No: 85538.00
DATE: 17/6/2016
SHEET 1 OF 1

[illegible]

RIG: Bobcat

DRILLER: GM

LOGGED: AT

CASING: Uncased

TYPE OF BORING: 100mm diameter solid flight auger to 1.2m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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



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BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 51.0 AHD
EASTING: 337236
NORTHING: 6253775
DIP/AZIMUTH: 90°/--

BORE No: C10
PROJECT No: 85538.00
DATE: 17/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
51	0.2	FILLING - dark grey silty sand filling (topsoil)		A/E	0.1					
		Bore discontinued at 0.2m - refusal on concrete								
50	1									
49	2									
48	3									
47	4									

RIG: Bobcat

DRILLER: GM

LOGGED: AT

CASING: Uncased

TYPE OF BORING: 100mm diameter solid flight auger to 0.2m

WATER OBSERVATIONS: No free groundwater observed

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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)



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BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 51.0 AHD
EASTING: 337236
NORTHING: 6253775
DIP/AZIMUTH: 90°/--

BORE No: C10A
PROJECT No: 85538.00
DATE: 22/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
50	0.06	CONCRETE PAVING		E	0.1					
	0.1	FILLING - yellow sand and cement bed								
	0.3	FILLING - grey sandy gravel filling (roadbase) with a trace of clay								
		FILLING - yellow-brown, medium grained sand filling with a trace of gravel, moist		E	0.5					
		- becoming wet at 0.7m								
50	0.8	SAND - yellow-brown, medium grained silty sand		E	1.0					
51	1.2	SANDSTONE - extremely low to low strength, extremely to highly weathered, yellow-brown and red-brown sandstone								
51	1.5	Bore discontinued at 1.5m - auger refusal on sandstone								
49	2									
49	3									
47	4									

RIG: Bobcat

DRILLER: GM

LOGGED: AT

CASING: Uncased

TYPE OF BORING: 100mm diameter solid flight auger to 1.5m

WATER OBSERVATIONS: No free groundwater observed

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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)



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BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 64.8 AHD
EASTING: 337284
NORTHING: 6253883
DIP/AZIMUTH: 90°/--

BORE No: C12
PROJECT No: 85538.00
DATE: 20/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.25	FILLING - apparently loosely compacted, dark grey silt filling with traces of fine sand, clay and rootlets, organic odour (topsoil)		A/E	0.1							
	0.35	FILLING - apparently moderately compacted, orange-brown medium sand filling with some traces of clay and gravel		A/E	0.15							
		Bore discontinued at 0.35m - auger refusal on rock			0.25							
					0.3							
63	1											
62	2											
61	3											
60	4											

RIG: Hand tools

DRILLER: AT

LOGGED: AT

CASING: Uncased

TYPE OF BORING: Hand auger to 0.35m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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	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)

BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 64.9 AHD
EASTING: 337292
NORTHING: 6253879
DIP/AZIMUTH: 90°/--

BORE No: C13
PROJECT No: 85538.00
DATE: 20/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.25	FILLING - apparently loosely compacted, dark brown-grey sandy silt filling with traces of plastic, rootlets, organic odour (topsoil)		A/E	0.1							
	0.45	FILLING - silty sand filling with traces of coarse quartz sand		A/E	0.3							
	0.55	FILLING - variably compacted, dark brown-grey medium sand filling with some coarse sand and crushed sandstone gravel, trace of rootlets		A/E	0.45							
		Bore discontinued at 0.55m - refusal on sandstone										
64	1											
63	2											
62	3											
61	4											
60												

RIG: Hand tools

DRILLER: AT

LOGGED: AT

CASING: Uncased

TYPE OF BORING: Hand auger to 0.55m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 62.3 AHD
EASTING: 337316
NORTHING: 6253845
DIP/AZIMUTH: 90°/--

BORE No: C14
PROJECT No: 85538.00
DATE: 20/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
62.3	0.25	FILLING - apparently loosely compacted, dark grey silt filling with some rootlets, igneous gravel and medium sand (topsoil)		E	0.1							
				E	0.2							
	0.35	FILLING - variably compacted, brown-grey silty sand filling with traces of rootlets		E	0.3							
				E	0.35							
	0.5	SANDSTONE - extremely low strength, highly weathered, medium grained sandstone with some orange ironstone layers		E	0.4							
		Bore discontinued at 0.5m - refusal on sandstone			0.45							
1												
2												
3												
4												

RIG: Hand tools

DRILLER: AT

LOGGED: AT

CASING: Uncased

TYPE OF BORING: Hand auger to 0.5m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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	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)

BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 64.9 AHD
EASTING: 337304
NORTHING: 6253854
DIP/AZIMUTH: 90°/--

BORE No: C15
PROJECT No: 85538.00
DATE: 20/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		FILLING - apparently loosely compacted, dark grey silt filling with some sand, trace rootlets, trace of plastic (topsoil)		A/E*	0.1							
				A/E	0.15							
					0.25							
					0.3							
	0.5	0.45m: becoming sandy										
		Bore discontinued at 0.5m - refusal on sandstone										
64	1											
63	2											
62	3											
61	4											
60												

RIG: Hand tools

DRILLER: AT

LOGGED: AT

CASING: Uncased

TYPE OF BORING: Hand auger to 0.5m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *BD5-200616 collected at 0.1m to 0.15m

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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	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)

BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 62.3 AHD
EASTING: 337301
NORTHING: 6253843
DIP/AZIMUTH: 90°/--

BORE No: C16
PROJECT No: 85538.00
DATE: 20/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
62.0	0.3	FILLING - apparently loosely compacted, dark grey sandy silt filling with traces of rootlets and fine sandstone gravel (topsoil)		A/E	0.15							
					0.25							
					0.35							
					0.4							
	0.4	SANDSTONE - extremely low strength, highly weathered, pale grey medium grained sandstone		A/E								
		Bore discontinued at 0.4m - refusal on sandstone										
1												
2												
3												
4												

RIG: Hand tools

DRILLER: AT

LOGGED: AT

CASING: Uncased

TYPE OF BORING: Hand auger to 0.4m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 59.2 AHD
EASTING: 337286
NORTHING: 6255820
DIP/AZIMUTH: 90°/--

BORE No: C17
PROJECT No: 85538.00
DATE: 20/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
58		FILLING - apparently loosely compacted, dark grey silt filling with some rootlets and organic matter (mulch/leaves), slightly sandy (topsoil)										
	0.75	- apparently becoming sandy, slightly fine igneous gravel, moderately compacted										
	1	FILLING - apparently loose, brown medium sand filling with traces of silt and some large grey-brown sandstone gravel										
	1.1	Bore discontinued at 1.1m - auger refusal on large tree root										
57	2											
56	3											
55	4											

RIG: Hand tools

DRILLER: AT

LOGGED: AT

CASING: Uncased

TYPE OF BORING: Hand auger to 1.1m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Refusal of auger on roots at 0.7m, then relocated

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)



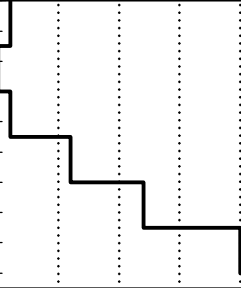
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BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 57.5 AHD
EASTING: 337292
NORTHING: 6253773
DIP/AZIMUTH: 90°/--

BORE No: C18
PROJECT No: 85538.00
DATE: 20/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
57	0.6	FILLING - apparently loosely compacted, dark grey silt filling with some rootlets, traces of fine sand (topsoil)		A/E	0.1							
					0.2							
		A/E	0.5									
		A/E	0.6									
0.95		SANDSTONE - extremely low strength, highly to moderately weathered, brown medium grained sandstone		A/E	0.7							
				A/E	0.8							
1	0.95	Bore discontinued at 0.95m - refusal on low strength sandstone						1				
56									2			
2												
55												
3												
54												
4												
53												

RIG: Hand tools

DRILLER: AT

LOGGED: AT

CASING: Uncased

TYPE OF BORING: Hand auger to 0.95m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3

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



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BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 51.6 AHD
EASTING: 337246
NORTHING: 6253789
DIP/AZIMUTH: 90°/--

BORE No: C19
PROJECT No: 85538.00
DATE: 20/6/2016
SHEET 1 OF 1

[illegible]

RIG: Hand tools

DRILLER: AT

LOGGED: AT

CASING: Uncased

TYPE OF BORING: Hand auger to 1.35m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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



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BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 51.6 AHD
EASTING: 337252
NORTHING: 6253784
DIP/AZIMUTH: 90°/--

BORE No: C20
PROJECT No: 85538.00
DATE: 20/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
51.6	0.7	FILLING - apparently loosely compacted, dark grey silt filling with slightly sandy, some rootlets, traces of plastic (topsoil) 0.2m: becoming sandy and variably compacted		E/A	0.1							
					0.2							
				E/A	0.4							
					0.5							
1	1.05	SAND - loose, brown sand, traces of silt 0.9m: becoming sandstone Bore discontinued at 1.05m - refusal on rock		E/A	0.8							
					1.0							
1.05												
2												
3												
4												
4.7												

RIG: Hand tools

DRILLER: AT

LOGGED: AT

CASING: Uncased

TYPE OF BORING: Hand auger to 1.05m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 55.4 AHD
EASTING: 337258
NORTHING: 6253818
DIP/AZIMUTH: 90°/--

BORE No: C21
PROJECT No: 85538.00
DATE: 20/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		FILLING - apparently loosely compacted, dark grey silt filling with some rootlets, slightly fine sand (topsoil)										
				A/E	0.2 0.3							
	0.4	Bore discontinued at 0.4m - refusal on possibly concrete, sandstone or root)										
	1											
	2											
	3											
	4											

RIG: Hand tools

DRILLER: AT

LOGGED: AT

CASING: Uncased

TYPE OF BORING: Hand auger to 0.4m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Refusal at 0.4m - hole moved by 0.5m away from tree

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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	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)

BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 48.3 AHD
EASTING: 337286
NORTHING: 6253737
DIP/AZIMUTH: 90°/--

BORE No: C22
PROJECT No: 85538.00
DATE: 22/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
48	0.25	FILLING - apparently moderately compacted, grey-brown silty sand filling with traces of organic matter (topsoil)		E	0.1							
		Bore discontinued at 0.25m - DCP layer refusal (possible sandstone boulder)			0.2							
1												
2												
3												
4												

RIG: Hand tools

DRILLER: AT

LOGGED: AT

CASING: Uncased

TYPE OF BORING: Hand auger to 0.25m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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 _s	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	W _s	Water seep	S	Standard penetration test
E	Environmental sample	W _L	Water level	V	Shear vane (kPa)

BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 48.3 AHD
EASTING: 337299
NORTHING: 6253743
DIP/AZIMUTH: 90°/--

BORE No: C23
PROJECT No: 85538.00
DATE: 22/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
48	0.25	FILLING - apparently moderately compacted, brown medium sand filling with trace of igneous gravel and organic matter (topsoil)		E	0.1							
		Bore discontinued at 0.25m - DCP and auger refusal on sandstone (possible floater)			0.2							
1												
47												
2												
46												
3												
45												
4												
44												

RIG: Hand tools

DRILLER: AT

LOGGED: AT

CASING: Uncased

TYPE OF BORING: Hand auger to 0.25m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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 _i	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W _L	Water level	V	Shear vane (kPa)

BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 48.3 AHD
EASTING: 337310
NORTHING: 6253749
DIP/AZIMUTH: 90°/--

BORE No: C24
PROJECT No: 85538.00
DATE: 22/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
48	0.2	FILLING - apparently moderately compacted, dark grey coarse igneous sand filling with some fine gravel, traces of rootlets and silt (topsoil)		E	0.1							
				E	0.2							
		FILLING - apparently moderately compacted, grey coarse igneous and crushed sandstone sand filling with traces of silt										
	0.55			E	0.5							
		Bore discontinued at 0.55m - auger refusal on sandstone (possible floater)			0.55							
1												
47												
2												
46												
3												
45												
4												
44												

RIG: Hand tools

DRILLER: AT

LOGGED: AT

CASING: Uncased

TYPE OF BORING: Hand auger to 0.55m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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 _s	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	W _s	Water seep	S	Standard penetration test
E	Environmental sample	W _l	Water level	V	Shear vane (kPa)

BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 48.3 AHD
EASTING: 337300
NORTHING: 6253736
DIP/AZIMUTH: 90°/--

BORE No: C25
PROJECT No: 85538.00
DATE: 22/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
48	0.13	FILLING - variably compacted, dark grey, silty medium sand filling with traces of organics (topsoil) Bore discontinued at 0.13m - refusal		F	0.1 0.13							
1												
47												
2												
46												
3												
45												
4												
44												

RIG: Hand tools

DRILLER: AT

LOGGED: AT

CASING: Uncased

TYPE OF BORING: Hand auger to 0.13m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

BOREHOLE LOG

CLIENT: Taronga Zoo Conservation Society Australia
PROJECT: Congo Site, Taronga Zoo
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 53.8 AHD
EASTING: 337245
NORTHING: 6253809
DIP/AZIMUTH: 90°/--

BORE No: C26
PROJECT No: 85538.00
DATE: 22/6/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.25	FILLING - variably compacted, dark grey silty sand filling with traces of sandstone gravel (topsoil)		E	0.1							
				E	0.2							
		FILLING - variably compacted, brown sand filling with some crushed sandstone gravel and cobbles										
				E	0.5							
	0.65	Bore discontinued at 0.65m - possible root or sandstone cobble			0.6							
-0.3	1											
-0.2												
-0.1												
0												
0.1												
0.2												
0.3												
0.4												
0.5												
0.6												
0.7												
0.8												
0.9												
1.0												
1.1												
1.2												
1.3												
1.4												
1.5												
1.6												
1.7												
1.8												
1.9												
2.0												
2.1												
2.2												
2.3												
2.4												
2.5												
2.6												
2.7												
2.8												
2.9												
3.0												
3.1												
3.2												
3.3												
3.4												
3.5												
3.6												
3.7												
3.8												
3.9												
4.0												

RIG: Hand tools

DRILLER: AT

LOGGED: AT

CASING: Uncased

TYPE OF BORING: Solid flight auger to 0.65m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *Moved due to early refusal at 0.2m

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

Results of Dynamic Penetrometer Tests

Client Taronga Zoo Conservation Society Australia
Project African Safari
Location Bradleys Head Road, Mosman

Project No. 85538.00
Date 17/06/2016
Page No. 1 of 3

Test Locations	C01	C02	C03	C04	C05	C07	C08	C09	C12	C13
RL of Test (AHD)	59.3	58.9	58.5	58.0	63.8	57.1	51.1	49.3	64.8	64.9
Depth (m)										
0.00 – 0.15	5	3	6	-		1	1	1	0	0
0.15 – 0.30	20	3	6	6	25/50	1	2	2	1	1
0.30 – 0.45	2	2	3	10		25/50	3	7	25/100	0
0.45 – 0.60	1	3	6	25/50		3	3	10	B	25/100
0.60 – 0.75	1	25/140	5	R		3	4	23		
0.75 – 0.90	4		5			25/50	1	22		
0.90 – 1.05	25/150		1			R	3	6		
1.05 – 1.20			3				5	6		
1.20 – 1.35			5				4	2		
1.35 – 1.50			25/130				25/70	5		
1.50 – 1.65							R	10		
1.65 – 1.80								12		
1.80 – 1.95								25/50		
1.95 – 2.10										
2.10 – 2.25										
2.25 – 2.40										
2.40 – 2.55										
2.55 – 2.70										
2.70 – 2.85										
2.85 – 3.00										

Test Method AS 1289.6.3.2, Cone Penetrometer ☒
 AS 1289.6.3.3, Sand Penetrometer ☐

Tested By AT
Checked By KDP

Remarks R = REFUSAL
 25/150 = 25 BLOW COUNTS FOR 150mm PENETRATION

Results of Dynamic Penetrometer Tests

Client Taronga Zoo Conservation Society Australia
Project African Safari
Location Bradleys Head Road, Mosman

Project No. 85538.00
Date 17-22/06/16
Page No. 2 of 3

Test Locations	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23
RL of Test (AHD)	62.3	64.1	62.3	59.2	57.5	51.6	51.6	55.4	48.3	48.3
Depth (m)										
0.00 – 0.15	1	1	1	1	1	1	1	1	10	7
0.15 – 0.30	1	1	2	0	0	1	0	0	25/140	25/100
0.30 – 0.45	12	1	25/50	1	1	13	3	25/100		
0.45 – 0.60	25/100	25/50		5	6	5	6			
0.60 – 0.75		B		5	12	2	3			
0.75 – 0.90				2	20	3	5			
0.90 – 1.05				3	25/100	5	3			
1.05 – 1.20				1		2	25/50			
1.20 – 1.35				4		6	R			
1.35 – 1.50				6		25/140				
1.50 – 1.65				6						
1.65 – 1.80				10						
1.80 – 1.95				5						
1.95 – 2.10				6						
2.10 – 2.25				3						
2.25 – 2.40				3						
2.40 – 2.55										
2.55 – 2.70										
2.70 – 2.85										
2.85 – 3.00										

Test Method AS 1289.6.3.2, Cone Penetrometer ☒
 AS 1289.6.3.3, Sand Penetrometer ☐

Tested By AT
Checked By KDP

Remarks B = BOUNCING
 R = REFUSAL
 25/100 = 25 BLOW COUNTS FOR 100mm PENETRATION

Results of Dynamic Penetrometer Tests

Client Taronga Zoo Conservation Society Australia
Project African Safari
Location Bradleys Head Road, Mosman

Project No. 85538.00
Date 17-22/06/16
Page No. 3 of 3

Test Locations	C24	C25	C26							
RL of Test (AHD)	48.3	48.3	53.8							
Depth (m)										
0.00 – 0.15	6	25/120	3							
0.15 – 0.30	7		2							
0.30 – 0.45	6		3							
0.45 – 0.60	B		7							
0.60 – 0.75			25/20							
0.75 – 0.90										
0.90 – 1.05										
1.05 – 1.20										
1.20 – 1.35										
1.35 – 1.50										
1.50 – 1.65										
1.65 – 1.80										
1.80 – 1.95										
1.95 – 2.10										
2.10 – 2.25										
2.25 – 2.40										
2.40 – 2.55										
2.55 – 2.70										
2.70 – 2.85										
2.85 – 3.00										

Test Method AS 1289.6.3.2, Cone Penetrometer ☒ **Tested By** AT
 AS 1289.6.3.3, Sand Penetrometer ☐ **Checked By** KDP
Remarks B = BOUNCING
 25/120 = 25 BLOW COUNTS FOR 120mm PENETRATION

Appendix E

Table of Laboratory Results

	Inorganics	Metals								TPH										BTEX						Halogenated Benzenes		
		Moisture	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	C10-C16	C16-C34	C34-C40	P2-NAPHTHALENE	C6 - C9	C10 - C14	C15 - C28	C29-C36	+C10 - C36 (Sum of total)	C6-C10 less BTEX (F1)	C6-C10	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Xylene Total	Hexachlorobenzene
EQL	0.1	2	0.4	1	1	1	0.05	1	1	50	100	100	50	25	50	100	100		25	25	0.2	1	0.5	2	1		0.1	
CRC Care Direct Contact HSL-D										20000	27000	38000								26000	430	27000	99000			81000		
CRC Care Direct Contact Intrusive Maintenance Worker										62000	85000	120000								82000	1100	85000	120000			130000		
NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil			3000	900	3600	240000	1500	730	6000	400000																	80	
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand 0-1m													NL						260		3	NL	NL			230		
NEPM 2013 EILs Comm/Ind Aged			160		320	160	1800		60	480																		
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Coarse Soil 0-2m											1700	3300	170						215		75	165	135			180		
NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil										1000	3500	10000								700								

