7.5 Stage 2 Detailed Contamination Assessment prepared by Network Geotechnics

Report

Stage 2 Detailed Contamination Assessment
Proposed Re-Zoning of Public Land to Residential Subdivision, Iluka Reserve, Kiama Downs, NSW

Prepared for:

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Executive Summary

SET Consultants commissioned Network Geotechnics Pty Ltd (NG) on behalf of Kiama Municipal Council to carry out a Stage 2 Contamination Assessment in accordance with the Planning Guidelines SEPP 55 – Remediation of Land and Contamination Land Management Act 1997 for the northern portion of Iluka Reserve, Kiama Downs.

The Stage 2 Contamination Assessment is required as the Stage 1 Contamination Assessment with Limited Sampling (Report Reference G09/1967-Ar) undertaken by NG identified uncontrolled filling within the northern portion of Iluka Reserve. The objective of this investigation was to carry out a Stage 2 Contamination Assessment in order to assess whether uncontrolled fill at the subject site is contaminated.

The scope of work undertaken to achieve the objectives included:

- Design and implementation of a field sampling and laboratory testing program.
- Excavation of 16 test pits in the northern portion of Iluka Reserve in order to collect soil samples from the fill material.
- On site sieving of 10L soil samples collected from test pits for assessment of asbestos containing material (ACM) content.
- Analytical testing of:
  - 27 soil samples for heavy metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg)
  - 7 soil samples for Total Recoverable Hydrocarbon, Benzene Toluene, Ethyl Benzene and Xylene and Polynuclear Aromatic Hydrocarbon (TRH/BTEX/PAH)
  - 3 soil samples for phenols
  - 6 soil samples for Polychlorinated Biphenyls (PCBs)
  - 6 soil samples for Organochlorine and Organophosphate Pesticides (OC/OP)
  - 10 bucket samples sieved on site for asbestos content
  - 10 soil samples for gravimetric asbestos analysis
  - Preparation of a Stage 2 Detailed Contamination Assessment report in accordance with Planning Guidelines SEPP 55 – Remediation of Land and the Contamination Land Management Act 1998.

Based on the desk study, field investigation and laboratory tests the following conclusions are made:

- Based on the desk study it is evident that the subject site has been generally used as open parklands for the public since 1958 and was possibly used for farming purposes prior to 1958. From 1963 to present, the site has been open to the public with a children's playground located in the north east section of the site. The Coffey Geotechnics report found that the southern portion of Iluka Reserve had been extensively filled during the 1980s. This fill may have encroached on the northern portion of the site.
- Fill material was encountered in all test pits to variable depths between 0.2m and 1m. Fill material in TP7, TP15 and TP16 was found to contain pieces of concrete, bricks and fibreglass. No ACM, hydrocarbon odours or staining was observed in any fill material.
- The laboratory test results indicate that soils at the subject site contain concentrations of contaminants less than the relevant HILs/HSLs and ESLs. Three samples were found to exceed the EIL for copper or zinc but were

assessed to pose a low risk to ecological receptors due to the isolated nature and relatively low concentration of the contamination.

Based on the above, it is assessed that the subject site is suitable for the proposed re-zoning and residential subdivision from a contamination perspective.

In the unlikely event that contamination hotspots are uncovered during earthworks, an environmental consultant should be contacted in order to provide appropriate remediation options.

1.0 Introduction

SET Consultants commissioned Network Geotechnics Pty Ltd (NG) on behalf of Kiama Municipal Council to carry out a Stage 2 Contamination Assessment in accordance with the Planning Guidelines SEPP 55 – Remediation of Land and Contamination Land Management Act 1997 for the northern portion of Iluka Reserve, Kiama Downs.

The Stage 2 Contamination Assessment is required as the Stage 1 Contamination Assessment with Limited Sampling (Report Reference G09/1967-Ar) undertaken by NG identified uncontrolled filling within the northern portion of Iluka Reserve.

2.0 Scope of Work

The objective of this investigation was to carry out a Stage 2 Contamination Assessment in order to assess whether uncontrolled fill at the subject site is contaminated.

The scope of work undertaken to achieve the objectives included:

- Design and implementation of a field sampling and laboratory testing program.
- Excavation of 16 test pits in the northern portion of Iluka Reserve in order to collect soil samples from the fill material.
- On site sieving of 10L soil samples collected from test pits for assessment of asbestos containing material (ACM) content.
- Analytical testing of:
  - 27 soil samples for heavy metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg)
  - 7 soil samples for Total Recoverable Hydrocarbon, Benzene Toluene, Ethyl Benzene and Xylene and Polynuclear Aromatic Hydrocarbon (TRH/BTEX/PAH)
  - 3 soil samples for phenols
  - 6 soil samples for Polychlorinated Biphenyls (PCBs)
  - 6 soil samples for Organochlorine and Organophosphate Pesticides (OC/OP)
  - 10 bucket samples sieved on site for asbestos content
  - 10 soil samples for gravimetric asbestos analysis
  - Preparation of a Stage 2 Detailed Contamination Assessment report in accordance with Planning Guidelines SEPP 55 – Remediation of Land and the Contamination Land Management Act 1998.

3.0 Site Identification

The subject site is identified as the northern section of Iluka Reserve (Part Lot 34 in DP 28122 and Part Lot 243 in DP 30200). The site is located to the east of Riverside Drive. The site is bounded by:

- Lots 25-28 in DP28122, Lots 41-42 in DP30200 & Lots 31-33 in DP28122 to the north
- Lot 1 in DP509019 to the south
- Lots 45-48 in DP30200 to the east

The subject site is located in Kiama Municipal Council area in Parish of Kiama and County of Camden.

A plan of the site is included in Appendix B.

4.0 Stage 1 Contamination Assessment

The Stage 1 Contamination Assessment involved a review of title records, historical aerial photographs, a site walkover assessment and drilling of a limited number of boreholes. Based on the desk study, field investigation and laboratory tests the following conclusions were made:

- Based on aerial photographs and title records, the subject site has been generally used as open parklands for the public and possible farming from 1911 to 1958. Between years 1958 and 1963, the site has been generally vacant and owned by Central Coast Realty Pty Ltd. From 1963 to present, the site has been open to the public with a children's playground located in the north east section of the site. An old creek line and low lying sections to west and south west had been subject to filling for the development of a proposed residential subdivision.
- A previous report for the southern potion of Iluka Reserve by Coffey Geotechnics Pty Ltd in 2014 found that the southern portion had been extensively filled during the 1980s. The investigation found two locations with asbestos in the topsoil. The concentration of copper, zinc and benzo(a)pyrene was found to exceed the Ecological Investigation Levels (EILs) and Ecological Screening Levels (ESLs) in several samples from the fill material. It is possible that the filling of the southern portion of Iluka Reserve may have encroached on the northern portion which is subject to this investigation.
- Five boreholes were drilled in the subject site during the Stage 1 Contamination Assessment and fill material was encountered up to 1.2m deep.

Based on the findings of the Stage 1 investigation it was concluded that a Stage 2 contamination assessment be carried out in order to assess fill material encountered.

5.0 Site Condition & Surrounding Environment

5.1 Topography

The subject site is located east of Riverside Drive, Kiama Downs. The subject site comprises one break in slope, as observed from the centre of the site, with south facing slopes of 15^{o} over a span of about 7m transition to a gentle 5^{o} south east facing slopes.

5.2 Site Observations

During fieldwork for the Stage 1 Contamination Assessment carried out on 19 November 2015 and the Stage 2 Contamination Assessment carried out on 8 April 2016 it was observed that the site is generally covered with grass and scattered trees. There was a children's playground near the north eastern corner of the site.

Fill material was identified in all boreholes and test pits excavated during both investigations to a variable depth of 0.1m to 1.2m. The fill generally contained gravelly clay and gravelly silty sand. Some fill material was found to contain pieces of bricks and concrete.

5.3 Flood Potential

A flood study was not carried out for this investigation. The closest body of water is the Pacific Ocean located about 300m to the east of the subject site. Due to the elevation of the subject site it would be unlikely to flood.

5.4 Sensitive Environments

It is assumed that run off from the subject site would flow towards the ocean 300m to the east of the subject site. This sensitive environment has potential to be affected by on site contamination.

6.0 Geology & Hydrogeology

6.1 Geology

Geological maps for the area indicate the site to be underlain by Bumbo Latite Member 'P_{sgb}' comprising Aphanitic to Porphyritic Latite.

The subsurface profile encountered in the boreholes and test pits may be generalised as follows:

Table 1 Subsurface Profile Encountered

Layer/Description		Depth to Base of Layer (m)
FILL:	Gravelly Silty SAND, fine to medium grained, dark grey, some clay or Sandy Silty Clay, low to medium plasticity, dark grey	0.2 - 1.0
RESIDUAL:	CLAY, high plasticity, grey mottled brown or Sandy CLAY, medium to high plasticity, red brown	1.1 – >2.0

6.2 Groundwater

The NSW Office of Water groundwater map indicates that there are no groundwater bores within 500m of the subject site. The nearest bore (GW023121) is approximately 750m to the north of the subject site and is used for irrigation purposes. The standing water level was not provided.

Groundwater was not encountered during drilling in of the boreholes. However, the depth to groundwater may change with the variation of environmental factors.

7.0 Fieldwork

Fieldwork carried out on 8 April 2016 comprised excavating 16 test pits (TP1 to TP16) in the northern portion of Iluka Reserve using a backhoe with 600mm bucket. During the fieldwork soil samples were collected from the bucket of the excavator with a clean gloved hand. Samples were kept in a large insulated box with ice and transported to a NG laboratory for chain of custody preparation and dispatch to the laboratory.

Field investigation was carried out by an Environmental Scientist and Geotechnical Engineer from NG who selected test pit locations, carried out sampling and prepared test pit logs. Test pit locations are shown on the attached site plan in Appendix B and test pit logs are in Appendix C.

8.0 Sampling & Analysis Plan & Sampling Methodology

8.1 Sampling & Analysis Plan

The density of sampling in the subject site was determined in accordance with the NSW EPA Sampling Design Guidelines. Therefore, a total of 16 test pits with hotspots no greater than 23.8m in diameter were excavated for the site area of 6750m^2.

Table 2 summarises the location and contaminants tested for each sample.

Table 2 Samples Tested for Contaminants

Sample No.	Depth (m)	Location and Justification	Analytes Tested
TP1	0.0-0.1	Near western boundary of the site in fill material.	OC/OP
TP1	0.5-0.6	Near western boundary of the site in fill material.	Heavy metals
TP2	0.0-0.1	Near western boundary of the site in fill material.	TRH/BTEX/PAH, heavy metals
TP2	1.0-1.1	Near western boundary of the site in residual material.	Heavy metals
TP3	0.0-0.1	Near western boundary of the site in fill material.	Heavy metals, OC/OP
TP3	0.5-0.6	Near western boundary of the site in fill material.	TRH/BTEX/PAH, phenols, PCB
TP3	0.9-1.0	Near western boundary of the site in fill material.	Heavy metals
TP4	0.0-0.1	Near southern boundary of the site in fill material.	OC/OP
TP4	0.5-0.6	Near western boundary of the site in residual material.	Heavy metals
TP5	0.0-0.1	Near north-western boundary of the site in fill material.	TRH/BTEX/PAH, heavy metals, PCB
TP6	0.0-0.1	Near north-western boundary of the site in fill material.	Heavy metals
TP6	0.5-0.6	Near north-western boundary of the site in residual material.	Heavy metals

TP6	1.0-1.1	Near north-western boundary of the site in residual material.	Heavy metals
TP7	0.0-0.1	Near northern boundary of the site in fill material.	Heavy metals
TP7	1.0-1.1	Near north-western boundary of the site in residual material.	PCB
TP8	0.0-0.1	Near western boundary of the site in fill material.	Heavy metals, OC/OP
TP8	0.5-0.6	Near western boundary of the site in residual material.	Heavy metals
TP9	0.0-0.1	Near southern boundary of the site in fill material.	Heavy metals, phenols
TP9	1.0-1.1	Near southern boundary of the site in residual material.	Heavy metals
TP10	0.0-0.1	Near southern boundary of the site in fill material.	Heavy metals
TP10	0.5-0.6	Near southern boundary of the site in fill material.	Heavy metals
TP11	0.0-0.1	Near middle of the site in fill material.	Heavy metals
TP11	0.5-0.6	Near middle of the site in residual material.	Heavy metals
TP12	0.0-0.1	Near middle of the site in fill material.	TRH/BTEX/PAH, heavy metals, Phenols
TP12	1.0-1.1	Near middle of the site in residual material.	Heavy metals
TP13	0.0-0.1	Near southern boundary of the site in fill material.	Heavy metals, OC/OP
TP14	0.1	Near south-eastern corner of the site in fill material.	PCB
TP15	0.1	Near eastern boundary of the site in fill material.	Heavy metals
TP15	0.5-0.6	Near eastern boundary of the site in fill material.	PCB, phenols, TRH/BTEX/PAH
TP15	1.0	Near eastern boundary of the site in fill material.	Heavy metals
TP15	2.0	Near eastern boundary of the site in residual material.	Heavy metals, TRH/BTEX/PAH
TP16	0.0-0.1	Near north-eastern corner of the site in fill material.	TRH/BTEX/PAH, heavy metals
TP16	0.5-0.6	Near north-eastern corner of the site in fill material.	TRH/BTEX/PAH, heavy metals
TP109	0.0-0.1	Duplicate of sample TP9 0.0-0.1.	Heavy metals
TP115	2.0	Duplicate of sample TP15 2.0.	Heavy metals

Soil samples for contamination testing were collected from test pits and boreholes at regular depth intervals. Samples were collected from the excavator bucket using a clean gloved hand. All samples for TRH/BTEX/PAH, heavy metals, OC/OP, phenols and PCB testing were placed in glass jars with plastic caps and Teflon seals with minimum headspace. Each sample was labelled with job number, the sample location and date. All samples were screened for volatile

organic compounds (VOCs) using a photo ionisation detector (PID). Samples were recorded on the Chain of Custody (COC) record.

The method for the on-site sieving involved collecting a 10L bucket of soil from the excavator bucket at a particular depth. The buckets were then weighed and the soil sample sieved through a 6.75mm sieve. Fragments of suspected ACM retained in the sieve were hand picked and placed in a plastic bag for identification and weighing at a NATA accredited laboratory. A 500mL soil sample was also collected from the excavator bucket and placed in a sealed plastic bag.

On completion of fieldwork, the samples were delivered under cold storage conditions to a NATA registered laboratory for analysis under Standard COC procedures.

8.2 Data Quality Objectives

The seven step process for data quality objectives in this investigation included the following:

Step 1 Identify the Problem

- The site contamination was suspected based on the findings of the Stage 1 Contamination Assessment. Potential contamination was assessed to be contained to the fill material.
- The aim of the investigation was to assess the contamination in the fill material across the site which may affect human health and the environment.

Step 2 Identify the Decisions

- Assess whether any soil contamination on site poses a risk to site occupants under residential land use scenario and the protection of the environment, and;
- Assess any risk of contamination migration offsite as a result of surface water runoff.