Field_ID	LocCode	Sample_Depth_Range	Sampled_Date-Time																											
C01	C01	0.1-0.2	17/06/2016	18	<4	0.6	12	18	56	<0.1	6	96	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	<0.1
C01	C01	0.5-0.6	17/06/2016	23	<4	<0.4	5	34	16	<0.1	37	94	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	-
C02	C02	0.9	17/06/2016	14	<4	<0.4	1	<1	2	<0.1	<1	2	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	<0.1
C03	C03	0.5	17/06/2016	14	<4	<0.4	7	15	24	<0.1	22	270	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	<0.1
C04	C04	0.1	17/06/2016	11	<4	1	8	14	62	<0.1	6	490	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	-
C05	C05	0.1	17/06/2016	4.3	10	0.6	26	22	13	0.3	2	10	<50	1400	520	<50	<25	<50	830	840	1695	<25	<25	<0.2	<1	<0.5	<2	<1	<3	-
C07	C07	0.1	17/06/2016	17	<4	<0.4	11	27	26	<0.1	16	150	<50	150	100	<50	<25	<50	<100	150	225	<25	<25	<0.2	<1	<0.5	<2	<1	<3	<0.1
C07	C07	0.8	17/06/2016	9.4	<4	<0.4	3	2	4	<0.1	<1	70	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	<0.1
C08	C08	1	17/06/2016	17	<4	0.6	40	57	590	<0.1	9	460	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	<0.1
C08	C08	1.6-1.7		17	<4	<0.4	29	7	29	<0.1	3	51	<50	170	<100	<50	<25	<50	130	<100	205	<25	<25	<0.2	<1	<0.5	<2	<1	<3	-
BD3/170616	C08	1.4-1.6	20/06/2016	17	<4	<0.4	9	1	8	<0.1	<1	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BD4/170616	C08	1.4-1.6	17/06/2016	18	2.1	<0.4	7.1	<5	6.2	<0.05	<5	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C09	C09	0.5	17/06/2016	7.2	<4	<0.4	10	16	18	<0.1	13	43	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	<0.1
C10	C10	0.1	17/06/2016	32	<4	<0.4	9	20	8	<0.1	5	98	53	530	170	53	<25	60	350	300	710	<25	<25	<0.2	<1	<0.5	4	2	6	-
C10	C10	0.5	22/06/2016	8.1	<4	<0.4	9	3	5	<0.1	4	9	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	<0.1
C12	C12	0.25-0.3	20/06/2016	19	<4	<0.4	10	9	13	<0.1	4	28	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	<0.1
C13	C13	0.45	20/06/2016	16	<4	<0.4	4	4	10	<0.1	2	23	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	-
C14	C14	0.1-0.2	20/06/2016	33	<4	<0.4	9	26	23	<0.1	4	91	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	-
C15	C15	0.25-0.3	20/06/2016	24	<4	<0.4	7	15	25	<0.1	5	95	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	<0.1
C16	C16	0.15-0.25	20/06/2016	27	<4	<0.4	8	20	18	<0.1	7	120	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	<0.1
C17	C17	0.9-1	20/06/2016	15	<4	<0.4	6	6	7	<0.1	3	27	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	<0.1
C18	C18	0.1-0.2	20/06/2016	19	<4	0.4	52	22	96	<0.1	5	150	<50	230	110	<50	<25	<50	120	180	325	<25	<25	<0.2	<1	<0.5	<2	<1	<3	-
C19	C19	0.5-0.6	20/06/2016	15	<4	<0.4	9	5	20	<0.1	2	32	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	-
C20	C20	0.1-0.2	20/06/2016	20	5	<0.4	15	27	57	<0.1	7	84	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	<0.1
C21	C21	0.2-0.3	20/06/2016	25	<4	0.5	18	86	35	0.3	32	100	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	<0.1
C22	C22	0.1-0.2	22/06/2016	22	<4	<0.4	10	44	31	0.2	6	82	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	-
C23	C23	0.1-0.2	22/06/2016	17	<4	<0.4	8	16	13	<0.1	4	32	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	-
C24	C24	0.5-0.55	22/06/2016	28	<4	<0.4	12	10	11	<0.1	6	24	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	<0.1
C25	C25	0.1-0.13	22/06/2016	42	5	<0.4	9	26	26	<0.1	5	120	<50	<100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	-
C26	C26	0.5-0.6	22/06/2016	15	5	<0.4	10	9	33	0.1	3	46	<50	100	<100	<50	<25	<50	<100	<100	<250	<25	<25	<0.2	<1	<0.5	<2	<1	<3	-

Statistical Summary																													
Number of Results	30	30	30	30	30	30	30	30	30	30	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	15	
Number of Detects	30	5	6	30	28	30	4	26	30	1	6	4	1	0	1	4	4	5	0	0	0	0	0	1	1	1	0		
Minimum Concentration	4.3	2.1	<0.4	1	<1	2	<0.05	<1	2	<50	<100	<100	<50	<25	<50	<100	<100	205	<25	<25	<0.2	<1	<0.5	<2	<1	<3	<0.1		
Minimum Detect	4.3	2.1	0.4	1	1	2	0.1	2	2	53	100	100	53	ND	60	120	150	205	ND	ND	ND	ND	ND	4	2	6	ND		
Maximum Concentration	42	10	1	52	86	590	0.3	37	490	53	1400	520	53	<25	60	830	840	1695	<25	<25	<0.2	<1	<0.5	4	2	6	<0.1		
Maximum Detect	42	10	1	52	86	590	0.3	37	490	53	1400	520	53	ND	60	830	840	1695	ND	ND	ND	ND	ND	4	2	6	ND		
Average Concentration	19	2.6	0.28	12	19	43	0.073	7.4	97	26	131	75	26	13	26	94	95	216	13	13	0.1	0.5	0.25	1.1	0.55	1.7	0.05		
Median Concentration	17	2	0.2	9	15.5	19	0.05	5	76	25	50	50	25	12.5	25	50	50	125	12.5	12.5	0.1	0.5	0.25	1	0.5	1.5	0.05		
Standard Deviation	8.1	1.7	0.19	11	18	105	0.068	8.7	117	5.3	267	91	5.3	0	6.6	156	156	312	0	0	0	0	0	0.57	0.28	0.85	0		
Number of Guideline Exceedances	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

	PAH																				
	Benzo(a)pyrene TEQ calc (zero)	Benzo(a)pyrene TEQ calc(half)	Benzo(a)pyrene TEQ calc(PQL)	Total Positive PAHs	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(g,h,i)perylene	Carcinogenic PAHs (as BaP TEQ)	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Phenolics Total	Pyrene
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.5	0.5	0.5		0.1	0.1	0.1	0.1	0.05	0.2	0.1							0.1	0.1	5	0.1
CRC Care Direct Contact HSL-D																		11000			
CRC Care Direct Contact Intrusive Maintenance Worker																		29000			
NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil	40	40	40	4000								40									
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand 0-1m																		NL			
NEPM 2013 EILs Comm/Ind Aged																		370			
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Coarse Soil 0-2m									1.4												
NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil																					

Field_ID	LocCode	Sample_Depth_Range	Sampled_Date-Time																			
C01	C01	0.1-0.2	17/06/2016	<0.5	<0.5	<0.5	1.2	<0.1	<0.1	<0.1	<0.1	0.2	0.1	0.3	0.1	0.177	0.1	<0.1	0.2	<0.1	<0.1	<0.1
C01	C01	0.5-0.6	17/06/2016	<0.5	<0.5	<0.5	0.21	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.172	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	-
C02	C02	0.9	17/06/2016	<0.5	<0.5	<0.5	0	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.172	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<5
C03	C03	0.5	17/06/2016	<0.5	<0.5	<0.5	1	<0.1	<0.1	<0.1	0.2	0.1	0.2	<0.1	<0.1765	0.1	<0.1	0.2	<0.1	<0.1	<5	0.2
C04	C04	0.1	17/06/2016	<0.5	<0.5	<0.5	2	<0.1	<0.1	<0.1	0.2	0.2	0.3	0.2	0.284	0.2	<0.1	0.3	<0.1	0.1	<0.1	0.1
C05	C05	0.1	17/06/2016	16	16	16	86	0.2	1.3	1.4	6.9	10	16	8.9	13.88	4.7	2.3	10	0.2	7.5	<0.1	2.1
C07	C07	0.1	17/06/2016	1.7	1.7	1.7	11	<0.1	0.1	0.2	1	1.1	2	0.9	1.498	0.9	0.2	1.5	<0.1	0.8	<0.1	0.6
C07	C07	0.8	17/06/2016	<0.5	0.5	0.6	4.1	<0.1	<0.1	<0.1	0.3	0.3	0.6	0.3	0.417	0.4	<0.1	0.8	<0.1	0.3	<0.1	0.3
C08	C08	1	17/06/2016	<0.5	<0.5	<0.5	2	<0.1	<0.1	<0.1	0.2	0.2	0.3	0.1	0.283	0.2	<0.1	0.3	<0.1	0.1	<0.1	0.1
C08	C08	1.6-1.7		3.9	3.9	3.9	21	<0.1	<0.1	0.2	3.1	2.8	4.3	0.9	3.554	2.5	0.3	2.1	<0.1	1.1	<0.1	0.8
BD3/170616	C08	1.4-1.6	20/06/2016	<0.5	<0.5	<0.5	0	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.172	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
BD4/170616	C08	1.4-1.6	17/06/2016	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<1.21	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
C09	C09	0.5	17/06/2016	<0.5	<0.5	<0.5	1.9	<0.1	0.2	0.1	0.2	0.1	0.2	0.2	0.183	0.1	<0.1	0.2	<0.1	0.1	<0.1	<5
C10	C10	0.1	17/06/2016	<0.5	<0.5	<0.5	0	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.172	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
C10	C10	0.5	22/06/2016	<0.5	<0.5	<0.5	0.31	<0.1	<0.1	<0.1	<0.1	0.07	<0.2	<0.1	0.131	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<5
C12	C12	0.25-0.3	20/06/2016	<0.5	<0.5	<0.5	0.29	<0.1	<0.1	<0.1	<0.1	0.06	<0.2	<0.1	0.121	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<5
C13	C13	0.45	20/06/2016	0.5	0.6	0.6	3	<0.1	<0.1	<0.1	0.4	0.4	0.7	0.3	0.516	0.3	<0.1	0.4	<0.1	0.2	<0.1	-
C14	C14	0.1-0.2	20/06/2016	<0.5	<0.5	<0.5	1.9	<0.1	<0.1	<0.1	0.2	0.2	0.3	0.2	0.283	0.1	<0.1	0.3	<0.1	0.1	<0.1	-
C15	C15	0.25-0.3	20/06/2016	<0.5	<0.5	<0.5	0.47	<0.1	<0.1	<0.1	<0.1	0.09	<0.2	<0.1	0.1515	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<5
C16	C16	0.15-0.25	20/06/2016	<0.5	<0.5	<0.5	0.5	<0.1	<0.1	<0.1	<0.1	0.09	<0.2	<0.1	0.1515	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<5
C17	C17	0.9-1	20/06/2016	<0.5	<0.5	<0.5	0.18	<0.1	<0.1	<0.1	<0.1	0.08	<0.2	0.1	0.1415	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<5
C18	C18	0.1-0.2	20/06/2016	2	2	2	13	<0.1	<0.1	0.2	1.6	1.3	2.2	0.7	1.748	1.1	0.2	2	<0.1	0.7	<0.1	0.6
C19	C19	0.5-0.6	20/06/2016	<0.5	<0.5	<0.5	1.1	<0.1	<0.1	<0.1	0.1	0.1	0.2	<0.1	0.1665	0.1	<0.1	0.2	<0.1	<0.1	<0.1	-
C20	C20	0.1-0.2	20/06/2016	0.5	0.6	0.6	3.7	<0.1	<0.1	<0.1	0.4	0.4	0.7	0.3	0.516	0.3	<0.1	0.6	<0.1	0.2	<0.1	<5
C21	C21	0.2-0.3	20/06/2016	<0.5	<0.5	<0.5	0	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.172	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<5
C22	C22	0.1-0.2	22/06/2016	<0.5	<0.5	<0.5	0.49	<0.1	<0.1	<0.1	<0.1	0.08	<0.2	<0.1	0.1415	0.1	<0.1	0.1	<0.1	<0.1	<0.1	-
C23	C23	0.1-0.2	22/06/2016	<0.5	<0.5	<0.5	0	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.172	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
C24	C24	0.5-0.55	22/06/2016	<0.5	<0.5	<0.5	0	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.172	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<5
C25	C25	0.1-0.13	22/06/2016	<0.5	<0.5	<0.5	0.99	<0.1	<0.1	<0.1	<0.1	0.1	0.2	0.1	0.162	0.1	<0.1	0.2	<0.1	<0.1	<0.1	-
C26	C26	0.5-0.6	22/06/2016	0.8	0.9	0.9	6.1	<0.1	<0.1	0.1	0.4	0.62	1	0.5	0.761	0.6	<0.1	0.9	<0.1	0.4	<0.1	0.3

Statistical Summary																						
Number of Results	30	30	30	30	30	30	30	30	30	29	30	30	30	30	30	30	30	30	30	15	30	
Number of Detects	7	9	9	29	1	3	6	15	22	16	16	22	18	4	22	1	12	0	10	0	22	
Minimum Concentration	<0.5	<0.5	<0.5	0	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	0.121	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<5	<0.1	
Minimum Detect	0.5	0.5	0.6	0.18	0.2	0.1	0.1	0.1	0.06	0.2	0.1	0.121	0.1	0.2	0.1	0.2	0.1	ND	0.1	ND	0.1	
Maximum Concentration	16	16	16	86	<0.5	1.3	1.4	6.9	10	16	8.9	13.88	4.7	2.3	10	<0.5	7.5	<0.5	2.1	<5	14	
Maximum Detect	16	16	16	86	0.2	1.3	1.4	6.9	10	16	8.9	13.88	4.7	2.3	10	0.2	7.5	ND	2.1	ND	14	
Average Concentration	1	1.1	1.1	5.4	0.062	0.11	0.12	0.55	0.63	1.1	0.49	0.89	0.43	0.15	0.71	0.062	0.42	0.057	0.21	2.5	0.88	
Median Concentration	0.25	0.25	0.25	0.995	0.05	0.05	0.05	0.15	0.1	0.2	0.1	0.1715	0.1	0.05	0.2	0.05	0.05	0.05	0.05	2.5	0.2	
Standard Deviation	2.9	2.9	2.9	16	0.045	0.23	0.25	1.3	1.9	3	1.6	2.6	0.94	0.41	1.8	0.045	1.4	0.037	0.41	0	2.6	
Number of Guideline Exceedances	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	

[illegible]

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July 2016

	Organophosphorous Pesticides											Pesticides		Asbestos	
	Azinophos methyl	Bromophos-ethyl	Chlorpyrifos	Chlorpyrifos-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenitrothion	Malathion	Ronnel	Pesticides (total, NSW Waste 2009)	Parathion	Asbestos ID	Asbestos fibres
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	g/kg	-
EQL	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		0.1	0.1	
CRC Care Direct Contact HSL-D															
CRC Care Direct Contact Intrusive Maintenance Worker															
NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil			2000												
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand 0-1m															
NEPM 2013 EILs Comm/Ind Aged															
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Coarse Soil 0-2m															
NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil															

Field_ID	LocCode	Sample_Depth_Range	Sampled_Date-Time														
C01	C01	0.1-0.2	17/06/2016	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.6	<0.1	No asbestos detected	0
C01	C01	0.5-0.6	17/06/2016	-	-	-	-	-	-	-	-	-	-	-	-	No asbestos detected	0
C02	C02	0.9	17/06/2016	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.6	<0.1	No asbestos detected	0
C03	C03	0.5	17/06/2016	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.6	<0.1	No asbestos detected	0
C04	C04	0.1	17/06/2016	-	-	-	-	-	-	-	-	-	-	-	-	No asbestos detected	0
C05	C05	0.1	17/06/2016	-	-	-	-	-	-	-	-	-	-	-	-	No asbestos detected	0
C07	C07	0.1	17/06/2016	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.6	<0.1	No asbestos detected	0
C07	C07	0.8	17/06/2016	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.6	<0.1	-	-
C08	C08	1	17/06/2016	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.6	<0.1	No asbestos detected	0
C08	C08	1.6-1.7		-	-	-	-	-	-	-	-	-	-	-	-	No asbestos detected	0
BD3/170616	C08	1.4-1.6	20/06/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BD4/170616	C08	1.4-1.6	17/06/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C09	C09	0.5	17/06/2016	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.6	<0.1	No asbestos detected	0
C10	C10	0.1	17/06/2016	-	-	-	-	-	-	-	-	-	-	-	-	No asbestos detected	0
C10	C10	0.5	22/06/2016	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.6	<0.1	No asbestos detected	0
C12	C12	0.25-0.3	20/06/2016	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.6	<0.1	No asbestos detected	0
C13	C13	0.45	20/06/2016	-	-	-	-	-	-	-	-	-	-	-	-	No asbestos detected	0
C14	C14	0.1-0.2	20/06/2016	-	-	-	-	-	-	-	-	-	-	-	-	No asbestos detected	0
C15	C15	0.25-0.3	20/06/2016	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.6	<0.1	No asbestos detected	0
C16	C16	0.15-0.25	20/06/2016	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.6	<0.1	No asbestos detected	0
C17	C17	0.9-1	20/06/2016	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.6	<0.1	No asbestos detected	0
C18	C18	0.1-0.2	20/06/2016	-	-	-	-	-	-	-	-	-	-	-	-	No asbestos detected	0
C19	C19	0.5-0.6	20/06/2016	-	-	-	-	-	-	-	-	-	-	-	-	No asbestos detected	0
C20	C20	0.1-0.2	20/06/2016	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.6	<0.1	No asbestos detected	0
C21	C21	0.2-0.3	20/06/2016	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.6	<0.1	No asbestos detected	0
C22	C22	0.1-0.2	22/06/2016	-	-	-	-	-	-	-	-	-	-	-	-	No asbestos detected	0
C23	C23	0.1-0.2	22/06/2016	-	-	-	-	-	-	-	-	-	-	-	-	No asbestos detected	0
C24	C24	0.5-0.55	22/06/2016	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.6	<0.1	No asbestos detected	0
C25	C25	0.1-0.13	22/06/2016	-	-	-	-	-	-	-	-	-	-	-	-	No asbestos detected	0
C26	C26	0.5-0.6	22/06/2016	-	-	-	-	-	-	-	-	-	-	-	-	No asbestos detected	0

Statistical Summary																	
Number of Results	15	15	15	15	15	15	15	15	15	15	15	15	15	15	-	27	
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	27	
Minimum Concentration	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.6	<0.1	-	0
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	ND
Maximum Concentration	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.6	<0.1	-	0
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	ND
Average Concentration	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.3	0.05	-	0
Median Concentration	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.3	0.05	-	0
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0
Number of Guideline Exceedances	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0

	Inorganics		Metals										TPH										BTEX						Halogenated Benzenes
	Moisture	Moisture Content (dried @ 103°C)	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Lead TCLP	Mercury	Nickel	Zinc	C10-C16	C16-C34	C34-C40	F2-NAPHTHALENE	C6 - C9	C10 - C14	C15 - C28	C29-C36	+C10 - C36 (Sum of total)	C6-C10 less BTEX (F1)	C6-C10	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Xylene Total	Hexachlorobenzene
%	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.1	1	2	0.4	1	1	1		0.05	1	1	50	100	100	50	25	50	100	100		25	25	0.2	1	0.5	2	1		
NSW EPA 2014 - GSW CT1 (No TCLP)			100	20			100	5	4	40												10	600	288			1000		
NSW EPA 2014 - GSW SCC1 (using TCLP)			500	100			1500	20	50	1050						650				10000		18	1080	518			1800		

Field_ID	LocCode	Sample_Depth_Range	Sampled_Date-Time	Matrix_Description																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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Statistical Summary																															
Number of Results	29	1	30	30	30	30	30		30	30	30	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	15	
Number of Detects	29	1	5	6	30	28	30		4	26	30	1	6	4	1	0	1	4	4	5	0	0	0	0	0	1	1	1	1	0	
Minimum Concentration	4.3	18	2.1	<0.4	1	<1	2		<0.05	<1	2	<50	<100	<100	<50	<25	<50	<100	<100	205	<25	<25	<0.2	<1	<0.5	<2	<1	<3		<0.1	
Minimum Detect	4.3	18	2.1	0.4	1	1	2		0.1	2	2	53	100	100	53	ND	60	120	150	205	ND	ND	ND	ND	ND	4	2	6		ND	
Maximum Concentration	42	18	10	1	52	86	590		0.3	37	490	53	1400	520	53	<25	60	830	840	1695	<25	<25	<0.2	<1	<0.5	4	2	6		<0.1	
Maximum Detect	42	18	10	1	52	86	590		0.3	37	490	53	1400	520	53	ND	60	830	840	1695	ND	ND	ND	ND	ND	4	2	6		ND	
Average Concentration	19		2.6	0.28	12	19	43		0.073	7.4	97	26	131	75	26	13	26	94	95	216	13	13	0.1	0.5	0.25	1.1	0.55	1.7		0.05	
Median Concentration	17	18	2	0.2	9	15.5	19		0.05	5	76	25	50	50	25	12.5	25	50	125	12.5	12.5	0.1	0.5	0.25	1	0.5	1.5		0.05		
Standard Deviation	8.2		1.7	0.19	11	18	105		0.068	8.7	117	5.3	267	91	5.3	0	6.6	156	156	312	0	0	0	0	0	0.57	0.28	0.85		0	
Number of Guideline Exceedances	0	0	0	0	0	0	1		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	1		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

	PAH/Phenols																				Polychlorinated Biphenyls							
	PAH (total, NSW Waste 2009)	Total PAH (TCLP)	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(a)pyrene TCLP	Benzo(b)&(k)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Phenolics Total	Pyrene	Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arochlor 1260	
	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
EQL			0.1	0.1	0.1	0.1	0.05		0.2	0.1	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
NSW EPA 2014 - GSW CT1 (No TCLP)							0.8	0.04																				
NSW EPA 2014 - GSW SCC1 (using TCLP)	200						10	0.16																				

Field_ID	LocCode	Sample_Depth_Range	Sampled_Date-Time	Matrix_Description	1.3	-	<0.1	<0.1	<0.1	0.2	0.1	-	0.3	0.1	-	0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<5	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C01	C01	0.1-0.2	17/06/2016		1.3	-	<0.1	<0.1	<0.1	0.2	0.1	-	0.3	0.1	-	0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<5	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C01	C01	0.5-0.6	17/06/2016		0.775	-	<0.1	<0.1	<0.1	<0.1	<0.05	-	<0.2	<0.1	-	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<5	0.1	-	-	-	-	-	-	-
C02	C02	0.9	17/06/2016		<1.35	-	<0.1	<0.1	<0.1	<0.1	<0.05	-	<0.2	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C03	C03	0.5	17/06/2016		1.25	-	<0.1	<0.1	<0.1	0.2	0.1	-	0.2	<0.1	-	0.1	<0.1	0.2	<0.1	<0.1	<0.1	<5	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C04	C04	0.1	17/06/2016		1.9	-	<0.1	<0.1	<0.1	0.2	0.2	-	0.3	0.2	-	0.2	<0.1	0.3	<0.1	0.1	<0.1	0.1	-	0.3	-	-	-	-	-	-	-
C05	C05	0.1	17/06/2016		69.55	0.005	0.2	1.3	1.4	6.9	10	<0.001	16	8.9	-	4.7	2.3	10	0.2	7.5	<0.1	2.1	-	14	-	-	-	-	-	-	-
C07	C07	0.1	17/06/2016		9.15	-	<0.1	0.1	0.2	1	1.1	-	2	0.9	-	0.9	0.2	1.5	<0.1	0.8	<0.1	0.6	<5	1.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C07	C07	0.8	17/06/2016		3.7	-	<0.1	<0.1	<0.1	0.3	0.3	-	0.6	0.3	-	0.4	<0.1	0.8	<0.1	0.3	<0.1	0.3	<5	0.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C08	C08	1	17/06/2016		1.8	-	<0.1	<0.1	<0.1	0.2	0.2	-	0.3	0.1	-	0.2	<0.1	0.3	<0.1	0.1	<0.1	0.1	<5	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C08	C08	1.6-1.7			16.6	-	<0.1	<0.1	0.2	3.1	2.8	-	4.3	0.9	-	2.5	0.3	2.1	<0.1	1.1	<0.1	0.8	-	2.6	-	-	-	-	-	-	-
BD3/170616	C08	1.4-1.6	20/06/2016		<1.35	-	<0.1	<0.1	<0.1	<0.1	<0.05	-	<0.2	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	-	-	-	-	-	-
BD4/170616	C08	1.4-1.6	17/06/2016		<7.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	-	-	-	-	-	-	-
C09	C09	0.5	17/06/2016		1.8	-	<0.1	0.2	0.1	0.2	0.1	-	0.2	0.2	-	0.1	<0.1	0.2	<0.1	0.1	<0.1	0.1	<5	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C10	C10	0.1	17/06/2016		<1.35	-	<0.1	<0.1	<0.1	<0.1	<0.05	-	<0.2	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	-	-	-	-	-	-
C10	C10	0.5	22/06/2016		0.82	-	<0.1	<0.1	<0.1	<0.1	0.07	-	<0.2	<0.1	-	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<5	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C12	C12	0.25-0.3	20/06/2016		0.81	-	<0.1	<0.1	<0.1	<0.1	0.06	-	<0.2	<0.1	-	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<5	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C13	C13	0.45	20/06/2016		2.75	-	<0.1	<0.1	<0.1	0.4	0.4	-	0.7	0.3	-	0.3	<0.1	0.4	<0.1	0.2	<0.1	<0.1	-	0.4	-	-	-	-	-	-	-
C14	C14	0.1-0.2	20/06/2016		1.85	-	<0.1	<0.1	<0.1	0.2	0.2	-	0.3	0.2	-	0.1	<0.1	0.3	<0.1	0.1	<0.1	<0.1	-	0.4	-	-	-	-	-	-	-
C15	C15	0.25-0.3	20/06/2016		0.89	-	<0.1	<0.1	<0.1	<0.1	0.09	-	<0.2	0.1	-	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<5	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C16	C16	0.15-0.25	20/06/2016		0.99	-	<0.1	<0.1	<0.1	<0.1	0.09	-	<0.2	<0.1	-	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<5	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C17	C17	0.9-1	20/06/2016		0.78	-	<0.1	<0.1	<0.1	<0.1	0.08	-	<0.2	0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C18	C18	0.1-0.2	20/06/2016		10.5	-	<0.1	<0.1	0.2	1.6	1.3	-	2.2	0.7	-	1.1	0.2	2	<0.1	0.7	<0.1	0.6	-	1.9	-	-	-	-	-	-	-
C19	C19	0.5-0.6	20/06/2016		1.15	-	<0.1	<0.1	<0.1	0.1	0.1	-	0.2	<0.1	-	0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	-	0.2	-	-	-	-	-	-	-
C20	C20	0.1-0.2	20/06/2016		3.3	-	<0.1	<0.1	<0.1	0.4	0.4	-	0.7	0.3	-	0.3	<0.1	0.6	<0.1	0.2	<0.1	0.2	<5	0.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C21	C21	0.2-0.3	20/06/2016		<1.35	-	<0.1	<0.1	<0.1	<0.1	<0.05	-	<0.2	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C22	C22	0.1-0.2	22/06/2016		0.98	-	<0.1	<0.1	<0.1	<0.1	0.08	-	<0.2	<0.1	-	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	-	0.2	-	-	-	-	-	-	-
C23	C23	0.1-0.2	22/06/2016		<1.35	-	<0.1	<0.1	<0.1	<0.1	<0.05	-	<0.2	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	-	-	-	-	-	-
C24	C24	0.5-0.55	22/06/2016		<1.35	-	<0.1	<0.1	<0.1	<0.1	<0.05	-	<0.2	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C25	C25	0.1-0.13	22/06/2016		1.15	-	<0.1	<0.1	<0.1	<0.1	0.1	-	0.2	0.1	-	0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	-	0.2	-	-	-	-	-	-	-
C26	C26	0.5-0.6	22/06/2016		5.07	-	<0.1	<0.1	0.1	0.4	0.62	-	1	0.5	-	0.6	<0.1	0.9	<0.1	0.4	<0.1	0.3	-	1	-	-	-	-	-	-	-

Statistical Summary																												
Number of Results	30		30	30	30	30	30		29	30	1	30	30	30	30	30	30	30	15	30	15	15	15	15	15	15	15	15
Number of Detects	23		1	3	6	15	22		16	16	0	18	4	22	1	12	0	10	0	22	0	0	0	0	0	0	0	0
Minimum Concentration	0.775		<0.1	<0.1	<0.1	<0.1	<0.05		<0.2	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Minimum Detect	0.775		0.2	0.1	0.1	0.1	0.06		0.2	0.1	ND	0.1	0.2	0.1	0.2	0.1	ND	0.1	ND	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	69.55		<0.5	1.3	1.4	6.9	10		16	8.9	<0.5	4.7	2.3	10	<0.5	7.5	<0.5	2.1	<5	14	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Maximum Detect	69.55		0.2	1.3	1.4	6.9	10		16	8.9	ND	4.7	2.3	10	0.2	7.5	ND	2.1	ND	14	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration	4.9		0.062	0.11	0.12	0.55	0.63		1.1	0.49		0.43	0.15	0.71	0.062	0.42	0.057	0.21	2.5	0.88	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Median Concentration	1.2		0.05	0.05	0.05	0.15	0.1		0.2	0.1	0.25	0.1	0.05	0.2	0.05	0.05	0.05	0.05	2.5	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Standard Deviation	13		0.045	0.23	0.25	1.3	1.9		3	1.6		0.94	0.41	1.8	0.045	1.4	0.037	0.41	0	2.6	0	0	0	0	0	0	0	0
Number of Guideline Exceedances	0		0	0	0	0	4		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)	0		0	0	0	0	4		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[illegible]

85538.01.R.001
July 2016

	Scheduled chemicals (NSW Waste 2009)	Pesticides (total, NSW Waste 2009)	Asbestos	
			Asbestos in Soil	Asbestos fibres
	mg/kg	mg/kg	g/kg	-
EQL			0.1	
NSW EPA 2014 - GSW CT1 (No TCLP)				
NSW EPA 2014 - GSW SCC1 (using TCLP)	50	250		

Field_ID	LocCode	Sample_Depth_Range	Sampled_Date-Time	Matrix_Description				
C01	C01	0.1-0.2	17/06/2016		<1.3	<0.6	No asbestos detected	0
C01	C01	0.5-0.6	17/06/2016		-	-	No asbestos detected	0
C02	C02	0.9	17/06/2016		<1.3	<0.6	No asbestos detected	0
C03	C03	0.5	17/06/2016		<1.3	<0.6	No asbestos detected	0
C04	C04	0.1	17/06/2016		-	-	No asbestos detected	0
C05	C05	0.1	17/06/2016		-	-	No asbestos detected	0
C07	C07	0.1	17/06/2016		<1.3	<0.6	No asbestos detected	0
C07	C07	0.8	17/06/2016		<1.3	<0.6	-	-
C08	C08	1	17/06/2016		<1.3	<0.6	No asbestos detected	0
C08	C08	1.6-1.7			-	-	No asbestos detected	0
BD3/170616	C08	1.4-1.6	20/06/2016		-	-	-	-
BD4/170616	C08	1.4-1.6	17/06/2016		-	-	-	-
C09	C09	0.5	17/06/2016		<1.3	<0.6	No asbestos detected	0
C10	C10	0.1	17/06/2016		-	-	No asbestos detected	0
C10	C10	0.5	22/06/2016		<1.3	<0.6	No asbestos detected	0
C12	C12	0.25-0.3	20/06/2016		<1.3	<0.6	No asbestos detected	0
C13	C13	0.45	20/06/2016		-	-	No asbestos detected	0
C14	C14	0.1-0.2	20/06/2016		-	-	No asbestos detected	0
C15	C15	0.25-0.3	20/06/2016		<1.3	<0.6	No asbestos detected	0
C16	C16	0.15-0.25	20/06/2016		<1.3	<0.6	No asbestos detected	0
C17	C17	0.9-1	20/06/2016		<1.3	<0.6	No asbestos detected	0
C18	C18	0.1-0.2	20/06/2016		-	-	No asbestos detected	0
C19	C19	0.5-0.6	20/06/2016		-	-	No asbestos detected	0
C20	C20	0.1-0.2	20/06/2016		<1.3	<0.6	No asbestos detected	0
C21	C21	0.2-0.3	20/06/2016		<1.3	<0.6	No asbestos detected	0
C22	C22	0.1-0.2	22/06/2016		-	-	No asbestos detected	0
C23	C23	0.1-0.2	22/06/2016		-	-	No asbestos detected	0
C24	C24	0.5-0.55	22/06/2016		<1.3	<0.6	No asbestos detected	0
C25	C25	0.1-0.13	22/06/2016		-	-	No asbestos detected	0
C26	C26	0.5-0.6	22/06/2016		-	-	No asbestos detected	0

Statistical Summary				
Number of Results	15	15	-	27
Number of Detects	0	0	-	27
Minimum Concentration	<1.3	<0.6	-	0
Minimum Detect	ND	ND	-	ND
Maximum Concentration	<1.3	<0.6	-	0
Maximum Detect	ND	ND	-	ND
Average Concentration	0.65	0.3	-	0
Median Concentration	0.65	0.3	-	0
Standard Deviation	0	0	-	0
Number of Guideline Exceedances	0	0	-	0
Number of Guideline Exceedances(Detects Only)	0	0	-	0

Appendix F

Laboratory Certificates and Chain of Custody Information



12 Ashley Street, Chatswood, NSW 2067
tel: +61 2 9910 6200

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envirolab.com.au

Envirolab Services Pty Ltd - Sydney | ABN 37 112 535 645

CERTIFICATE OF ANALYSIS

148765

Client:

Douglas Partners Pty Ltd
96 Hermitage Rd
West Ryde
NSW 2114

Attention: Nerilee Edwards

Sample log in details:

Your Reference:	85538.01, Mosman Congo		
No. of samples:	21 soils		
Date samples received / completed instructions received	21/06/16	/	21/06/16

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:	28/06/16	/	27/06/16
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:

David Springer
General Manager



Envirolab Reference: 148765
Revision No: R 00

vTRH(C6-C10)/BTEXN in Soil Our Reference: Your Reference	UNITS ----- -	148765-1 C01	148765-2 C01	148765-3 C02	148765-4 C03	148765-5 C04
Depth	-----	0.1-0.2	0.5-0.6	0.9	0.5	0.1
Date Sampled		17/06/2016	17/06/2016	17/06/2016	17/06/2016	17/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
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	%	80	82	97	93	92

vTRH(C6-C10)/BTEXN in Soil Our Reference: Your Reference	UNITS ----- -	148765-6 C05	148765-7 C07	148765-8 C08	148765-9 C09	148765-10 C10
Depth	-----	0.1	0.1	1.0	0.5	0.1
Date Sampled		17/06/2016	17/06/2016	17/06/2016	17/06/2016	17/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
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	4
o-Xylene	mg/kg	<1	<1	<1	<1	2
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	96	87	92	91	85

vTRH(C6-C10)/BTEXN in Soil Our Reference: Your Reference	UNITS ----- -	148765-11 C12	148765-12 C13	148765-13 C14	148765-14 C15	148765-15 C16
Depth	-----	0.25-0.3	0.45	0.1-0.2	0.25-0.3	0.15-0.25
Date Sampled		20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	22/06/2016	22/06/2016	23/06/2016	23/06/2016	23/06/2016
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	%	93	89	86	104	103

vTRH(C6-C10)/BTEXN in Soil Our Reference: Your Reference	UNITS ----- -	148765-16 C17	148765-17 C18	148765-18 C19	148765-19 C20	148765-20 C21
Depth	-----	0.9-1.0	0.1-0.2	0.5-0.6	0.1-0.2	0.2-0.3
Date Sampled		20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	23/06/2016	23/06/2016	23/06/2016	23/06/2016	23/06/2016
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	%	89	87	89	87	81

svTRH (C10-C40) in Soil Our Reference: Your Reference	UNITS ----- -	148765-1 C01	148765-2 C01	148765-3 C02	148765-4 C03	148765-5 C04
Depth Date Sampled Type of sample	----- ----- -----	0.1-0.2 17/06/2016 Soil	0.5-0.6 17/06/2016 Soil	0.9 17/06/2016 Soil	0.5 17/06/2016 Soil	0.1 17/06/2016 Soil
Date extracted	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	23/06/2016	23/06/2016	23/06/2016	23/06/2016	23/06/2016
TRHC ₁₀ - C ₁₄	mg/kg	<50	<50	<50	<50	<50
TRHC ₁₅ - C ₂₈	mg/kg	<100	<100	<100	<100	<100
TRHC ₂₉ - C ₃₆	mg/kg	<100	<100	<100	<100	<100
TRH>C ₁₀ -C ₁₆	mg/kg	<50	<50	<50	<50	<50
TRH>C ₁₀ - C ₁₆ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C ₁₆ -C ₃₄	mg/kg	<100	<100	<100	<100	<100
TRH>C ₃₄ -C ₄₀	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	94	86	81	73	81

svTRH (C10-C40) in Soil Our Reference: Your Reference	UNITS ----- -	148765-6 C05	148765-7 C07	148765-8 C08	148765-9 C09	148765-10 C10
Depth Date Sampled Type of sample	----- ----- -----	0.1 17/06/2016 Soil	0.1 17/06/2016 Soil	1.0 17/06/2016 Soil	0.5 17/06/2016 Soil	0.1 17/06/2016 Soil
Date extracted	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	23/06/2016	23/06/2016	23/06/2016	23/06/2016	23/06/2016
TRHC ₁₀ - C ₁₄	mg/kg	<50	<50	<50	<50	60
TRHC ₁₅ - C ₂₈	mg/kg	830	<100	<100	<100	350
TRHC ₂₉ - C ₃₆	mg/kg	840	150	<100	<100	300
TRH>C ₁₀ -C ₁₆	mg/kg	<50	<50	<50	<50	53
TRH>C ₁₀ - C ₁₆ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	53
TRH>C ₁₆ -C ₃₄	mg/kg	1,400	150	<100	<100	530
TRH>C ₃₄ -C ₄₀	mg/kg	520	100	<100	<100	170
Surrogate o-Terphenyl	%	110	82	76	73	86

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	148765-11	148765-12	148765-13	148765-14	148765-15
Your Reference	-----	C12	C13	C14	C15	C16
	-					
Depth	-----	0.25-0.3	0.45	0.1-0.2	0.25-0.3	0.15-0.25
Date Sampled		20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	23/06/2016	23/06/2016	23/06/2016	23/06/2016	23/06/2016
TRHC ₁₀ - C ₁₄	mg/kg	<50	<50	<50	<50	<50
TRHC ₁₅ - C ₂₈	mg/kg	<100	<100	<100	<100	<100
TRHC ₂₉ - C ₃₆	mg/kg	<100	<100	<100	<100	<100
TRH>C ₁₀ -C ₁₆	mg/kg	<50	<50	<50	<50	<50
TRH>C ₁₀ - C ₁₆ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C ₁₆ -C ₃₄	mg/kg	<100	<100	<100	<100	<100
TRH>C ₃₄ -C ₄₀	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	73	73	79	76	85

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	148765-16	148765-17	148765-18	148765-19	148765-20
Your Reference	-----	C17	C18	C19	C20	C21
	-					
Depth	-----	0.9-1.0	0.1-0.2	0.5-0.6	0.1-0.2	0.2-0.3
Date Sampled		20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	23/06/2016	23/06/2016	23/06/2016	23/06/2016	23/06/2016
TRHC ₁₀ - C ₁₄	mg/kg	<50	<50	<50	<50	<50
TRHC ₁₅ - C ₂₈	mg/kg	<100	120	<100	<100	<100
TRHC ₂₉ - C ₃₆	mg/kg	<100	180	<100	<100	<100
TRH>C ₁₀ -C ₁₆	mg/kg	<50	<50	<50	<50	<50
TRH>C ₁₀ - C ₁₆ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C ₁₆ -C ₃₄	mg/kg	<100	230	<100	<100	<100
TRH>C ₃₄ -C ₄₀	mg/kg	<100	110	<100	<100	<100
Surrogate o-Terphenyl	%	81	86	78	82	85

PAHs in Soil Our Reference: Your Reference	UNITS ----- -	148765-1 C01	148765-2 C01	148765-3 C02	148765-4 C03	148765-5 C04
Depth	-----	0.1-0.2	0.5-0.6	0.9	0.5	0.1
Date Sampled		17/06/2016	17/06/2016	17/06/2016	17/06/2016	17/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<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	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.2	0.1	<0.1	0.2	0.3
Pyrene	mg/kg	0.2	0.1	<0.1	0.2	0.3
Benzo(a)anthracene	mg/kg	0.2	<0.1	<0.1	0.2	0.2
Chrysene	mg/kg	0.1	<0.1	<0.1	0.1	0.2
Benzo(b,j+k)fluoranthene	mg/kg	0.3	<0.2	<0.2	0.2	0.3
Benzo(a)pyrene	mg/kg	0.1	<0.05	<0.05	0.1	0.2
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
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	<0.1	<0.1	0.2
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Total Positive PAHs	mg/kg	1.2	0.21	NIL(+)VE	1.0	2.0
Surrogate p-Terphenyl-d14	%	81	87	92	88	89

PAHs in Soil Our Reference: Your Reference	UNITS ----- -	148765-6 C05	148765-7 C07	148765-8 C08	148765-9 C09	148765-10 C10
Depth	-----	0.1	0.1	1.0	0.5	0.1
Date Sampled		17/06/2016	17/06/2016	17/06/2016	17/06/2016	17/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	1.3	0.1	<0.1	0.2	<0.1
Acenaphthene	mg/kg	0.2	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	0.2	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	2.1	0.6	0.1	0.1	<0.1
Anthracene	mg/kg	1.4	0.2	<0.1	0.1	<0.1
Fluoranthene	mg/kg	10	1.5	0.3	0.2	<0.1
Pyrene	mg/kg	14	1.7	0.3	0.3	<0.1
Benzo(a)anthracene	mg/kg	6.9	1	0.2	0.2	<0.1
Chrysene	mg/kg	4.7	0.9	0.2	0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	16	2	0.3	0.2	<0.2
Benzo(a)pyrene	mg/kg	10	1.1	0.2	0.1	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	7.5	0.8	0.1	0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	2.3	0.2	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	8.9	0.9	0.1	0.2	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	16	1.7	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	16	1.7	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	16	1.7	<0.5	<0.5	<0.5
Total Positive PAHs	mg/kg	86	11	2.0	1.9	NIL(+)VE
Surrogate p-Terphenyl-d14	%	84	91	92	89	99