Step 3 Identify Inputs

- Excavate an adequate number of test pits in areas identified as having a risk of contaminated soil.
- Visually assess all collected samples for site contamination such as odour, colour, presence of asbestos etc and screen samples for VOCs using a PID.
- Test a statistically significant number of samples to characterise the area to provide data on concentration of contaminants.

Step 4 Project Boundaries

- The project boundary for investigation was taken as the northern portion of Iluka Reserve as indicated in the site plan in Appendix B.
- Soil samples were collected at 0.5m depth intervals to about 2m depth or refusal on rock for test pits.

Step 5 Decision Rule

- Analytical methods and detection levels appropriate for contaminated site assessment approved by NSW EPA Guidelines will be used and testing will be carried out by SGS Environmental.
- The assessment criteria will be based upon the National Environmental Protection Measure 2013 Health Investigation Levels (HILs) and Health Screening Levels (HSLs) for residential use with garden/accessible soil and the Ecological Investigation Levels (EILs) and Ecological Screening Levels (ESLs) for urban residential and public open space. These criteria have been selected as the proposed development involves a residential subdivision.
- All parameters exceeding the action criteria are assessed as representing an area where further investigation is needed.

Step 6 Error Tolerances

- Limit of reporting adopted by SGS Environmental were assessed to be relevant. Error tolerances indicated in Laboratory Quality Control reports were adopted.
- A confidence level of 95% has been adopted for detailed investigation.
- The accuracy of test results will be tested using blind duplicate test results within the lab, and intra laboratory duplicate samples. Representativeness of the test results will be assessed based on the use of appropriate sample containers, holding times, laboratory duplicate test results and matrix recovery data.

Step 7 Optimise Sample Design

- Sample design was based on the need for a reliable data for assessment of site contamination. The horizontal and vertical spacing of sampling was based on expected contamination potential. Sample locations were selected to evenly cover the subject site.

9.0 Quality Assurance & Quality Control

9.1 Field Quality Assurance & Quality control

Field quality assurance objectives were designed based on Australian Standard AS4482 and comprised the following:

- Sample collection and dispatch to testing laboratory were carried out by experienced environmental/civil engineers appropriately trained for such tests.
- Chain of custody forms were used in dispatching samples.
- Containers, sampling packaging and holding times were checked prior to dispatch of samples and checked after samples were received by the laboratories.
- Testing of one trip blank and trip spike soil sample.

Trip blank results indicated that TRH/BTEX/PAH levels were below laboratory detection levels. Trip spike results for BTEX were between 77% and 95% recovery, which is within the acceptable criteria. Trip spike and blank results are presented in Appendix D certificate SE149178.

9.2 Laboratory Quality Assurance & Quality Control

Only NATA accredited laboratories were used for testing. Certificates of analysis and quality control records were reviewed for each batch of test results.

Specific elements that have been checked and assessed include the following:

- Preservation and storage of samples upon collection and during transport to the laboratory;
- Sample holding times;
- Use of appropriate analytical and field sampling procedures;
- Required limits of reporting;
- Frequency of conducting quality control measurements;
- Laboratory duplicate results;
- The occurrence of apparently unusual or anomalous results, e.g. laboratory results that appear to be inconsistent with field observations or measurements have been assessed.

Two field duplicate samples were tested during the Stage 2 investigation. The results are summarised below.

Table 3 Summary of results of duplicate samples

	Analyte (mg/kg)							
Sample ID	**Arsenic**	**Cadmium**	**Chromium**	**Copper**	**Lead**	**Mercury**	**Nickel**	**Zinc**
LOR	3	0.3	0.3	0.5	1	0.01	0.5	0.5
TP9 0.0-0.1	<3	0.7	20	24	20	0.04	3.1	32
TP109 0.0-0.1	<3	0.7	19	26	20	0.04	3.2	35
RPD (%)	**N/A**	**N/A**	**5%**	**8%**	**0%**	**N/A**	**N/A**	**9%**

Notes:

1. N/A indicates that sample results for analyte are not greater than 10 times the Limit of Reporting (LOR)

AS 4482.1-2005 *Guide to the Investigation and Sampling of Sites with Potentially Contaminated Soil- Non-volatile and Semi-volatile Compounds* states that the typical RPD which can be expected from acceptable field duplicates is < ± 30-50% of the mean concentration of the analyte, where the results are greater than ten times the limit of reporting. All of the duplicate sample results were within these criteria.

On the basis of the analytical data validation procedures employed, the overall quality of the analytical data produced is considered to be of an acceptable standard for interpretive use.

10.0 Assessment Criteria

10.1 Soil

The assessment of potentially contaminated land involves the evaluation of potential human health hazards and environmental impacts. The receptors (or potential receptors) of concern may be within the site being assessed, or outside the site boundaries due to potential off-site migration of contaminants.

The following assessment criteria were used for assessment of the site soils:

- The Health Investigation Levels (HIL) and Health Screening Levels (HSL) summarised in the following Table 4 to 6, which are extracted from Schedule B1 of the NEPM Guidelines May 2013 are used for assessing the risk to human health.

- The Ecological Investigation Levels (EIL) and Ecological Screening Levels (ESL) summarised in the following Table 7 and 9 from Schedule B1 of the NEPM Guidelines May 2013 are used for assessing the risk to the environment.

Table 4 Health Investigation Levels for soil contaminants (mg/kg)

Chemical	Health-based investigation levels (mg/kg) Residential[1] A
Metals and Inorganics	
Arsenic[2]	100
Cadmium	20
Chromium (VI)	100
Copper	6000
Lead[3]	300
Mercury (inorganic)[5]	40
Methyl mercury[4]	10
Nickel	400
Zinc	7400

Polycyclic Aromatic Hydrocarbons (PAHs)	
Carcinogenic PAHs (as BaP TEQ)[6]	3
Total PAHs[7]	300

Organochlorine Pesticides	
DDT+DDE+DDD	240
Aldrin and dieldrin	6
Chlordane	50
Endosulfan	270
Endrin	10
Heptachlor	6
HCB	10
Methoxychlor	300
Mirex	10
Toxaphene	20
Other Pesticides	
Atrazine	320
Chlorpyrifos	160
Bifenthrin	600

Table 5 Soil HSLs for vapour intrusion (mg/kg)

	HSL A & HSL B Low – high density residential				
CHEMICAL	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4m**	**4 m+**	**Soil saturation concentration (Csat)**
SAND					
Toluene	160	220	310	540	560
Ethylbenzene	55	NL	NL	NL	64
Xylenes	40	60	95	170	300
Naphthalene	3	NL	NL	NL	9
Benzene	0.5	0.5	0.5	0.5	360
F1	45	70	110	200	950
F2	110	240	440	NL	560
SILT					
Toluene	390	NL	NL	NL	640
Ethylbenzene	NL	NL	NL	NL	69
Xylenes	95	210	NL	NL	330
Naphthalene	4	NL	NL	NL	10
Benzene	0.6	0.7	1	2	440
F1	40	65	100	190	910
F2	230	NL	NL	NL	570

	HSL A & HSL B Low – high density residential				
CLAY					
Toluene	480	NL	NL	NL	630
Ethylbenzene	NL	NL	NL	NL	68
Xylenes	110	310	NL	NL	330
Naphthalene	5	NL	NL	NL	10
Benzene	0.7	1	2	3	430
F1	50	90	150	290	850
F2	280	NL	NL	NL	560

Table 6 Health screening levels for asbestos contamination in soil

	Health Screening Level (w/w)
Form of asbestos	**Residential A**
Bonded ACM	0.01%
Friable asbestos (FA) and asbestos fines (AF)	0.001%
All forms of asbestos	No visible asbestos for surface soil

Table 7 ESLs for TRH Fractions F1 – F4, BTEX and Benzo(a)pyrene in Soil

CHEMICAL	Soil texture	ESLs (mg/kg dry soil)
		Urban residential and public open space
F1 C_6-C_{10}	*Coarse / Fine*	180*
F2 **>C_{10}-C_{16}**		120*
F3 **>C_{16}-C_{34}**	*Coarse*	300
	Fine	1300
F4 **>C_{34}-C_{40}**	*Coarse*	2800
	Fine	5600
Benzene	*Coarse*	50
	Fine	65
Toluene	*Coarse*	85
	Fine	105
Ethylbenzene	*Coarse*	70
	Fine	125
Xylenes	*Coarse*	105
	Fine	45
Benzo(a)pyrene	*Coarse*	0.7
	Fine	0.7

Table 8 EILs for contaminants in Soil

Chemical	Ecological investigation levels (mg/kg)		
	Urban residential/public open space	Added Contaminant Limit (ACL) (mg/kg)	Ambient Background Concentration (ABC) (mg/kg)
Metals and Inorganics			
Arsenic	100	100	<3
Chromium (III)	210	190	20
Copper	89	60	29
Lead	1115	1100	15
Nickel	33	30	3
Zinc	83	70	13
Naphthalene	170	170	-

Notes:

1. The EIL is calculated from summing the Added Contaminant Limit (ACL) and the Ambient Background Concentration (ABC).
2. The EIL is based on a pH of 4.5 and a CEC of 2.0 in accordance with SGS results (a copy of which has been attached).
3. The ABC has been calculated using the average of laboratory test results from samples from the residual material (TP2 1.0-1.1, TP4 0.5-0.6, TP6 0.5-0.6, TP6 1.0-1.1, TP8 0.5-0.6, TP9 1.0-1.1, TP11 0.5-0.6, TP12 1.0-1.1 and TP15 2.0). The samples used were from areas where contamination was not recorded in the overlying layers or nearby test pits.

The subject site is proposed for residential use. Consequently, the issues of concern for contamination within the site are considered to be the risk of harm to human health and environmental impacts.

The test results for soils will therefore be assessed against the available Health Investigation Levels (HIL) for Residential 'A' and Ecological Investigation Levels (EIL) for urban residential/public open space.

11.0 Results & Discussion

11.1 Visual Assessment of Soil Samples

Fill material was encountered in all test pits to variable depths between 0.2m and 1m. Fill material in TP7, TP15 and TP16 was found to contain pieces of concrete, bricks and fibreglass. No ACM, hydrocarbon odours or staining was observed in any fill material.

11.2 Analytical Test Results for Soil Samples

Tests were carried out on discrete soil samples collected mainly from the layer of fill material. The results of the Stage 2 investigation is discussed below:

11.2.1 Metals

The concentrations of heavy metals in soil were below the HIL and most were below the EIL in the samples tested. The results are summarised in Table 9.

Table 9 Summary of Metals in Soil Results

Client Sample ID	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
HIL	100	20	100	6000	300	40	400	7400
EIL	100	-	210	89	1115	-	33	83
TP1 0.5-0.6	<3	0.7	24	27	18	0.04	6	14
TP2 0-0.1	3	0.3	8.7	55	21	0.03	3	33
TP2 1.0-1.1	<3	0.5	20	34	18	0.03	4	10
TP3 0.0-0.1	<3	0.4	8.2	110	25	0.06	5	47
TP3 0.9-1.0	<3	0.4	6.9	82	19	0.03	5	34
TP4 0.5-0.6	<3	0.4	15	29	16	0.04	4	14
TP5 0.0-0.1	<3	0.8	15	28	23	0.09	3	35
TP6 0.0-0.1	<3	0.6	21	27	22	0.04	3	36
TP6 0.5-0.6	<3	0.5	22	18	11	0.02	3	10
TP6 1.0-1.1	<3	0.5	23	16	11	<0.01	3	9
TP7 0.0-0.1	<3	0.5	15	26	15	0.03	3	110
TP8 0.0-0.1	<3	0.6	20	21	15	0.04	3	14
TP8 0.5-0.6	<3	0.4	22	16	11	0.03	3	9
TP9 0.0-0.1	<3	0.7	20	24	20	0.04	3	32
TP9 1.0-1.1	<3	0.3	21	20	12	0.02	3	7
TP10 0.0-0.1	<3	0.5	16	23	18	0.04	2	27
TP10 0.5-0.6	<3	0.4	13	22	11	0.03	2	8
TP11 0.0-0.1	<3	0.6	17	21	17	0.04	2	26
TP11 0.5-0.6	<3	0.5	26	20	13	0.04	3	10
TP12 0.0-0.1	<3	0.4	15	32	16	0.03	2	32
TP12 1.0-1.1	<3	0.6	23	19	19	0.04	3	12
TP13 0.0-0.1	<3	0.4	12	56	43	0.05	3	72
TP15 0.1	<3	0.5	14	62	15	0.04	5	29
TP15 1.0	<3	0.7	16	68	16	0.04	5	27
TP15 2.0	<3	0.6	8.9	91	11	0.02	2	11
TP16 0.1	<3	0.5	15	36	15	0.03	3	28
TP16 0.5-0.6	<3	0.7	17	43	13	0.01	2	10

The 95% upper confidence limit (UCL) of the arithmetic average concentration indicates that the 95% UCL for the 27 samples tested for zinc is 34mg/kg, which is below the EIL of 83mg/kg.

Furthermore, the 95% UCL for the copper concentration is 46mg/kg, which is below the EIL of 89mg/kg. Therefore, it is assessed that the concentration of zinc and copper in these samples pose a low risk of harm to both on-site and off-site ecological receptors.

11.2.2 Polynuclear Aromatic Hydrocarbon

Seven samples were tested for PAH compounds. The results were below laboratory detection levels for all samples.

11.2.3 Total Recoverable Hydrocarbons & BTEX

Seven samples were tested for TRH/BTEX and all results were below laboratory detection levels.

11.2.4 OC/OP Pesticides

Four samples were tested for OC/OP and the results were below the laboratory detection levels.

11.2.5 Asbestos

Ten 500mL soil samples and ten 10L soil samples were tested for gravimetric quantification of asbestos in soil. All test results indicated no asbestos was detected.

12.0 Conclusions

Based on the desk study, field investigation and laboratory tests the following conclusions are made:

- Based on the desk study it is evident that the subject site has been generally used as open parklands for the public since 1958 and was possibly used for farming purposes prior to 1958. From 1963 to present, the site has been open to the public with a children's playground located in the north east section of the site. The Coffey Geotechnics report found that the southern portion of Iluka Reserve had been extensively filled during the 1980s. This fill may have encroached on the northern portion of the site.
- Fill material was encountered in all test pits to variable depths between 0.2m and 1m. Fill material in TP7, TP15 and TP16 was found to contain pieces of concrete, bricks and fibreglass. No ACM, hydrocarbon odours or staining was observed in any fill material.
- The laboratory test results indicate that soils at the subject site contain concentrations of contaminants less than the relevant HILs/HSLs and ESLs. Three samples were found to exceed the EIL for copper or zinc but were assessed to pose a low risk to ecological receptors due to the isolated nature and relatively low concentration of the contamination.

Based on the above, it is assessed that the subject site is suitable for the proposed re-zoning and residential subdivision from a contamination perspective.

Due to the presence of building material in the fill, the presence of asbestos cannot be completely ruled out. Therefore, we recommend that an Unexpected Finds Protocol (UFP) be prepared to manage any unexpected asbestos finds.

13.0 References

1. NSW EPA, 2013, National Environment Protection Measures (NEPM).
2. Contaminated Land Management Act 1997.
3. Planning Guidelines SEPP 55 – Remediation of Land.

14.0 Limitations

This report has been prepared for Kiama Municipal Council c/- SET Consultants in accordance with NG's proposal dated 2 March 2016 (Ref G09/2087r) under NG's Terms of Engagement.

The report is provided for the exclusive use of Kiama Municipal Council and SET Consultants for the specific development and purpose as described in the report. The report may not contain sufficient information for developments or purposes other than that described in the report.

The information in this report is considered accurate at the date of issue with regard to the current conditions of the site. The conclusions drawn in the report are based on interpolation between boreholes or test pits. Conditions can vary between test locations that cannot be explicitly defined or inferred by investigation.

The report, or sections of the report, should not be used as part of a specification for a project, without review and agreement by NG, as the report has been written as advice and opinion rather than instructions for construction.

The report must be read in conjunction with the attached Information Sheets and any other explanatory notes and should be kept in its entirety without separation of individual pages or sections. NG cannot be held responsible for interpretations or conclusions from review by others of this report or test data, which are not otherwise supported by an expressed statement, interpretation, outcome or conclusion stated in this report. In preparing the report NG has necessarily relied upon information provided by the client and/or their agents.

Network Geotechnics Pty Ltd

Appendix A

Information Sheets

General Notes About This Report

INTRODUCTION

These notes have been prepared by Network Geotechnics Pty Ltd (NG) to help our Clients interpret and understand the limitations of this report. Not all sections below are necessarily relevant to all reports.

SCOPE OF SERVICES

This report has been prepared in accordance with the scope of services set out in NG's proposal under NG's Terms of Engagement, or as otherwise agreed with the Client. The scope of work may have been limited by a range of factors including time, budget, access and/or site constraints.

RELIANCE ON INFORMATION PROVIDED

In preparing the report NG has necessarily relied upon information provided by the Client and/or their Agents. Such data may include surveys, analyses, designs, maps and plans. NG has not verified the accuracy or completeness of the data except as stated in this report.

GEOTECHNICAL AND ENVIRONMENTAL REPORTING

Geotechnical and environmental reporting relies on the interpretation of factual information based on judgment and opinion and is far less exact than other engineering or design disciplines.

Geotechnical and environmental reports are for a specific purpose, development and site as described in the report and may not contain sufficient information for other purposes, developments or sites (including adjacent sites) other than that described in the report.

SUBSURFACE CONDITIONS

Subsurface conditions can change with time and can vary between test locations. For example, the actual interface between the materials may be far more gradual or abrupt than indicated and contaminant presence may be affected by spatial and temporal patterns.

Therefore, actual conditions in areas not sampled may differ from those predicted since no subsurface investigation, no matter how comprehensive, can reveal all subsurface details and anomalies.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations can also affect subsurface conditions and thus the continuing adequacy of a geotechnical report. NG should be kept informed of any such events and should be retained to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

GROUNDWATER

Groundwater levels indicated on borehole and test pit logs are recorded at specific times. Depending on ground permeability, measured levels may or may not reflect actual levels if measured over a longer time period. Also, groundwater levels and seepage inflows may fluctuate with seasonal and environmental variations and construction activities.

INTERPRETATION OF DATA

Data obtained from nominated discrete locations, subsequent laboratory testing and empirical or external sources are interpreted by trained professionals in order to provide an opinion about overall site conditions, their likely impact with respect to the report purpose and recommended actions in accordance with any relevant industry standards, guidelines or procedures.

SOIL AND ROCK DESCRIPTIONS

Soil and rock descriptions are based on AS 1726 – 1993, using visual and tactile assessment except at discrete locations where field and / or laboratory tests have been carried out. Refer to the accompanying soil and rock terms sheet for further information.

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FURTHER ADVICE

NG would be pleased to further discuss how any of the above issues could affect a specific project. We would also be pleased to provide further advice or assistance including:

- Assessment of suitability of designs and construction techniques;
- Contract documentation and specification;
- Construction control testing (earthworks, pavement materials, concrete);
- Construction advice (foundation assessments, excavation support).

Abbreviations, Notes & Symbols

SUBSURFACE INVESTIGATION

METHOD

Borehole Logs		Excavation Logs	
AS#	Auger screwing (#-bit)	BH	Backhoe/excavator bucket
AD#	Auger drilling (#-bit)	NE	Natural exposure
B	Blank bit	HE	Hand excavation
V	V-bit	X	Existing excavation
T	TC-bit		
HA	Hand auger	**Cored Borehole Logs**	
R	Roller/tricone	NMLC	NMLC core drilling
W	Washbore	NQ/HQ	Wireline core drilling
AH	Air hammer		
AT	Air track		
LB	Light bore push tube		
MC	Macro core push tube		
DT	Dual core push tube		

SUPPORT

Borehole Logs		Excavation Logs	
C	Casing	S	Shoring
M	Mud	B	Benched

SAMPLING

B	Bulk sample
D	Disturbed sample
U#	Thin-walled tube sample (#mm diameter)
ES	Environmental sample
EW	Environmental water sample

FIELD TESTING

PP	Pocket penetrometer (kPa)
DCP	Dynamic cone penetrometer
PSP	Perth sand penetrometer
SPT	Standard penetration test
PBT	Plate bearing test
s_U	Vane shear strength peak/residual (kPa) and vane size (mm)
N*	SPT (blows per 300mm)
Nc	SPT with solid cone
R	Refusal

**denotes sample taken*

BOUNDARIES

——— Known

– – – – Probable

..... Possible

SOIL

MOISTURE CONDITION

D	Dry
M	Moist
W	Wet
Wp	Plastic Limit
Wl	Liquid Limit
MC	Moisture Content

CONSISTENCY		DENSITY INDEX	
VS	Very Soft	VL	Very Loose
S	Soft	L	Loose
F	Firm	MD	Medium Dense
St	Stiff	D	Dense
VSt	Very Stiff	VD	Very Dense
H	Hard		
Fb	Friable		

USCS SYMBOLS

GW	Well graded gravels and gravel-sand mixtures, little or no fines
GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
GM	Silty gravels, gravel-sand-silt mixtures
GC	Clayey gravels, gravel-sand-clay mixtures
SW	Well graded sands and gravelly sands, little or no fines
SP	Poorly graded sands and gravelly sands, little or no fines
SM	Silty sand, sand-silt mixtures
SC	Clayey sand, sand-clay mixtures
ML	Inorganic silts of low plasticity, very fine sands, rock flour, silty or clayey fine sands
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays
OL	Organic silts and organic silty clays of low plasticity
MH	Inorganic silts of high plasticity
CH	Inorganic clays of high plasticity
OH	Organic clays of medium to high plasticity
PT	Peat muck and other highly organic soils

ROCK

WEATHERING		STRENGTH	
RS	Residual Soil	EL	Extremely Low
XW	Extremely Weathered	VL	Very Low
HW	Highly Weathered	L	Low
MW	Moderately Weathered	M	Medium
DW*	Distinctly Weathered	H	High
SW	Slightly Weathered	VH	Very High
FR	Fresh	EH	Extremely High

**covers both HW & MW*

ROCK QUALITY DESIGNATION (%)

$$= \frac{\text{sum of intact core pieces} > 100\text{mm}}{\text{total length of section being evaluated}} \times 100$$

CORE RECOVERY (%)

$$= \frac{\text{core recovered}}{\text{core lIft}} \times 100$$

NATURAL FRACTURES

Type

JT	Joint
BP	Bedding plane
SM	Seam
FZ	Fractured zone
SZ	Shear zone
VN	Vein

Infill or Coating

Cn	Clean
St	Stained
Vn	Veneer
Co	Coating
Cl	Clay
Ca	Calcite
Fe	Iron oxide
Mi	Micaceous
Qz	Quartz

Shape

pl	Planar
cu	Curved
un	Undulose
st	Stepped
ir	Irregular

Roughness

pol	Polished
slk	Slickensided
smo	Smooth
rou	Rough

Soil & Rock Terms

SOIL

MOISTURE CONDITION

Term	Description
Dry	Looks and feels dry. Cohesive and cemented soils are hard, friable or powdery. Uncemented granular soils run freely through the hand.
Moist	Feels cool and darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.
Wet	As for moist, but with free water forming on hands when handled.

For cohesive soils, moisture content may also be described in relation to plastic limit (W_P) or liquid limit (W_L). [>> much greater than, > greater than, < less than, << much less than].

CONSISTENCY

Term	c_u (kPa)	Term	c_u (kPa)
Very Soft	< 12	Very Stiff	100 - 200
Soft	12 - 25	Hard	> 200
Firm	25 - 50	Friable	-
Stiff	50 - 100		

DENSITY INDEX

Term	I_D (%)	Term	I_D (%)
Very Loose	< 15	Dense	65 – 85
Loose	15 – 35	Very Dense	> 85
Medium Dense	35 – 65		

PARTICLE SIZE

Name	Subdivision	Size (mm)
Boulders		> 200
Cobbles		63 - 200
Gravel	coarse	20 - 63
	medium	6 - 20
	fine	2.36 - 6
Sand	coarse	0.6 - 2.36
	medium	0.2 - 0.6
	fine	0.075 - 0.2
Silt & Clay		< 0.075

MINOR COMPONENTS

Term	Proportion by Mass coarse grained	fine grained
Trace	≤ 5%	≤ 15%
Some	5 - 2%	15 - 30%

SOIL ZONING

Layers	Continuous exposures
Lenses	Discontinuous layers of lenticular shape
Pockets	Irregular inclusions of different material

SOIL CEMENTING

Weakly	Easily broken up by hand
Moderately	Effort is required to break up the soil by hand

SOIL STRUCTURE

Massive	Coherent, with any partings both vertically and horizontally spaced at greater than 100mm
Weak	Peds indistinct and barely observable on pit face. When disturbed approx. 30% consist of peds smaller than 100mm
Strong	Peds are quite distinct in undisturbed soil. When disturbed >60% consists of peds smaller than 100mm

ROCK

SEDIMENTARY ROCK TYPE DEFINITIONS

Rock Type	Definition (more than 50% of rock consists of….)
Conglomerate	… gravel sized (> 2mm) fragments
Sandstone	… sand sized (0.06 to 2mm) grains
Siltstone	… silt sized (<0.06mm) particles, rock is not laminated
Claystone	… clay, rock is not laminated
Shale	… silt or clay sized particles, rock is laminated

STRENGTH

Term	Is50 (MPa)	Term	Is50 (MPa)
Extremely Low	< 0.03	High	1 – 3
Very Low	0.03 – 0.1	Very High	3 – 10
Low	0.1 – 0.3	Extremely High	> 10
Medium	0.3 – 1		

WEATHERING

Term	Description
Residual Soil	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident
Extremely Weathered	Rock is weathered to such an extent that it has 'soil' properties, i.e. it either disintegrates or can be remoulded, in water. Fabric of original rock is still visible
Highly Weathered	Rock strength usually highly changed by weathering; rock may be highly discoloured
Moderately Weathered	Rock strength usually moderately changed by weathering; rock may be moderately discoloured
Distinctly Weathered	See 'Highly Weathered' or 'Moderately Weathered'
Slightly Weathered	Rock is slightly discoloured but shows little or no change of strength from fresh rock
Fresh	Rock shows no signs of decomposition or staining

NATURAL FRACTURES

Type	Description
Joint	A discontinuity or crack across which the rock has little or no tensile strength. May be open or closed
Bedding plane	Arrangement in layers of mineral grains of similar sizes or composition
Seam	Seam with deposited soil (infill), extremely weathered insitu rock (XW), or disoriented usually angular fragments of the host rock (crushed)
Shear zone	Zone with roughly parallel planar boundaries, of rock material intersected by closely spaced (generally < 50mm) joints and /or microscopic fracture (cleavage) planes
Vein	Intrusion of any shape dissimilar to the adjoining rock mass. Usually igneous

Shape	Description
Planar	Consistent orientation
Curved	Gradual change in orientation
Undulose	Wavy surface
Stepped	One or more well defined steps
Irregular	Many sharp changes in orientation

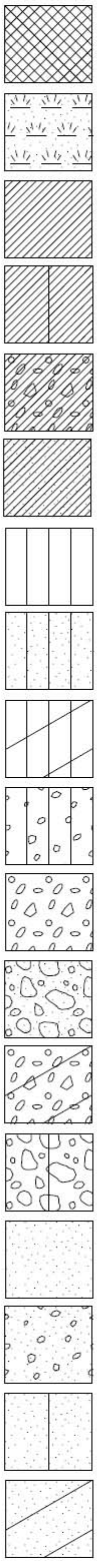
Infill or Coating	Description
Clean	No visible coating or discolouring
Stained	No visible coating but surfaces are discoloured
Veneer	A visible coating of soil or mineral, too thin to measure; may be patchy
Coating	Visible coating ≤ 1mm thick. Ticker soil material described as seam

Roughness	Description
Polished	Shiny smooth surface
Slickensided	Grooved or striated surface, usually polished
Smooth	Smooth to touch. Few or no surface irregularities
Rough	Many small surface irregularities (amplitude generally < 1mm). Feels like fine to coarse sandpaper

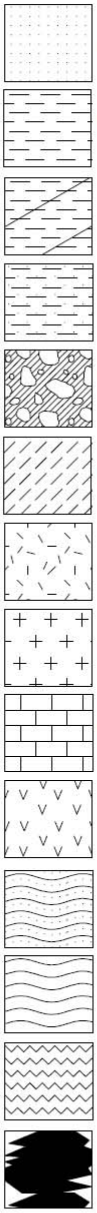
Note: soil and rock descriptions are generally in accordance with AS1726-1993 Geotechnical Site Investigations