PAHs in Soil Our Reference: Your Reference	UNITS ----- -	148765-11 C12	148765-12 C13	148765-13 C14	148765-14 C15	148765-15 C16
Depth	-----	0.25-0.3	0.45	0.1-0.2	0.25-0.3	0.15-0.25
Date Sampled		20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<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	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.1	0.4	0.3	0.1	0.1
Pyrene	mg/kg	0.1	0.4	0.4	0.1	0.2
Benzo(a)anthracene	mg/kg	<0.1	0.4	0.2	<0.1	<0.1
Chrysene	mg/kg	<0.1	0.3	0.1	<0.1	0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	0.7	0.3	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.06	0.4	0.2	0.09	0.09
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	0.2	0.1	<0.1	<0.1
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	0.3	0.2	0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	0.6	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	0.6	<0.5	<0.5	<0.5
Total Positive PAHs	mg/kg	0.29	3.0	1.9	0.47	0.50
Surrogate p-Terphenyl-d14	%	92	90	99	93	93

PAHs in Soil Our Reference: Your Reference	UNITS ----- -	148765-16 C17	148765-17 C18	148765-18 C19	148765-19 C20	148765-20 C21
Depth	-----	0.9-1.0	0.1-0.2	0.5-0.6	0.1-0.2	0.2-0.3
Date Sampled		20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<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	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	0.6	<0.1	0.2	<0.1
Anthracene	mg/kg	<0.1	0.2	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	2.0	0.2	0.6	<0.1
Pyrene	mg/kg	<0.1	1.9	0.2	0.6	<0.1
Benzo(a)anthracene	mg/kg	<0.1	1.6	0.1	0.4	<0.1
Chrysene	mg/kg	<0.1	1.1	0.1	0.3	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	2.2	0.2	0.7	<0.2
Benzo(a)pyrene	mg/kg	0.08	1.3	0.1	0.4	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	0.7	<0.1	0.2	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	0.2	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.1	0.7	<0.1	0.3	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	2.0	<0.5	0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	2.0	<0.5	0.6	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	2.0	<0.5	0.6	<0.5
Total Positive PAHs	mg/kg	0.18	13	1.1	3.7	NIL(+)VE
Surrogate p-Terphenyl-d14	%	86	95	83	100	92

PAHs in Soil Our Reference: Your Reference	UNITS ----- -	148765-21 BD3/170616
Depth Date Sampled Type of sample	----- ----- -----	- 20/06/2016 Soil
Date extracted	-	22/06/2016
Date analysed	-	22/06/2016
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	<0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	<0.1
Pyrene	mg/kg	<0.1
Benzo(a)anthracene	mg/kg	<0.1
Chrysene	mg/kg	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2
Benzo(a)pyrene	mg/kg	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5
Total Positive PAHs	mg/kg	NIL (+)VE
Surrogate <i>p</i> -Terphenyl-d14	%	90

Organochlorine Pesticides in soil	UNITS	148765-1	148765-3	148765-4	148765-7	148765-8
Our Reference:	-----	C01	C02	C03	C07	C08
Your Reference	-					
Depth	-----	0.1-0.2	0.9	0.5	0.1	1.0
Date Sampled		17/06/2016	17/06/2016	17/06/2016	17/06/2016	17/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	23/06/2016	23/06/2016	23/06/2016	23/06/2016	23/06/2016
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	%	93	91	93	91	91

Organochlorine Pesticides in soil	UNITS	148765-9	148765-11	148765-14	148765-15	148765-16
Our Reference:	-----	C09	C12	C15	C16	C17
Your Reference	-					
Depth	-----	0.5	0.25-0.3	0.25-0.3	0.15-0.25	0.9-1.0
Date Sampled		17/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	23/06/2016	23/06/2016	23/06/2016	23/06/2016	23/06/2016
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	%	94	94	97	98	93

Organochlorine Pesticides in soil			
Our Reference:	UNITS	148765-19	148765-20
Your Reference	-----	C20	C21
	-		
Depth	-----	0.1-0.2	0.2-0.3
Date Sampled		20/06/2016	20/06/2016
Type of sample		Soil	Soil
Date extracted	-	22/06/2016	22/06/2016
Date analysed	-	23/06/2016	23/06/2016
HCB	mg/kg	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1
Surrogate TCMX	%	92	97

Organophosphorus Pesticides	UNITS	148765-1	148765-3	148765-4	148765-7	148765-8
Our Reference:	-----	C01	C02	C03	C07	C08
Your Reference	-					
Depth	-----	0.1-0.2	0.9	0.5	0.1	1.0
Date Sampled		17/06/2016	17/06/2016	17/06/2016	17/06/2016	17/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	23/06/2016	23/06/2016	23/06/2016	23/06/2016	23/06/2016
Azinphos-methyl (Guthion)	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
Chlorpyriphos	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
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dichlorvos	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
Ethion	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
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	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
Surrogate TCMX	%	93	91	93	91	91

Organophosphorus Pesticides	UNITS	148765-9	148765-11	148765-14	148765-15	148765-16
Our Reference:	-----	C09	C12	C15	C16	C17
Your Reference	-					
Depth	-----	0.5	0.25-0.3	0.25-0.3	0.15-0.25	0.9-1.0
Date Sampled		17/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	23/06/2016	23/06/2016	23/06/2016	23/06/2016	23/06/2016
Azinphos-methyl (Guthion)	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
Chlorpyriphos	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
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dichlorvos	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
Ethion	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
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	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
Surrogate TCMX	%	94	94	97	98	93

Organophosphorus Pesticides			
Our Reference:	UNITS	148765-19	148765-20
Your Reference	-----	C20	C21
	-		
Depth	-----	0.1-0.2	0.2-0.3
Date Sampled		20/06/2016	20/06/2016
Type of sample		Soil	Soil
Date extracted	-	22/06/2016	22/06/2016
Date analysed	-	23/06/2016	23/06/2016
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1
Surrogate TCMX	%	92	97

PCBs in Soil Our Reference: Your Reference	UNITS ----- -	148765-1 C01	148765-3 C02	148765-4 C03	148765-7 C07	148765-8 C08
Depth Date Sampled Type of sample	----- ----- -----	0.1-0.2 17/06/2016 Soil	0.9 17/06/2016 Soil	0.5 17/06/2016 Soil	0.1 17/06/2016 Soil	1.0 17/06/2016 Soil
Date extracted	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	23/06/2016	23/06/2016	23/06/2016	23/06/2016	23/06/2016
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	93	91	93	91	91

PCBs in Soil Our Reference: Your Reference	UNITS ----- -	148765-9 C09	148765-11 C12	148765-14 C15	148765-15 C16	148765-16 C17
Depth Date Sampled Type of sample	----- ----- -----	0.5 17/06/2016 Soil	0.25-0.3 20/06/2016 Soil	0.25-0.3 20/06/2016 Soil	0.15-0.25 20/06/2016 Soil	0.9-1.0 20/06/2016 Soil
Date extracted	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	23/06/2016	23/06/2016	23/06/2016	23/06/2016	23/06/2016
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	94	94	97	98	93

PCBs in Soil			
Our Reference:	UNITS	148765-19	148765-20
Your Reference	-----	C20	C21
	-		
Depth	-----	0.1-0.2	0.2-0.3
Date Sampled		20/06/2016	20/06/2016
Type of sample		Soil	Soil
Date extracted	-	22/06/2016	22/06/2016
Date analysed	-	23/06/2016	23/06/2016
Aroclor 1016	mg/kg	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1
Surrogate TCLMX	%	92	97

Acid Extractable metals in soil	UNITS	148765-1	148765-2	148765-3	148765-4	148765-5
Our Reference:	-----	C01	C01	C02	C03	C04
Your Reference	-					
Depth	-----	0.1-0.2	0.5-0.6	0.9	0.5	0.1
Date Sampled		17/06/2016	17/06/2016	17/06/2016	17/06/2016	17/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	0.6	<0.4	<0.4	<0.4	1
Chromium	mg/kg	12	5	1	7	8
Copper	mg/kg	18	34	<1	15	14
Lead	mg/kg	56	16	2	24	62
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	6	37	<1	22	6
Zinc	mg/kg	96	94	2	270	490

Acid Extractable metals in soil	UNITS	148765-6	148765-7	148765-8	148765-9	148765-10
Our Reference:	-----	C05	C07	C08	C09	C10
Your Reference	-					
Depth	-----	0.1	0.1	1.0	0.5	0.1
Date Sampled		17/06/2016	17/06/2016	17/06/2016	17/06/2016	17/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Arsenic	mg/kg	10	<4	<4	<4	<4
Cadmium	mg/kg	0.6	<0.4	0.6	<0.4	<0.4
Chromium	mg/kg	26	11	40	10	9
Copper	mg/kg	22	27	57	16	20
Lead	mg/kg	13	26	590	18	8
Mercury	mg/kg	0.3	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	2	16	9	13	5
Zinc	mg/kg	10	150	460	43	98

Acid Extractable metals in soil	UNITS	148765-11	148765-12	148765-13	148765-14	148765-15
Our Reference:	-----	C12	C13	C14	C15	C16
Your Reference	-					
Depth	-----	0.25-0.3	0.45	0.1-0.2	0.25-0.3	0.15-0.25
Date Sampled		20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	10	4	9	7	8
Copper	mg/kg	9	4	26	15	20
Lead	mg/kg	13	10	23	25	18
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	4	2	4	5	7
Zinc	mg/kg	28	23	91	95	120

Acid Extractable metals in soil	UNITS	148765-16	148765-17	148765-18	148765-19	148765-20
Our Reference:	-----	C17	C18	C19	C20	C21
Your Reference	-					
Depth	-----	0.9-1.0	0.1-0.2	0.5-0.6	0.1-0.2	0.2-0.3
Date Sampled		20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Arsenic	mg/kg	<4	<4	<4	5	<4
Cadmium	mg/kg	<0.4	0.4	<0.4	<0.4	0.5
Chromium	mg/kg	6	52	9	15	18
Copper	mg/kg	6	22	5	27	86
Lead	mg/kg	7	96	20	57	35
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	0.3
Nickel	mg/kg	3	5	2	7	32
Zinc	mg/kg	27	150	32	84	100

Acid Extractable metals in soil		
Our Reference:	UNITS	148765-21
Your Reference	-----	BD3/170616
	-	
Depth	-----	-
Date Sampled		20/06/2016
Type of sample		Soil
Date prepared	-	22/06/2016
Date analysed	-	22/06/2016
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.4
Chromium	mg/kg	9
Copper	mg/kg	1
Lead	mg/kg	8
Mercury	mg/kg	<0.1
Nickel	mg/kg	<1
Zinc	mg/kg	9

Moisture Our Reference: Your Reference	UNITS ----- -	148765-1 C01	148765-2 C01	148765-3 C02	148765-4 C03	148765-5 C04
Depth Date Sampled Type of sample	----- 	0.1-0.2 17/06/2016 Soil	0.5-0.6 17/06/2016 Soil	0.9 17/06/2016 Soil	0.5 17/06/2016 Soil	0.1 17/06/2016 Soil
Date prepared	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	23/06/2016	23/06/2016	23/06/2016	23/06/2016	23/06/2016
Moisture	%	18	23	14	14	11

Moisture Our Reference: Your Reference	UNITS ----- -	148765-6 C05	148765-7 C07	148765-8 C08	148765-9 C09	148765-10 C10
Depth Date Sampled Type of sample	----- 	0.1 17/06/2016 Soil	0.1 17/06/2016 Soil	1.0 17/06/2016 Soil	0.5 17/06/2016 Soil	0.1 17/06/2016 Soil
Date prepared	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	23/06/2016	23/06/2016	23/06/2016	23/06/2016	23/06/2016
Moisture	%	4.3	17	17	7.2	32

Moisture Our Reference: Your Reference	UNITS ----- -	148765-11 C12	148765-12 C13	148765-13 C14	148765-14 C15	148765-15 C16
Depth Date Sampled Type of sample	----- 	0.25-0.3 20/06/2016 Soil	0.45 20/06/2016 Soil	0.1-0.2 20/06/2016 Soil	0.25-0.3 20/06/2016 Soil	0.15-0.25 20/06/2016 Soil
Date prepared	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	23/06/2016	23/06/2016	23/06/2016	23/06/2016	23/06/2016
Moisture	%	19	16	33	24	27

Moisture Our Reference: Your Reference	UNITS ----- -	148765-16 C17	148765-17 C18	148765-18 C19	148765-19 C20	148765-20 C21
Depth Date Sampled Type of sample	----- 	0.9-1.0 20/06/2016 Soil	0.1-0.2 20/06/2016 Soil	0.5-0.6 20/06/2016 Soil	0.1-0.2 20/06/2016 Soil	0.2-0.3 20/06/2016 Soil
Date prepared	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	23/06/2016	23/06/2016	23/06/2016	23/06/2016	23/06/2016
Moisture	%	15	19	15	20	25

Moisture Our Reference: Your Reference	UNITS ----- -	148765-21 BD3/170616
Depth Date Sampled Type of sample	----- 	- 20/06/2016 Soil
Date prepared	-	22/06/2016
Date analysed	-	23/06/2016
Moisture	%	17

Asbestos ID - soils Our Reference: Your Reference	UNITS ----- -	148765-1 C01	148765-2 C01	148765-3 C02	148765-4 C03	148765-5 C04
Depth Date Sampled Type of sample	----- ----- -----	0.1-0.2 17/06/2016 Soil	0.5-0.6 17/06/2016 Soil	0.9 17/06/2016 Soil	0.5 17/06/2016 Soil	0.1 17/06/2016 Soil
Date analysed	-	24/06/2016	24/06/2016	24/06/2016	24/06/2016	24/06/2016
Sample mass tested	g	Approx. 30g	Approx. 25g	Approx. 50g	Approx. 35g	Approx. 40g
Sample Description	-	Brown coarse-grained soil & rocks	Grey fine-grained soil & rocks	Grey sandy soil & rocks	Grey coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils Our Reference: Your Reference	UNITS ----- -	148765-6 C05	148765-7 C07	148765-8 C08	148765-9 C09	148765-10 C10
Depth Date Sampled Type of sample	----- ----- -----	0.1 17/06/2016 Soil	0.1 17/06/2016 Soil	1.0 17/06/2016 Soil	0.5 17/06/2016 Soil	0.1 17/06/2016 Soil
Date analysed	-	24/06/2016	24/06/2016	24/06/2016	24/06/2016	24/06/2016
Sample mass tested	g	Approx. 50g	Approx. 35g	Approx. 35g	Approx. 40g	Approx. 15g
Sample Description	-	Red coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown fine-grained soil & rocks	Brown sandy soil	Brown fine-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils Our Reference: Your Reference	UNITS ----- -	148765-11 C12	148765-12 C13	148765-13 C14	148765-14 C15	148765-15 C16
Depth Date Sampled Type of sample	----- ----- -----	0.25-0.3 20/06/2016 Soil	0.45 20/06/2016 Soil	0.1-0.2 20/06/2016 Soil	0.25-0.3 20/06/2016 Soil	0.15-0.25 20/06/2016 Soil
Date analysed	-	24/06/2016	24/06/2016	24/06/2016	24/06/2016	24/06/2016
Sample mass tested	g	Approx. 35g	Approx. 35g	Approx. 20g	Approx. 25g	Approx. 25g
Sample Description	-	Red coarse-grained soil & rocks	Grey coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils Our Reference: Your Reference	UNITS ----- -	148765-16 C17	148765-17 C18	148765-18 C19	148765-19 C20	148765-20 C21
Depth Date Sampled Type of sample	----- ----- -----	0.9-1.0 20/06/2016 Soil	0.1-0.2 20/06/2016 Soil	0.5-0.6 20/06/2016 Soil	0.1-0.2 20/06/2016 Soil	0.2-0.3 20/06/2016 Soil
Date analysed	-	24/06/2016	24/06/2016	24/06/2016	24/06/2016	24/06/2016
Sample mass tested	g	Approx. 35g	Approx. 30g	Approx. 40g	Approx. 30g	Approx. 25g
Sample Description	-	Grey coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Misc Soil - Inorg Our Reference: Your Reference	UNITS ----- -	148765-1 C01	148765-3 C02	148765-4 C03	148765-7 C07	148765-8 C08
Depth	-----	0.1-0.2	0.9	0.5	0.1	1.0
Date Sampled		17/06/2016	17/06/2016	17/06/2016	17/06/2016	17/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Misc Soil - Inorg Our Reference: Your Reference	UNITS ----- -	148765-9 C09	148765-11 C12	148765-14 C15	148765-15 C16	148765-16 C17
Depth	-----	0.5	0.25-0.3	0.25-0.3	0.15-0.25	0.9-1.0
Date Sampled		17/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date analysed	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Misc Soil - Inorg Our Reference: Your Reference	UNITS ----- -	148765-19 C20	148765-20 C21
Depth	-----	0.1-0.2	0.2-0.3
Date Sampled		20/06/2016	20/06/2016
Type of sample		Soil	Soil
Date prepared	-	22/06/2016	22/06/2016
Date analysed	-	22/06/2016	22/06/2016
Total Phenolics (as Phenol)	mg/kg	<5	<5

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	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. For soil results:- 1. 'TEQ PQL' values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'TEQ zero' values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'TEQ half PQL' values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
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.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	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.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.