Graphic Symbols Index

Soil



Rock

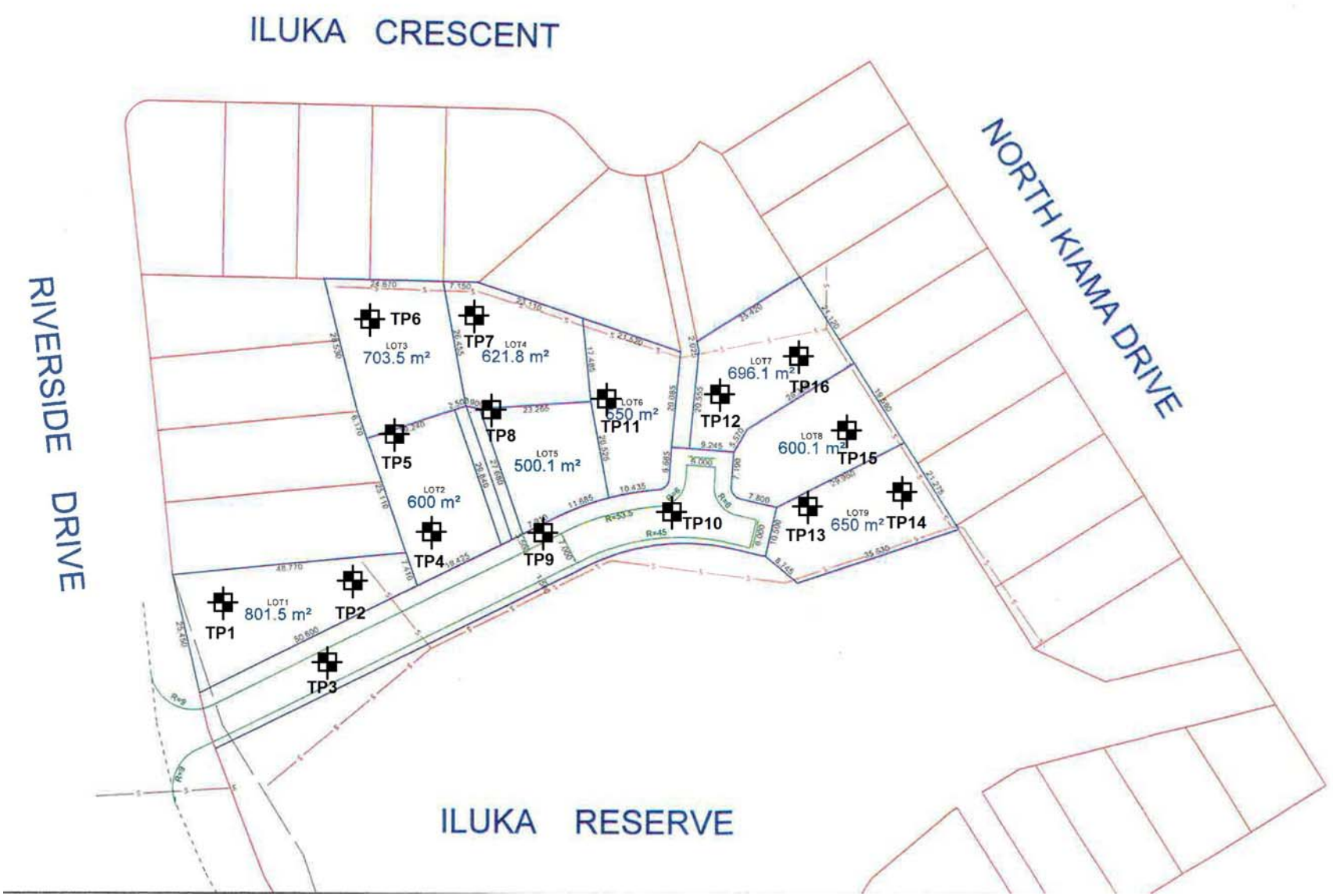


Other

Water Measurements

Appendix B

Site Plan



	LEGEND:		Scale: A4 - NOT TO SCALE	Client: KIAMA MUNICIPAL COUNCIL C/- SET CONSULTANTS
⌖	APPROXIMATE TEST PIT LOCATIONS	Network Geotechnics Pty Ltd *12/9-15 Gundah Road,* *MT KURING-GAI NSW 2080* *Tel: (02) 8438 0300* *Fax: (02) 8438 0310* *Email: engineering@netgeo.com.au*	Date: 20/4/16	Project: PROPOSED RE-ZONING OF PUBLIC LAND TO RESIDENTIAL SUBDIVISION
			Drawing: TPR	Location: ILUKA RESERVE, KIAMA DOWNS
			Drawing No: G09/2087-1	Sheet: 1 of 1 — **SITE PLAN**

Appendix C

Test Pit Logs

Network Geotechnics Pty Ltd

ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

TEST PIT LOG

Job No:	G09/2087
Hole No:	**TP01**
Sheet:	PAGE 1 / 1
Started:	08/04/16
Finished:	08/04/16
Logged:	TPR
Checked:	VDS
RL Surface:	-
Datum:	-

Client: Set Consultants

Project: Proposed Re-Zoning of Public Land

Location: Iluka Reserve, Kiama Downs
GPS

Equipment Type: Backhoe

Bucket Size: 600mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
BH	None Encountered	D				SP	Gravelly Silty SAND fine to medium grained, dark grey, some clay	M		TOPSOIL/FILL
		D								
						CI/CH	CLAY medium to high plasticity, grey mottle orange			RESIDUAL
		D		1.0						
				2.0			TP01 Terminated at 1.5 m			

BOREHOLE LOG LOGS.GPJ NETWORK GEOTECHNICS PTY LTD.GDT 19/04/16

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

TEST PIT LOG

Network Geotechnics Pty Ltd
ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

Job No:	G09/2087
Hole No:	**TP02**
Sheet:	PAGE 1 / 1
Started:	08/04/16
Finished:	08/04/16
Logged:	TPR
Checked:	VDS
RL Surface:	-
Datum:	-

Client: Set Consultants

Project: Proposed Re-Zoning of Public Land

Location: Iluka Reserve, Kiama Downs
GPS

Equipment Type: Backhoe

Bucket Size: 600mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
BH	None Encountered	D				SP	Gravelly Silty SAND fine to medium grained, dark grey, some clay	M		TOPSOIL/FILL
		D								
						CI/CH	CLAY medium to high plasticity, grey mottled orange			RESIDUAL
		D		1.0						
				2.0			TP02 Terminated at 1.5 m			Refusal on rock @ 1.5m

BOREHOLE LOG LOGS.GPJ NETWORK GEOTECHNICS PTY LTD.GDT 19/04/16

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

TEST PIT LOG

Network Geotechnics Pty Ltd
ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

Job No:	G09/2087
Hole No:	**TP03**
Sheet:	PAGE 1 / 1
Started:	08/04/16
Finished:	08/04/16
Logged:	TPR
Checked:	VDS
RL Surface:	-
Datum:	-

Client: Set Consultants

Project: Proposed Re-Zoning of Public Land

Location: Iluka Reserve, Kiama Downs
GPS

Equipment Type: Backhoe

Bucket Size: 600mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
BH	None Encountered	D				SP	Gravelly Silty SAND fine to medium grained, dark grey, some clay, cobbles and boulders	M		TOPSOIL/FILL
		D								
		D		1.0						
							TP03 Terminated at 1 m			Refusal @ 1.0m on rock
				2.0						

BOREHOLE LOG LOGS.GPJ NETWORK GEOTECHNICS PTY LTD.GDT 19/04/16

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

TEST PIT LOG

Network Geotechnics Pty Ltd
ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

Job No:	G09/2087
Hole No:	**TP04**
Sheet:	PAGE 1 / 1
Started:	08/04/16
Finished:	08/04/16
Logged:	TPR
Checked:	VDS
RL Surface:	-
Datum:	-

Client: Set Consultants

Project: Proposed Re-Zoning of Public Land

Location: Iluka Reserve, Kiama Downs
GPS

Equipment Type: Backhoe

Bucket Size: 600mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
BH	None Encountered	D				SP	Gravelly Silty SAND fine to medium grained, dark grey, some clay	M		TOPSOIL/FILL
						CI/CH	CLAY medium to high plasticity, grey mottled orange			RESIDUAL
		D								
		D		1.0						
				2.0			TP04 Terminated at 1.8 m			Refusal @ 1.8m on rock

BOREHOLE LOG LOGS.GPJ NETWORK GEOTECHNICS PTY LTD.GDT 19/04/16

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

TEST PIT LOG

Network Geotechnics Pty Ltd
ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

Job No:	G09/2087
Hole No:	**TP05**
Sheet:	PAGE 1 / 1
Started:	08/04/16
Finished:	08/04/16
Logged:	TPR
Checked:	VDS
RL Surface:	-
Datum:	-

Client: Set Consultants

Project: Proposed Re-Zoning of Public Land

Location: Iluka Reserve, Kiama Downs
GPS

Equipment Type: Backhoe

Bucket Size: 600mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
BH	None Encountered	D				CL/CI	Sandy Silty CLAY low to medium plasticity, dark grey	M		TOPSOIL/FILL
						CI/CH	Sandy CLAY medium to high plasticity, red brown			RESIDUAL
		D								
				1.0						
		D								
							TP05 Terminated at 1.1 m			
				2.0						

BOREHOLE LOG LOGS.GPJ NETWORK GEOTECHNICS PTY LTD.GDT 19/04/16

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

TEST PIT LOG

Network Geotechnics Pty Ltd
ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

Job No:	G09/2087
Hole No:	**TP06**
Sheet:	PAGE 1 / 1
Started:	08/04/16
Finished:	08/04/16
Logged:	TPR
Checked:	VDS
RL Surface:	-
Datum:	-

Client: Set Consultants

Project: Proposed Re-Zoning of Public Land

Location: Iluka Reserve, Kiama Downs
GPS

Equipment Type: Backhoe

Bucket Size: 600mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
BH	None Encountered	D				CL/CI	Sandy Silty CLAY low to medium plasticity, dark grey	M		TOPSOIL/FILL
						CI/CH	Sandy CLAY medium to high plasticity, red brown			RESIDUAL
		D								
		D		1.0						
				2.0			TP06 Terminated at 1.1 m			

BOREHOLE LOG LOGS.GPJ NETWORK GEOTECHNICS PTY LTD.GDT 19/04/16

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

TEST PIT LOG

Network Geotechnics Pty Ltd
ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

Job No:	G09/2087
Hole No:	**TP07**
Sheet:	PAGE 1 / 1
Started:	08/04/16
Finished:	08/04/16
Logged:	TPR
Checked:	VDS
RL Surface:	-
Datum:	-

Client: Set Consultants

Project: Proposed Re-Zoning of Public Land

Location: Iluka Reserve, Kiama Downs
GPS

Equipment Type: Backhoe

Bucket Size: 600mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
BH	None Encountered	D				CL/CI	Sandy Silty CLAY low to medium plasticity, dark grey, some peices of bricks and concrete	M		TOPSOIL/FILL
						CI/CH	Sandy CLAY medium to high plasticity, red brown mottled grey			RESIDUAL
		D								
		D		1.0						
				2.0			TP07 Terminated at 1.1 m			

BOREHOLE LOG LOGS.GPJ NETWORK GEOTECHNICS PTY LTD.GDT 19/04/16

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

TEST PIT LOG

Network Geotechnics Pty Ltd
ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

Job No:	G09/2087
Hole No:	**TP08**
Sheet:	PAGE 1 / 1
Started:	08/04/16
Finished:	08/04/16
Logged:	TPR
Checked:	VDS
RL Surface:	-
Datum:	-

Client: Set Consultants

Project: Proposed Re-Zoning of Public Land

Location: Iluka Reserve, Kiama Downs
GPS

Equipment Type: Backhoe

Bucket Size: 600mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
BH	None Encountered	D				CL/CI	Sandy Silty CLAY low to medium plasticity, dark grey	M		TOPSOIL/FILL
						CI/CH	Sandy CLAY medium to high plasticity, red brown			REDISUAL
		D								
		D		1.0						
				2.0			TP08 Terminated at 1.1 m			

BOREHOLE LOG LOGS.GPJ NETWORK GEOTECHNICS PTY LTD.GDT 19/04/16

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

Network Geotechnics Pty Ltd

ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

TEST PIT LOG

Job No:	G09/2087
Hole No:	**TP09**
Sheet:	PAGE 1 / 1
Started:	08/04/16
Finished:	08/04/16
Logged:	TPR
Checked:	VDS
RL Surface:	-
Datum:	-

Client: Set Consultants

Project: Proposed Re-Zoning of Public Land

Location: Iluka Reserve, Kiama Downs
GPS

Equipment Type: Backhoe

Bucket Size: 600mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
BH	None Encountered	D				CL/CI	Sandy Silty CLAY low to medium plasticity, dark grey, some gravel	M		TOPSOIL/FILL
		D				CI/CH	Sandy CLAY medium to high plasticity, red brown			RESIDUAL
		D		1.0						
							TP09 Terminated at 1.1 m			
				2.0						

BOREHOLE LOG LOGS.GPJ NETWORK GEOTECHNICS PTY LTD.GDT 19/04/16

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

TEST PIT LOG

Network Geotechnics Pty Ltd
ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

Job No:	G09/2087
Hole No:	**TP10**
Sheet:	PAGE 1 / 1
Started:	08/04/16
Finished:	08/04/16
Logged:	TPR
Checked:	VDS
RL Surface:	-
Datum:	-

Client: Set Consultants

Project: Proposed Re-Zoning of Public Land

Location: Iluka Reserve, Kiama Downs
GPS

Equipment Type: Backhoe

Bucket Size: 600mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
BH	None Encountered	D				CL/CI	Sandy Silty CLAY low to medium plasticity, dark grey	M		TOPSOIL/FILL
		D								
				1.0		CI/CH	Sandy CLAY medium to high plasticity, red brown			RESIDUAL
		D								
							TP10 Terminated at 1.1 m			Refusal @ 1.1m on rock
				2.0						

BOREHOLE LOG LOGS.GPJ NETWORK GEOTECHNICS PTY LTD.GDT 19/04/16

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

TEST PIT LOG

Network Geotechnics Pty Ltd
ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

Job No:	G09/2087
Hole No:	**TP11**
Sheet:	PAGE 1 / 1
Started:	08/04/16
Finished:	08/04/16
Logged:	TPR
Checked:	VDS
RL Surface:	-
Datum:	-

Client: Set Consultants

Project: Proposed Re-Zoning of Public Land

Location: Iluka Reserve, Kiama Downs
GPS

Equipment Type: Backhoe

Bucket Size: 600mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
BH	None Encountered	D				CL/CI	Sandy Silty CLAY Low to medium plasticity, dark grey	M		TOPSOIL
						CI/CH	Sandy CLAY medium to high plasticity, red brown			RESIDUAL
		D								
		D		1.0						
				2.0			TP11 Terminated at 1.1 m			Refusal @ 1.1m on rock

BOREHOLE LOG LOGS.GPJ NETWORK GEOTECHNICS PTY LTD.GDT 19/04/16

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

TEST PIT LOG

Network Geotechnics Pty Ltd
ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

Job No:	G09/2087
Hole No:	**TP12**
Sheet:	PAGE 1 / 1
Started:	08/04/16
Finished:	08/04/16
Logged:	TPR
Checked:	VDS
RL Surface:	-
Datum:	-

Client: Set Consultants

Project: Proposed Re-Zoning of Public Land

Location: Iluka Reserve, Kiama Downs
GPS

Equipment Type: Backhoe

Bucket Size: 600mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
BH	None Encountered	D				CL/CI	Sandy Silty CLAY low to medium plasticity, dark grey	M		TOPSOIL
						CI/CH	Sandy CLAY medium to high plasticity, red brown			RESIDUAL
		D								
		D		1.0						
				2.0			TP12 Terminated at 1.1 m			Refusal @ 1.1m on rock

BOREHOLE LOG LOGS.GPJ NETWORK GEOTECHNICS PTY LTD.GDT 19/04/16

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

TEST PIT LOG

Network Geotechnics Pty Ltd
ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

Job No:	G09/2087
Hole No:	**TP13**
Sheet:	PAGE 1 / 1
Started:	08/04/16
Finished:	08/04/16
Logged:	TPR
Checked:	VDS
RL Surface:	-
Datum:	-

Client: Set Consultants

Project: Proposed Re-Zoning of Public Land

Location: Iluka Reserve, Kiama Downs
GPS

Equipment Type: Backhoe

Bucket Size: 600mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
BH	Encountered	D				CL/CI	Sandy Silty CLAY low to medium plasticity, dark grey	M		TOPSOIL/FILL
	None			1.0			TP13 Terminated at 0.2 m			Refusal on rock @ 0.2m
				2.0						

BOREHOLE LOG LOGS.GPJ NETWORK GEOTECHNICS PTY LTD.GDT 19/04/16

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

TEST PIT LOG

Network Geotechnics Pty Ltd
ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

Job No:	G09/2087
Hole No:	**TP14**
Sheet:	PAGE 1 / 1
Started:	08/04/16
Finished:	08/04/16
Logged:	TPR
Checked:	VDS
RL Surface:	-
Datum:	-

Client: Set Consultants

Project: Proposed Re-Zoning of Public Land

Location: Iluka Reserve, Kiama Downs
GPS

Equipment Type: Backhoe

Bucket Size: 600mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
BH	None Encountered	D				CL/CH	Sandy Silty CLAY low to medium plasticity, dark grey	M		TOPSOIL/FILL
				1.0			TP14 Terminated at 0.2 m			Refusal on rock @ 0.2m
				2.0						

BOREHOLE LOG LOGS.GPJ NETWORK GEOTECHNICS PTY LTD.GDT 19/04/16

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

Network Geotechnics Pty Ltd

ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

TEST PIT LOG

Job No:	G09/2087
Hole No:	**TP15**
Sheet:	PAGE 1 / 1
Started:	08/04/16
Finished:	08/04/16
Logged:	TPR
Checked:	VDS
RL Surface:	-
Datum:	-

Client: Set Consultants

Project: Proposed Re-Zoning of Public Land

Location: Iluka Reserve, Kiama Downs
GPS

Equipment Type: Backhoe

Bucket Size: 600mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
BH	None Encountered	D				CL/CI	Gravelly Sandy CLAY low to medium plasticity, dark grey, some pieces of concrete, bricks, fibreglass	M		TOPSOIL/FILL
						CL/CI	Gravelly Sandy CLAY low to medium plasiticty, orange brown, some pieces of concrete, bricks, fibreglass			FILL
		D								
		D		1.0						
						CI/CH	CLAY medium to highj plasticity, red brown mottled grey			RESIDUAL
		D		2.0						
							TP15 Terminated at 2.1 m			Refusal on rock @ 2.1m

BOREHOLE LOG LOGS.GPJ NETWORK GEOTECHNICS PTY LTD.GDT 19/04/16

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

TEST PIT LOG

Network Geotechnics Pty Ltd
ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

Job No:	G09/2087
Hole No:	**TP16**
Sheet:	PAGE 1 / 1
Started:	08/04/16
Finished:	08/04/16
Logged:	TPR
Checked:	VDS
RL Surface:	-
Datum:	-

Client: Set Consultants

Project: Proposed Re-Zoning of Public Land

Location: Iluka Reserve, Kiama Downs
GPS

Equipment Type: Backhoe

Bucket Size: 600mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
BH	None Encountered	D				CL/CH	Gravelly Sandy CLAY low to medium plasticity, dark grey, some pieces of concrete, bricks, fibreglass	M		TOPSOIL/FILL
						CI/CH	Sandy CLAY medium to high plasticity, red brown mottled grey			RESIDUAL
		D								
				1.0			TP16 Terminated at 0.9 m			Refusal on rock @ 0.9m
				2.0						

BOREHOLE LOG LOGS.GPJ NETWORK GEOTECHNICS PTY LTD.GDT 19/04/16

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

Appendix D

Laboratory Test Results

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Mehran Asadabadi
Client	NETWORK GEOTECHNICS PTY LTD
Address	
Telephone	02 8438 0312 / 0411 112 824
Facsimile	02 8438 0310
Email	masadabadi@netgeo.com.au
Project	**G09-2087**
Order Number	(Not specified)
Samples	37

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE151024 R0**
Date Received	11/4/2016
Date Reported	18/4/2016

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(4354).

SIGNATORIES

Dong Liang
Metals/Inorganics Team Leader

Kamrul Ahsan
Senior Chemist

Ly Kim Ha
Organic Section Head

VOC's in Soil [AN433/AN434] Tested: 14/4/2016

PARAMETER	UOM	LOR	TP2 0-0.1 SOIL - 8/4/2016 SE151024.003	TP3 0.5-0.6 SOIL - 8/4/2016 SE151024.006	TP5 0-0.1 SOIL - 8/4/2016 SE151024.010	TP12 0-0.1 SOIL - 8/4/2016 SE151024.024	TP15 0.5-0.6 SOIL - 8/4/2016 SE151024.029
Benzene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ethylbenzene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
m/p-xylene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-xylene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Xylenes*	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Total BTEX	mg/kg	0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Naphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1

PARAMETER	UOM	LOR	TP15 2.0 SOIL - 8/4/2016 SE151024.031	TP16 0.5-0.6 SOIL - 8/4/2016 SE151024.033	Trip Spike SOIL - 8/4/2016 SE151024.036	Trip Blank SOIL - 8/4/2016 SE151024.037
Benzene	mg/kg	0.1	<0.1	<0.1	[95%]	<0.1
Toluene	mg/kg	0.1	<0.1	<0.1	[83%]	<0.1
Ethylbenzene	mg/kg	0.1	<0.1	<0.1	[82%]	<0.1
m/p-xylene	mg/kg	0.2	<0.2	<0.2	[81%]	<0.2
o-xylene	mg/kg	0.1	<0.1	<0.1	[77%]	<0.1
Total Xylenes*	mg/kg	0.3	<0.3	<0.3	-	<0.3
Total BTEX	mg/kg	0.6	<0.6	<0.6	-	<0.6
Naphthalene	mg/kg	0.1	<0.1	<0.1	-	<0.1

Volatile Petroleum Hydrocarbons in Soil [AN433/AN434/AN410] Tested: 14/4/2016

PARAMETER	UOM	LOR	TP2 0-0.1 SOIL - 8/4/2016 SE151024.003	TP3 0.5-0.6 SOIL - 8/4/2016 SE151024.006	TP5 0-0.1 SOIL - 8/4/2016 SE151024.010	TP12 0-0.1 SOIL - 8/4/2016 SE151024.024	TP15 0.5-0.6 SOIL - 8/4/2016 SE151024.029
TRH C6-C9	mg/kg	20	<20	<20	<20	<20	<20
Benzene (F0)	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
TRH C6-C10	mg/kg	25	<25	<25	<25	<25	<25
TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	<25	<25	<25	<25

PARAMETER	UOM	LOR	TP15 2.0 SOIL - 8/4/2016 SE151024.031	TP16 0.5-0.6 SOIL - 8/4/2016 SE151024.033	Trip Blank SOIL - 8/4/2016 SE151024.037
TRH C6-C9	mg/kg	20	<20	<20	<20
Benzene (F0)	mg/kg	0.1	<0.1	<0.1	<0.1
TRH C6-C10	mg/kg	25	<25	<25	<25
TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	<25	<25

TRH (Total Recoverable Hydrocarbons) in Soil [AN403] Tested: 14/4/2016

PARAMETER	UOM	LOR	TP2 0-0.1 SOIL - 8/4/2016 SE151024.003	TP3 0.5-0.6 SOIL - 8/4/2016 SE151024.006	TP5 0-0.1 SOIL - 8/4/2016 SE151024.010	TP12 0-0.1 SOIL - 8/4/2016 SE151024.024	TP15 0.5-0.6 SOIL - 8/4/2016 SE151024.029
TRH C10-C14	mg/kg	20	<20	<20	<20	<20	<20
TRH C15-C28	mg/kg	45	<45	<45	<45	<45	<45
TRH C29-C36	mg/kg	45	<45	<45	<45	<45	<45
TRH C37-C40	mg/kg	100	<100	<100	<100	<100	<100
TRH >C10-C16 (F2)	mg/kg	25	<25	<25	<25	<25	<25
TRH >C10-C16 (F2) - Naphthalene	mg/kg	25	<25	<25	<25	<25	<25
TRH >C16-C34 (F3)	mg/kg	90	<90	<90	<90	<90	<90
TRH >C34-C40 (F4)	mg/kg	120	<120	<120	<120	<120	<120
TRH C10-C36 Total	mg/kg	110	<110	<110	<110	<110	<110
TRH C10-C40 Total	mg/kg	210	<210	<210	<210	<210	<210

PARAMETER	UOM	LOR	TP15 2.0 SOIL - 8/4/2016 SE151024.031	TP16 0.5-0.6 SOIL - 8/4/2016 SE151024.033	Trip Blank SOIL - 8/4/2016 SE151024.037
TRH C10-C14	mg/kg	20	<20	<20	<20
TRH C15-C28	mg/kg	45	<45	<45	<45
TRH C29-C36	mg/kg	45	<45	<45	<45
TRH C37-C40	mg/kg	100	<100	<100	<100
TRH >C10-C16 (F2)	mg/kg	25	<25	<25	<25
TRH >C10-C16 (F2) - Naphthalene	mg/kg	25	<25	<25	<25
TRH >C16-C34 (F3)	mg/kg	90	<90	<90	<90
TRH >C34-C40 (F4)	mg/kg	120	<120	<120	<120
TRH C10-C36 Total	mg/kg	110	<110	<110	<110
TRH C10-C40 Total	mg/kg	210	<210	<210	<210

PAH (Polynuclear Aromatic Hydrocarbons) in Soil [AN420] Tested: 14/4/2016

PARAMETER	UOM	LOR	TP2 0-0.1 SOIL - 8/4/2016 SE151024.003	TP3 0.5-0.6 SOIL - 8/4/2016 SE151024.006	TP5 0-0.1 SOIL - 8/4/2016 SE151024.010	TP12 0-0.1 SOIL - 8/4/2016 SE151024.024	TP15 0.5-0.6 SOIL - 8/4/2016 SE151024.029
Naphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(ah)anthracene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Carcinogenic PAHs, BaP TEQ <LOR=0	TEQ	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Carcinogenic PAHs, BaP TEQ <LOR=LOR	TEQ (mg/kg)	0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	TEQ (mg/kg)	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total PAH (18)	mg/kg	0.8	<0.8	<0.8	<0.8	<0.8	<0.8

PARAMETER	UOM	LOR	TP15 2.0 SOIL - 8/4/2016 SE151024.031	TP16 0.5-0.6 SOIL - 8/4/2016 SE151024.033	Trip Blank SOIL - 8/4/2016 SE151024.037
Naphthalene	mg/kg	0.1	<0.1	<0.1	<0.1
2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	<0.1
1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	0.1	<0.1	<0.1	<0.1
Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	mg/kg	0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	mg/kg	0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	<0.1	<0.1
Dibenzo(ah)anthracene	mg/kg	0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	mg/kg	0.1	<0.1	<0.1	<0.1
Carcinogenic PAHs, BaP TEQ <LOR=0	TEQ	0.2	<0.2	<0.2	<0.2
Carcinogenic PAHs, BaP TEQ <LOR=LOR	TEQ (mg/kg)	0.3	<0.3	<0.3	<0.3
Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	TEQ (mg/kg)	0.2	<0.2	<0.2	<0.2
Total PAH (18)	mg/kg	0.8	<0.8	<0.8	<0.8

OC Pesticides in Soil [AN400/AN420] Tested: 14/4/2016

PARAMETER	UOM	LOR	TP1 0-0.1 SOIL - 8/4/2016 SE151024.001	TP3 0-0.1 SOIL - 8/4/2016 SE151024.005	TP4 0-0.1 SOIL - 8/4/2016 SE151024.008	TP8 0-0.1 SOIL - 8/4/2016 SE151024.016	TP13 0-0.1 SOIL - 8/4/2016 SE151024.026
Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Lindane	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Beta BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Delta BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor epoxide	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDE	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha Endosulfan	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Gamma Chlordane	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha Chlordane	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
trans-Nonachlor	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDE	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o,p'-DDD	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDT	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Beta Endosulfan	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
p,p'-DDD	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDT	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan sulphate	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Ketone	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Isodrin	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1

OC Pesticides in Soil [AN400/AN420] Tested: 14/4/2016 (continued)

PARAMETER	UOM	LOR	TP16 0.1 SOIL - 8/4/2016 SE151024.032
Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1
Alpha BHC	mg/kg	0.1	<0.1
Lindane	mg/kg	0.1	<0.1
Heptachlor	mg/kg	0.1	<0.1
Aldrin	mg/kg	0.1	<0.1
Beta BHC	mg/kg	0.1	<0.1
Delta BHC	mg/kg	0.1	<0.1
Heptachlor epoxide	mg/kg	0.1	<0.1
o,p'-DDE	mg/kg	0.1	<0.1
Alpha Endosulfan	mg/kg	0.2	<0.2
Gamma Chlordane	mg/kg	0.1	<0.1
Alpha Chlordane	mg/kg	0.1	<0.1
trans-Nonachlor	mg/kg	0.1	<0.1
p,p'-DDE	mg/kg	0.1	<0.1
Dieldrin	mg/kg	0.2	<0.2
Endrin	mg/kg	0.2	<0.2
o,p'-DDD	mg/kg	0.1	<0.1
o,p'-DDT	mg/kg	0.1	<0.1
Beta Endosulfan	mg/kg	0.2	<0.2
p,p'-DDD	mg/kg	0.1	<0.1
p,p'-DDT	mg/kg	0.1	<0.1
Endosulfan sulphate	mg/kg	0.1	<0.1
Endrin Aldehyde	mg/kg	0.1	<0.1
Methoxychlor	mg/kg	0.1	<0.1
Endrin Ketone	mg/kg	0.1	<0.1
Isodrin	mg/kg	0.1	<0.1
Mirex	mg/kg	0.1	<0.1

OP Pesticides in Soil [AN400/AN420] Tested: 14/4/2016

PARAMETER	UOM	LOR	TP1 0-0.1 SOIL - 8/4/2016 SE151024.001	TP3 0-0.1 SOIL - 8/4/2016 SE151024.005	TP4 0-0.1 SOIL - 8/4/2016 SE151024.008	TP8 0-0.1 SOIL - 8/4/2016 SE151024.016	TP13 0-0.1 SOIL - 8/4/2016 SE151024.026
Dichlorvos	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dimethoate	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon (Dimpylate)	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fenitrothion	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Malathion	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorpyrifos (Chlorpyrifos Ethyl)	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Parathion-ethyl (Parathion)	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Bromophos Ethyl	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Methidathion	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Azinphos-methyl (Guthion)	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2

PARAMETER	UOM	LOR	TP16 0.1 SOIL - 8/4/2016 SE151024.032
Dichlorvos	mg/kg	0.5	<0.5
Dimethoate	mg/kg	0.5	<0.5
Diazinon (Dimpylate)	mg/kg	0.5	<0.5
Fenitrothion	mg/kg	0.2	<0.2
Malathion	mg/kg	0.2	<0.2
Chlorpyrifos (Chlorpyrifos Ethyl)	mg/kg	0.2	<0.2
Parathion-ethyl (Parathion)	mg/kg	0.2	<0.2
Bromophos Ethyl	mg/kg	0.2	<0.2
Methidathion	mg/kg	0.5	<0.5
Ethion	mg/kg	0.2	<0.2
Azinphos-methyl (Guthion)	mg/kg	0.2	<0.2