Client Reference: 85538.01, Mosman Congo

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
vTRH(C6-C10)/BTEXN in Soil						Base II Duplicate II %RPD		
Date extracted	-			22/06/2016	148765-1	22/06/2016 22/06/2016	LCS-7	22/06/2016
Date analysed	-			22/06/2016	148765-1	22/06/2016 22/06/2016	LCS-7	22/06/2016
TRHC ₆ - C ₉	mg/kg	25	Org-016	<25	148765-1	<25 <25	LCS-7	99%
TRHC ₆ - C ₁₀	mg/kg	25	Org-016	<25	148765-1	<25 <25	LCS-7	99%
Benzene	mg/kg	0.2	Org-016	<0.2	148765-1	<0.2 <0.2	LCS-7	92%
Toluene	mg/kg	0.5	Org-016	<0.5	148765-1	<0.5 <0.5	LCS-7	99%
Ethylbenzene	mg/kg	1	Org-016	<1	148765-1	<1 <1	LCS-7	103%
m+p-xylene	mg/kg	2	Org-016	<2	148765-1	<2 <2	LCS-7	100%
o-Xylene	mg/kg	1	Org-016	<1	148765-1	<1 <1	LCS-7	96%
naphthalene	mg/kg	1	Org-014	<1	148765-1	<1 <1	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	100	148765-1	80 91 RPD: 13	LCS-7	92%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
svTRH (C10-C40) in Soil						Base II Duplicate II %RPD		
Date extracted	-			22/06/2016	148765-1	22/06/2016 22/06/2016	LCS-7	22/06/2016
Date analysed	-			23/06/2016	148765-1	23/06/2016 23/06/2016	LCS-7	23/06/2016
TRHC ₁₀ - C ₁₄	mg/kg	50	Org-003	<50	148765-1	<50 <50	LCS-7	96%
TRHC ₁₅ - C ₂₈	mg/kg	100	Org-003	<100	148765-1	<100 <100	LCS-7	102%
TRHC ₂₈ - C ₃₆	mg/kg	100	Org-003	<100	148765-1	<100 <100	LCS-7	92%
TRH>C ₁₀ -C ₁₆	mg/kg	50	Org-003	<50	148765-1	<50 <50	LCS-7	96%
TRH>C ₁₆ -C ₃₄	mg/kg	100	Org-003	<100	148765-1	<100 <100	LCS-7	102%
TRH>C ₃₄ -C ₄₀	mg/kg	100	Org-003	<100	148765-1	<100 <100	LCS-7	92%
Surrogate o-Terphenyl	%		Org-003	76	148765-1	94 76 RPD: 21	LCS-7	86%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
PAHs in Soil						Base II Duplicate II %RPD		
Date extracted	-			22/06/2016	148765-1	22/06/2016 22/06/2016	LCS-7	22/06/2016
Date analysed	-			22/06/2016	148765-1	22/06/2016 22/06/2016	LCS-7	22/06/2016
Naphthalene	mg/kg	0.1	Org-012	<0.1	148765-1	<0.1 <0.1	LCS-7	94%
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012	<0.1	148765-1	<0.1 <0.1	LCS-7	110%
Phenanthrene	mg/kg	0.1	Org-012	<0.1	148765-1	<0.1 <0.1	LCS-7	107%
Anthracene	mg/kg	0.1	Org-012	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	148765-1	0.2 0.3 RPD: 40	LCS-7	89%
Pyrene	mg/kg	0.1	Org-012	<0.1	148765-1	0.2 0.3 RPD: 40	LCS-7	79%
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	148765-1	0.2 0.2 RPD: 0	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012	<0.1	148765-1	0.1 0.2 RPD: 67	LCS-7	91%
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	148765-1	0.3 0.4 RPD: 29	[NR]	[NR]

Client Reference: 85538.01, Mosman Congo

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
PAHs in Soil						Base II Duplicate II %RPD		
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	148765-1	0.1 0.2 RPD: 67	LCS-7	94%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	148765-1	<0.1 0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	148765-1	0.1 0.2 RPD: 67	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012	95	148765-1	81 90 RPD: 11	LCS-7	105%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Organochlorine Pesticides in soil						Base II Duplicate II %RPD		
Date extracted	-			22/06/2016	148765-1	22/06/2016 22/06/2016	LCS-7	22/06/2016
Date analysed	-			23/06/2016	148765-1	23/06/2016 23/06/2016	LCS-7	23/06/2016
HCB	mg/kg	0.1	Org-005	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	148765-1	<0.1 <0.1	LCS-7	124%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	148765-1	<0.1 <0.1	LCS-7	122%
Heptachlor	mg/kg	0.1	Org-005	<0.1	148765-1	<0.1 <0.1	LCS-7	121%
delta-BHC	mg/kg	0.1	Org-005	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	148765-1	<0.1 <0.1	LCS-7	118%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	148765-1	<0.1 <0.1	LCS-7	124%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	148765-1	<0.1 <0.1	LCS-7	125%
Dieldrin	mg/kg	0.1	Org-005	<0.1	148765-1	<0.1 <0.1	LCS-7	124%
Endrin	mg/kg	0.1	Org-005	<0.1	148765-1	<0.1 <0.1	LCS-7	122%
pp-DDD	mg/kg	0.1	Org-005	<0.1	148765-1	<0.1 <0.1	LCS-7	125%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	148765-1	<0.1 <0.1	LCS-7	128%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
Surrogate TCMX	%		Org-005	93	148765-1	93 92 RPD: 1	LCS-7	110%

Client Reference: 85538.01, Mosman Congo

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Organophosphorus Pesticides						Base II Duplicate II %RPD		
Date extracted	-			22/06/2016	148765-1	22/06/2016 22/06/2016	LCS-7	22/06/2016
Date analysed	-			23/06/2016	148765-1	23/06/2016 23/06/2016	LCS-7	23/06/2016
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
Chlorpyrifos	mg/kg	0.1	Org-008	<0.1	148765-1	<0.1 <0.1	LCS-7	99%
Chlorpyrifos-methyl	mg/kg	0.1	Org-008	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
Diazinon	mg/kg	0.1	Org-008	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
Dichlorvos	mg/kg	0.1	Org-008	<0.1	148765-1	<0.1 <0.1	LCS-7	88%
Dimethoate	mg/kg	0.1	Org-008	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
Ethion	mg/kg	0.1	Org-008	<0.1	148765-1	<0.1 <0.1	LCS-7	109%
Fenitrothion	mg/kg	0.1	Org-008	<0.1	148765-1	<0.1 <0.1	LCS-7	80%
Malathion	mg/kg	0.1	Org-008	<0.1	148765-1	<0.1 <0.1	LCS-7	80%
Parathion	mg/kg	0.1	Org-008	<0.1	148765-1	<0.1 <0.1	LCS-7	89%
Ronnel	mg/kg	0.1	Org-008	<0.1	148765-1	<0.1 <0.1	LCS-7	105%
Surrogate TCMX	%		Org-008	93	148765-1	93 92 RPD: 1	LCS-7	95%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
PCBs in Soil						Base II Duplicate II %RPD		
Date extracted	-			22/06/2016	148765-1	22/06/2016 22/06/2016	LCS-7	22/06/2016
Date analysed	-			23/06/2016	148765-1	23/06/2016 23/06/2016	LCS-7	23/06/2016
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	148765-1	<0.1 <0.1	LCS-7	102%
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	148765-1	<0.1 <0.1	[NR]	[NR]
Surrogate TCLMX	%		Org-006	93	148765-1	93 92 RPD: 1	LCS-7	95%

Client Reference: 85538.01, Mosman Congo

QUALITYCONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Acid Extractable metals in soil						Base Duplicate %RPD		
Date prepared	-			22/06/2016	148765-1	22/06/2016 22/06/2016	LCS-7	22/06/2016
Date analysed	-			22/06/2016	148765-1	22/06/2016 22/06/2016	LCS-7	22/06/2016
Arsenic	mg/kg	4	Metals-020	<4	148765-1	<4 <4	LCS-7	114%
Cadmium	mg/kg	0.4	Metals-020	<0.4	148765-1	0.6 <0.4	LCS-7	105%
Chromium	mg/kg	1	Metals-020	<1	148765-1	12 11 RPD: 9	LCS-7	108%
Copper	mg/kg	1	Metals-020	<1	148765-1	18 19 RPD: 5	LCS-7	111%
Lead	mg/kg	1	Metals-020	<1	148765-1	56 38 RPD: 38	LCS-7	109%
Mercury	mg/kg	0.1	Metals-021	<0.1	148765-1	<0.1 <0.1	LCS-7	99%
Nickel	mg/kg	1	Metals-020	<1	148765-1	6 8 RPD: 29	LCS-7	103%
Zinc	mg/kg	1	Metals-020	<1	148765-1	96 85 RPD: 12	LCS-7	106%
QUALITYCONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Misc Soil - Inorg						Base Duplicate %RPD		
Date prepared	-			22/06/2016	148765-1	22/06/2016 22/06/2016	LCS-1	22/06/2016
Date analysed	-			22/06/2016	148765-1	22/06/2016 22/06/2016	LCS-1	22/06/2016
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	148765-1	<5 <5	LCS-1	106%
QUALITYCONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	Dup. Sm#		Duplicate Base + Duplicate + %RPD		Spike Sm#	Spike % Recovery	
Date extracted	-	148765-11		22/06/2016 22/06/2016		148765-3	22/06/2016	
Date analysed	-	148765-11		22/06/2016 22/06/2016		148765-3	22/06/2016	
TRHC ₆ - C ₉	mg/kg	148765-11		<25 <25		148765-3	99%	
TRHC ₆ - C ₁₀	mg/kg	148765-11		<25 <25		148765-3	99%	
Benzene	mg/kg	148765-11		<0.2 <0.2		148765-3	93%	
Toluene	mg/kg	148765-11		<0.5 <0.5		148765-3	99%	
Ethylbenzene	mg/kg	148765-11		<1 <1		148765-3	102%	
m+p-xylene	mg/kg	148765-11		<2 <2		148765-3	101%	
o-Xylene	mg/kg	148765-11		<1 <1		148765-3	97%	
naphthalene	mg/kg	148765-11		<1 <1		[NR]	[NR]	
Surrogate aaa-Trifluorotoluene	%	148765-11		93 92 RPD: 1		148765-3	94%	

Client Reference: 85538.01, Mosman Congo

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	148765-11	22/06/2016 22/06/2016	148765-3	22/06/2016
Date analysed	-	148765-11	23/06/2016 23/06/2016	148765-3	23/06/2016
TRHC ₁₀ - C ₁₄	mg/kg	148765-11	<50 <50	148765-3	97%
TRHC ₁₅ - C ₂₈	mg/kg	148765-11	<100 <100	148765-3	102%
TRHC ₂₉ - C ₃₆	mg/kg	148765-11	<100 <100	148765-3	94%
TRH>C ₁₀ -C ₁₆	mg/kg	148765-11	<50 <50	148765-3	97%
TRH>C ₁₆ -C ₃₄	mg/kg	148765-11	<100 <100	148765-3	102%
TRH>C ₃₄ -C ₄₀	mg/kg	148765-11	<100 <100	148765-3	94%
Surrogate o-Terphenyl	%	148765-11	73 81 RPD: 10	148765-3	81%
QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	148765-11	22/06/2016 22/06/2016	148765-3	22/06/2016
Date analysed	-	148765-11	22/06/2016 22/06/2016	148765-3	22/06/2016
Naphthalene	mg/kg	148765-11	<0.1 <0.1	148765-3	98%
Acenaphthylene	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Acenaphthene	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Fluorene	mg/kg	148765-11	<0.1 <0.1	148765-3	116%
Phenanthrene	mg/kg	148765-11	<0.1 <0.1	148765-3	111%
Anthracene	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Fluoranthene	mg/kg	148765-11	0.1 <0.1	148765-3	91%
Pyrene	mg/kg	148765-11	0.1 <0.1	148765-3	81%
Benzo(a)anthracene	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Chrysene	mg/kg	148765-11	<0.1 <0.1	148765-3	100%
Benzo(b,j,k)fluoranthene	mg/kg	148765-11	<0.2 <0.2	[NR]	[NR]
Benzo(a)pyrene	mg/kg	148765-11	0.06 <0.05	148765-3	100%
Indeno(1,2,3-c,d)pyrene	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Surrogate p-Terphenyl-d14	%	148765-11	92 96 RPD: 4	148765-3	104%

Client Reference: 85538.01, Mosman Congo

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	148765-11	22/06/2016 22/06/2016	148765-3	22/06/2016
Date analysed	-	148765-11	23/06/2016 23/06/2016	148765-3	23/06/2016
HCB	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
alpha-BHC	mg/kg	148765-11	<0.1 <0.1	148765-3	122%
gamma-BHC	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
beta-BHC	mg/kg	148765-11	<0.1 <0.1	148765-3	117%
Heptachlor	mg/kg	148765-11	<0.1 <0.1	148765-3	121%
delta-BHC	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Aldrin	mg/kg	148765-11	<0.1 <0.1	148765-3	117%
Heptachlor Epoxide	mg/kg	148765-11	<0.1 <0.1	148765-3	120%
gamma-Chlordane	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Endosulfan I	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
pp-DDE	mg/kg	148765-11	<0.1 <0.1	148765-3	124%
Dieldrin	mg/kg	148765-11	<0.1 <0.1	148765-3	123%
Endrin	mg/kg	148765-11	<0.1 <0.1	148765-3	127%
pp-DDD	mg/kg	148765-11	<0.1 <0.1	148765-3	74%
Endosulfan II	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
pp-DDT	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	148765-11	<0.1 <0.1	148765-3	125%
Methoxychlor	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Surrogate TCMX	%	148765-11	94 92 RPD: 2	148765-3	110%

Client Reference: 85538.01, Mosman Congo

QUALITY CONTROL Organophosphorus Pesticides	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	148765-11	22/06/2016 22/06/2016	148765-3	22/06/2016
Date analysed	-	148765-11	23/06/2016 23/06/2016	148765-3	23/06/2016
Azinphos-methyl (Guthion)	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Bromophos-ethyl	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Chlorpyrifos	mg/kg	148765-11	<0.1 <0.1	148765-3	85%
Chlorpyrifos-methyl	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Diazinon	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Dichlorvos	mg/kg	148765-11	<0.1 <0.1	148765-3	86%
Dimethoate	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Ethion	mg/kg	148765-11	<0.1 <0.1	148765-3	102%
Fenitrothion	mg/kg	148765-11	<0.1 <0.1	148765-3	123%
Malathion	mg/kg	148765-11	<0.1 <0.1	148765-3	79%
Parathion	mg/kg	148765-11	<0.1 <0.1	148765-3	84%
Ronnel	mg/kg	148765-11	<0.1 <0.1	148765-3	97%
Surrogate TCMX	%	148765-11	94 92 RPD: 2	148765-3	90%
QUALITY CONTROL PCBs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	148765-11	22/06/2016 22/06/2016	148765-3	22/06/2016
Date analysed	-	148765-11	23/06/2016 23/06/2016	148765-3	23/06/2016
Aroclor 1016	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Aroclor 1221	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Aroclor 1232	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Aroclor 1242	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Aroclor 1248	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Aroclor 1254	mg/kg	148765-11	<0.1 <0.1	148765-3	101%
Aroclor 1260	mg/kg	148765-11	<0.1 <0.1	[NR]	[NR]
Surrogate TCLMX	%	148765-11	94 92 RPD: 2	148765-3	90%
QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	148765-11	22/06/2016 22/06/2016	148765-3	22/06/2016
Date analysed	-	148765-11	22/06/2016 22/06/2016	148765-3	22/06/2016
Arsenic	mg/kg	148765-11	<4 <4	148765-3	105%
Cadmium	mg/kg	148765-11	<0.4 <0.4	148765-3	111%
Chromium	mg/kg	148765-11	10 8 RPD: 22	148765-3	109%
Copper	mg/kg	148765-11	9 7 RPD: 25	148765-3	110%
Lead	mg/kg	148765-11	13 11 RPD: 17	148765-3	109%
Mercury	mg/kg	148765-11	<0.1 <0.1	148765-3	102%
Nickel	mg/kg	148765-11	4 4 RPD: 0	148765-3	107%
Zinc	mg/kg	148765-11	28 25 RPD: 11	148765-3	109%

Client Reference: 85538.01, Mosman Congo

QUALITY CONTROL Misc Soil - Inorg	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	148765-19	22/06/2016 22/06/2016	148765-3	22/06/2016
Date analysed	-	148765-19	22/06/2016 22/06/2016	148765-3	22/06/2016
Total Phenolics (as Phenol)	mg/kg	148765-19	<5 <5	148765-3	101%
QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD		
Date extracted	-	148765-21	22/06/2016 22/06/2016		
Date analysed	-	148765-21	22/06/2016 22/06/2016		
Naphthalene	mg/kg	148765-21	<0.1 <0.1		
Acenaphthylene	mg/kg	148765-21	<0.1 <0.1		
Acenaphthene	mg/kg	148765-21	<0.1 <0.1		
Fluorene	mg/kg	148765-21	<0.1 <0.1		
Phenanthrene	mg/kg	148765-21	<0.1 <0.1		
Anthracene	mg/kg	148765-21	<0.1 <0.1		
Fluoranthene	mg/kg	148765-21	<0.1 <0.1		
Pyrene	mg/kg	148765-21	<0.1 <0.1		
Benzo(a)anthracene	mg/kg	148765-21	<0.1 <0.1		
Chrysene	mg/kg	148765-21	<0.1 <0.1		
Benzo(b,j+k)fluoranthene	mg/kg	148765-21	<0.2 <0.2		
Benzo(a)pyrene	mg/kg	148765-21	<0.05 <0.05		
Indeno(1,2,3-c,d)pyrene	mg/kg	148765-21	<0.1 <0.1		
Dibenzo(a,h)anthracene	mg/kg	148765-21	<0.1 <0.1		
Benzo(g,h,i)perylene	mg/kg	148765-21	<0.1 <0.1		
Surrogate <i>p</i> -Terphenyl-d14	%	148765-21	90 124 RPD: 32		

QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	148765-21	22/06/2016 22/06/2016
Date analysed	-	148765-21	22/06/2016 22/06/2016
Arsenic	mg/kg	148765-21	<4 <4
Cadmium	mg/kg	148765-21	<0.4 <0.4
Chromium	mg/kg	148765-21	9 7 RPD: 25
Copper	mg/kg	148765-21	1 2 RPD: 67
Lead	mg/kg	148765-21	8 10 RPD: 22
Mercury	mg/kg	148765-21	<0.1 <0.1
Nickel	mg/kg	148765-21	<1 <1
Zinc	mg/kg	148765-21	9 13 RPD: 36

Report Comments:

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.

Note: Samples 148765-1 to 20 were sub-sampled from jars provided by the client.

Asbestos ID was analysed by Approved Identifier: Paul Ching

Asbestos ID was authorised by Approved Signatory: Paul Ching

INS: Insufficient sample for this test

NR: 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.

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Project Name: Mosman - Congo.....
 Project No: 85538.01.....
 Project Mgr: NLE.....
 Email: nerilee.edwards@douglaspartners.com.au.....
 Date Required: STD; ESdat Format.....
 To: Envirolab Services
 12 Ashley St Chatswood 2067
 Attn: Tania Notaras
 Phone: (02) 9910 6200 Fax: (02) 9910 6201
 Email: tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Sampling Date	Sample Type	Container type	Analytes								Notes/preservation		
					Combo 8a	Combo 8	Combo 3a	Combo 3	HM8	PAH	Asbestos (material)	pH, CEC, Fe, TOC		BTEX	
C01/0.1-0.2	1	17/6	S	G - glass	✓										
C01/0.5-0.6	2		S	G - glass	✓		✓								
C02/0.9	3		S	G - glass	✓										
C03/0.5	4		S	G - glass	✓										
C04/0.1	5		S	G - glass	✓										
C05/0.1	6		S	G - glass	✓		✓								
C07/0.1	7		S	G - glass	✓		✓								
C08/1.0	8		S	G - glass	✓										
C08/1.4-1.6	N.R		S	G - glass			✓								
C09/0.5	9		S	G - glass	✓										
C10/0.1	10		S	G - glass			✓								
C12/0.25-0.3	11	20/6	S	G - glass	✓										
C13/0.45	12		S	G - glass	✓		✓								

Lab Report No.
 Send Results to: Douglas Partners Address: 96 Hermitage Road West Ryde NSW 2114
 Relinquished by: *[Signature]* Signed: *[Signature]* Date & Time: 21/06/2016 17:30
 Received By: *[Signature]* Date & Time: 21/06/2016 17:30
 Transported to laboratory by: Hunter Express
 Phone: (02) 4271 1836 Fax: (02) 4271 1897

Project Name: Mosman - Congo To: Envirolab Services
Project No: 85538.01 Sampler: MH/AT
Project Mgr: NLE Mob. Phone: 0414 769 011 Attn: Tania Notaras
Email: nerilee.edwards@douglaspartners.com.au Phone: (02) 9910 6200 Fax: (02) 9910 6201
Date Required: STD; ESdat Format Lab Quote No. Email: tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Sampling Date	Sample Type S - soil W - water	Container type G - glass P - plastic	Analytes								Notes/preservation	
					Combo 8a	Combo 8	Combo 3a	Combo 3	HM8	PAH	Asbestos (material)	pH, CEC, Fe, TOC		BTEX
C14/0.1-0.2	13	20/6	S	G	✓		✓							
C15/0.25-0.3	14	→	S	→	✓									
C16/0.15-0.25	15				✓									
C17/0.9-1.0	16				✓									
C18/0.1-0.2	17				✓									
C19/0.5-0.6	18				✓									
C20/0.1-0.2	19				✓									
C21/0.2-0.3	20	→	S	→	✓					✓	✓			
B03/170616	21				17/6									

Lab Report No.
Send Results to: Douglas Partners Address: 96 Hermitage Road West Ryde NSW 2114 Phone: (02) 4271 1836 Fax: (02) 4271 1897
Relinquished by: *M. Hughes* Signed: *[Signature]* Date & Time: 21/6/16 1330 Transported to laboratory by: Hunter Express
Received By: *[Signature]* Date & Time: 21/6/2016 17:30

SAMPLE RECEIPT ADVICE

Client Details	
Client	Douglas Partners Pty Ltd
Attention	Nerilee Edwards

Sample Login Details	
Your Reference	85538.01, Mosman Congo
Envirolab Reference	148765
Date Sample Received	21/06/2016
Date Instructions Received	21/06/2016
Date Results Expected to be Reported	28/06/2016

Sample Condition	
Samples received in appropriate condition for analysis	YES
No. of Samples Provided	21 soils
Turnaround Time Requested	Standard
Temperature on receipt (°C)	14.0
Cooling Method	None
Sampling Date Provided	YES

Comments
Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples
missing C08/1.4-1.6

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	Phone: 02 9910 6200
Fax: 02 9910 6201	Fax: 02 9910 6201
Email: ahie@envirolabservices.com.au	Email: jhurst@envirolabservices.com.au