PCBs in Soil [AN400/AN420] Tested: 14/4/2016

PARAMETER	UOM	LOR	TP3 0.5-0.6 SOIL - 8/4/2016 SE151024.006	TP5 0-0.1 SOIL - 8/4/2016 SE151024.010	TP7 1.0-1.1 SOIL - 8/4/2016 SE151024.015	TP12 0-0.1 SOIL - 8/4/2016 SE151024.024	TP14 0.1 SOIL - 8/4/2016 SE151024.027
Arochlor 1016	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1221	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1232	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1242	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1248	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1254	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1260	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1262	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1268	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total PCBs (Arochlors)	mg/kg	1	<1	<1	<1	<1	<1

PARAMETER	UOM	LOR	TP15 0.5-0.6 SOIL - 8/4/2016 SE151024.029
Arochlor 1016	mg/kg	0.2	<0.2
Arochlor 1221	mg/kg	0.2	<0.2
Arochlor 1232	mg/kg	0.2	<0.2
Arochlor 1242	mg/kg	0.2	<0.2
Arochlor 1248	mg/kg	0.2	<0.2
Arochlor 1254	mg/kg	0.2	<0.2
Arochlor 1260	mg/kg	0.2	<0.2
Arochlor 1262	mg/kg	0.2	<0.2
Arochlor 1268	mg/kg	0.2	<0.2
Total PCBs (Arochlors)	mg/kg	1	<1

Total Phenolics in Soil [AN289] Tested: 18/4/2016

PARAMETER	UOM	LOR	TP3 0.5-0.6 SOIL - 8/4/2016 SE151024.006	TP9 0-0.1 SOIL - 8/4/2016 SE151024.018	TP15 0.5-0.6 SOIL - 8/4/2016 SE151024.029
Total Phenols	mg/kg	0.1	**1.3**	**3.1**	**0.4**

Total Recoverable Metals in Soil/Waste Solids/Materials by ICPOES [AN040/AN320] Tested: 15/4/2016

PARAMETER	UOM	LOR	TP1 0.5-0.6 SOIL - 8/4/2016 SE151024.002	TP2 0-0.1 SOIL - 8/4/2016 SE151024.003	TP2 1.0-1.1 SOIL - 8/4/2016 SE151024.004	TP3 0-0.1 SOIL - 8/4/2016 SE151024.005	TP3 0.9-1.0 SOIL - 8/4/2016 SE151024.007
Arsenic, As	mg/kg	3	<3	3	<3	<3	<3
Cadmium, Cd	mg/kg	0.3	0.7	0.3	0.5	0.4	0.4
Chromium, Cr	mg/kg	0.3	24	8.7	20	8.2	6.9
Copper, Cu	mg/kg	0.5	27	55	34	110	82
Lead, Pb	mg/kg	1	18	21	18	25	19
Nickel, Ni	mg/kg	0.5	5.8	3.3	4.3	5.0	4.7
Zinc, Zn	mg/kg	0.5	14	33	9.8	47	34

PARAMETER	UOM	LOR	TP4 0.5-0.6 SOIL - 8/4/2016 SE151024.009	TP5 0-0.1 SOIL - 8/4/2016 SE151024.010	TP6 0-0.1 SOIL - 8/4/2016 SE151024.011	TP6 0.5-0.6 SOIL - 8/4/2016 SE151024.012	TP6 1.0-1.1 SOIL - 8/4/2016 SE151024.013
Arsenic, As	mg/kg	3	<3	<3	<3	<3	<3
Cadmium, Cd	mg/kg	0.3	0.4	0.8	0.6	0.5	0.5
Chromium, Cr	mg/kg	0.3	15	15	21	22	23
Copper, Cu	mg/kg	0.5	29	28	27	18	16
Lead, Pb	mg/kg	1	16	23	22	11	11
Nickel, Ni	mg/kg	0.5	3.9	3.3	3.4	3.1	2.9
Zinc, Zn	mg/kg	0.5	14	35	36	9.8	9.0

PARAMETER	UOM	LOR	TP7 0-0.1 SOIL - 8/4/2016 SE151024.014	TP8 0-0.1 SOIL - 8/4/2016 SE151024.016	TP8 0.5-0.6 SOIL - 8/4/2016 SE151024.017	TP9 0-0.1 SOIL - 8/4/2016 SE151024.018	TP9 1.0-1.1 SOIL - 8/4/2016 SE151024.019
Arsenic, As	mg/kg	3	<3	<3	<3	<3	<3
Cadmium, Cd	mg/kg	0.3	0.5	0.6	0.4	0.7	0.3
Chromium, Cr	mg/kg	0.3	15	20	22	20	21
Copper, Cu	mg/kg	0.5	26	21	16	24	20
Lead, Pb	mg/kg	1	15	15	11	20	12
Nickel, Ni	mg/kg	0.5	3.3	2.9	2.9	3.1	3.4
Zinc, Zn	mg/kg	0.5	110	14	8.6	32	7.4

PARAMETER	UOM	LOR	TP10 0-0.1 SOIL - 8/4/2016 SE151024.020	TP10 0.5-0.6 SOIL - 8/4/2016 SE151024.021	TP11 0-0.1 SOIL - 8/4/2016 SE151024.022	TP11 0.5-0.6 SOIL - 8/4/2016 SE151024.023	TP12 0-0.1 SOIL - 8/4/2016 SE151024.024
Arsenic, As	mg/kg	3	<3	<3	<3	<3	<3
Cadmium, Cd	mg/kg	0.3	0.5	0.4	0.6	0.5	0.4
Chromium, Cr	mg/kg	0.3	16	13	17	26	15
Copper, Cu	mg/kg	0.5	23	22	21	20	32
Lead, Pb	mg/kg	1	18	11	17	13	16
Nickel, Ni	mg/kg	0.5	2.3	1.8	2.5	3.3	2.4
Zinc, Zn	mg/kg	0.5	27	7.7	26	9.7	32

Total Recoverable Metals in Soil/Waste Solids/Materials by ICPOES [AN040/AN320] Tested: 15/4/2016 (continued)

PARAMETER	UOM	LOR	TP12 1.0-1.1 SOIL - 8/4/2016 SE151024.025	TP13 0-0.1 SOIL - 8/4/2016 SE151024.026	TP15 0.1 SOIL - 8/4/2016 SE151024.028	TP15 1.0 SOIL - 8/4/2016 SE151024.030	TP15 2.0 SOIL - 8/4/2016 SE151024.031
Arsenic, As	mg/kg	3	<3	<3	<3	<3	<3
Cadmium, Cd	mg/kg	0.3	0.6	0.4	0.5	0.7	0.6
Chromium, Cr	mg/kg	0.3	23	12	14	16	8.9
Copper, Cu	mg/kg	0.5	19	56	62	68	91
Lead, Pb	mg/kg	1	19	43	15	16	11
Nickel, Ni	mg/kg	0.5	2.5	3.4	4.7	4.9	2.3
Zinc, Zn	mg/kg	0.5	12	72	29	27	11

PARAMETER	UOM	LOR	TP16 0.1 SOIL - 8/4/2016 SE151024.032	TP16 0.5-0.6 SOIL - 8/4/2016 SE151024.033	TP109 0-0.1 SOIL - 8/4/2016 SE151024.034	TP115 2.0 SOIL - 8/4/2016 SE151024.035
Arsenic, As	mg/kg	3	<3	<3	<3	<3
Cadmium, Cd	mg/kg	0.3	0.5	0.7	0.7	<0.3
Chromium, Cr	mg/kg	0.3	15	17	19	5.3
Copper, Cu	mg/kg	0.5	36	43	26	56
Lead, Pb	mg/kg	1	15	13	20	7
Nickel, Ni	mg/kg	0.5	3.0	1.8	3.2	0.9
Zinc, Zn	mg/kg	0.5	28	9.5	35	5.5

Mercury in Soil [AN312] Tested: 14/4/2016

PARAMETER	UOM	LOR	TP1 0.5-0.6 SOIL - 8/4/2016 SE151024.002	TP2 0-0.1 SOIL - 8/4/2016 SE151024.003	TP2 1.0-1.1 SOIL - 8/4/2016 SE151024.004	TP3 0-0.1 SOIL - 8/4/2016 SE151024.005	TP3 0.9-1.0 SOIL - 8/4/2016 SE151024.007
Mercury	mg/kg	0.01	0.04	0.03	0.03	0.06	0.03

PARAMETER	UOM	LOR	TP4 0.5-0.6 SOIL - 8/4/2016 SE151024.009	TP5 0-0.1 SOIL - 8/4/2016 SE151024.010	TP6 0-0.1 SOIL - 8/4/2016 SE151024.011	TP6 0.5-0.6 SOIL - 8/4/2016 SE151024.012	TP6 1.0-1.1 SOIL - 8/4/2016 SE151024.013
Mercury	mg/kg	0.01	0.04	0.09	0.04	0.02	<0.01

PARAMETER	UOM	LOR	TP7 0-0.1 SOIL - 8/4/2016 SE151024.014	TP8 0-0.1 SOIL - 8/4/2016 SE151024.016	TP8 0.5-0.6 SOIL - 8/4/2016 SE151024.017	TP9 0-0.1 SOIL - 8/4/2016 SE151024.018	TP9 1.0-1.1 SOIL - 8/4/2016 SE151024.019
Mercury	mg/kg	0.01	0.03	0.04	0.03	0.04	0.02

PARAMETER	UOM	LOR	TP10 0-0.1 SOIL - 8/4/2016 SE151024.020	TP10 0.5-0.6 SOIL - 8/4/2016 SE151024.021	TP11 0-0.1 SOIL - 8/4/2016 SE151024.022	TP11 0.5-0.6 SOIL - 8/4/2016 SE151024.023	TP12 0-0.1 SOIL - 8/4/2016 SE151024.024
Mercury	mg/kg	0.01	0.04	0.03	0.04	0.04	0.03

PARAMETER	UOM	LOR	TP12 1.0-1.1 SOIL - 8/4/2016 SE151024.025	TP13 0-0.1 SOIL - 8/4/2016 SE151024.026	TP15 0.1 SOIL - 8/4/2016 SE151024.028	TP15 1.0 SOIL - 8/4/2016 SE151024.030	TP15 2.0 SOIL - 8/4/2016 SE151024.031
Mercury	mg/kg	0.01	0.04	0.05	0.04	0.04	0.02

PARAMETER	UOM	LOR	TP16 0.1 SOIL - 8/4/2016 SE151024.032	TP16 0.5-0.6 SOIL - 8/4/2016 SE151024.033	TP109 0-0.1 SOIL - 8/4/2016 SE151024.034	TP115 2.0 SOIL - 8/4/2016 SE151024.035
Mercury	mg/kg	0.01	0.03	0.01	0.04	0.04

Moisture Content [AN002] Tested: 14/4/2016

PARAMETER	UOM	LOR	TP1 0-0.1 SOIL - 8/4/2016 SE151024.001	TP1 0.5-0.6 SOIL - 8/4/2016 SE151024.002	TP2 0-0.1 SOIL - 8/4/2016 SE151024.003	TP2 1.0-1.1 SOIL - 8/4/2016 SE151024.004	TP3 0-0.1 SOIL - 8/4/2016 SE151024.005
% Moisture	%w/w	0.5	12	27	11	29	24

PARAMETER	UOM	LOR	TP3 0.5-0.6 SOIL - 8/4/2016 SE151024.006	TP3 0.9-1.0 SOIL - 8/4/2016 SE151024.007	TP4 0-0.1 SOIL - 8/4/2016 SE151024.008	TP4 0.5-0.6 SOIL - 8/4/2016 SE151024.009	TP5 0-0.1 SOIL - 8/4/2016 SE151024.010
% Moisture	%w/w	0.5	27	18	34	27	27

PARAMETER	UOM	LOR	TP6 0-0.1 SOIL - 8/4/2016 SE151024.011	TP6 0.5-0.6 SOIL - 8/4/2016 SE151024.012	TP6 1.0-1.1 SOIL - 8/4/2016 SE151024.013	TP7 0-0.1 SOIL - 8/4/2016 SE151024.014	TP7 1.0-1.1 SOIL - 8/4/2016 SE151024.015
% Moisture	%w/w	0.5	24	25	27	24	24

PARAMETER	UOM	LOR	TP8 0-0.1 SOIL - 8/4/2016 SE151024.016	TP8 0.5-0.6 SOIL - 8/4/2016 SE151024.017	TP9 0-0.1 SOIL - 8/4/2016 SE151024.018	TP9 1.0-1.1 SOIL - 8/4/2016 SE151024.019	TP10 0-0.1 SOIL - 8/4/2016 SE151024.020
% Moisture	%w/w	0.5	22	23	28	28	28

PARAMETER	UOM	LOR	TP10 0.5-0.6 SOIL - 8/4/2016 SE151024.021	TP11 0-0.1 SOIL - 8/4/2016 SE151024.022	TP11 0.5-0.6 SOIL - 8/4/2016 SE151024.023	TP12 0-0.1 SOIL - 8/4/2016 SE151024.024	TP12 1.0-1.1 SOIL - 8/4/2016 SE151024.025
% Moisture	%w/w	0.5	22	19	24	27	22

PARAMETER	UOM	LOR	TP13 0-0.1 SOIL - 8/4/2016 SE151024.026	TP14 0.1 SOIL - 8/4/2016 SE151024.027	TP15 0.1 SOIL - 8/4/2016 SE151024.028	TP15 0.5-0.6 SOIL - 8/4/2016 SE151024.029	TP15 1.0 SOIL - 8/4/2016 SE151024.030
% Moisture	%w/w	0.5	36	23	25	26	22

PARAMETER	UOM	LOR	TP15 2.0 SOIL - 8/4/2016 SE151024.031	TP16 0.1 SOIL - 8/4/2016 SE151024.032	TP16 0.5-0.6 SOIL - 8/4/2016 SE151024.033	TP109 0-0.1 SOIL - 8/4/2016 SE151024.034	TP115 2.0 SOIL - 8/4/2016 SE151024.035
% Moisture	%w/w	0.5	26	22	28	31	25

Moisture Content [AN002] Tested: 14/4/2016 (continued)

PARAMETER	UOM	LOR	Trip Blank SOIL - 8/4/2016 SE151024.037
% Moisture	%w/w	0.5	<0.5