Sample and Testing Details on following page

<i>Sample Id</i>	<i>VTRH(C6- C10)/BTEXN in Soil</i>	<i>svTRH (C10-C40) in Soil</i>	<i>PAHs in Soil</i>	<i>Organochlorine Pesticides in soil</i>	<i>Organophosphorus Pesticides</i>	<i>PCBs in Soil</i>	<i>Acid Extractable metals in soil</i>	<i>Asbestos ID - soils</i>	<i>Total Phenolics (as Phenol)</i>
C01-0.1-0.2	✓	✓	✓	✓	✓	✓	✓	✓	✓
C01-0.5-0.6	✓	✓	✓				✓	✓	
C02-0.9	✓	✓	✓	✓	✓	✓	✓	✓	✓
C03-0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓
C04-0.1	✓	✓	✓				✓	✓	
C05-0.1	✓	✓	✓				✓	✓	
C07-0.1	✓	✓	✓	✓	✓	✓	✓	✓	✓
C08-1.0	✓	✓	✓	✓	✓	✓	✓	✓	✓
C09-0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓
C10-0.1	✓	✓	✓				✓	✓	
C12-0.25-0.3	✓	✓	✓	✓	✓	✓	✓	✓	✓
C13-0.45	✓	✓	✓				✓	✓	
C14-0.1-0.2	✓	✓	✓				✓	✓	
C15-0.25-0.3	✓	✓	✓	✓	✓	✓	✓	✓	✓
C16-0.15-0.25	✓	✓	✓	✓	✓	✓	✓	✓	✓
C17-0.9-1.0	✓	✓	✓	✓	✓	✓	✓	✓	✓
C18-0.1-0.2	✓	✓	✓				✓	✓	
C19-0.5-0.6	✓	✓	✓				✓	✓	
C20-0.1-0.2	✓	✓	✓	✓	✓	✓	✓	✓	✓
C21-0.2-0.3	✓	✓	✓	✓	✓	✓	✓	✓	✓
BD3/170616			✓				✓		



12 Ashley Street, Chatswood, NSW 2067
tel: +61 2 9910 6200

email: sydney@envirolab.com.au
envirolab.com.au

Envirolab Services Pty Ltd - Sydney | ABN 37 112 535 645

CERTIFICATE OF ANALYSIS

148765-A

Client:

Douglas Partners Pty Ltd
96 Hermitage Rd
West Ryde
NSW 2114

Attention: Nerilee Edwards

Sample log in details:

Your Reference:	85538.01, Mosman Congo
No. of samples:	Additional Testing
Date samples received / completed instructions received	21/06/16 / 28/06/16

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:	5/07/16 / 30/06/16
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:

David Springer
General Manager



Envirolab Reference: 148765-A
Revision No: R 00

Metals in TCLP USEPA 1311			
Our Reference:	UNITS	148765-A-6	148765-A-8
Your Reference	-----	C05	C08
	-		
Depth	-----	0.1	1.0
Date Sampled		17/06/2016	17/06/2016
Type of sample		Soil	Soil
Date extracted	-	29/06/2016	29/06/2016
Date analysed	-	30/06/2016	29/06/2016
pH of soil for fluid# determ.	pH units	10.3	10.0
pH of soil TCLP (after HCl)	pH units	1.6	1.7
Extraction fluid used	-	1	1
pH of final Leachate	pH units	4.7	4.9
Lead in TCLP	mg/L	[NA]	0.84

PAHs in TCLP (USEPA 1311)		
Our Reference:	UNITS	148765-A-6
Your Reference	-----	C05
	-	
Depth	-----	0.1
Date Sampled		17/06/2016
Type of sample		Soil
Date extracted	-	29/06/2016
Date analysed	-	29/06/2016
Naphthalene in TCLP	mg/L	0.003
Acenaphthylene in TCLP	mg/L	<0.001
Acenaphthene in TCLP	mg/L	0.001
Fluorene in TCLP	mg/L	<0.001
Phenanthrene in TCLP	mg/L	0.001
Anthracene in TCLP	mg/L	<0.001
Fluoranthene in TCLP	mg/L	<0.001
Pyrene in TCLP	mg/L	<0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001
Chrysene in TCLP	mg/L	<0.001
Benzo(b,j,k)fluoranthene in TCLP	mg/L	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001
Total +ve PAH's	mg/L	0.0050
Surrogate p-Terphenyl-d14	%	94

Method ID	Methodology Summary
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using 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 latest edition, 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.
Org-012	Leachates are extracted with Dichloromethane and analysed by GC-MS.
Org-012	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-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.

Client Reference: 85538.01, Mosman Congo

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Metals in TCLP USEPA1311						Base II Duplicate II %RPD		
Date extracted	-			29/06/2016	148765-A-8	29/06/2016 29/06/2016	LCS-W1	29/06/2016
Date analysed	-			29/06/2016	148765-A-8	29/06/2016 29/06/2016	LCS-W1	29/06/2016
Lead in TCLP	mg/L	0.03	Metals-020 ICP-AES	<0.03	148765-A-8	0.84 0.84 RPD: 0	LCS-W1	111%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
PAHs in TCLP (USEPA 1311)						Base II Duplicate II %RPD		
Date extracted	-			29/06/2016	[NT]	[NT]	LCS-W1	29/06/2016
Date analysed	-			29/06/2016	[NT]	[NT]	LCS-W1	29/06/2016
Naphthalene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	77%
Acenaphthylene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Acenaphthene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Fluorene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	82%
Phenanthrene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	94%
Anthracene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Fluoranthene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	74%
Pyrene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	68%
Benzo(a)anthracene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Chrysene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	82%
Benzo(bjk)fluoranthene in TCLP	mg/L	0.002	Org-012	<0.002	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	84%
Indeno(1,2,3-c,d)pyrene -TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012	120	[NT]	[NT]	LCS-W1	90%

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
NR: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

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Laboratory Acceptance Criteria

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Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

Aileen Hie

From: Nerilee Edwards <Nerilee.Edwards@douglaspartners.com.au>
Sent: Tuesday, 28 June 2016 10:03 AM
To: Aileen Hie
Subject: Additional analysis - 148765

148765-A
Due: 5/7/16
Std TAT.

Hi Aileen,

Can you organise the following on our project mosman – congo 85538.01

C05/0.1 – TCLP PAH - ⑥
C08/1 – TCLP Lead - ⑧

thanks

Nerilee Edwards | Associate / Environmental Scientist
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: 0414 769 011 | E: Nerilee.Edwards@douglaspartners.com.au

FINANCIAL REVIEW
CLIENT CHO
FINALIST

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email: sydney@envirolab.com.au
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Envirolab Services Pty Ltd - Sydney | ABN 37 112 535 645

CERTIFICATE OF ANALYSIS

148866

Client:

Douglas Partners Pty Ltd
96 Hermitage Rd
West Ryde
NSW 2114

Attention: Nerilee Edwards

Sample log in details:

Your Reference:	85538, Mosman
No. of samples:	1 Soil
Date samples received / completed instructions received	22/06/16 / 22/06/16

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:	29/06/16 / 27/06/16
Date of Preliminary Report:	Not Issued

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Results Approved By:

David Springer
General Manager



Envirolab Reference: 148866
Revision No: R 00

vTRH(C6-C10)/BTEXN in Soil		
Our Reference:	UNITS	148866-1
Your Reference	-----	C08
	-	
Depth	-----	1.6-1.7
Type of sample		Soil
Date extracted	-	23/06/2016
Date analysed	-	24/06/2016
TRHC ₆ - C ₉	mg/kg	<25
TRHC ₆ - C ₁₀	mg/kg	<25
VTPHC ₆ - C ₁₀ less BTEX (F1)	mg/kg	<25
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-Xylene	mg/kg	<1
naphthalene	mg/kg	<1
Surrogate aaa-Trifluorotoluene	%	107

svTRH (C10-C40) in Soil		
Our Reference:	UNITS	148866-1
Your Reference	-----	C08
	-	
Depth	-----	1.6-1.7
Type of sample		Soil
Date extracted	-	23/06/2016
Date analysed	-	25/06/2016
TRHC ₁₀ - C ₁₄	mg/kg	<50
TRHC ₁₅ - C ₂₈	mg/kg	130
TRHC ₂₉ - C ₃₆	mg/kg	<100
TRH>C ₁₀ -C ₁₆	mg/kg	<50
TRH>C ₁₀ - C ₁₆ less Naphthalene (F2)	mg/kg	<50
TRH>C ₁₆ -C ₃₄	mg/kg	170
TRH>C ₃₄ -C ₄₀	mg/kg	<100
Surrogate o-Terphenyl	%	81

PAHs in Soil		
Our Reference:	UNITS	148866-1
Your Reference	-----	C08
	-	
Depth	-----	1.6-1.7
Type of sample		Soil
Date extracted	-	23/06/2016
Date analysed	-	23/06/2016
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	0.8
Anthracene	mg/kg	0.2
Fluoranthene	mg/kg	2.1
Pyrene	mg/kg	2.6
Benzo(a)anthracene	mg/kg	3.1
Chrysene	mg/kg	2.5
Benzo(b,j+k)fluoranthene	mg/kg	4.3
Benzo(a)pyrene	mg/kg	2.8
Indeno(1,2,3-c,d)pyrene	mg/kg	1.1
Dibenzo(a,h)anthracene	mg/kg	0.3
Benzo(g,h,i)perylene	mg/kg	0.9
Benzo(a)pyrene TEQ calc (zero)	mg/kg	3.9
Benzo(a)pyrene TEQ calc(half)	mg/kg	3.9
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	3.9
Total Positive PAHs	mg/kg	21
Surrogate <i>p</i> -Terphenyl-d14	%	98

Acid Extractable metals in soil		
Our Reference:	UNITS	148866-1
Your Reference	-----	C08
	-	
Depth	-----	1.6-1.7
Type of sample		Soil
Date prepared	-	23/06/2016
Date analysed	-	23/06/2016
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.4
Chromium	mg/kg	29
Copper	mg/kg	7
Lead	mg/kg	29
Mercury	mg/kg	<0.1
Nickel	mg/kg	3
Zinc	mg/kg	51

Moisture		
Our Reference:	UNITS	148866-1
Your Reference	-----	C08
	-	
Depth	-----	1.6-1.7
Type of sample		Soil
Date prepared	-	23/06/2016
Date analysed	-	24/06/2016
Moisture	%	17

Asbestos ID - soils		
Our Reference:	UNITS	148866-1
Your Reference	-----	C08
	-	
Depth	-----	1.6-1.7
Type of sample		Soil
Date analysed	-	24/06/2016
Sample mass tested	g	Approx. 35g
Sample Description	-	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No 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	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. For soil results:- 1. 'TEQ PQL' values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'TEQ zero' values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'TEQ half PQL' values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	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	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
vTRH(C6-C10)/BTEXN in Soil						Base II Duplicate II %RPD		
Date extracted	-			23/06/2016	[NT]	[NT]	LCS-6	23/06/2016
Date analysed	-			24/06/2016	[NT]	[NT]	LCS-6	24/06/2016
TRHC ₆ - C ₉	mg/kg	25	Org-016	<25	[NT]	[NT]	LCS-6	122%
TRHC ₆ - C ₁₀	mg/kg	25	Org-016	<25	[NT]	[NT]	LCS-6	122%
Benzene	mg/kg	0.2	Org-016	<0.2	[NT]	[NT]	LCS-6	110%
Toluene	mg/kg	0.5	Org-016	<0.5	[NT]	[NT]	LCS-6	121%
Ethylbenzene	mg/kg	1	Org-016	<1	[NT]	[NT]	LCS-6	127%
m+p-xylene	mg/kg	2	Org-016	<2	[NT]	[NT]	LCS-6	126%
o-Xylene	mg/kg	1	Org-016	<1	[NT]	[NT]	LCS-6	120%
naphthalene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	117	[NT]	[NT]	LCS-6	122%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
svTRH (C10-C40) in Soil						Base II Duplicate II %RPD		
Date extracted	-			23/06/2016	[NT]	[NT]	LCS-6	23/06/2016
Date analysed	-			24/06/2016	[NT]	[NT]	LCS-6	24/06/2016
TRHC ₁₀ - C ₁₄	mg/kg	50	Org-003	<50	[NT]	[NT]	LCS-6	99%
TRHC ₁₅ - C ₂₈	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-6	94%
TRHC ₂₈ - C ₃₆	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-6	92%
TRH>C ₁₀ -C ₁₆	mg/kg	50	Org-003	<50	[NT]	[NT]	LCS-6	99%
TRH>C ₁₆ -C ₃₄	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-6	94%
TRH>C ₃₄ -C ₄₀	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-6	92%
Surrogate o-Terphenyl	%		Org-003	89	[NT]	[NT]	LCS-6	97%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
PAHs in Soil						Base II Duplicate II %RPD		
Date extracted	-			23/06/2016	[NT]	[NT]	LCS-6	23/06/2016
Date analysed	-			23/06/2016	[NT]	[NT]	LCS-6	23/06/2016
Naphthalene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-6	90%
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-6	112%
Phenanthrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-6	104%
Anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-6	94%
Pyrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-6	86%
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-6	92%
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	[NT]	[NT]	[NR]	[NR]

Client Reference: 85538, Mosman

QUALITYCONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
PAHs in Soil						Base II Duplicate II %RPD		
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	[NT]	[NT]	LCS-6	106%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012	102	[NT]	[NT]	LCS-6	121%
QUALITYCONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Acid Extractable metals in soil						Base II Duplicate II %RPD		
Date prepared	-			23/06/2016	[NT]	[NT]	LCS-6	23/06/2016
Date analysed	-			23/06/2016	[NT]	[NT]	LCS-6	23/06/2016
Arsenic	mg/kg	4	Metals-020	<4	[NT]	[NT]	LCS-6	104%
Cadmium	mg/kg	0.4	Metals-020	<0.4	[NT]	[NT]	LCS-6	102%
Chromium	mg/kg	1	Metals-020	<1	[NT]	[NT]	LCS-6	101%
Copper	mg/kg	1	Metals-020	<1	[NT]	[NT]	LCS-6	102%
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	LCS-6	99%
Mercury	mg/kg	0.1	Metals-021	<0.1	[NT]	[NT]	LCS-6	99%
Nickel	mg/kg	1	Metals-020	<1	[NT]	[NT]	LCS-6	97%
Zinc	mg/kg	1	Metals-020	<1	[NT]	[NT]	LCS-6	99%

Report Comments:

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.

Note: Sample 148866-1 was sub-sampled from jar provided by the client.

Asbestos ID was analysed by Approved Identifier: Paul Ching

Asbestos ID was authorised by Approved Signatory: Paul Ching

INS: Insufficient sample for this test

NR: 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.

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

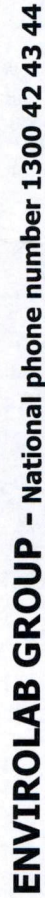
Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

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

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

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

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



Page No:

SAMPLE RECEIPT ADVICE

Client Details	
Client	Douglas Partners Pty Ltd
Attention	Nerilee Edwards

Sample Login Details	
Your Reference	85538, Mosman
Envirolab Reference	148866
Date Sample Received	22/06/2016
Date Instructions Received	22/06/2016
Date Results Expected to be Reported	29/06/2016

Sample Condition	
Samples received in appropriate condition for analysis	YES
No. of Samples Provided	1 Soil
Turnaround Time Requested	Standard
Temperature on receipt (°C)	18.4
Cooling Method	None
Sampling Date Provided	Not Provided on the COC

Comments
Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	Phone: 02 9910 6200
Fax: 02 9910 6201	Fax: 02 9910 6201
Email: ahie@envirolabservices.com.au	Email: jhurst@envirolabservices.com.au

Sample and Testing Details on following page

<i>Sample Id</i>	<i>vTRH(C6-C10)/BTEXN in Soil</i>	<i>svTRH (C10-C40) in Soil</i>	<i>PAHs in Soil</i>	<i>Acid Extractable metals in soil</i>	<i>Asbestos ID - soils</i>
C08-1.4-1.6	✓	✓	✓	✓	✓



12 Ashley Street, Chatswood, NSW 2067
tel: +61 2 9910 6200

email: sydney@envirolab.com.au
envirolab.com.au

Envirolab Services Pty Ltd - Sydney | ABN 37 112 535 645

CERTIFICATE OF ANALYSIS

149101

Client:

Douglas Partners Pty Ltd
96 Hermitage Rd
West Ryde
NSW 2114

Attention: Nerilee Edwards

Sample log in details:

Your Reference:	85538.01, Mosman Congo
No. of samples:	9 soils
Date samples received / completed instructions received	27/06/16 / 27/06/16

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:	4/07/16 / 1/07/16
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:

David Springer
General Manager



Envirolab Reference: 149101
Revision No: R 00

vTRH(C6-C10)/BTEXN in Soil Our Reference: Your Reference	UNITS ----- -	149101-1 TB1	149101-2 TS1	149101-3 C07	149101-4 C10	149101-5 C22
Depth	-----	-	-	0.8	0.5	0.1-0.2
Date Sampled		22/06/2016	22/06/2016	17/06/2016	22/06/2016	22/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	28/06/2016	28/06/2016	28/06/2016	28/06/2016	28/06/2016
Date analysed	-	30/06/2016	30/06/2016	30/06/2016	30/06/2016	30/06/2016
TRHC ₆ - C ₉	mg/kg	[NA]	[NA]	<25	<25	<25
TRHC ₆ - C ₁₀	mg/kg	[NA]	[NA]	<25	<25	<25
vTPHC ₆ - C ₁₀ less BTEX (F1)	mg/kg	[NA]	[NA]	<25	<25	<25
Benzene	mg/kg	<0.2	99%	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	99%	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	97%	<1	<1	<1
m+p-xylene	mg/kg	<2	99%	<2	<2	<2
o-Xylene	mg/kg	<1	98%	<1	<1	<1
naphthalene	mg/kg	[NA]	[NA]	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	110	89	100	105	98

vTRH(C6-C10)/BTEXN in Soil Our Reference: Your Reference	UNITS ----- -	149101-6 C23	149101-7 C24	149101-8 C25	149101-9 C26
Depth	-----	0.1-0.2	0.5-0.55	0.1-0.13	0.5-0.6
Date Sampled		22/06/2016	22/06/2016	22/06/2016	22/06/2016
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	28/06/2016	28/06/2016	28/06/2016	28/06/2016
Date analysed	-	30/06/2016	30/06/2016	30/06/2016	30/06/2016
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	%	101	94	84	101

svTRH (C10-C40) in Soil	UNITS	149101-3	149101-4	149101-5	149101-6	149101-7
Our Reference:	-----	C07	C10	C22	C23	C24
Your Reference	-					
Depth	-----	0.8	0.5	0.1-0.2	0.1-0.2	0.5-0.55
Date Sampled		17/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	28/06/2016	28/06/2016	28/06/2016	28/06/2016	28/06/2016
Date analysed	-	29/06/2016	29/06/2016	29/06/2016	29/06/2016	30/06/2016
TRHC ₁₀ - C ₁₄	mg/kg	<50	<50	<50	<50	<50
TRHC ₁₅ - C ₂₈	mg/kg	<100	<100	<100	<100	<100
TRHC ₂₉ - C ₃₆	mg/kg	<100	<100	<100	<100	<100
TRH>C ₁₀ -C ₁₆	mg/kg	<50	<50	<50	<50	<50
TRH>C ₁₀ - C ₁₆ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C ₁₆ -C ₃₄	mg/kg	<100	<100	<100	<100	<100
TRH>C ₃₄ -C ₄₀	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	85	85	88	84	76

svTRH (C10-C40) in Soil	UNITS	149101-8	149101-9
Our Reference:	-----	C25	C26
Your Reference	-		
Depth	-----	0.1-0.13	0.5-0.6
Date Sampled		22/06/2016	22/06/2016
Type of sample		Soil	Soil
Date extracted	-	28/06/2016	28/06/2016
Date analysed	-	30/06/2016	30/06/2016
TRHC ₁₀ - C ₁₄	mg/kg	<50	<50
TRHC ₁₅ - C ₂₈	mg/kg	<100	<100
TRHC ₂₉ - C ₃₆	mg/kg	<100	<100
TRH>C ₁₀ -C ₁₆	mg/kg	<50	<50
TRH>C ₁₀ - C ₁₆ less Naphthalene (F2)	mg/kg	<50	<50
TRH>C ₁₆ -C ₃₄	mg/kg	<100	100
TRH>C ₃₄ -C ₄₀	mg/kg	<100	<100
Surrogate o-Terphenyl	%	94	83

PAHs in Soil Our Reference: Your Reference	UNITS ----- -	149101-3 C07	149101-4 C10	149101-5 C22	149101-6 C23	149101-7 C24
Depth	-----	0.8	0.5	0.1-0.2	0.1-0.2	0.5-0.55
Date Sampled		17/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	28/06/2016	28/06/2016	28/06/2016	28/06/2016	28/06/2016
Date analysed	-	28/06/2016	28/06/2016	28/06/2016	28/06/2016	28/06/2016
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<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	<0.1	<0.1
Phenanthrene	mg/kg	0.3	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.8	0.1	0.1	<0.1	<0.1
Pyrene	mg/kg	0.7	0.1	0.2	<0.1	<0.1
Benzo(a)anthracene	mg/kg	0.3	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	0.4	<0.1	0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	0.6	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.3	0.07	0.08	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	0.3	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.3	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.6	<0.5	<0.5	<0.5	<0.5
Total Positive PAHs	mg/kg	4.1	0.31	0.49	NIL(+)VE	NIL(+)VE
Surrogate p-Terphenyl-d14	%	85	82	87	95	93

PAHs in Soil Our Reference: Your Reference	UNITS ----- -	149101-8 C25	149101-9 C26
Depth Date Sampled Type of sample	----- 	0.1-0.13 22/06/2016 Soil	0.5-0.6 22/06/2016 Soil
Date extracted	-	28/06/2016	28/06/2016
Date analysed	-	28/06/2016	28/06/2016
Naphthalene	mg/kg	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	0.3
Anthracene	mg/kg	<0.1	0.1
Fluoranthene	mg/kg	0.2	0.9
Pyrene	mg/kg	0.2	1.0
Benzo(a)anthracene	mg/kg	<0.1	0.4
Chrysene	mg/kg	0.1	0.6
Benzo(b,j+k)fluoranthene	mg/kg	0.2	1
Benzo(a)pyrene	mg/kg	0.1	0.62
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	0.4
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.1	0.5
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	0.8
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	0.9
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	0.9
Total Positive PAHs	mg/kg	0.99	6.1
Surrogate <i>p</i> -Terphenyl-d14	%	91	83

Organochlorine Pesticides in soil				
Our Reference:	UNITS	149101-3	149101-4	149101-7
Your Reference	-----	C07	C10	C24
	-			
Depth	-----	0.8	0.5	0.5-0.55
Date Sampled		17/06/2016	22/06/2016	22/06/2016
Type of sample		Soil	Soil	Soil
Date extracted	-	28/06/2016	28/06/2016	28/06/2016
Date analysed	-	29/06/2016	29/06/2016	29/06/2016
HCB	mg/kg	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1
Surrogate TCMX	%	94	96	102

Organophosphorus Pesticides				
Our Reference:	UNITS	149101-3	149101-4	149101-7
Your Reference	-----	C07	C10	C24
	-			
Depth	-----	0.8	0.5	0.5-0.55
Date Sampled		17/06/2016	22/06/2016	22/06/2016
Type of sample		Soil	Soil	Soil
Date extracted	-	28/06/2016	28/06/2016	28/06/2016
Date analysed	-	29/06/2016	29/06/2016	29/06/2016
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1
Chlorpyrifos	mg/kg	<0.1	<0.1	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1
Surrogate TCMX	%	94	96	102

PCBs in Soil				
Our Reference:	UNITS	149101-3	149101-4	149101-7
Your Reference	-----	C07	C10	C24
	-			
Depth	-----	0.8	0.5	0.5-0.55
Date Sampled		17/06/2016	22/06/2016	22/06/2016
Type of sample		Soil	Soil	Soil
Date extracted	-	28/06/2016	28/06/2016	28/06/2016
Date analysed	-	29/06/2016	29/06/2016	29/06/2016
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1
Surrogate TCLMX	%	94	96	102

Acid Extractable metals in soil	UNITS	149101-3	149101-4	149101-5	149101-6	149101-7
Our Reference:	-----	C07	C10	C22	C23	C24
Your Reference	-					
Depth	-----	0.8	0.5	0.1-0.2	0.1-0.2	0.5-0.55
Date Sampled		17/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	28/06/2016	28/06/2016	28/06/2016	28/06/2016	28/06/2016
Date analysed	-	28/06/2016	28/06/2016	28/06/2016	28/06/2016	28/06/2016
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	3	9	10	8	12
Copper	mg/kg	2	3	44	16	10
Lead	mg/kg	4	5	31	13	11
Mercury	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Nickel	mg/kg	<1	4	6	4	6
Zinc	mg/kg	70	9	82	32	24

Acid Extractable metals in soil	UNITS	149101-8	149101-9
Our Reference:	-----	C25	C26
Your Reference	-		
Depth	-----	0.1-0.13	0.5-0.6
Date Sampled		22/06/2016	22/06/2016
Type of sample		Soil	Soil
Date prepared	-	28/06/2016	28/06/2016
Date analysed	-	28/06/2016	28/06/2016
Arsenic	mg/kg	5	5
Cadmium	mg/kg	<0.4	<0.4
Chromium	mg/kg	9	10
Copper	mg/kg	26	9
Lead	mg/kg	26	33
Mercury	mg/kg	<0.1	0.1
Nickel	mg/kg	5	3
Zinc	mg/kg	120	46

Moisture Our Reference: Your Reference	UNITS ----- -	149101-3 C07	149101-4 C10	149101-5 C22	149101-6 C23	149101-7 C24
Depth Date Sampled Type of sample	----- ----- -----	0.8 17/06/2016 Soil	0.5 22/06/2016 Soil	0.1-0.2 22/06/2016 Soil	0.1-0.2 22/06/2016 Soil	0.5-0.55 22/06/2016 Soil
Date prepared	-	28/06/2016	28/06/2016	28/06/2016	28/06/2016	28/06/2016
Date analysed	-	29/06/2016	29/06/2016	29/06/2016	29/06/2016	29/06/2016
Moisture	%	9.4	8.1	22	17	28

Moisture Our Reference: Your Reference	UNITS ----- -	149101-8 C25	149101-9 C26
Depth Date Sampled Type of sample	----- ----- -----	0.1-0.13 22/06/2016 Soil	0.5-0.6 22/06/2016 Soil
Date prepared	-	28/06/2016	28/06/2016
Date analysed	-	29/06/2016	29/06/2016
Moisture	%	42	15

Asbestos ID - soils Our Reference: Your Reference	UNITS ----- -	149101-4 C10	149101-5 C22	149101-6 C23	149101-7 C24	149101-8 C25
Depth	-----	0.5	0.1-0.2	0.1-0.2	0.5-0.55	0.1-0.13
Date Sampled		22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	30/06/2016	30/06/2016	30/06/2016	30/06/2016	30/06/2016
Sample mass tested	g	Approx. 25	Approx. 30	Approx. 35	Approx. 25	Approx. 15
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Grey coarse-grained soil & rocks	Grey coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils Our Reference: Your Reference	UNITS ----- -	149101-9 C26
Depth	-----	0.5-0.6
Date Sampled		22/06/2016
Type of sample		Soil
Date analysed	-	30/06/2016
Sample mass tested	g	Approx. 35
Sample Description	-	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected

Misc Soil - Inorg	UNITS	149101-3	149101-4	149101-7
Our Reference:	-----	C07	C10	C24
Your Reference	-			
Depth	-----	0.8	0.5	0.5-0.55
Date Sampled		17/06/2016	22/06/2016	22/06/2016
Type of sample		Soil	Soil	Soil
Date prepared	-	28/06/2016	28/06/2016	28/06/2016
Date analysed	-	28/06/2016	28/06/2016	28/06/2016
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5

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	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. For soil results:- 1. 'TEQ PQL' values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'TEQ zero' values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'TEQ half PQL' values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
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.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	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.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.

Client Reference: 85538.01, Mosman Congo

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
vTRH(C6-C10)/BTEXN in Soil						Base II Duplicate II %RPD		
Date extracted	-			28/06/2016	149101-3	28/06/2016 28/06/2016	LCS-8	28/06/2016
Date analysed	-			30/06/2016	149101-3	30/06/2016 30/06/2016	LCS-8	30/06/2016
TRHC ₆ - C ₉	mg/kg	25	Org-016	<25	149101-3	<25 <25	LCS-8	124%
TRHC ₆ - C ₁₀	mg/kg	25	Org-016	<25	149101-3	<25 <25	LCS-8	124%
Benzene	mg/kg	0.2	Org-016	<0.2	149101-3	<0.2 <0.2	LCS-8	117%
Toluene	mg/kg	0.5	Org-016	<0.5	149101-3	<0.5 <0.5	LCS-8	123%
Ethylbenzene	mg/kg	1	Org-016	<1	149101-3	<1 <1	LCS-8	129%
m+p-xylene	mg/kg	2	Org-016	<2	149101-3	<2 <2	LCS-8	126%
o-Xylene	mg/kg	1	Org-016	<1	149101-3	<1 <1	LCS-8	122%
naphthalene	mg/kg	1	Org-014	<1	149101-3	<1 <1	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	107	149101-3	100 101 RPD: 1	LCS-8	107%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
svTRH (C10-C40) in Soil						Base II Duplicate II %RPD		
Date extracted	-			28/06/2016	149101-3	28/06/2016 28/06/2016	LCS-8	28/06/2016
Date analysed	-			29/06/2016	149101-3	29/06/2016 29/06/2016	LCS-8	29/06/2016
TRHC ₁₀ - C ₁₄	mg/kg	50	Org-003	<50	149101-3	<50 <50	LCS-8	109%
TRHC ₁₅ - C ₂₈	mg/kg	100	Org-003	<100	149101-3	<100 <100	LCS-8	105%
TRHC ₂₈ - C ₃₆	mg/kg	100	Org-003	<100	149101-3	<100 <100	LCS-8	92%
TRH>C ₁₀ -C ₁₆	mg/kg	50	Org-003	<50	149101-3	<50 <50	LCS-8	109%
TRH>C ₁₆ -C ₃₄	mg/kg	100	Org-003	<100	149101-3	<100 <100	LCS-8	105%
TRH>C ₃₄ -C ₄₀	mg/kg	100	Org-003	<100	149101-3	<100 <100	LCS-8	92%
Surrogate o-Terphenyl	%		Org-003	84	149101-3	85 89 RPD: 5	LCS-8	102%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
PAHs in Soil						Base II Duplicate II %RPD		
Date extracted	-			28/06/2016	149101-3	28/06/2016 28/06/2016	LCS-8	28/06/2016
Date analysed	-			28/06/2016	149101-3	28/06/2016 28/06/2016	LCS-8	28/06/2016
Naphthalene	mg/kg	0.1	Org-012	<0.1	149101-3	<0.1 <0.1	LCS-8	92%
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012	<0.1	149101-3	<0.1 <0.1	LCS-8	109%
Phenanthrene	mg/kg	0.1	Org-012	<0.1	149101-3	0.3 0.7 RPD: 80	LCS-8	103%
Anthracene	mg/kg	0.1	Org-012	<0.1	149101-3	<0.1 0.1	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	149101-3	0.8 1.6 RPD: 67	LCS-8	83%
Pyrene	mg/kg	0.1	Org-012	<0.1	149101-3	0.7 1.5 RPD: 73	LCS-8	76%
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	149101-3	0.3 0.5 RPD: 50	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012	<0.1	149101-3	0.4 0.8 RPD: 67	LCS-8	97%
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	149101-3	0.6 1 RPD: 50	[NR]	[NR]

Client Reference: 85538.01, Mosman Congo

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
PAHs in Soil						Base II Duplicate II %RPD		
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	149101-3	0.3 0.71 RPD: 81	LCS-8	81%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	149101-3	0.3 0.5 RPD: 50	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	149101-3	<0.1 0.2	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	149101-3	0.3 0.6 RPD: 67	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012	90	149101-3	85 82 RPD: 4	LCS-8	98%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Organochlorine Pesticides in soil						Base II Duplicate II %RPD		
Date extracted	-			28/06/2016	149101-3	28/06/2016 28/06/2016	LCS-8	28/06/2016
Date analysed	-			29/06/2016	149101-3	29/06/2016 29/06/2016	LCS-8	29/06/2016
HCB	mg/kg	0.1	Org-005	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	149101-3	<0.1 <0.1	LCS-8	97%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	149101-3	<0.1 <0.1	LCS-8	96%
Heptachlor	mg/kg	0.1	Org-005	<0.1	149101-3	<0.1 <0.1	LCS-8	96%
delta-BHC	mg/kg	0.1	Org-005	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	149101-3	<0.1 <0.1	LCS-8	98%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	149101-3	<0.1 <0.1	LCS-8	103%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	149101-3	<0.1 <0.1	LCS-8	98%
Dieldrin	mg/kg	0.1	Org-005	<0.1	149101-3	<0.1 <0.1	LCS-8	103%
Endrin	mg/kg	0.1	Org-005	<0.1	149101-3	<0.1 <0.1	LCS-8	110%
pp-DDD	mg/kg	0.1	Org-005	<0.1	149101-3	<0.1 <0.1	LCS-8	93%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	149101-3	<0.1 <0.1	LCS-8	89%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
Surrogate TCMX	%		Org-005	95	149101-3	94 95 RPD: 1	LCS-8	117%

Client Reference: 85538.01, Mosman Congo

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Organophosphorus Pesticides						Base II Duplicate II %RPD		
Date extracted	-			28/06/2016	149101-3	28/06/2016 28/06/2016	LCS-8	28/06/2016
Date analysed	-			29/06/2016	149101-3	29/06/2016 29/06/2016	LCS-8	29/06/2016
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
Chlorpyrifos	mg/kg	0.1	Org-008	<0.1	149101-3	<0.1 <0.1	LCS-8	98%
Chlorpyrifos-methyl	mg/kg	0.1	Org-008	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
Diazinon	mg/kg	0.1	Org-008	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
Dichlorvos	mg/kg	0.1	Org-008	<0.1	149101-3	<0.1 <0.1	LCS-8	91%
Dimethoate	mg/kg	0.1	Org-008	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
Ethion	mg/kg	0.1	Org-008	<0.1	149101-3	<0.1 <0.1	LCS-8	108%
Fenitrothion	mg/kg	0.1	Org-008	<0.1	149101-3	<0.1 <0.1	LCS-8	102%
Malathion	mg/kg	0.1	Org-008	<0.1	149101-3	<0.1 <0.1	LCS-8	90%
Parathion	mg/kg	0.1	Org-008	<0.1	149101-3	<0.1 <0.1	LCS-8	100%
Ronnel	mg/kg	0.1	Org-008	<0.1	149101-3	<0.1 <0.1	LCS-8	104%
Surrogate TCMX	%		Org-008	95	149101-3	94 95 RPD: 1	LCS-8	93%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
PCBs in Soil						Base II Duplicate II %RPD		
Date extracted	-			28/06/2016	149101-3	28/06/2016 28/06/2016	LCS-8	28/06/2016
Date analysed	-			29/06/2016	149101-3	29/06/2016 29/06/2016	LCS-8	29/06/2016
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	149101-3	<0.1 <0.1	LCS-8	104%
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	149101-3	<0.1 <0.1	[NR]	[NR]
Surrogate TCLMX	%		Org-006	95	149101-3	94 95 RPD: 1	LCS-8	93%

Client Reference: 85538.01, Mosman Congo

QUALITYCONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Acid Extractable metals in soil						Base II Duplicate II %RPD		
Date prepared	-			28/06/2016	149101-3	28/06/2016 28/06/2016	LCS-8	28/06/2016
Date analysed	-			28/06/2016	149101-3	28/06/2016 28/06/2016	LCS-8	28/06/2016
Arsenic	mg/kg	4	Metals-020	<4	149101-3	<4 <4	LCS-8	103%
Cadmium	mg/kg	0.4	Metals-020	<0.4	149101-3	<0.4 <0.4	LCS-8	97%
Chromium	mg/kg	1	Metals-020	<1	149101-3	3 5 RPD: 50	LCS-8	100%
Copper	mg/kg	1	Metals-020	<1	149101-3	2 5 RPD: 86	LCS-8	99%
Lead	mg/kg	1	Metals-020	<1	149101-3	4 8 RPD: 67	LCS-8	99%
Mercury	mg/kg	0.1	Metals-021	<0.1	149101-3	<0.1 <0.1	LCS-8	113%
Nickel	mg/kg	1	Metals-020	<1	149101-3	<1 2	LCS-8	95%
Zinc	mg/kg	1	Metals-020	<1	149101-3	70 80 RPD: 13	LCS-8	99%
QUALITYCONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Misc Soil - Inorg						Base II Duplicate II %RPD		
Date prepared	-			28/06/2016	[NT]	[NT]	LCS-1	28/06/2016
Date analysed	-			28/06/2016	[NT]	[NT]	LCS-1	28/06/2016
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	[NT]	[NT]	LCS-1	105%

Report Comments:

PAH_S: The RPD for duplicate results is accepted due to the non homogenous nature of the sample/s.

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.

Note: Samples 149101-4 to 9 were sub-sampled from jars provided by the client.

Asbestos ID was analysed by Approved Identifier: Paul Ching

Asbestos ID was authorised by Approved Signatory: Paul Ching

INS: Insufficient sample for this test

NR: 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.

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Project Name: Mosman - Congo..... To: EnviroLab Services
Project No: 85538.01..... Sampler: ...AT/JMS.....
Project Mgr: NLE..... Mob. Phone: 0414 769 011.....
Email: nerilee.edwards@douglaspartners.com.au.....
Date Required: STD; ESdat Format..... Lab Quote No.
Phone: (02) 9910 6200 Fax: (02) 9910 6201
Email: tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Sampling Date	Sample Type S - soil W - water	Container type G - glass P - plastic	Analytes								Notes/preservation		
					Combo 8a	Combo 8	Combo 3a	Combo 3	HM8	PAH	Asbestos (material)	PH, CEC, Fe, TOC		BTEX	
TB1	1		S	G									✓		EnviroLab Services 12 Ashley St Chatswood NSW 2067 Ph: (02) 9948 6200 149101
TS1	2		S	G									✓		
C07/0.8	3	17/6				✓									
C10/0.5	4	22/6			✓										
C22/0.1-0.2	5						✓								
C23/0.1-0.2	6						✓								
C24/0.5-0.55	7				✓										
C25/0.1-0.15	8						✓								
C26/0.5-0.6	9						✓								
															Date Received: 27/06/16 Time Received: 14:30 Received by: D.F. Temp: Cool/Ambient Cooling: Ice/Icepack Security: Intact/Broken/None

Lab Report No.
Send Results to: Douglas Partners Address: 96 Hermitage Road West Ryde NSW 2114
Relinquished by: Signed: Date & Time:
Received By: Daniel Ford-GMS Date & Time: 27/06/16
Transported to laboratory by: Hunter Express

SAMPLE RECEIPT ADVICE

Client Details	
Client	Douglas Partners Pty Ltd
Attention	Nerilee Edwards

Sample Login Details	
Your Reference	85538.01, Mosman Congo
Envirolab Reference	149101
Date Sample Received	27/06/2016
Date Instructions Received	27/06/2016
Date Results Expected to be Reported	04/07/2016

Sample Condition	
Samples received in appropriate condition for analysis	YES
No. of Samples Provided	9 soils
Turnaround Time Requested	Standard
Temperature on receipt (°C)	7.6
Cooling Method	None
Sampling Date Provided	YES

Comments
Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	Phone: 02 9910 6200
Fax: 02 9910 6201	Fax: 02 9910 6201
Email: ahie@envirolabservices.com.au	Email: jhurst@envirolabservices.com.au

Sample and Testing Details on following page

<i>Sample Id</i>	<i>vTRH(C6- C10)/BTEXN in Soil</i>	<i>svTRH (C10-C40) in Soil</i>	<i>PAHs in Soil</i>	<i>Organochlorine Pesticides in soil</i>	<i>Organophosphorus Pesticides</i>	<i>PCBs in Soil</i>	<i>Acid Extractable metals in soil</i>	<i>Asbestos ID - soils</i>	<i>Total Phenolics (as Phenol)</i>
TB1	✓								
TS1	✓								
C07-0.8	✓	✓	✓	✓	✓	✓	✓		✓
C10-0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓
C22-0.1-0.2	✓	✓	✓				✓	✓	
C23-0.1-0.2	✓	✓	✓				✓	✓	
C24-0.5-0.55	✓	✓	✓	✓	✓	✓	✓	✓	✓
C25-0.1-0.13	✓	✓	✓				✓	✓	
C26-0.5-0.6	✓	✓	✓				✓	✓	

Douglas Partners (Syd)
96 Hermitage Road
West Ryde
NSW 2114



Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or
measurements included in this document are traceable
to Australian/national standards.

Attention: **Nerilee Edwards**

Report **505216-S**
Project name MOSMAN-CONGO
Project ID 85538.01
Received Date Jun 21, 2016

Client Sample ID			BD4/170616
Sample Matrix			Soil
Eurofins mgt Sample No.			S16-Jn19729
Date Sampled			Jun 17, 2016
Test/Reference	LOR	Unit	
Polycyclic Aromatic Hydrocarbons			
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2
Acenaphthene	0.5	mg/kg	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5
Anthracene	0.5	mg/kg	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	< 0.5
Benzo(g,h,i)perylene	0.5	mg/kg	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5
Chrysene	0.5	mg/kg	< 0.5
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5
Fluorene	0.5	mg/kg	< 0.5
Indeno(1,2,3-cd)pyrene	0.5	mg/kg	< 0.5
Naphthalene	0.5	mg/kg	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5
Pyrene	0.5	mg/kg	< 0.5
Total PAH*	0.5	mg/kg	< 0.5
2-Fluorobiphenyl (surr.)	1	%	100
p-Terphenyl-d14 (surr.)	1	%	99
Heavy Metals			
Arsenic	2	mg/kg	2.1
Cadmium	0.4	mg/kg	< 0.4
Chromium	5	mg/kg	7.1
Copper	5	mg/kg	< 5
Lead	5	mg/kg	6.2
Mercury	0.05	mg/kg	< 0.05
Nickel	5	mg/kg	< 5
Zinc	5	mg/kg	11
% Moisture	1	%	18

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.