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN040/AN320	A portion of sample is digested with nitric acid to decompose organic matter and hydrochloric acid to complete the digestion of metals. The digest is then analysed by ICP OES with metals results reported on the dried sample basis. Based on USEPA method 200.8 and 6010C.
AN040	A portion of sample is digested with Nitric acid to decompose organic matter and Hydrochloric acid to complete the digestion of metals and then filtered for analysis by ASS or ICP as per USEPA Method 200.8.
AN289	Analysis of Total Phenols in Soil Sediment and Water: Steam distillable phenols react with 4-aminoantipyrine at pH 7.9±0.1 in the presence of potassium ferricyanide to form a coloured antipyrine dye analysed by Discrete Analyser. Reference APHA 5530 B/D.
AN312	Mercury by Cold Vapour AAS in Soils: After digestion with nitric acid, hydrogen peroxide and hydrochloric acid, mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500
AN400	OC and OP Pesticides by GC-ECD: The determination of organochlorine (OC) and organophosphorus (OP) pesticides and polychlorinated biphenyls (PCBs) in soils, sludges and groundwater. (Based on USEPA methods 3510, 3550, 8140 and 8080.)
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36 and in recognition of the NEPM 1999 (2013), >C10-C16 (F2), >C16-C34 (F3) and >C34-C40 (F4). F2 is reported directly and also corrected by subtracting Naphthalene (from VOC method AN433) where available.
AN403	Additionally, the volatile C6-C9 fraction may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Petroleum Hydrocarbons (TPH) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with differential polarity of the eluent solvents .
AN403	The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependent on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.
AN420	(SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols (etc) in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).
AN420	SVOC Compounds: Semi-Volatile Organic Compounds (SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).
AN433/AN434/AN410	VOCs and C6-C9/C6-C10 Hydrocarbons by GC-MS P&T: VOC`s are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.
AN433/AN434	VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC`s are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
		NVL	Not validated.	LOR	Limit of Reporting.
**	Indicative data, theoretical holding time exceeded.	IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022 QA QC Plan.pdf

This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/en/terms-and-conditions. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

SGS

CHAIN OF CUSTODY & ANALYSIS REQUEST

SGS Environmental Services
Unit 16, 33 Maddox Street
Alexandria NSW 2015
Telephone No: (02) 85940400
Facsimile No: (02) 85940499
Email: au.samplereceipt.sydney@sgs.com

Company Name:	Network Geotechnics Pty Ltd	Project Name/No:	GOG/2087
Address:	Unit 12/9-15 Gundah Road, Mt Kuring-Gai	Purchase Order No:	
	NSW 2080	Results Required By:	15/04/16 (standard)
Contact Name:	MEZ	Telephone:	0411 112 824
		Facsimile:	02 8438 0310
		Email Results:	engineering@netgeo.com.au;masadabadi@netgeo.com.au

Client Sample ID	Date Sampled	Lab Sample ID	WATER	SOIL	PRESERVATIVE	NO OF CONTAINERS	Heavy Metals	TRH/BTEX/PAH	OC/OP	Phenols	PCB
TP1 0-0.1	8/4	1		/			/	/	/		
0.5-0.6		2		/			/				
1.0-1.1				/							
TP2 0-0.1		3		/			/	/			
0.5-0.6				/							
1.0-1.1		4		/			/				
1.4-1.5				/							
TP3 0-0.1		5		/			/		/		
0.5-0.6		6		/				/	/	/	

SGS Alexandria Environmental

SE151024 COC
Received: 11-Apr-2016

Relinquished By: MEZ	Date/Time: 11/4 11pm	Received By:	Date/Time 11/04/16 12 00
Relinquished By:	Date/Time:	Received By:	Date/Time
Samples Intact: (Yes)/ No	Temperature: Ambient / (Chilled)	Sample Cooler Sealed: Yes/ No	Laboratory Quotation No:
	Comments:		

CHAIN OF CUSTODY & ANALYSIS REQUEST

SGS Environmental Services
Unit 16, 33 Maddox Street
Alexandria NSW 2015
Telephone No: (02) 85940400
Facsimile No: (02) 85940499
Email: au.samplereceipt.sydney@sgs.com

Company Name:	Network Geotechnics Pty Ltd	Project Name/No:	G09/2087
Address:	Unit 12/9-15 Gundah Road, Mt Kuring-Gai	Purchase Order No:	
	NSW 2080	Results Required By:	18/4
		Telephone:	0411 112 824
Contact Name:	MEZ	Facsimile:	02 8438 0310
		Email Results:	engineering@netgeo.com.au;masadabadi@netgeo.com.au

Client Sample ID	Date Sampled	Lab Sample ID	WATER	SOIL	PRESERVATIVE	NO OF CONTAINERS	TRH/BTEX/PAH	8 metals	OC/OP Phenols	PCB's
TP3 0.9-1.0	8/4	7		/				/		
TP4 0-0.1	↓	8		↓				/	/	
0.5-0.6		9						/		
1.0-1.1										
TP5 0-0.1		10					/	/		/
0.5-0.6										
1.0-1.1										
TP6 0-0.1		11						/		
0.5-0.6		12						/		

Relinquished By:	Date/Time:	Received By:	Date/Time 11/04/16
Relinquished By:	Date/Time:	Received By:	Date/Time
Samples Intact: (Yes)/ No	Temperature: Ambient / (Chilled)	Sample Cooler Sealed: Yes/ No	Laboratory Quotation No:
	Comments:		

CHAIN OF CUSTODY & ANALYSIS REQUEST

SGS Environmental Services
Unit 16, 33 Maddox Street
Alexandria NSW 2015
Telephone No: (02) 85940400
Facsimile No: (02) 85940499
Email: au.samplereceipt.sydney@sgs.com

Company Name:	Network Geotechnics Pty Ltd	Project Name/No:	G09/2057
Address:	Unit 12/9-15 Gundah Road, Mt Kuring-Gai	Purchase Order No:	
	NSW 2080	Results Required By:	18/4
		Telephone:	0411 112 824
Contact Name:	MEZ	Facsimile:	02 8438 0310
		Email Results:	engineering@netgeo.com.au;masadabadi@netgeo.com.au

Client Sample ID	Date Sampled	Lab Sample ID	WATER	SOIL	PRESERVATIVE	NO OF CONTAINERS	8 metals	TRH/BTEX/PAH	OC/OP	PCB's	Asbestos
TP6 1.0-1.1	8/4	13		/			/				
TP7 0-0.1		14					/				
0.5-0.6											
1.0-1.1		15								/	
TP8 0-0.1		16					/		/		
0.5-0.6		17					/				
1.0-1.1											
TP9 0-0.1		18					/				/
0.5-0.6											

Relinquished By:	Date/Time:	Received By:	Date/Time 11/04/16
Relinquished By:	Date/Time:	Received By:	Date/Time
Samples Intact: (Yes) No	Temperature: Ambient / (Chilled)	Sample Cooler Sealed: Yes/ No	Laboratory Quotation No:
	Comments:		

CHAIN OF CUSTODY & ANALYSIS REQUEST

Page 4 of 6

SGS Environmental Services
Unit 16, 33 Maddox Street
Alexandria NSW 2015
Telephone No: (02) 85940400
Facsimile No: (02) 85940499
Email: au.samplereceipt.sydney@sgs.com

Company Name:	Network Geotechnics Pty Ltd	Project Name/No:	GOA/2087
Address:	Unit 12/9-15 Gundah Road, Mt Kuring-Gai	Purchase Order No:	
	NSW 2080	Results Required By:	18/4
		Telephone:	0411 112 824
Contact Name:	MEZ	Facsimile:	02 8438 0310
		Email Results:	engineering@netgeo.com.au;masadabadi@netgeo.com.au

Client Sample ID	Date Sampled	Lab Sample ID	WATER	SOIL	PRESERVATIVE	NO OF CONTAINERS	8 metals	TPH/BTEX/PAH	OC/OP	PCB	Phenols											
TP9 1.0-1.1	8/4	19		/			/															
TP10 0-0.1		20					/															
0.5-0.6		21					/															
1.0-1.1																						
TP11 0-0.1		22					/															
0.5-0.6		23					/															
1-1.1																						
TP12 (0-0.1)		24					/	/		/												
(0.5-0.6)																						

Relinquished By:	Date/Time:	Received By:	Date/Time 11/04/16
Relinquished By:	Date/Time:	Received By:	Date/Time
Samples Intact: Yes/ No	Temperature: Ambient / Chilled	Sample Cooler Sealed: Yes/ No	Laboratory Quotation No:
	Comments:		

CHAIN OF CUSTODY & ANALYSIS REQUEST

Page 5 of 6

SGS Environmental Services
Unit 16, 33 Maddox Street
Alexandria NSW 2015
Telephone No: (02) 85940400
Facsimile No: (02) 85940499
Email: au.samplereceipt.sydney@sgs.com

Company Name:	Network Geotechnics Pty Ltd	Project Name/No:	609/2087
Address:	Unit 12/9-15 Gundah Road, Mt Kuring-Gai	Purchase Order No:	
	NSW 2080	Results Required By:	18/4
		Telephone:	0411 112 824
Contact Name:	MEZ	Facsimile:	02 8438 0310
		Email Results:	engineering@netgeo.com.au;masadabadi@netgeo.com.au

Client Sample ID	Date Sampled	Lab Sample ID	WATER	SOIL	PRESERVATIVE	NO OF CONTAINERS	8 metals	PCB	Phenols	o/op	TRH/BTEX/PAH											
TP12 (1.0-1.1)	8/4	25		/			/															
TP13 (0-0.1)		26					/			/												
TP13 (0.3)																						
TP14 (0.1)		27						/														
TP15 (0.1)		28						/			/											
(0.5-0.6)		29						/			/											
(1.0)		30						/														
(2.0)		31						/			/											
TP16 (0-0.1)		32					/			/												

Relinquished By:	Date/Time:	Received By: B. Bury	Date/Time 4/04/16
Relinquished By:	Date/Time:	Received By:	Date/Time
Samples Intact: Yes/ No	Temperature: Ambient / Chilled	Sample Cooler Sealed: Yes/ No	Laboratory Quotation No:
	Comments:		

CHAIN OF CUSTODY & ANALYSIS REQUEST

Page 6 of 6

SGS Environmental Services
Unit 16, 33 Maddox Street
Alexandria NSW 2015
Telephone No: (02) 85940400
Facsimile No: (02) 85940499
Email: au.samplereceipt.sydney@sgs.com

Company Name:	Network Geotechnics Pty Ltd	Project Name/No:	609/2087
Address:	Unit 12/9-15 Gundah Road, Mt Kuring-Gai	Purchase Order No:	
	NSW 2080	Results Required By:	18/4
		Telephone:	0411 112 824
Contact Name:	MEZ	Facsimile:	02 8438 0310
		Email Results:	engineering@netgeo.com.au;masadabadi@netgeo.com.au

Client Sample ID	Date Sampled	Lab Sample ID	WATER	SOIL	PRESERVATIVE	NO OF CONTAINERS	TRH/BTEX/PAH	BTEX	8metals
TP16 (0.5-0.6)	8/4	33		/			/		/
TP109 (0-0.1)	1	34							/
TP115 (2.0)		35							/
Trip spike		36							/
Trip blank		37					/	/	/

Relinquished By:	Date/Time:	Received By:	Date/Time 11/04/16
Relinquished By:	Date/Time:	Received By:	Date/Time
Samples Intact: (Yes)/ No	Temperature: Ambient / (Chilled)	Sample Cooler Sealed: Yes/ No	Laboratory Quotation No:
	Comments:		

SAMPLE RECEIPT ADVICE

SE151024

CLIENT DETAILS

Contact	Mehran Asadabadi
Client	NETWORK GEOTECHNICS PTY LTD
Address	Unit 12/9 - 15 Gundah Road, Mt Kuring-Gai NSW 2080
Telephone	02 8438 0312 / 0411 112 824
Facsimile	02 8438 0310
Email	masadabadi@netgeo.com.au
Project	**G09-2087**
Order Number	(Not specified)
Samples	37

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
Samples Received	Mon 11/4/2016
Report Due	Mon 18/4/2016
SGS Reference	**SE151024**

SUBMISSION DETAILS

This is to confirm that 37 samples were received on Monday 11/4/2016. Results are expected to be ready by Monday 18/4/2016. Please quote SGS reference SE151024 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Sample counts by matrix	37 Soil	Type of documentation received	COC
Date documentation received	11/4/2016	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	8.6°C
Sample container provider	SGS	Turnaround time requested	Standard
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	Ice Bricks	Samples clearly labelled	Yes
Complete documentation received	Yes		

Samples will be held for one month for water samples and two months for soil samples from date of report, unless otherwise instructed.

COMMENTS

SAMPLE RECEIPT ADVICE

SE151024

CLIENT DETAILS

Client NETWORK GEOTECHNICS PTY LTD

Project G09-2087

SUMMARY OF ANALYSIS

No.	Sample ID	OC Pesticides in Soil	OP Pesticides in Soil	PAH (Polynuclear Aromatic Hydrocarbons) in Soil	PCBs in Soil	Total Phenolics in Soil	TRH (Total Recoverable Hydrocarbons) in Soil	VOC's in Soil	Volatile Petroleum Hydrocarbons in Soil
001	TP1 0-0.1	28	13	-	-	-	-	-	-
003	TP2 0-0.1	-	-	25	-	-	10	12	8
005	TP3 0-0.1	28	13	-	-	-	-	-	-
006	TP3 0.5-0.6	-	-	25	11	1	10	12	8
008	TP4 0-0.1	28	13	-	-	-	-	-	-
010	TP5 0-0.1	-	-	25	11	-	10	12	8
015	TP7 1.0-1.1	-	-	-	11	-	-	-	-
016	TP8 0-0.1	28	13	-	-	-	-	-	-
018	TP9 0-0.1	-	-	-	-	1	-	-	-
024	TP12 0-0.1	-	-	25	11	-	10	12	8

CONTINUED OVERLEAF

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SAMPLE RECEIPT ADVICE

SE151024

CLIENT DETAILS

Client NETWORK GEOTECHNICS PTY LTD

Project G09-2087

SUMMARY OF ANALYSIS

No.	Sample ID	OC Pesticides in Soil	OP Pesticides in Soil	PAH (Polynuclear Aromatic Hydrocarbons) in Soil	PCBs in Soil	Total Phenolics in Soil	TRH (Total Recoverable Hydrocarbons) in Soil	VOC's in Soil	Volatile Petroleum Hydrocarbons in Soil
026	TP13 0-0.1	28	13	-	-	-	-	-	-
027	TP14 0.1	-	-	-	11	-	-	-	-
029	TP15 0.5-0.6	-	-	25	11	1	10	12	8
031	TP15 2.0	-	-	25	-	-	10	12	8
032	TP16 0.1	28	13	-	-	-	-	-	-
033	TP16 0.5-0.6	-	-	25	-	-	10	12	8
036	Trip Spike	-	-	-	-	-	-	12	-
037	Trip Blank	-	-	25	-	-	10	12	8

CONTINUED OVERLEAF

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SAMPLE RECEIPT ADVICE

SE151024

CLIENT DETAILS

Client NETWORK GEOTECHNICS PTY LTD

Project G09-2087

SUMMARY OF ANALYSIS

No.	Sample ID	Mercury in Soil	Moisture Content	Total Recoverable Metals in Soil/Waste
001	TP1 0-0.1	-	1	-
002	TP1 0.5-0.6	1	1	7
003	TP2 0-0.1	1	1	7
004	TP2 1.0-1.1	1	1	7
005	TP3 0-0.1	1	1	7
006	TP3 0.5-0.6	-	1	-
007	TP3 0.9-1.0	1	1	7
008	TP4 0-0.1	-	1	-
009	TP4 0.5-0.6	1	1	7
010	TP5 0-0.1	1	1	7
011	TP6 0-0.1	1	1	7
012	TP6 0.5-0.6	1	1	7
013	TP6 1.0-1.1	1	1	7
014	TP7 0-0.1	1	1	7
015	TP7 1.0-1.1	-	1	-
016	TP8 0-0.1	1	1	7
017	TP8 0.5-0.6	1	1	7
018	TP9 0-0.1	1	1	7
019	TP9 1.0-1.1	1	1	7
020	TP10 0-0.1	1	1	7
021	TP10 0.5-0.6	1	1	7
022	TP11 0-0.1	1	1	7
023	TP11 0.5-0.6	1	1	7
024	TP12 0-0.1	1	1	7

CONTINUED OVERLEAF

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SAMPLE RECEIPT ADVICE

SE151024

CLIENT DETAILS

Client NETWORK GEOTECHNICS PTY LTD

Project G09-2087

SUMMARY OF ANALYSIS

No.	Sample ID	Mercury in Soil	Moisture Content	Total Recoverable Metals in Soil/Waste
025	TP12 1.0-1.1	1	1	7
026	TP13 0-0.1	1	1	7
027	TP14 0.1	-	1	-
028	TP15 0.1	1	1	7
029	TP15 0.5-0.6	-	1	-
030	TP15 1.0	1	1	7
031	TP15 2.0	1	1	7
032	TP16 0.1	1	1	7
033	TP16 0.5-0.6	1	1	7
034	TP109 0-0.1	1	1	7
035	TP115 2.0	1	1	7
037	Trip Blank	-	1	-

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Thalia Park-Ross
Client	NETWORK GEOTECHNICS PTY LTD
Address	Unit 12/9 - 15 Gundah Road, NSW 2080
Telephone	02 8438 0312 / 0411 112 824
Facsimile	02 8438 0310
Email	tparkross@netgeo.com.au
Project	**G09-2087 - Additional Analysis**
Order Number	(Not specified)
Samples	37

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE151024A R0**
Date Received	19/4/2016
Date Reported	20/4/2016

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(4354).