A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

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

Description	Testing Site	Extracted	Holding Time
Polycyclic Aromatic Hydrocarbons	Sydney	Jun 24, 2016	14 Day
- Method: E007 Polyaromatic Hydrocarbons (PAH)			
Metals M8	Sydney	Jun 23, 2016	28 Day
- Method: LTM-MET-3040_R0 TOTAL AND DISSOLVED METALS AND MERCURY IN WATERS BY ICP-MS			
% Moisture	Sydney	Jun 22, 2016	14 Day
- Method: LTM-GEN-7080 Moisture			

Company Name: Douglas Partners (Syd)
Address: 96 Hermitage Road
West Ryde
NSW 2114
Project Name: MOSMAN-CONGO
Project ID: 85538.01

Order No.:
Report #: 505216
Phone: 02 9809 0666
Fax:

Received: Jun 21, 2016 1:30 PM
Due: Jun 28, 2016
Priority: 5 Day
Contact Name: Nerilee Edwards

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Polycyclic Aromatic Hydrocarbons	Metals M8	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
External Laboratory								
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID			
1	BD4/170616	Jun 17, 2016		Soil	S16-Jn19729	X	X	X
Test Counts						1	1	1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

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

Units

mg/kg: milligrams per Kilogram

mg/l: milligrams per litre

ug/l: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100ml: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

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

Terms

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

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs 20-130%

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g,h,i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a,h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.05			0.05	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	113			70-130	Pass	
Acenaphthylene	%	119			70-130	Pass	
Anthracene	%	115			70-130	Pass	
Benz(a)anthracene	%	110			70-130	Pass	
Benzo(a)pyrene	%	109			70-130	Pass	
Benzo(b&j)fluoranthene	%	112			70-130	Pass	
Benzo(g,h,i)perylene	%	103			70-130	Pass	
Benzo(k)fluoranthene	%	121			70-130	Pass	
Chrysene	%	116			70-130	Pass	
Dibenz(a,h)anthracene	%	102			70-130	Pass	
Fluoranthene	%	113			70-130	Pass	
Fluorene	%	111			70-130	Pass	
Indeno(1,2,3-cd)pyrene	%	104			70-130	Pass	
Naphthalene	%	116			70-130	Pass	
Phenanthrene	%	110			70-130	Pass	
Pyrene	%	110			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	90			70-130	Pass	
Cadmium	%	99			70-130	Pass	
Chromium	%	91			70-130	Pass	
Copper	%	92			70-130	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Lead			%	99			70-130	Pass	
Mercury			%	101			70-130	Pass	
Nickel			%	92			70-130	Pass	
Zinc			%	94			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	S16-Jn20241	NCP	%	107			70-130	Pass	
Acenaphthylene	S16-Jn20241	NCP	%	115			70-130	Pass	
Anthracene	S16-Jn20241	NCP	%	109			70-130	Pass	
Benz(a)anthracene	S16-Jn20241	NCP	%	103			70-130	Pass	
Benzo(a)pyrene	S16-Jn20241	NCP	%	108			70-130	Pass	
Benzo(b&j)fluoranthene	S16-Jn20241	NCP	%	116			70-130	Pass	
Benzo(g,h,i)perylene	S16-Jn20241	NCP	%	113			70-130	Pass	
Benzo(k)fluoranthene	S16-Jn20241	NCP	%	115			70-130	Pass	
Chrysene	S16-Jn20241	NCP	%	111			70-130	Pass	
Dibenz(a,h)anthracene	S16-Jn20241	NCP	%	106			70-130	Pass	
Fluoranthene	S16-Jn20241	NCP	%	107			70-130	Pass	
Fluorene	S16-Jn20241	NCP	%	107			70-130	Pass	
Indeno(1,2,3-cd)pyrene	S16-Jn20241	NCP	%	111			70-130	Pass	
Naphthalene	S16-Jn20241	NCP	%	111			70-130	Pass	
Phenanthrene	S16-Jn20241	NCP	%	105			70-130	Pass	
Pyrene	S16-Jn20241	NCP	%	102			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S16-Jn21771	NCP	%	87			70-130	Pass	
Cadmium	S16-Jn21771	NCP	%	108			70-130	Pass	
Chromium	S16-Jn21771	NCP	%	90			70-130	Pass	
Copper	S16-Jn21771	NCP	%	85			70-130	Pass	
Lead	S16-Jn21771	NCP	%	93			70-130	Pass	
Mercury	S16-Jn21771	NCP	%	108			70-130	Pass	
Nickel	S16-Jn21771	NCP	%	95			70-130	Pass	
Zinc	S16-Jn21771	NCP	%	91			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	S16-Jn19217	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	S16-Jn19217	NCP	mg/kg	0.9	0.7	22	30%	Pass	
Anthracene	S16-Jn19217	NCP	mg/kg	1.4	1.1	22	30%	Pass	
Benz(a)anthracene	S16-Jn19217	NCP	mg/kg	3.9	2.8	32	30%	Fail	Q15
Benzo(a)pyrene	S16-Jn19217	NCP	mg/kg	3.6	3.1	16	30%	Pass	
Benzo(b&j)fluoranthene	S16-Jn19217	NCP	mg/kg	3.9	2.9	28	30%	Pass	
Benzo(g,h,i)perylene	S16-Jn19217	NCP	mg/kg	2.2	1.9	13	30%	Pass	
Benzo(k)fluoranthene	S16-Jn19217	NCP	mg/kg	3.0	2.6	15	30%	Pass	
Chrysene	S16-Jn19217	NCP	mg/kg	3.4	2.9	15	30%	Pass	
Dibenz(a,h)anthracene	S16-Jn19217	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	S16-Jn19217	NCP	mg/kg	6.9	5.4	25	30%	Pass	
Fluorene	S16-Jn19217	NCP	mg/kg	0.7	0.6	10	30%	Pass	
Indeno(1,2,3-cd)pyrene	S16-Jn19217	NCP	mg/kg	1.8	1.5	13	30%	Pass	
Naphthalene	S16-Jn19217	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	S16-Jn19217	NCP	mg/kg	4.4	3.5	22	30%	Pass	
Pyrene	S16-Jn19217	NCP	mg/kg	7.0	5.5	25	30%	Pass	

Duplicate								
Heavy Metals				Result 1	Result 2	RPD		
Arsenic	S16-Jn21074	NCP	mg/kg	2.1	2.3	5.0	30%	Pass
Cadmium	S16-Jn21074	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass
Chromium	S16-Jn21074	NCP	mg/kg	46	53	15	30%	Pass
Copper	S16-Jn21074	NCP	mg/kg	34	35	4.0	30%	Pass
Lead	S16-Jn21074	NCP	mg/kg	65	78	18	30%	Pass
Mercury	S16-Jn21074	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Nickel	S16-Jn21074	NCP	mg/kg	89	89	<1	30%	Pass
Zinc	S16-Jn21074	NCP	mg/kg	89	110	21	30%	Pass
Duplicate								
				Result 1	Result 2	RPD		
% Moisture	S16-Jn19729	CP	%	18	18	<1	30%	Pass

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q15	The RPD reported passes Eurofins mgt's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised By

Nibha Vaidya	Analytical Services Manager
Bob Symons	Senior Analyst-Inorganic (NSW)
Ivan Taylor	Senior Analyst-Metal (NSW)
Ryan Hamilton	Senior Analyst-Organic (NSW)



Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please [click here](#).

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Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Polycyclic Aromatic Hydrocarbons	Metals M8	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
External Laboratory								
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID			
1	BD4/170616	Jun 17, 2016		Soil	S16-Jn19729	X	X	X
Test Counts						1	1	1

Sample Receipt Advice

Company name: **Douglas Partners (Syd)**
Contact name: **Nerilee Edwards**
Project name: **MOSMAN-CONGO**
Project ID: **85538.01**
COC number: **Not provided**
Turn around time: **5 Day**
Date/Time received: **Jun 21, 2016 1:30 PM**
Eurofins | mgt reference: **505216**

Sample information

- ☒ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ☒ All samples have been received as described on the above COC.
- ☒ COC has been completed correctly.
- ☒ Attempt to chill was evident.
- ☒ Appropriately preserved sample containers have been used.
- ☒ All samples were received in good condition.
- ☒ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ☒ Appropriate sample containers have been used.
- ☒ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Nibha Vaidya on Phone : +61 (2) 9900 8400 or by e.mail: NibhaVaidya@eurofins.com

Results will be delivered electronically via e.mail to Nerilee Edwards - nerilee.edwards@douglaspartners.com.au.

Project Name: Mosman - Congo
Project No: 85538.01..... Sampler: ...MH/AT.....
Project Mgr: NLE..... Mob. Phone: 0414 769 011
Email: nerilee.edwards@douglaspartners.com.au
Date Required: STD; ESdat Format..... Lab Quote No.

To: Eurofins | mgt
Unit F6, Building F, 16 Mars Road,
Lane Cove West NSW 2066
Attn: Jean Heng
Phone: (02) 8215 6222
Email: JeanHeng@eurofins.com.au

505216

Sample ID	Lab ID	Sampling Date	Sample Type S - soil W - water	Container type G - glass P - plastic	Analytes									Notes/preservation
					HM8	As Cd Cr Pb Hg Ni	TRH/ BTEX MTBE	PAH	phenol/ OCP/OPP PCB	VOC	asbestos	pH		
8D4/170616		17/6	S	G	✓			✓						

Lab Report No.

Phone: (02) 4271 1836

Send Results to: Douglas Partners Address: 96 Hermitage Road West Ryde NSW 2114

Fax: (02) 4271 1897

Relinquished by: *Melinda*

Signed: *[Signature]*

Date & Time: 21/6/16 13:30

Transported to laboratory by: Hunter Express

Received By: *SCOTT CARROLL* - Date & Time: 21/06/16 15:54

21 JUN 2016 15:54

Appendix G

Data Quality Assessment

DATA QUALITY ASSESSMENT

Q1. Data Quality Objectives

The Preliminary Site Investigation (PSI) was prepared with reference to the seven step data quality objective (DQO) process which is provided in Appendix B, Schedule B2 of the *National Environment Protection (Assessment of Site Contamination) Measure 1999* as amended 2013 (NEPC, 2013). The DQO process is outlined as follows:

- Stating the Problem;
- Identifying the Decision;
- Identifying Inputs to the Decision;
- Defining the Boundary of the Assessment;
- Developing a Decision Rule;
- Specifying Acceptable Limits on Decision Errors; and
- Optimising the Design for Obtaining Data.

The DQOs have been addressed within the report as shown in Table Q1.

Table Q1: Data Quality Objectives

Data Quality Objective	Report Section where Addressed
State the Problem	S1 Introduction
Identify the Decision	S11 Discussion S12 Conclusion and Recommendations
Identify Inputs to the Decision	S1 Introduction S3 Site Description S4 Regional Topography, Geology and Hydrogeology S5 Site History Assessment S6 Preliminary Conceptual Site Model S8 Site Assessment Criteria S9 Field Work Results S10 Laboratory Testing
Define the Boundary of the Assessment	S3 Site Description Drawing 1 - Appendix A
Develop a Decision Rule	S8 Site Assessment Criteria
Specify Acceptable Limits on Decision Errors	S7 Fieldwork Methods S8 Site Assessment Criteria QA/QC Procedures and Results – Sections Q2, Q3

Data Quality Objective	Report Section where Addressed
Optimise the Design for Obtaining Data	S2 Scope of Works S7 Field Work Methods QA/QC Procedures and Results – Sections Q2, Q3

Q2. FIELD AND LABORATORY QUALITY CONTROL

The field and laboratory quality control (QC) procedures and results are summarised in Tables Q2 and Q3. Reference should be made to the field work and analysis procedures in Section 7 and the laboratory results certificates in Appendix F for further details.

Table Q2: Field QC

Item	Frequency	Acceptance Criteria	Achievement
Intra-laboratory replicates	5% primary samples	RPD <30% inorganics), <50% (organics)	yes ¹
Inter-laboratory replicates	5% primary samples	RPD <30% inorganics), <50% (organics)	yes ²
Trip Spikes	1 per field batch	60-140% recovery	Yes ³
Trip Blanks	1 per field batch	<PQL/LOR	Yes ⁴

NOTES:

- 1 qualitative assessment of RPD results overall; refer Section Q2.1
- 2 qualitative assessment of RPD results overall; refer Section Q2.2
- 3 Sample TS1 (149101-2) BTEX recovery 97-99%
- 4 Sample TB1 (149101-1) BTEX concentration <PQL

Table Q3: Laboratory QC

Item	Frequency	Acceptance Criteria	Achievement
Analytical laboratories used		NATA accreditation	yes
Holding times		In accordance with NEPC (2013) which references various Australian and international standards	yes
Laboratory / Reagent Blanks	1 per lab batch	<PQL	yes
Laboratory duplicates	10% primary samples	Laboratory specific ¹	yes
Matrix Spikes	1 per lab batch	70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC, speciated phenols)	yes
Surrogate Spikes	organics by GC	70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC, speciated phenols)	yes
Control Samples	1 per lab batch	70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC, speciated phenols)	yes

NOTES:

- 1 ELS: <5xPQL – any RPD; >5xPQL – 0-50%RPD

Report 149101: PAH_S: The RPD for duplicate results exceeded criteria but was accepted due to the non homogenous nature of the sample.

Report 148866 No Comments

Report 148765: No comments

Report 148765A: No Comments

Eurofins: 30% any concentration. Report 505216-S – No Comments

In summary, the QC data is considered to be of sufficient quality to be acceptable for the assessment.

Q2.1 Intra-Laboratory Replicates

An intra-laboratory replicate was analysed as an internal check of the reproducibility within the primary laboratory Envirolab Services Pty Ltd (ELS) and as a measure of consistency of sampling techniques. The comparative results of analysis between original and intra-laboratory replicate samples are summarised in Table Q4.

Note that, where both samples are below LOR/PQL the difference and RPD has been given as zero. Where one sample is reported below LOR/PQL, but a concentration is reported for the other, the LOR/PQL value has been used for calculation of the RPD for the less than LOR/PQL sample.

Table Q4: Relative Percentage Difference Results – Intra-laboratory Replicates

Analyte	C08/1.6-1.7	BD3/170616	Difference	RPD
Moisture	17	17	0	0
Arsenic	<4	<4	0	0
Cadmium	<0.4	<0.4	0	0
Chromium (III+VI)	29	9	20	105
Copper	7	1	6	150
Lead	29	8	21	114
Mercury	<0.1	<0.1	0	0
Nickel	3	<1	2	100
Zinc	51	9	42	140
Acenaphthene	<0.1	<0.1	0	0
Acenaphthylene	<0.1	<0.1	0	0
Anthracene	0.2	<0.1	0.1	67
Benz(a)anthracene	3.1	<0.1	3	188
Benzo(a) pyrene	2.8	<0.05	2.75	193
Benzo(b)&(k)fluoranthene	4.3	<0.2	4.1	182

Analyte	C08/1.6-1.7	BD3/170616	Difference	RPD
Benzo(g,h,i)perylene	0.9	<0.1	0.8	160
Chrysene	2.5	<0.1	2.4	185
Dibenz(a,h)anthracene	0.3	<0.1	0.2	100
Fluoranthene	2.1	<0.1	2	182
Fluorene	<0.1	<0.1	0	0
Indeno(1,2,3-c,d)pyrene	1.1	<0.1	1	167
Naphthalene	<0.1	<0.1	0	0
Phenanthrene	0.8	<0.1	0.7	156
Pyrene	2.6	<0.1	2.5	185

The calculated RPD values exceeded the acceptance criteria of ± 30 for inorganic analytes and $\pm 50\%$ for organics for analytes indicated by shading. However, this is not considered to be significant because: The replicate pair being collected from fill soils which were heterogeneous in nature;

- Soil replicates, rather than homogenised soil duplicates, were used to minimise the risk of possible volatile loss, hence greater variability can be expected;
- Most of the recorded concentrations being relatively close to the LOR/PQL. High RPD values reflect the low concentrations; and
- All other QA/QC parameters met the DQIs.

Overall, the intra-laboratory replicate comparisons indicate that the sampling techniques were generally consistent and repeatable.

Q2.1.1 Inter-Laboratory Analysis

An inter-laboratory replicate was conducted as a check of the reproducibility of results between the primary laboratory ELS and the secondary laboratory Eurofins and as a measure of consistency of sampling techniques.

The comparative results of analysis between original and inter-laboratory replicate samples are summarised in Table Q5.

Note that, where both samples are below LOR/PQL the difference and RPD has been given as zero. Where one sample is reported below LOR/PQL, but a concentration is reported for the other, the LOR/PQL value has been used for calculation of the RPD for the less than LOR/PQL sample.

Table Q5: Relative Percentage Difference Results – Inter-laboratory Replicates

Analyte	C08/1.6-1.7	BD4/170616	Difference	RPD
Moisture	17	18	1	6
Arsenic	<4	2.1	0	0
Cadmium	<0.4	<0.4	0	0
Chromium (III+VI)	29	7.1	21.9	121
Copper	7	<5	2	33
Lead	29	6.2	22.8	130
Mercury	<0.1	<0.05	0	0
Nickel	3	<5	0	0
Zinc	51	11	40	129
Acenaphthene	<0.1	<0.5	0	0
Acenaphthylene	<0.1	<0.5	0	0
Anthracene	0.2	<0.5	0	0
Benz(a)anthracene	3.1	<0.5	2.6	144
Benzo(a) pyrene	2.8	<0.5	2.3	139
Benzo(g,h,i)perylene	0.9	<0.5	0.4	57
Chrysene	2.5	<0.5	2	133
Dibenz(a,h)anthracene	0.3	<0.5	0	0
Fluoranthene	2.1	<0.5	1.6	123
Fluorene	<0.1	<0.5	0	0
Indeno(1,2,3-c,d)pyrene	1.1	<0.5	0.6	75
Naphthalene	<0.1	<0.5	0	0
Phenanthrene	0.8	<0.5	0.3	46
Pyrene	2.6	<0.5	2.1	135

The calculated RPD values exceeded the acceptance criteria of ± 30 for inorganic analytes and $\pm 50\%$ for organics for analytes indicated by shading. However, this is not considered to be significant because:

- The replicate pair being collected from fill soils which were heterogeneous in nature;
- Soil replicates, rather than homogenised duplicates, were used to minimise the risk of volatile loss, hence greater variability can be expected;
- Most of the recorded concentrations being relatively close to the LOR/PQL. High RPD values reflect the low concentrations; and
- All other QA/QC parameters met the DQIs.

The overall inter-laboratory replicate comparisons indicate that the sampling technique was generally consistent and repeatable and the two laboratory sampling handling and analytical methods are comparable.

Q3. Data Quality Indicators

The reliability of field procedures and analytical results was assessed against the following data quality indicators (DQIs):

- Completeness – a measure of the amount of usable data from a data collection activity;
- Comparability – the confidence (qualitative) that data may be considered to be equivalent for each sampling and analytical event;
- Representativeness – the confidence (qualitative) of data representativeness of media present on-site;
- Precision – a measure of variability or reproducibility of data; and
- Accuracy – a measure of closeness of the data to the 'true' value.

The DQIs were assessed as outlined in the following Table Q6.

Table Q6: Data Quality Indicators

Data Quality Indicator	Method(s) of Achievement
Completeness	Planned systematic and selected target locations sampled; Preparation of field logs, sample location plan and chain of custody (COC) records; Laboratory sample receipt information received confirming receipt of samples intact and appropriateness of the chain of custody; Samples analysed for contaminants of potential concern (COPC) identified in the Conceptual Site Model (CSM); Completion of COC documentation; NATA endorsed laboratory certificates provided by the laboratory; Satisfactory frequency and results for field and laboratory QC samples as discussed in Section Q2.
Comparability	Using appropriate techniques for sample recovery, storage and transportation, which were the same for the duration of the project; Works undertaken by appropriately experienced and trained DP environmental scientist / engineer; Use of NATA registered laboratories, with test methods the same or similar between laboratories; Satisfactory results for field and laboratory QC samples.

Data Quality Indicator	Method(s) of Achievement
Representativeness	Target media sampled; Spatial distribution of sample locations; Sample numbers recovered and analysed are considered to be representative of the target media and complying with DQOs; Samples were extracted and analysed within holding times; Samples were analysed in accordance with the analysis request.
Precision	Acceptable RPD between original samples and replicates; Satisfactory results for all other field and laboratory QC samples.
Accuracy	Satisfactory results for all field and laboratory QC samples.

Based on the above, it is considered that the DQIs have been complied with. As such, it is concluded that the field and laboratory test data obtained are reliable and useable for this assessment.