SIGNATORIES

Dong Liang
Metals/Inorganics Team Leader

Kamrul Ahsan
Senior Chemist

pH in soil (1:5) [AN101] Tested: 19/4/2016

PARAMETER	UOM	LOR	TP7 1.0-1.1 SOIL - 8/4/2016 SE151024A.015
pH	pH Units	-	**4.4**

Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) [AN122] Tested: 19/4/2016

PARAMETER	UOM	LOR	TP7 1.0-1.1 SOIL - 8/4/2016 SE151024A.015
Exchangeable Sodium, Na	mg/kg	2	**84**
Exchangeable Sodium, Na	meq/100g	0.01	**0.37**
Exchangeable Sodium Percentage*	%	0.1	**18.3**
Exchangeable Potassium, K	mg/kg	2	**16**
Exchangeable Potassium, K	meq/100g	0.01	**0.04**
Exchangeable Potassium Percentage*	%	0.1	**2.1**
Exchangeable Calcium, Ca	mg/kg	2	**130**
Exchangeable Calcium, Ca	meq/100g	0.01	**0.67**
Exchangeable Calcium Percentage*	%	0.1	**33.4**
Exchangeable Magnesium, Mg	mg/kg	2	**110**
Exchangeable Magnesium, Mg	meq/100g	0.02	**0.92**
Exchangeable Magnesium Percentage*	%	0.1	**46.3**
Cation Exchange Capacity	meq/100g	0.02	**2.0**

METHOD	METHODOLOGY SUMMARY
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode and is calibrated against 3 buffers purchased commercially. For soils, sediments and sludges, an extract with water (or 0.01M CaCl2) is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN122	Exchangeable Cations, CEC and ESP: Soil sample is extracted in 1M Ammonium Acetate at pH=7 (or 1M Ammonium Chloride at pH=7) with cations (Na, K, Ca & Mg) then determined by ICP OES/ICP MS and reported as Exchangeable Cations. For saline soils, these results can be corrected for water soluble cations and reported as Exchangeable cations in meq/100g or soil can be pre-treated (aqueous ethanol/aqueous glycerol) prior to extraction. Cation Exchange Capacity (CEC) is the sum of the exchangeable cations in meq/100g.
AN122	The Exchangeable Sodium Percentage (ESP) is calculated as the exchangeable sodium divided by the CEC (all in meq/100g) times 100. ESP can be used to categorise the sodicity of the soil as below: ESP < 6% non-sodic ESP 6-15% sodic ESP >15% strongly sodic Method is refernced to Rayment and Higginson, 1992, sections 15D3 and 15N1.-

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
		NVL	Not validated.	LOR	Limit of Reporting.
**	Indicative data, theoretical holding time exceeded.	IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022 QA QC Plan.pdf

AUSTRALIAN SAFER ENVIRONMENT & TECHNOLOGY PTY LTD

ABN 36 088 095 112

Our ref : ASET49814/ 52994 / 1 - 11
Your ref : G09 / 2087 - Iluka Reserve
NATA Accreditation No: 14484

14 April 2016

Network Geotechnics Pty Ltd
12 / 9-15 Gundah Road
Mt Kuring Gai NSW 2080

Accredited for compliance with ISO/IEC 17025.

Attn: Mr Richard King

Dear Richard

Asbestos Identification
This report presents the results of eleven samples, forwarded by Network Geotechnics Pty Ltd on 11 April 2016, for analysis for asbestos.

1.Introduction: Eleven samples forwarded were examined and analysed for the presence of asbestos.

2. Methods : The samples were examined under a Stereo Microscope and selected fibres were analysed by Polarized Light Microscopy in conjunction with Dispersion Staining method **(Australian Standard AS 4964 - 2004 and Safer Environment Method 1 as the supplementary work instruction) (Qualitative Analysis only).**

The report also provides approximate weights and percentages, categories of asbestos forms appearing in the sample, such as **AF**(Asbestos Fines), **FA**(Friable Asbestos and **ACM** (Asbestos Containing Material), also satisfying the requirements of the WA/ NEPM Guidelines)

3. Results :

Sample No. 1. ASET49814 / 52994 / 1. TP2 (0.2-0.4).
Approx dimensions 10.0 cm x 10.0 cm x 6.0 cm
Approx total dry weight of soil = 610.0g
The sample consisted of a mixture of clayish soil, stones, plant matter, fragments of plaster and brick.
No asbestos detected.

Sample No. 2. ASET49814 / 52994 / 2. TP4 (0.0-0.2).
Approx dimensions 11.0 cm x 10.0 cm x 5.7 cm
Approx total dry weight of soil = 640.0g
The sample consisted of a mixture of clayish soil, stones, sandstone, plant matter and fragments of plaster.
No asbestos detected.

Sample No. 3. ASET49814 / 52994 / 3. TP7 (0.2-0.5).
Approx dimensions 11.0 cm x 10.0 cm x 6.2 cm
Approx total dry weight of soil = 698.0g
The sample consisted of a mixture of clayish soil, stones, sandstone, plant matter, fragments of plaster and brick.
No asbestos detected.

Sample No. 4. ASET49814 / 52994 / 4. TP3 (0.1-0.3).
Approx dimensions 10.0 cm x 10.0 cm x 5.0 cm
Approx total dry weight of soil = 520.0g
The sample consisted of a mixture of clayish soil, stones, plant matter and fragments of plaster.
No asbestos detected.

Sample No. 5. ASET49814 / 52994 / 5. TP1 (0.3-0.5).
Approx dimensions 10.0 cm x 10.0 cm x 7.5 cm
Approx total dry weight of soil = 760.0g
The sample consisted of a mixture of clayish soil, stones, plant matter, fragments of plaster and brick.
No asbestos detected.

Sample No. 6. ASET49814 / 52994 / 6. TP15 (0.1-0.2).
Approx dimensions 10.0 cm x 10.0 cm x 7.0 cm
Approx total dry weight of soil = 715.0g
The sample consisted of a mixture of clayish soil, stones, sandstone, plant matter, fragments of plaster and brick.
No asbestos detected.

Sample No. 7. ASET49814 / 52994 / 7. TP15 (0.2-0.4).
Approx dimensions 10.0 cm x 10.0 cm x 5.9 cm
Approx total dry weight of soil = 600.0g
The sample consisted of a mixture of clayish soil, stones, sandstone, plant matter and fragments of plaster.
No asbestos detected.

Sample No. 8. ASET49814 / 52994 / 8. TP12 (0.2-0.4).
Approx dimensions 11.0 cm x 10.0 cm x 6.5 cm
Approx total dry weight of soil = 730.0g
The sample consisted of a mixture of clayish soil, stones, plant matter and fragments of plaster.
No asbestos detected.

Sample No. 9. ASET49814 / 52994 / 9. TP13 (0.2-0.3).
Approx dimensions 11.0 cm x 10.0 cm x 7.2 cm
Approx total dry weight of soil = 810.0g
The sample consisted of a mixture of clayish soil, stones, sandstone, plant matter and fragments of plaster.
No asbestos detected.

Sample No. 10. ASET49814 / 52994 / 10. TP10 (0.2-0.4).
Approx dimensions 10.0 cm x 10.0 cm x 6.5 cm
Approx total dry weight of soil = 680.0g
The sample consisted of a mixture of clayish soil, stones, plant matter and fragments of plaster.
No asbestos detected.

Sample No. 11. ASET49814 / 52994 / 11. TP16 (0-0.2).
Approx dimensions 11.0 cm x 10.0 cm x 6.7 cm
Approx total dry weight of soil = 750.0g
The sample consisted of a mixture of clayish soil, stones, plant matter and fragments of plaster.
No asbestos detected.

Analysed and reported by,

Chamath Annakkage. BSc
Environmental Technician/Approved Identifier

Mahen De Silva. BSc, MSc, Grad Dip (Occ Hyg)
Occupational Hygienist / Approved Signatory

Accredited for compliance with ISO/IEC 17025.

This report is consistent with the analytical procedures and reporting recommendations in the Western Australia Guidelines for the Assessment Remediation and Management of Asbestos contaminated sites in Western Australia and it also satisfies the requirements of the current NEPM Guidelines. NATA Accreditation does not cover the performance of this service (NATA ISO/IEC17025 AUG 2014).

Disclaimers;

The approx; weights given above can be used only as a guide. They do not represent absolute weights of each kind of asbestos, as it is impossible to extract all loose fibres from soil and other asbestos containing building material samples using this method. However above figures may be used as closest approximations to the exact values in each case. Estimation and/ or reporting of asbestos fibre weights in asbestos containing materials and soil is out of the Scope of the NATA Accreditation. NATA Accreditation only covers the qualitative part of the results reported. This weight disclaimer also covers weight / weight percentages given.

The results contained in this report relate only to the sample/s submitted for testing. Australian Safer Environment & Technology accepts no responsibility for whether or not the submitted sample/s is/are representative. Results indicating "No asbestos detected" indicates a reporting limit specified in AS4964 -2004 which is 0.1g/ Kg (0.01%). Any amounts detected at assumed lower level than that would be reported, however those assumed lower levels may be treated as "No asbestos detected" as specified and recommended by AS4964-2004. Trace / respirable level asbestos will be reported only when detected.

Estimation of asbestos weights involves the use of following assumptions;
Volume of each kind of Asbestos present in broken edges have been visually estimated and its been assumed that volumes remain similar throughout the binding matrix and those volumes are only approximate and not exact. Material densities have been assumed to be similar to commonly found similar materials and may not be exact.

ACM - Asbestos Containing Material - Products or materials that contain asbestos in an inert bound matrix such as cement or resin. Here taken to be sound material, even as fragments and not fitting through a 7mm X 7 mm sieve.

AF -Includes asbestos free fibres, small fibre bundles and also ACM fragments that pass through a 7mm X 7 mm sieve.

FA -Friable asbestos material such as severely weathered ACM, and asbestos in the form of loose fibrous material such as insulation products.

^ denotes loose fibres of relevant asbestos types detected in soil/dust and fragments of ACM smaller than 7mm diameter.
*** denotes asbestos detected in ACM in bonded form.**
 # denotes FA.

All samples indicating "No asbestos detected" are assumed to be less than 0.001 % unless the actual approximate weight is given.

AUSTRALIAN SAFER ENVIRONMENT & TECHNOLOGY PTY LTD
Suite 710/ 90 George Street Hornsby NSW 2077 PO Box 1644 Hornsby Westfield NSW 1635
Ph: 02 9987 2183 Fax: 02 9987 2151 Email: info@ausset.com.au

50 mL sample →

ASET JOB NO: ASET49814/52994/1-10

Company Name & Address: Network Geotechnics

Contact Ph:

Contact Name: Mehran Asadabadi

Job No: 609/2087

Project Name: Iluka Reserve

Email Results to: engineering@netgeo.com.au

	Sample ID	Date	Type	Container	Sample Location	Asbestos in Material	Asbestos in Soil	Asbestos Fibre Count	Asbestos in Water	Asbestos WA/NEPM	Lead Analysis	
1	TP2 (0.2-0.4)	8/4	soil	Plastic bag	—					/		
2	TP4 (0-0.2)	↓	↓	↓	↓					/		
3	TP7 (0.2-0.5)									/		
4	TP3 (0.1-0.3)									/		
5	TP1 (0.3-0.5)									/		
6	TP15 (0.1-0.2)									/		
7	TP15 (0.2-0.4)									/		
8	TP12 (0.2-0.4)									/		
9	TP13 (0.2-0.3)									/		
10	TP10 (0.2-0.4)									/		
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												

RECEIVED
11 APR 2016

Relinquished By: Mez
Date & Time: 12.30 pm
Signature:

Received By: AMALKA
Date & Time: 12.15
Signature:

Turn around time				Method of Shipment
24 Hrs		3 Days	X	Hand del.
48 Hrs		5 Days		

Appendix E

PID Calibration Certificate

PID Calibration Certificate

Instrument PhoCheck Tiger
Serial No. T-105522

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments			
Battery	Charge Condition	✓				
	Fuses	✓				
	Capacity	✓				
	Recharge OK?	✓				
Switch/keypad	Operation	✓				
Display	Intensity	✓				
	Operation (segments)	✓				
Grill Filter	Condition	✓				
	Seal	✓				
Pump	Operation	✓				
	Filter	✓				
	Flow	✓				
	Valves, Diaphragm	✓				
PCB	Condition	✓				
Connectors	Condition	✓				
Sensor	PID	✓	10.6 ev			
Alarms	Beeper	✓	**Low**	**High**	**TWA**	**STEL**
	Settings	✓	50ppm	100ppm	N/A	N/A
Software	Version	✓				
Data logger	Operation	✓				
Download	Operation	✓				
Other tests:						

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No		Instrument Reading
PID Lamp		100ppm Isobutylene	NIST	SY64		102.0ppm

Calibrated by: **Justine Teo**

Calibration date: **5/04/2016**

Next calibration due: **5/05/2016**